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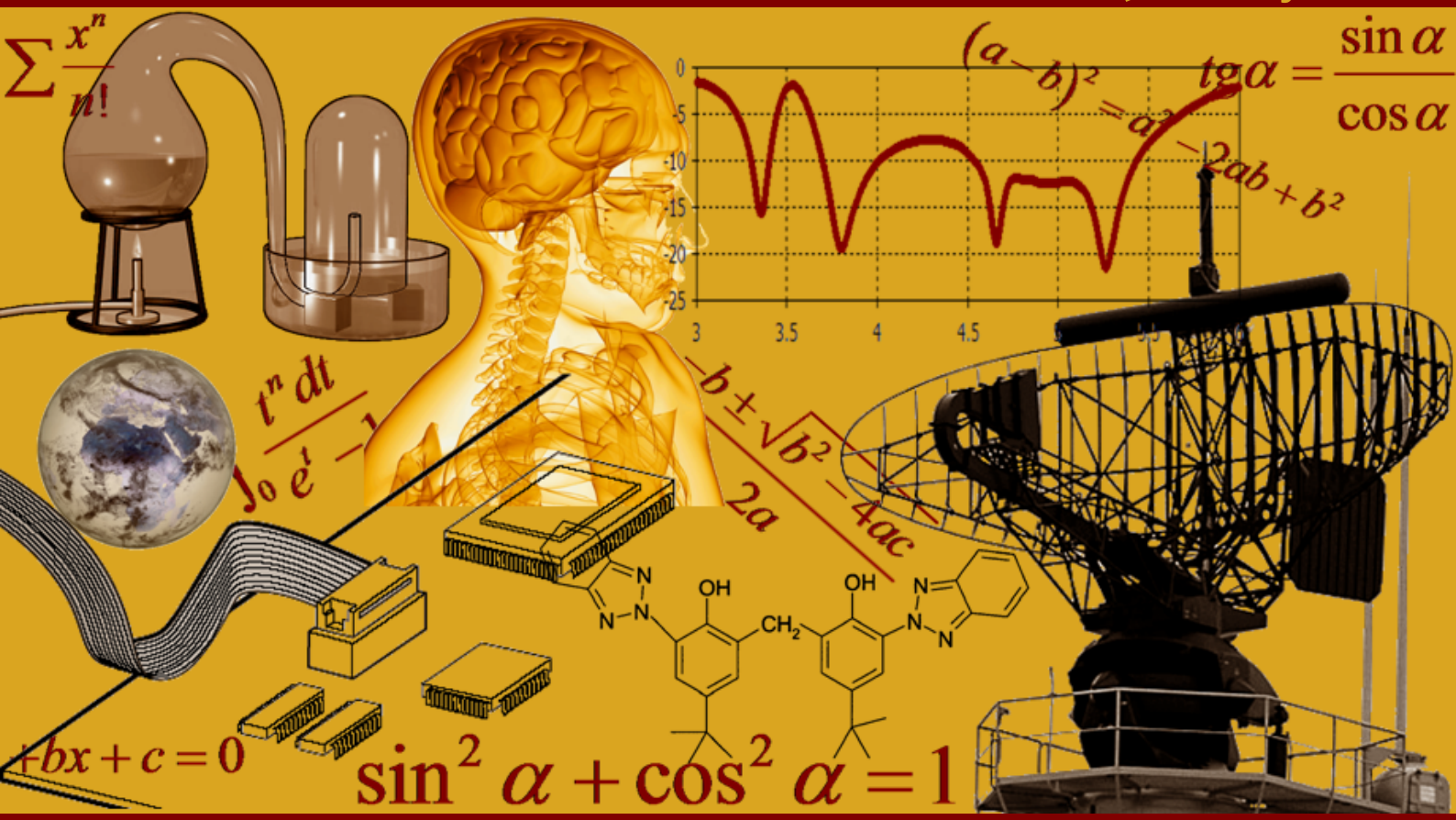

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Age, Gender and Students' Attitude Towards the Study of Economics in some selected Secondary Schools in Calabar Municipality of Cross River State Nigeria

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ABSTRACT: The main purpose of this research work was to examine the effect of age, gender and students' attitude towards the study of Economics in some selected secondary schools in Calabar municipality of Cross River state of Nigeria. The sample for this study was 120 senior secondary two students selected from four secondary schools in Calabar municipality, thirty students were randomly selected from each of the four schools using simple random sampling technique. Four hypotheses were postulated as a guide to this study and a 20 items questionnaire divided into four sections was used to get the required information. A simple Pearson's product moment correlation was used to test the hypotheses at 0.05% level of significance. It was found out that there is significant relationship between ages, gender, interest and motivation of the students and their attitude towards Economics. Based on these findings, it was recommended that since there is a significant relationship between students, ages, gender and their attitude towards economics, both sexes should be encourage and motivated to study Economics. Also, the existing examination bodies and Ministry of Education should use the knowledge embedded in this work to improve on the contents of their syllabuses in order to make it more relevant to the needs of the students. Given its importance in a world like ours, the authorities of our various schools and even the Ministry of Education should endeavour to make Economics a core course in the secondary school programme.

KEYWORDS: Attitude, interest, motivation, economics, education, age, gender, involvement.

BACKGROUND TO THE STUDY

Economics education deals fundamentally with the impact of education on such phenomena as the occupational structure of the labour force, the recruitment and promotion practices of employers, the migration of labour between regions within a country and between different countries, the patterns of international trade, the size and distribution of personal income, the propensity to save out of current income and most general of all, the prospects of economic growth. It is an essential component of the learning process of secondary school students and in line with the policy of education that secondary education is designed to diversify the knowledge and skills, which young boys and girls should acquire to be able to actualize their varying motivations, interests and attitudes [3 pp. 5]. This quality is often lacking in most economic teachers, the result of which leads to poor attitude towards the subject by students. Where economics is taught, much is left to individual teacher's taste and initiative. Sometimes, the teachers involved in the teaching of this subject are unqualified teachers. The other common reason which generates a total neglect of economics education and poor attitude towards the subject in schools is the involvement of economic teachers in teaching other subjects in the secondary school curriculum, thus allowing them little or no attention to economics. The undue emphasis on science subjects has also led to the negligence of economics education and this has reduced the value we tend to place on it in our indigenous culture. It is also noted that the period for economic lessons are diverted and used by the teacher for other subjects. This poor method of economics education inhibits students' application of basic economic tools and encourages them to be completely dependent in later life.

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[6] Noted that the position of economics as a school teaching subject has been deteriorating to the extent that even those who qualify in it abandon it for other subjects – being looked upon as inferior and unintellectual. Thus the talented student in economics education is denied the opportunity to excel in economics. It is important also to mention that the study of economics especially in secondary schools is important because it sets out a foundation which initiates students into a particular way of thinking and eventually responding to situations. Emphasis has been laid on the attitude dimension of larger personality variables as they relate to the overall school achievement. According to [11 pp. 216], attitude is "a developmental state of organismic valence, created by psych-biological processes, exerting a motivational influence upon the individuals' responsive behaviour in situations directly and indirectly related to it". Attitude depends on self-concept, interest, student involvement, motivation and students' perception of the subjects. To help students understand the study of economics in the classroom requires an understanding of their effective behaviour such as interests, attitude, values, and personality, as well as their cognitive skills and knowledge. Students should have a sound foundation in the study of economics right from secondary school level to be able to fit into economic, social and business life since secondary education, according to the National Policy of Education, is aimed at preparing students for working life and for higher studies.

This research work therefore intends to examine the issue of students' ages, gender and attitude towards economics and how their attitude, interest, involvement and motivation influence their study of economics.

REVIEW OF RELATED LITERATURE

This segment is aimed at reviewing related literature and views espoused by some authors on students' ages, gender and attitude towards the study of economics in secondary schools and will be done under the following subheadings; the historical view point of economics as it relates to its study in schools, students' attitude towards the study of economics, students' involvement in ethno economic activities, students' interest and their attitude towards economics, motivation and students' attitude towards economics:

THE HISTORICAL VIEWPOINT OF ECONOMICS AS IT RELATES TO ITS STUDY IN SCHOOLS

According to [9], the early curriculum experts Dewey (1913), Stratemeyer (1918) and Tyler (1949) have expressed in their different articles the necessity of relating the content of the school curriculum to the needs, interest and experience of the learners as well as goals, needs and values of the society.

Milton Friedman (intellectual father of the Monetarist school of thought) recommended economics strongly as did Keynes who said that the study of economics lets one understand many things about life. In another perspective, Keynes (1936) recorded that there are so many things a person really cannot understand without some "scientific knowledge" of economics, and that economics usually does not seek to predict the behaviour of a specific individual, instead it focuses on the general behaviour of a large number of individuals. Tradition played a very important role in economics in ancient times and, infact throughout most of history. It still plays a very important role in some of the less developed countries of the world. Its influence still can be seen even in modern society in such things as the economic relationship.

According to [10], the growth of economics in the school curriculum spans through what constituted curriculum in the pre-historic time, Greek, Romans period to the present. By the period of the Roman imperialism, economics has been included in the writings of most philosophers from the very beginning [10 pp 3]. The Old Testament and the New Testament of the bible contain much economics, as do the writings of religious other than Christianity. Every religion has been concerned with the issues of the right and wrong economic behaviour and with social choices. The bible, the Talmud, the Koran and other sacred scriptures and religious writings contain much economics.

The end of the 19th century witnessed the colonization of the present Nigeria. The British tradition in education is steadily planted in Nigeria schools through the curriculum that was western world oriented. [2]remarked that "one clear inheritance from the past of the persistent official desire to justify economics (or, as it was always called in the early days, common sense) as a 'useful subject"'. Teachers were offered economics courses in the 'Normal Schools' and colleges and given welcome incentives. Step by step, the teachings of economics entered the secondary schools. Within the apparently rigid and stable society, dynamic forces were at work as Darwin, Charles,Marx; etc turned the world into an unquiet position. Many eminent people began to have interest in the notion of children's economic work as a valuable activity in its own right. St Thomas Aquinas, a medieval philosopher was one of the writers who insisted that economics was a process, important to individual development.

Tyler (1949) as quoted by [9], suggested that since learning results from the active involvement of the learner, the teacher should have adequate information about his students to know whether their present achievements, their present background and their present mental sets are such that the desired behaviour is possible for them since the drive for further achievement results from the satisfaction of past achievements.

STUDENTS' ATTITUDE TOWARDS THE STUDY OF ECONOMIC

According to [11pp216-217], "attitude is a developmental state of organismic valence created by psycho-biological processes, exerting a motivational influence upon the individual's responsive behaviour in situations directly and indirectly related to it ". He further contended that attitude possesses intellectual, biological, social and emotional components derived from experience, which excercises a determining influence upon behaviour. Numerous experiences that show in individual, certain stimuli are responsible for satisfying state of affairs that predispose him to readily accept such stimulations as beautiful. Biological limitation and visual impairments hinder this appreciation. The school aims at helping learners to perceive the aesthetic structure of objects to sense and love beauty whenever encountered. This creates positive attitude. Children learn such appreciation when they perceive themselves as constituting part of the experience, teachers who are sensitive to beauty in nature and art can influence the development of appreciation of expression in others, through subtle teaching, comments and facial and body movements as they share their aesthetic experiences with the learners.

In consonance to [11] proposition, [6] adds sharing something of value, with students (such as humor and personal experiences) listening to them with empathy, treating them with warmth and acceptance, showing interest in the subject, communicating positive expectations and encouragement and ensuring that students set realistic goals. Positive attitude enhance learning as they create interest in the tasks viewed as beautiful. This attitude could be generalized to the teacher, other subjects, other teachers and the entire school or even the education system. Negative attitude creates dislike and leads to opposite responses.

To buttress [6]'s idea, [7] as quoted by [12 pp. 208] sees attitude as a "learned internal state which influences choices of personal actions towards some category of persons, objects or events". He further opined that attitude is a desire or tendency to approach or avoid something, persons or situations. It has intensity and direction. Attitude affects instructional communication through the various components of the process. Conversely, [14], (as quoted in the journals of Faculty of Education, University of Calabar (2003, vol.2) in his HIV/AIDS awareness, attitude and behaviour) defined attitude as "a person's position or disposition with regards to an individual or thing". It can be viewed as a predisposition to perceive things, events, persons and action. Our attitude towards a thing or event determines our relationship with the situation, he contended. Here, attitude has been conceptualized to be the manner and state of mind, behaviuor or conduct regarding matters and indicating opinions and purpose.

Again, [5] opined that attitude underlies behaviour in such a fundamental way that if we wish to understand behaviour, it is necessary to first understand the nature of attitude. Attitudes are formed as a result of experience and can hardly be represented as a singe construct [14]. Hence, they are said to have cognitive, affective and behavioural dimension [5 pp45]. [8] Had earlier demonstrated the multi-dimensional rather than uni-dimensional nature of this construct when he related sex, age, educational and other background factors to it.

Finally, attitude which is an expression of likeness or dislikeness plays a significant role in learning all subjects, particularly economics. Since economics involves a little of mathematics in learning it, students' attitude is a major factor because their thinking or behaviour towards it will determine the levels of their diligence and achievement. In essence, without positive attitude, it is almost impossible to perform well in economics.

STUDENTS' INVOLVEMENT IN ETHNO- ECONOMIC ACTIVITIES

Students' involvement refers to being involved in activities that are connected to learning. The liberating factor in this definition is the freedom of the classroom. The learning does not have to be restricted to a classroom setting, but can encompass all areas. According to [4 pp 23] in his "A Development Theory for Higher Education" opined:

> "Quite *simply, student involvement refers to the amount of physical and psychological Energy that the student devotes to the academic experience*".

Freud 1967 believed that people invest psychological energy in objects and persons outside of themselves. In other words, people can cathect for their friends, families, schoolwork and jobs. According to Freud's definition, involvement here refers to people placing lots of energy into outside activities. This energy translates into learning. By cathecting, or investing emotional energy on their schoolwork, they become more involved in the schoolwork and thus are more psychologically

invested. Involvement refers to investment of physical and psychological energy in various objects. It speaks how much physical and mental energy you put into an activity. Regardless of its object, involvement occurs along a continuum; that is, different students manifest different degree of involvement in a given object. For the purpose of this study, students' involvement in ethno – economic activities such as drawing scale of preference to rank their demands, saving money in the bank, attending quizzes, debates and economic conferences, bargaining for the prices of goods and services in the market will help sharpen and ginger positive attitude towards economic.

As Austin [4 pp23] put it, "the amount of student learning and personal development associated with any educational programme is directly proportional to the quality and quantity of student involvement in that programme." The more and better the student involvement is, the more and better the student learning will be. The effectiveness of any educational policy or practice is directly related to the capacity of that policy or practice to increase student involvement. To ginger positive attitude towards economics, student involvement in ethno – economic activities should be encouraged. It turned out that virtually every significant effect could be rationalized in terms of the involvement concept, that is, every positive factor was likely to increase student involvement in school experience, whereas every negative factor was likely to reduce involvement.

STUDENTS' INTEREST AND THEIR ATTITUDE TOWARDS ECONOMICS

The mental state called interest has received much attention in recent literature. Psychologists have disputed as to the exact meaning to be assigned to the term and the precise nature of mental state. Interest has been variously defined as a kind of consciousness accompanying and stimulating attention, a feeling pleasant or painful directing attention – the pleasurable or painful aspect of a process of attention and as identical with attention itself. Thus it may be said; "I attend to what interests me", and again that to be interested and to attend to are identical.

To [17 pp24] in their description of normative interest sees interest in the sphere of action that has a legalistic connotation. According to them, in the sense of the usage of the term, they refer to action to which one has right, actions that are appropriate and worthwhile for the person concerned. In the school system, they contend that the teacher in the normative sense of the use interests ought to pursue the concerns of his student. His actions and teacher – pupil relationship in the course of doing his job as a teacher should be intent in guidelines; and he is indeed following the curriculum? What are the expected achievements of the programme and is he equipped to achieve those set goals? Consideration of interests in this sense refers to those aspects of school activities that are beneficial to the children to which, by rules and regulations of the school system, the school pupils have a right to benefit from.

Again, [17 pp25] also described the psychological usage of the term "interest" as what a child in school for instance is interested in, what he pays attention to, and what he is inclined to participate in, take notice of or even contribute to. They further added that there is a reference to interest in a more dispositional sense, dispositions that are somewhat permanent as in the case of hobbies like reading, gardening, walking, and singing. There are activities we could be interested in and disposed to in a somewhat permanent way.

Furthermore, [15] defined interest as "a preference for one activity over another." This definition emphasizes two points: first, interest involves the selection and ranking of activities along a like – dislike dimension. One student, for instance, may prefer listening to records to working arithmetic problems. Second, interest involves activities or behaviours engaged in by individuals. Interest is expressed by actions verbs, such as reading a book, playing a phonograph or planting flowers. Regardless of the method used to measuring interests, the components of indicating preferences for activities along a like-dislike dimension will be present.

MOTIVATION AND STUDENTS' ATTITUDE TOWARDS ECONOMICS

[6 pp3] defines motivation as "a theoretical construct used to explain the initiation, direction, intensity and persistence of behaviour, especially goal-directed behaviour". It refers to the subjective experiences of students particularly their willingness to be involved in learning activities including reason to or involvement. Also, [12 pp205] says "motivation is a trigger stimulus – it can be mere expectation." Generally, it refers to a process of arousing, maintaining, controlling and channeling interest and attention towards or while performing a particular task.

In general terms, students' motivation refers to a students' willingness, need desire and compulsion to participate in, and be successful in, the learning process. [16] developed the definition further, noting that students who are motivated to engage in school "select tasks at the border of their competences, initiate action when given the opportunity and exert

intense effort and concentration in the implementation of learning tasks; they slow generally positive emotion during ongoing action, including enthusiasm, optimism, curiosity and interest"(p3). Less motivated or disengaged students on the other hand, "are passive, do not try hard, and give up easily in the face of challenges" [16].

Student motivation is often divided into two categories: extrinsic motivation and intrinsic motivation. A student can be described as extrinsically motivated when he or she engages in learning "purely for the sake of attaining a reward or for avoiding some punishment" [8]. He further contends that school practices that seek to motivate students extrinsically include publicly recognizing students for academic achievement; giving out stickers, candy and other rewards; and taking away privileges, such as recess, on the basis of students' academic performance [7]. A student can be described as intrinsically motivated when he/she is motivated from within. Intrinsically motivated students actively engage themselves in learning out of curiosity, interest or enjoyment or in order to achieve their own intellectual and personal goals. According to [8], "a student who is intrinsically motivated will not need any type of reward or incentive to initiate or complete a task; " this type of student is more likely to complete the chosen task and be excited by the challenging nature of an activity". While any kind of motivation seems preferable to none, there is compelling evidence that students who are more intrinsically than extrinsically motivated fare better [7].

To further buttress [8]'s proposition, [1] opined that students' attitude about their capabilities and their interpretation of success and failure further affect their willingness to engage themselves in learning. For example, students who understand poor performance as a lack of attainable skills, rather than as some innate personal deficiency, are more likely to re-engage themselves in a task and try again. Students whose self concept is bound up in their history of failure, on the other hand, are less likely to be motivated to learn. To motivate students in the study of economics, teachers should tend to magnify students' initial level of motivation. This is fine for students who enter the classroom motivationally "rich", they will "get rich". However, for students whose motivation is low, their typical classroom experiences may result I its further deterioration, also, promotion of mastery learning [1]. When a student completes an assignment that does not meet the expected criteria, give him or her opportunity or more to tackle the task again, with guidelines on how to achieve the desired result" [8]. Evaluate students' work as soon as possible after a task completion, and be sure that feedback is clear and constructive.

Research has it that the teachers who are more successful in engaging students develop activities with students' basic psychological and intellectual needs in mind [2], will motivate them to study economics eagerly.

THEORETICAL FRAMEWORK

Following theories were advanced to support the research topic:

1. The Stimulus- Response Theory of Pavlov, Thorndike and Skinner.
2. Abraham Maslow Motivational Theory.
3. Clark Hull S-R Theory.

The stimulus – response theory split into classical and operant conditioning theories of Ivan Pavlov, Edward Lee Thorndike and Burrhus Skinner, which has it that all responses are subject to stimulus within the environment, supports the age, gender and students' attitude towards economics.

Generally, students have a strong aversion for mathematics and mathematics related courses such as economics, so to be able to develop their interest for economics one has to pair what they (students) like by praising every effort they make in solving any economics problem in the class.

Edward Lee Thorndike (1874-1949) was one of the earliest American educational psychologist and the first that systematically carried out experiments to study how non- reflexive behaviours can be modified from experience. In his operant conditioning of stimulus- response theory, he considered the strengthening of the connection between stimuli and responses as being responsible for the formation of habits. He performed some experiments to demonstrate how this happens and used an apparatus called puzzle or problem box where he placed hungry animals such as rats, cats and tested them to create a stronger stimulus – response connection from them. The educational implication of Thorndike operant conditioning theory as it relates to study is that the teacher is to ensure that once an appropriate response is made, it is important to reward it. Continuously rewarding the correct response ensures the establishment and strengthening of the stimulus response connection or bond [11 pp217].

Abraham Maslow motivational theory of 1954 as described in his hierarchy of needs proposes that every human being has needs which are consistent with the theory of learning. According to his self actualization needs theory which involves the drive to become what one is capable of becoming – includes growth, achieving one's potential and self – fulfillment will

motivate a student performance and attitude in a given subject. The educational implication is that performance motivation may thus be considered as a latent disposition which involves a persistent desire to get involved and perform.

Clark Hull, an American psychologist covered different areas in his studies, which include hypnosis, concept formation, test measurement, learning and motivation. He focused mainly on habit strength, drive reduction and intervention variables. Hull's 1943 theory was essentially a stimulus- response, in which he mainly sought to break this connection into a number of intervening variables that are responsible. He identified some positive factors that enable an individual to respond and some negative factors that hinder the response. The positive factors include the habit strength and drive while the negative factors include fatigue and conditioned inhibition. He further contends that the difference between the positive and negative factors determines the possibility, speed and intensity of the response.

Hull advocated for drive reduction theory of reinforcement when he classified reinforcement into primary and secondary reinforcement. The theory states that "strong stimulation of any sort is aversive to an organism and any reduction in this stimulus acts as a reinforce for immediately preceding behaviour.

The educational implication of Hull's theory as it relates to this topic is that it provides much value to school system. The school authorities can base the planning of their curriculum, syllabuses, scheme of work and the notes of lesson on means of drive reduction. It also reduces negative stimulation for students and made for positive reinforce building. From the above discourse, it is pertinent to state that since attitude, motivation, interest, self – concept and involvement can change according to circumstances and incentives and since they can act in both directions, the attitude of students towards economics can change positively or negatively thereby affecting performance. It is also imperative that this study be carried out since it is assumed that little literature on attitude exists with reference to behaviour change and achievement in economics.

METHODOLOGY

The research design used in this study is a non experimental survey design. This design is chosen because it is a form of descriptive research that is aimed at studying large and small population where large and small samples from population are collected in order to examine the distribution, incidence and interaction of educational, sociological and psychological phenomena or problems. The population of this study constitutes students in senior secondary two (SSS 2) from four (4) secondary schools randomly selected from fifteen (15) secondary school in calabar municipality which was randomly selected using simple random sampling techniques. The total of one hundred and twenty (120) students were randomly selected from the four schools, hence thirty (30) students were selected from each of the four (4) schools. It was however believe that these students have been taught and have gained some experience in the subject for at least one full year in their respective secondary schools. The instrument used to gather information was a questionnaire designed to test student's response on attitude, age and gender towards economics. The students were required to provide the researcher with correct information relating to their opinion and disposition about the study of economics. to ascertain the effectiveness of the learning of economics in the selected schools, there was a questionnaire designed to test students' interest, involvement and motivation towards the study of economics. This was meant to evaluate the students towards the study of economic as a subject. The questionnaire meant for the study contained 20 items which will be divided into four (4) sections. The first section will contain students' personal data, the second section will require their responses on interest, the third section will require their responses on involvement while the fourth section will be motivation and a space provided for their individual responses. The questionnaire was administered and the responses was collected, collated, tabulated, quantified and computed. A Spearman Correlation Coefficient was used in analyzing the items to test the hypotheses. The analysis was therefore meant to find out the relationship between students' ages, gender, interest, involvement and motivation. The result of the analysis is as shown on the tables below:

Table 1.1

Ages of students	**Male (X)**	**Female (Y)**
12 – 15 yrs	25	12
16 – 18 yrs	27	20
19 – 21 yrs	16	10
22yrs and above	7	3

Table 1.2

Variables	∑X	∑Y	∑X2	∑Y2	∑XY	r-value
Student's Ages	77	45	1659	653	1021	0.980

Critical value = 0.176, calculated value r = 0.980, DF = 118, N = 120

Table 1.3

Gender		∑X2	∑X	∑Y	∑Y2	∑XY
Male (X)	Female (Y)					
18	12	1593	75	45	693	657
30	0					
15	15					
12	18					

∑X = 75 ∑Y= 45 ∑X2= 1593 ∑Y2 = 693 ∑XY = 657;
Critical value = 0.176, calculated value r = 0.980, DF = 118, N= 120

Table 1.4

Variable	∑X	∑Y	∑X2	∑Y2	∑XY	r-value
Students' interest	272	68	16696	1428	2940	0.590

Critical value = 0.176, calculated value r = 0.590, DF = 118, N = 120

Table 1.5

Variable	∑X	∑Y	∑X2	∑Y2	∑XY	r-value
Students Involvement in Ethno – Economic Activities	338	106	17462	2260	4594	0.718

Critical value = 0.176, calculated value r = 0.718, DF = 118, N = 120

Table 1.6

Variable	∑X	∑Y	∑X2	∑Y2	∑XY	r-value
Students' motivation	392	110	23206	1956	4121	0.589

Critical value = 0.176, calculated value r = 0.589, DF = 118, N = 120

Table 1.7

VARIABLES	MEAN (X)	SD Standard Deviation	R- VALUES	DF Degree of Freedom	Capital values
Ages	8.50	2.89	0.980	118	0.176
Gender	5.47	2.73	0.615	118	0.176
Interest	24.5	11.26	0.590	118	0.176
Students' involvement	38.28	11.25	0.718	118	0.176
Motivation	34.34	13.30	0.589	118	0.176

RESULT

The result of the findings of hypothesis one as shown in table 1.1, shows that there is a significant relationship between students' ages and their attitude towards economics. This is true because the ages of the students will go a long way to determine their attitude towards the study of economics. In line with this, Pavlov (1849 - 1936), a cognitive theorist, argues that the age of a student determine his attitude and achievement in a particular subject.

The result of table 1.2 shows that gender has a significance influence in the attitude of students towards the study of economics. Studies have shown that female students are more conservative and prudent in their spending than male students. This could lead to the high level of females in the study of economics than male students, but according to this

finding, the attitude of both sexes towards the subject is the same. The result of table 1.3 shows that there is a significant relationship between students' interest and their attitude towards economics. In agreement with the result these findings, [15], observed that interest involves that interest involves the selection and ranking of activities along a like – dislike dimension. One student may prefer listening to records to working arithmetic problems. He also alleged that interest involves activities or behaviours engaged in by an individual.

Also, [17] observed that if a student has an interest in a particular subject, it will be in his / her best interest to attend lessons, carry out class activities like participation in laboratory exercises, listen to the teacher, do assignments, look up references and so on. Again to Pavlov theory of stimulus – response, to elicit a students' interest is to award any positive response from him/ her. So interest goes a long way to determine the performance a particular student in a subject. The result of table 1.4 shows that students' involvement in ethno – economic activities is significantly related to their attitude towards economics. This implies that the students' involvement in ethno – economic activities will help shape their attitude towards the study of economics. Since economics involves the study of the optimal use of available resources, their (students') involvement in ethno – economic activities will build a positive attitude towards the study of economics. The result of table 1.5 shows that attitude of students towards economics is dependent on their motivation towards the subject. According to [12], motivation is a trigger stimulus- it can be mere expectation. Generally, it refers to a process of arousing, maintaining, controlling and channeling interest and attention towards or while performing a particular task. In line with result of this findings, [16], notes that students who are motivated to engage in school select tasks at the border of their competences, initiate actions when given the opportunity and exert intense effort and concentration in the implementation of learning tasks; they show generally positive emotion during ongoing action, including enthusiasm, optimum curiosity and interest. To motivate students in the study of economics, teachers should tend to magnify students initial level of motivation. [13] Further opined that to a very large extent, students expect to learn if their teacher expects them to learn. [1] Observed that students' attitude about their capabilities and their interpretation of success and failure further affect their willingness or motivation to engage them in learning.

CONCLUSION

This study investigates the influence of age, gender and attitude of students towards the study of economics in secondary schools in Calabar. From the findings as already stated above, the following conclusion can be drawn.

It was found out that it is not necessarily age and gender that can influence students' attitude in the subject but rather, other intervening variables such as students' involvement, motivation and the interest of the students towards the subject. Discrepancy in ages could also play a vital role in creating interest in the study of economics. Students' within the age bracket of 16 – 18 years could be showing greater interest in economics than students within the age range of 12 – 15 years. Also, female students are seen showing more interest and having a positive attitude towards economics than male students. This is because of the conservative nature of their lives.

Also, the role of interest in developing positive attitude towards the study of economics is very vital. Our study shows that eliciting students interest is to award any positive response he / she makes. Hence, there is a significant relationship between students' interest towards the study of economics. Interest and attention is one of the factors that affect students' perception towards a particular subject. Although there could be distinction between interest and attitude, these two terms are not entirely independent, one may have an interest in arranging flower and positive attitude towards flowers in general. Students' motivation affects their readiness to offer or choose economics as a subject. This is so because teachers and parents should magnify the students' effort in trying to solve economic problems.

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EVALUATION DE LA PRODUCTION ET COMMERCIALISATION DU SOYA (*Glycine max*) DANS LE GROUPEMENT DE BUSHUMBA, COTE OCCIDENTAL DU LAC KIVU, EST DE LA REPUBLIQUE DEMOCRATIQUE DU CONGO

[EVALUATION OF PRODUCTION AND MARKETING OF SOYBEANS (*Glycine max*) IN BUSHUMBA, WESTERN COAST OF LAKE KIVU,DEMOCRATIC REPUBLIC OF CONGO]

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ABSTRACT: The research went on in BUSHUMBA Grouping (Kabare Territory) and aims at assessing (evaluating) the production and commercialization (selling) of soya in this area, since it contribute satisfactory to the development of KABARE Territory in BUSHUMBA grouping particularly and South Kivu province generally. Through the inductive method, direct observation and investigation we came to the following results: 82, 1% of sample population state that the production of soya have reduced the rate of poverty in their home (s), 17,9% of them have rejected the fact. Then the following recommendations (suggestions) could be given: May the sensitization meeting about nutritious values of soya be organized by the medical staff in order to encourage the producer to benefit from their production. Secondly may the public service collaborate sufficiently with both sellers and producers so as to motivate to be creative and take themselves in charge (support themselves). Finally, may the local producer population accept willingly the (other) industrial soya seeds (hybrid-seed) so that they produce more.

KEYWORDS: Soya, production, commerce, nutritious, economical, KABARE Territory, DR Congo

RESUME: L'étude s'est déroulée dans le groupement de Bushumba et a comme objectif d'évaluer la production et la commercialisation du soya dans ledit groupement car cette culture contribue, d'une manière satisfaisante au développement de la Chefferie de Kabare, dans le groupement de Bushumba en particulier et celui de la province en général. Les méthodes inductives, d'observation directe et de l'enquête ont été utilisées. Les résultants montrent que 82,1 %confirment que ce soja contribue à la réduction de la pauvreté au sein de leurs familles, 17,9% ne l'acceptent pas. Les recommandations suivantes peuvent être formulées : Que les séances de sensibilisation sur les valeurs nutritives du soja soient organisées par le personnel médical du milieu pour aider les agriculteurs à consommer ce qu'ils produisent localement ensuite que les services étatiques collaborent étroitement avec les producteurs et vendeurs de manière à les stimuler à la créativité pour leur auto-prise en charge et enfin, que les populations accueillent à bras ouverts d'autres semences améliorées de soja pouvant leur permettre de produire davantage et de se conformer à l'évolution de la science.

MOTS-CLEFS: Soja, production, commercialisation, nutritive, économique, Kabare, RD Congo.

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1 INTRODUCTION

Le Soja ou soya (*Glycine max*) est une culture vieille. Le soja est cultivé en Asie depuis les temps immémoriaux pour l'alimentation de l'homme et des animaux et utilisé pour la première fois en Chine, le soja a été adopté comme aliment de base dans de nombreuses parties d'Asie, notamment au Japon, en Corée, en Indonésie, aux Philippines, au Vietnam, en Thaïlande, en Malaisie, en Birmanie, au Népal et au nord de l'Inde entre le I^{er} et XVI^{ème} siècle[1].

Le soja est le végétal cultivé le plus riche en protéines, éléments minéraux et autres nutriments indispensables à la santé de l'homme (vitamines A, B, C, D, F et K). De par sa composition, le soja peut valablement se substituer à la viande, aux œufs et au lait qui font défaut dans certaines régions. En effet, un kilogramme de soja équivaut en protéines à 40 kg de manioc, 13 litres de lait de vache, 3 kg de viande de bœuf et 60 œufs de poules. Le soja est cultivé pour ses graines qui sont utilisées en entier dans l'alimentation humaine ou transformées pour produire de l'huile de soja et des tourteaux destinés au bétail. La farine déshuilée de soja entre pour une bonne part dans l'industrie alimentaire : biscuiterie, boulangerie, pâtisserie, pâtes alimentaires, laiterie, fromagerie, aliments pour enfant, aliments de régime (pour les diabétiques), etc. Par ailleurs, les tiges et les feuilles du soja constituent un excellent engrais vert et servent de fourrage pour les animaux. En outre, de par sa capacité à fixer l'azote de l'air, le soja enrichit le sol et fait profiter les cultures qui lui succèdent. Cependant, la principale utilisation des graines de soja reste la fabrication de l'huile de soja qui concurrence l'huile d'arachide sur le marché international [2].

Le soja joue pour certains pays un réel rôle économique : les plus grands exportateurs du monde sont par ordre d'importance : les USA, le Brésil, l'Allemagne, la Chine et le Paraguay [3] et la pénétration de soya s'est opérée en commençant par les pays anglophones africains. Sur ce continent, les pays comme le Nigeria, l'Afrique du Sud, le Zimbabwe sont classés parmi les grands producteurs de cette culture. Le soja est connu en Afrique depuis une trentaine d'années, mais sa culture s'est peu développée. Elle fait sur tout l'objet l'expérience dans les stations expérimentales de différents pays.

L'Afrique intervient très peu sur le marché du soja malgré quelques réussites tant au niveau de la production commerciale (Zimbabwe), qu'au niveau de la consommation d'une production du soja. Ont été mis en place par les Etats (Nigéria) des centres internationaux (IITA) ou des organisations non gouvernementales [4].

La RD Congo a d'énormes potentialités tant minérales qu'agricoles qui font sa fierté sur l'échiquier mondial. Ces richesses sont répandues d'une manière inéquitable dans toutes ses provinces. En agriculture, la RDC a tissé des partenariats avec des organismes et organisations internationaux pour accompagner les communautés à valoriser leurs terres ; donc à pouvoir produire davantage. L'Organisation des Nations Unies pour l'Alimentation et l'Agriculture (FAO) en RD Congo assure un appui technique et organisationnel aux acteurs des services connexes et l'encadrement des groupes défavorisés (femmes et jeunes), finance « à 100% sur une période de deux ans » le projet « Appui au développement de la filière soja » pour un montant de 297.000 USD. Destiné à enrayer la malnutrition observée dans certaines familles insuffisamment instruites, le projet recourt à la méthode des « champs école-paysans » initiée par la FAO en vue de développer cette filière par la promotion des techniques de conservation et de transformation du soja, d'appuyer sa commercialisation par la mise sur les marchés des produits et des sous-produits du soja, et de renforcer les capacités techniques et organisationnelles des producteurs. Il a été ajouté aux autres cultures de base bien qu'il ait été introduit durant les années antérieures. La préoccupation du gouvernement est d'assurer la sécurité et l'autosuffisance alimentaire à tous les Congolais, où qu'ils soient sur le territoire national. Chaque province a été ciblée pour la production des aliments constituant la base et la culture alimentaire de ses habitants, en tenant compte des atouts climatiques et pédologiques qu'offre son relief. Cette culture de soja ne s'adapte pas à toute sorte des sols car en RDC, toutes les provinces n'ont pas la même structure des sols. Dans la province de Bandundu, le représentant de l'Organisation des Nations Unies pour l'Alimentation et l'Agriculture (FAO) en République Démocratique du Congo (RDC) a salué la promotion de la culture du soja dans le territoire d'Idiofa situé à 131 km de la ville de Kikwit [5].

Le gouvernement veut étendre cette culture dans toutes les provinces dans le but ultime de lutter contre la malnutrition dans les milieux ruraux. De nombreuses familles congolaises font de la culture du soja du business parce qu'elle leur permet de subvenir à leurs besoins vitaux une fois travaillé sous plusieurs formes. Dans la province du Sud Kivu, cette culture de soja n'est pas oubliée par les agriculteurs à cause non seulement de ce qu'elle procure en terme d'argent mais aussi ses apports sur le plan nutritionnel. Le soja n'est pas généralement cultivé sur de grandes étendues en province du Sud Kivu. Les agriculteurs locaux l'associent avec d'autres cultures et /ou légumineuses comme l'arachide et le haricot. Cependant, il est pratiqué dans beaucoup de coins de la province.

Désormais, les cultivateurs de soja sont appuyés par le Projet d'appui au développement de la filière de culture de soya, une initiative mise en place par l'Organisation des Nations unies pour l'Alimentation (FAO) et un projet pilote de la culture de soja vient a été lancé dans la Chefferie de Kaziba, territoire de Walungu, au Sud Kivu par la FAO où plus ou moins 1200

ménages, ainsi que de micros, petites et moyennes entreprises, ont été identifiées comme bénéficiaires de ce projet. Cette culture est aussi pratiquée dans la Chefferie de Kabare plus particulièrement dans la Commune Rurale de Kavumu.

Au regard de ce qui précède, la production du soja dans le groupement de Bushumba contribue-t-elle au développement socio-économique du milieu ? Es-ce que les producteurs et les vendeurs du soja de Bushumba tirent profit dans cette culture de manière à répondre à leurs besoins existentiels ?

Le soya est une des légumineuses, la plus cultivée, pratiquée dans les groupements de la Commune Rurale de Kavumu, elle procurerait des avantages non négligeables aux agriculteurs lorsque le rendement est élevé. Nombreux ménages résolvaient leurs problèmes vitaux (paiement des primes scolaires de leurs enfants, construction et/ou réhabilitation de logements, paiement des factures de soins médicaux, etc.) à partir des dividendes dégagées par cette culture, une fois mise sur le marché. Mais, les efforts devraient encore entre consentis d'une part par ces agriculteurs en ce qui concerne certaines méthodes culturales et autres techniques agricoles pour que le rendement soit maximal afin de répondre valablement à la panoplie des problèmes qui sont les leurs et d'autre part, le Gouvernement devrait, au travers ses services spécialisés, apporter de l'assistance financière, matérielle, technique et morale à ces agriculteurs pour qu'ils s'investissent avec assurance dans cette noble activité.

L'objectif de cette est d'évaluer la production et la commercialisation du soya dans le groupement de Bushumba car cette culture contribue, d'une manière satisfaisante, au développement de la Chefferie de Kabare, dans le groupement de Bushumba en particulier, et celui de la province en général.

2 MATERIEL ET METHODES

2.1 MILIEU D'ETUDE

Le groupement de Bushumba est l'un de 7 groupements qui compose la Commune Rurale de Kavumu et s'étend sur une superficie de 203 km^2 dont 104 km occupés par la population et 89 km occupés par des concessionnaires et des collines dénudées. Il est limité au Nord par le groupement de Bugorhe et le groupement de Luhihi, au Sud par le groupement de Mudaka, à l'Ouest par le lac Kivu et le groupement de Lugendo et à l'Est par le groupement de Miti.

L'altitude de Bushumba varie entre 1780 m et 1850m. Il comporte un relief accidenté dominé par des nombreuses collines presqu'inhabitées. Ces collines nécessitent un reboisement car elles subissent souvent des érosions hydriques. Il compte plus de 50 marais très inondés et qui sont exploités de façon irrégulière sous un drainage élémentaire par les paysans.

Le climat dominant de cette partie du Sud-Kivu est celui de tropical humide avec deux saisons à savoir la saison de pluie qui dure neuf mois, soit du mois de septembre au mois de mai, et la saison sèche qui ne dure que trois mois, soit du mois de juin au mois d'août. Des températures sont modérées et diminuent avec l'altitude à 20,5^{o} C à Birava (bord du lac), 19^{o}C au camp militaire de Nyamunyunyi et 16^{o}C au tour du Parc National de Kahuzi Biega. Son sol est en grande partie argilo-sablonneux sur des collines mais très exposés aux érosions tant hydriques qu'éoliennes et des sols aides au pH 4 dans la plus part des marais.

La végétation à Bushumba est constituée d'une savane herbeuse de montagne dominée par des graminées fortement diversifiées et quelques arbustes. Cette végétation a remplacé une végétation primitive constituée de la forêt primaire à *Albizia grandibracteata* dont les reliques sont encore visibles dans les stations de Mugeri, Kakondo et Lwiro [6].

2.2 METHODE

L'enquête s'est déroulée dans la Commune Rurale de Kavumu, plus précisément dans le groupement de Bushumba, à travers un questionnaire d'enquête distribué à plus de 38 enquêtés durant quinze mois, période allant de juin 2013 à août 2014. La méthode d'observation (directe) des plants de soya a été faite. L'observation directe nous a permis d'observer certains faits tels que la nature du sol, l'état de santé des enfants dont les familles produisent et vendent du soja. Bref, observer les incidences de la culture du soja sur la population et le milieu.

Le questionnaire d'enquête nous a permis de collecter des données, des informations auprès de certains producteurs et vendeurs du soja vivant dans notre rayon de recherche.

Nous avons laissé huit semaines aux enquêtés pour qu'ils répondent aux questions sans précipitation et contrainte. Les personnes que nous avons ciblées sont des producteurs et des vendeurs de tout âge et de sexe confondus, vivant dans les localités de la recherche.

Lorsqu'on mène une enquête en vue de récolter les renseignements sur un problème donné, on travaille sur de petits groupes bien définis qu'on appelle « échantillon » [7]. Un échantillon est donc une représentation réduite de la population plus large. Les techniques d'échantillonnage sont nombreuses, elles différent selon les auteurs. C'est ainsi que nous avons opté pour un échantillon de 40 sujets que nous avons réparti selon le sexe, l'âge, la quantité produite, le prix du soja, la rentabilité, la connaissance de la valeur nutritive du soja et sur une population mère de 198.

Voici la formule que nous avons utilisée pour calculer la taille de l'échantillon : $n \geq N/7$

NB : si n< à 30, il est conseillé d'augmenter la taille de l'échantillon [8].

La méthode inductive nous a permis de généraliser certaines réalités liées à la culture de soja constatées dans les groupements de la recherche et de pouvoir tirer la conclusion qui s'impose. Grace à la méthode analytique et comparative, nous avons pu analyser et interpréter les données recueillies sur le terrain [9]. Nous avons vu et partagé les informations avec les vendeurs sur ce qu'ils gagnent dans le soja par rapport à d'autres producteurs du milieu dont le marché ne constitue pas le dernier débouché.

L'analyse multi variée, pour décrire la population ciblée de notre recherche, a été utilisée et, plus de deux variables entre autre l'âge, la fonction, l'état civil, etc. ont été utilisés.

L'analyse statistique a été faite par le logiciel EPI- INFO.

3 RESULTATS

Tableau 1. Ages de nos enquêtés

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
De 10 à 19 ans	3	7,5	7,5
De 20 à 29 ans	15	37,5	45,0
De 30 à 39 ans	5	12,5	57,5
De 40 et plus	17	42,5	100
Total	**40**	**100**	**100**

A la lumière de ce tableau, nous remarquons que 17 personnes sur 40 (soit 42,5%) sont âgées de 40 et plus, 15 personnes sur 40 (37,5 %) sont âgées de 20 à 29 ans, 5 personnes sur 40 (12,5) sont âgées de 30 à 39 ans alors que 3 personnes sur 40 (soit 7,5%) sont âgées de 10 à 19 ans.

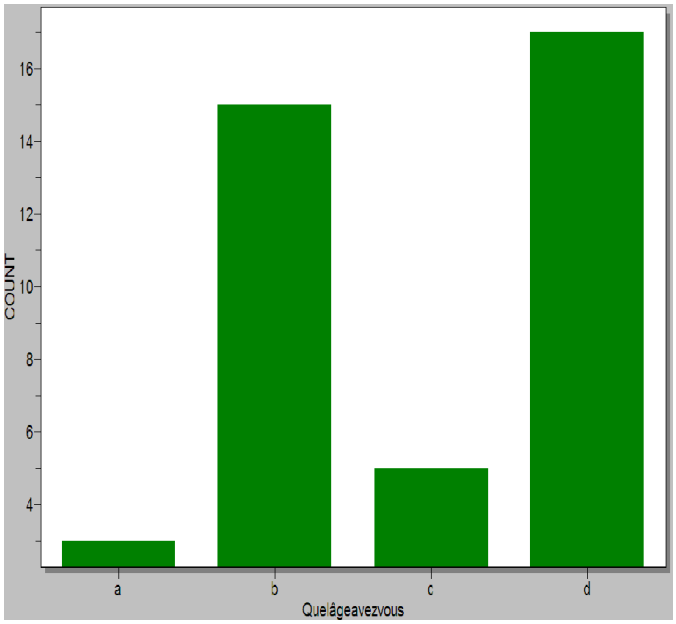

Fig 1. Comparaison d'âge de nos enquêtés

Tableau 2. Sexes

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Masculin	25	62,5	62,5
Féminin	15	37,5	100
Total	**40**	**100**	**100**

Au vu de ce tableau, nous lisons que 25 personnes sur 40 de nos enquêtées (soit 62,5%) sont de sexe masculin alors que 15 personnes sur 40 (soit 37,5 %) sont de sexe féminin.

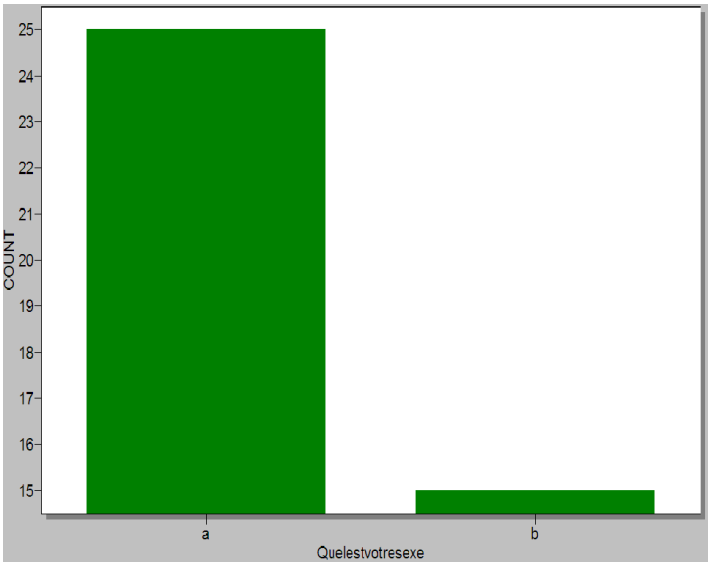

Fig 2. Sexe de nos enquêtés

Tableau 3. Niveau d'études

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Primaire	10	25,0	25,0
Secondaire	9	22,5	47,5
Universitaire	16	40,0	87,5
Pas d'études	5	12,5	100
Total	**40**	**100**	**100**

En observant ce tableau, nous nous rendons compte que 16 personnes sur 40 de nos enquêtés (soit 40 %) sont de niveau universitaire, 10 personnes sur 40 (25 %) sont de niveau primaire, 9 personnes sur 40 (soit 22,5 %) sont du niveau secondaire et 5 personnes sur 40 (soit 12,5 %) n'ont pas d'études.

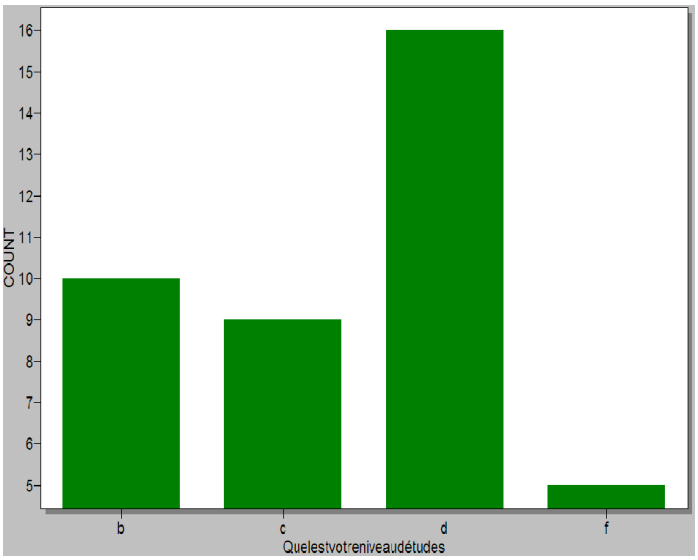

Fig 3. Niveau d'études de nos enquêtés

Tableau 4. Etat civil

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Célibataire	17	42,5	42,5
Marié	18	45,0	87,5
Divorcé	2	5,0	92,5
Veuf (ve)	3	7,5	100
Total	40	100	100

Au vu de ce tableau, nous remarquons que 18 personnes sur 40 (soit 45%) sont des mariés, 17 personnes sur 40 (soit 42,5 %) sont des célibataires, 3 personnes sur 40 (soit 7,5%) sont des veufs (ves) alors que 2 personnes sur 40 (soit 5 %) sont des divorcés.

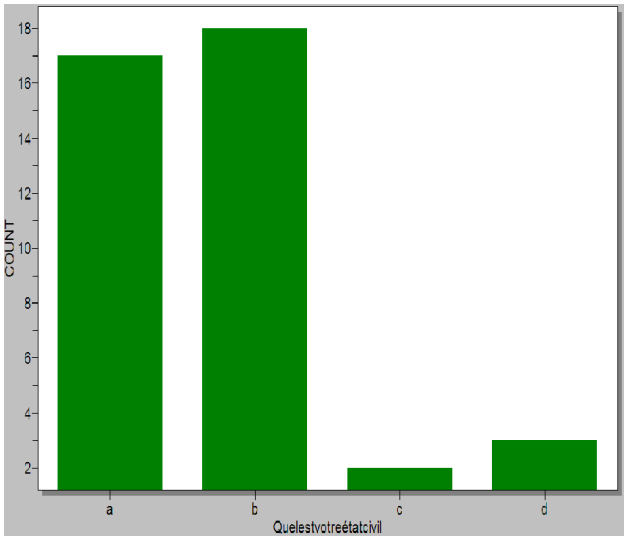

Fig 4. Etat civil des enquêtés

Tableau 5. Fonctions de nos enquêtés

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Etudiant	5	12,5	12,5
Cultivateur	18	45,0	57,5
Vendeur	16	40,0	97,5
Autres	1	2,5	100
Total	**40**	**100**	**100**

En observant ce tableau, nous nous rendons compte que 18 personnes de nos enquêtés sur 40 (soit 45%) sont des cultivateurs, 16 personnes sur 40 (soit 40 %) sont des vendeurs de soja, 5 personnes sur 40 (soit 12,5 %) sont des étudiants alors que 1 personne sur 40 (2,5 %) est fonctionnaire.

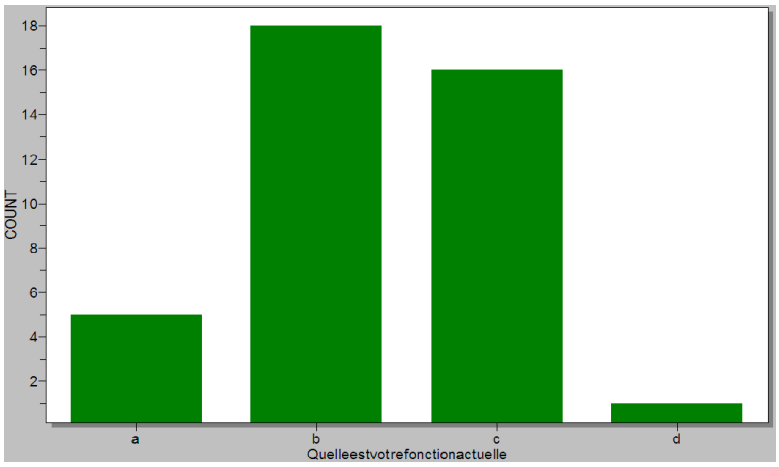

Fig 5.Fonctions de nos enquêtés

Tableau 6.Cultivateurs du Soja dans le groupement de Bushumba

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Les femmes	11	27,5	27,5
Les hommes	2	5,0	32,5
Toutes ces catégories précitées	27	67,5	100
Total	**40**	**100**	**100**

A la lumière de ce tableau, nous lisons que 27 personnes sur 40 (67,5%) témoignent que le soja est cultivé par les hommes comme les femmes, 11 personnes sur 40 (soit 27,5 %) disent que ce sont les femmes qui le cultivent contre 2 personnes sur 40 (soit 5%) qui pensent que ce sont les hommes.

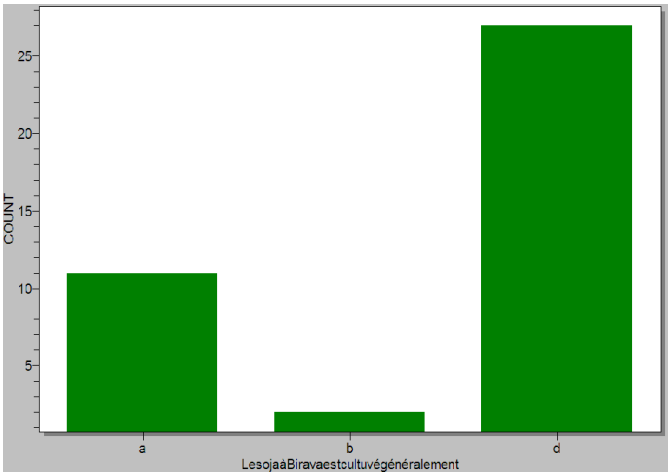

Fig 6.Cultivateurs du Soja dans le groupement de Bushumba

Tableau 7.Place du soja parmi les autres légumineuses dans le groupement de Bushumba

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Oui	29	72,5%	72,5
Non	11	27,5%	100
Total	**40**	**100**	**100**

A la lumière, nous lisons que 29 personnes sur 40 (soit 72,5 %) confirment que le soja occupe la première place alors que 11 personnes sur 40 (27,5 %) lui attribuent une autre place.

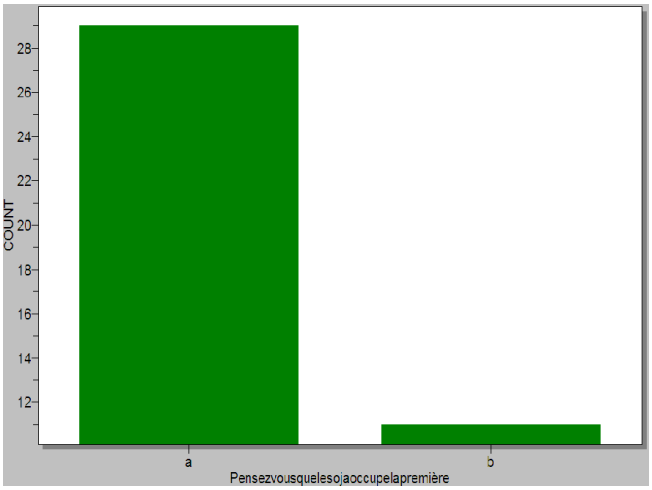

Fig 7.Place du soja parmi les autres légumineuses dans le groupement de Bushumba

Tableau 8. Connaissance de la population sur les valeurs nutritives du soja

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Oui	24	60	60
Non	16	40	100
Total	40	100	100

En lisant ce tableau, nous constatons que 24 personnes sur 40 (60 %) ne connaissent pas ces valeurs nutritives alors que 16 personnes sur 40 (40 %) affirment connaitre cela.

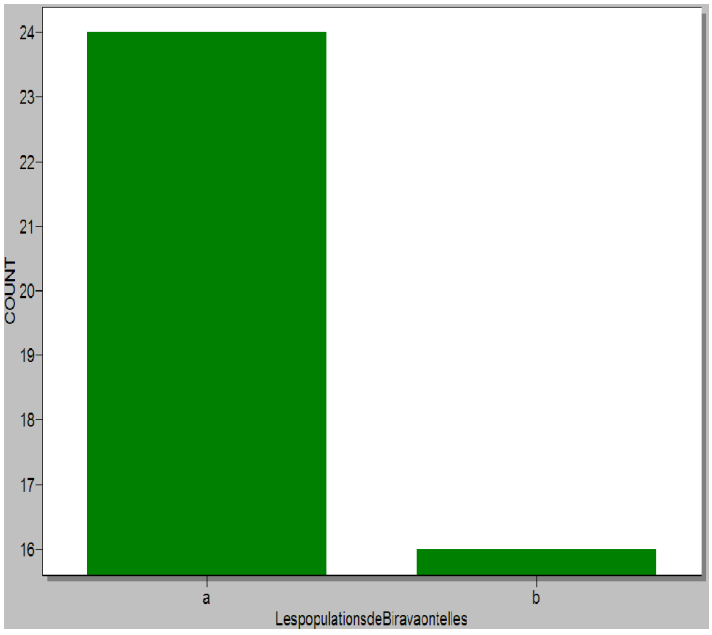

Fig 8. Connaissance de la population sur les valeurs nutritives du soja

Tableau 9. Présence des dépôts de soja dans le groupement de Bushumba

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Oui	20	50	50
Non	20	50	100
Total	**40**	**100**	**100**

Au vu de ce tableau, nous remarquons que 20 personnes sur 40 (soit 50 %) affirment que ces dépôts existent à Bushumba alors 20 personnes sur 40 (soit 50 %) ne le confirment pas.

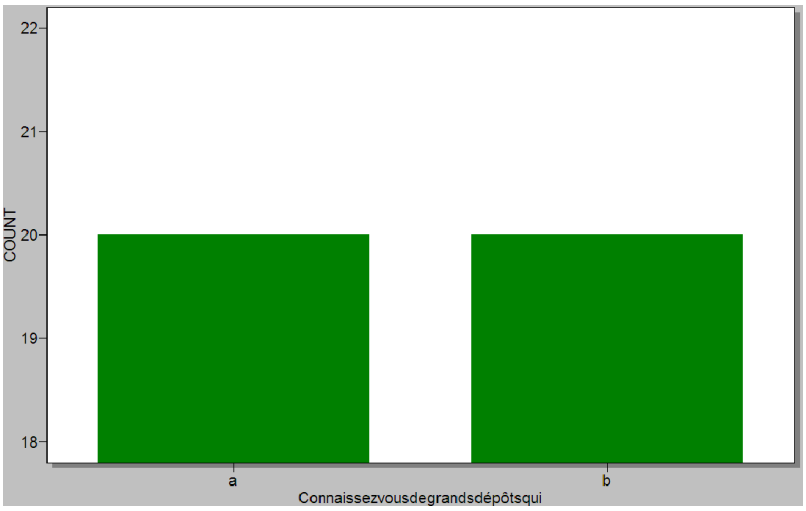

Fig 9. Présence des dépôts de soja dans le groupement de Bushumba

Tableau 10. Production annuelle

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
De 5 à 10 tonnes	5	12,5	12,5
De 10 à 19 tonnes	24	60	72,5
De 20 à 29 tonnes	10	25	97,5
De 29 et plus	1	2,5	100
Total	**40**	**100**	**100**

En lisant ce tableau, nous remarquons que 24 personnes sur 40 (60 %) disent que le groupement de Bushumba produit mensuellement entre 10 à 19 tonnes, 1O personnes sur 40 (25,3 %) parlent de 20 à 29 tonnes, 5 personnes sur 40 (12,5 %) parlent de 5 à 10 contre 1 personne sur 40 (2,5) qui parle de 29 tonnes et plus.

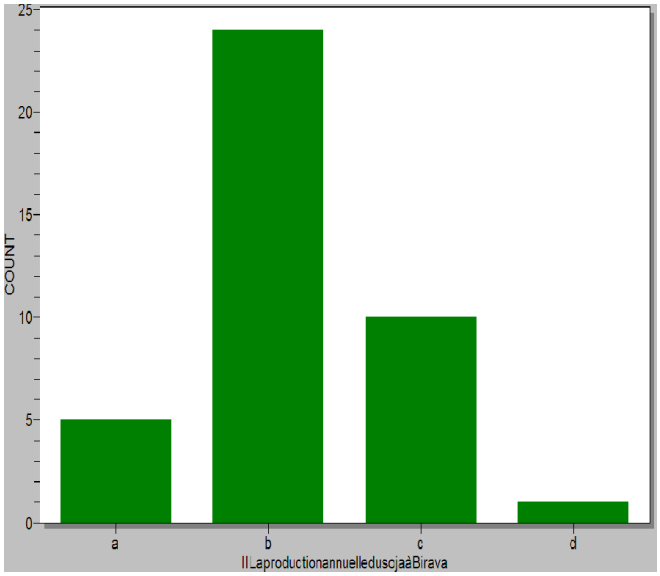

Fig10.Production annuelle

Tableau 11. Existence d'une organisation des producteurs

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Oui	22	56,4	56,4
Non	17	43,6	100
Total	**39**	**100**	**100**

A la lumière de ce tableau, nous constatons que 22 personnes sur 40 (soit 56,4 %) acceptent qu'il y a une organisation des producteurs du soja à Bushumba alors que 17 personnes sur 40 (43,6 %) disent ne pas le reconnaitre.

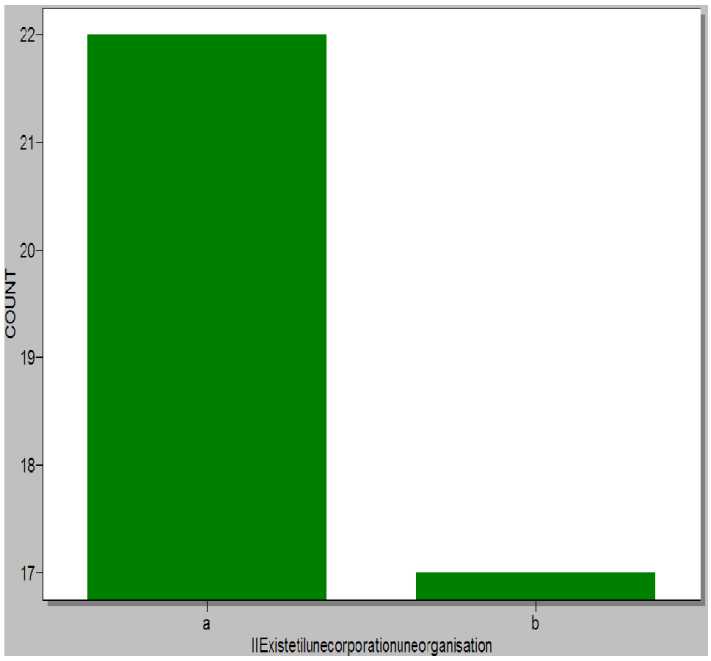

Fig11. Existence d'une organisation des producteurs

Tableau 12. Consommation du soja dans le groupement de Bushumba

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Les populations locales	10	25	25
Les populations vivant en dehors du groupement de Bushumba	30	75	100
Total	**40**	**100**	**100**

En lisant ce tableau, nous nous rendons compte que 30 personnes sur 40 (soit 75%) affirment que le soja produit à Birava est plus consommé par l'extérieur et 10 personnes sur 40 (soit 25 %) disent que ce sont les populations locales qui le consomment.

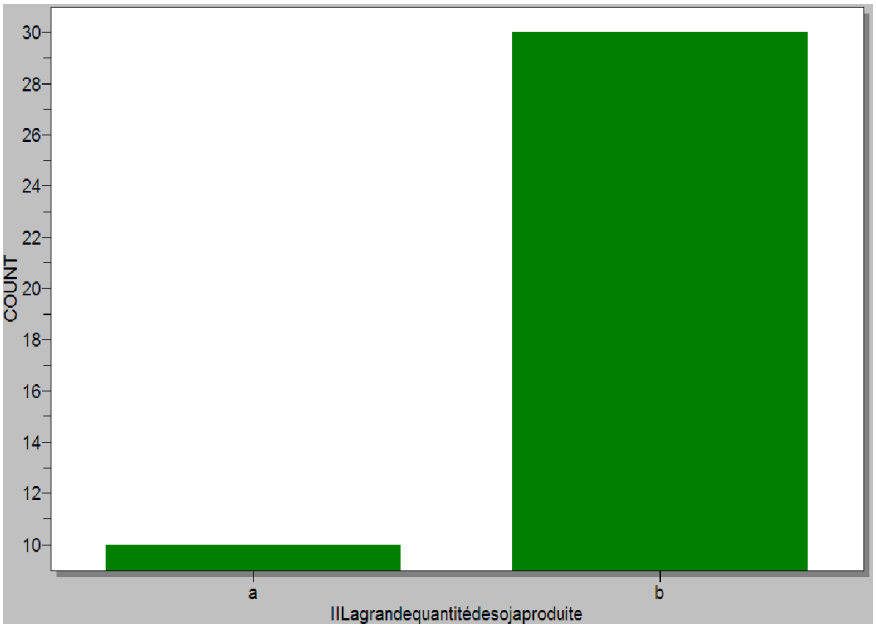

Fig 12. Consommation du soja dans le groupement de Bushumba

Tableau 13. Prix du soja

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Moins de 1 U$	33	82,5	82,5
1,5 U$ et plus	7	17,5	100
Total	**40**	**100**	**100**

Au vu de ce tableau, nous lisons que 33 personnes sur 40 (soit 82,5 %) confirment qu'un kilogramme de soja coûte moins de un dollar américain dans le groupement contre 7 personnes sur 40 (17,5 %) qui pensent qu'il coûte un dollars et demi et plus.

Fig. 13. Prix du soja

Tableau 14. Appréciation du prix

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Acceptable	5	12,8	12,8
Dérisoire	32	82,1	94,9
Exorbitant	2	5,1	100
Total	**39**	**100**	**100**

Au regard de ce tableau, nous constatons que 32 personnes sur 40 (soit 82,1 %) jugent ce prix dérisoire, 5 personnes sur 40 (soit 12,8 %) le jugent acceptable alors 2 personnes sur 40 (5,1 %) le traitent d'exorbitant.

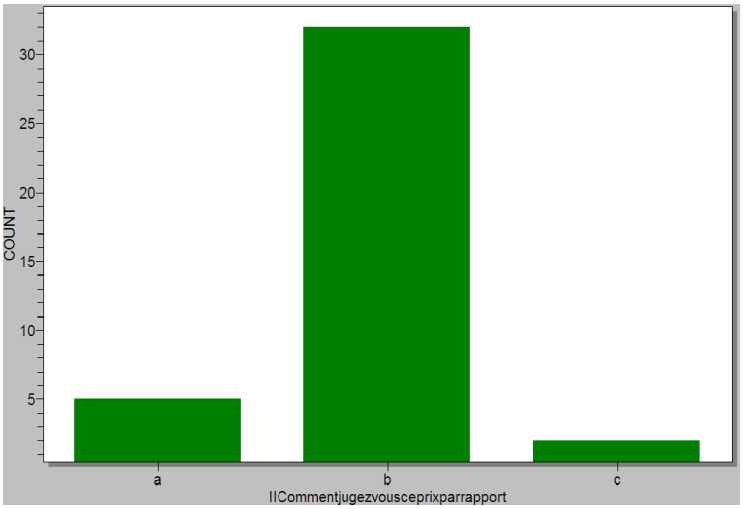

Fig 14. Appréciation du prix

Tableau 15. Concurrence entre produits

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Oui	28	70	70
Non	11	27,5	97,5
Souvent	1	2,5	100
Total	**40**	**100**	**100**

A la lumière de ce tableau, nous remarquons que 28 personnes sur 40 (soit 70 %) disent que le soja dans le groupement de Bushumba rencontre d'autres produits sur le marché, 11 personnes sur 40 (soit 27,5 %) ne le confirment alors que 1 personne sur 40 (2,5 %) sont sceptiques.

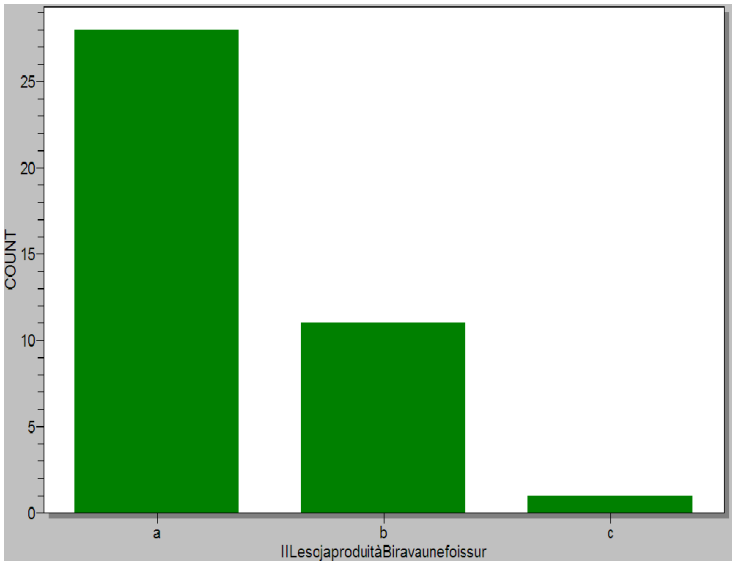

Fig 15. Concurrence entre produits

Tableau 16. Collaboration avec les services étatiques

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Oui	14	35	35
Non	15	37,5	72,5
Quelque fois	11	27,5	100
Total	**40**	**100**	**100**

Au vu de ce tableau, nous voyons que 15 personnes sur 40 (soit 37,5 %) refusent que les services de l'Etat ne favorisent pas les vendeurs de soja de Bushumba, 14 personnes sur 40 (35 %) l'acceptent tandis que 11 personnes sur 40 (27,5%) sont sceptiques également.

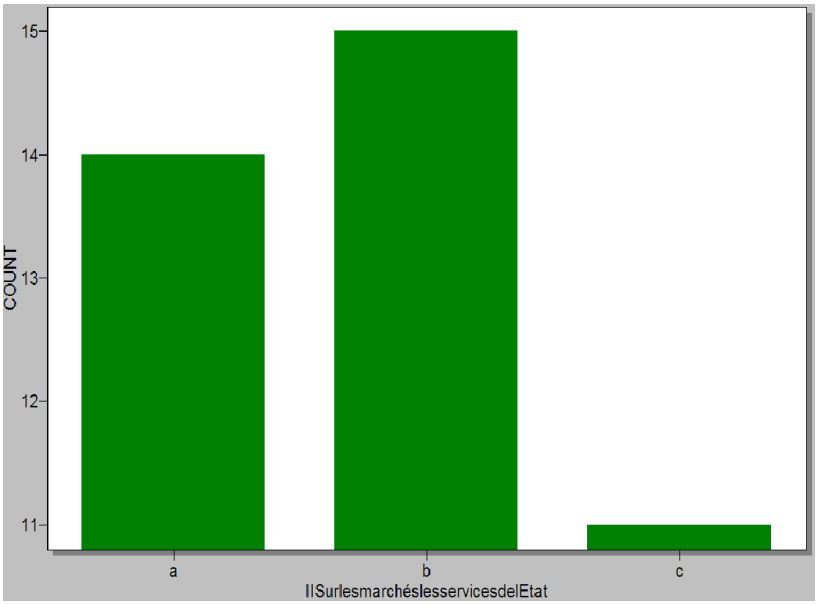

Fig 16. Collaboration avec les services étatiques

Tableau 17.Rentabilité

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Oui	17	42,5	42,5
Non	23	57,5	100
Total	**40**	**100**	**100**

Au regard de ce tableau, nous lisons que 23 personnes sur 40 (soit 57,5 %) disent que ces efforts ne sont pas proportionnels au rendement, 17 personnes sur 40 (soit 42,5 %) pensent qu'il y a en.

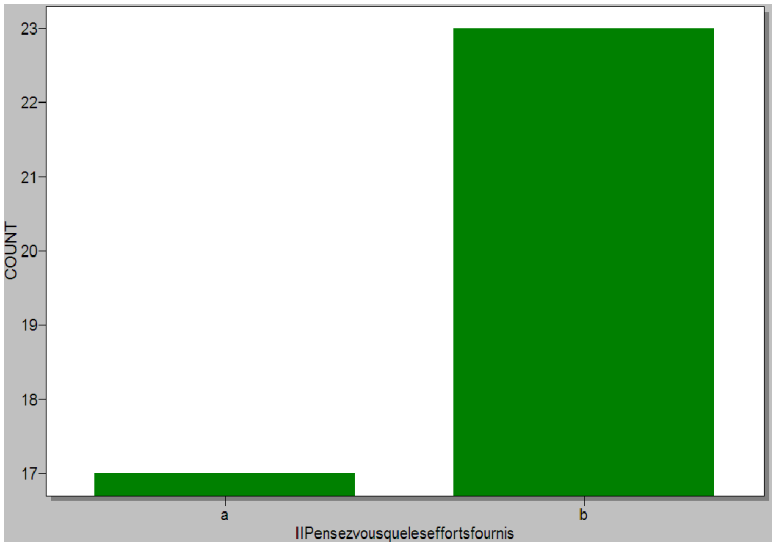

Fig 17.Rentabilité

Tableau 18. Contribution à la réduction de la pauvreté

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Oui	32	82,1	82,1
Non	7	17,9	100
Total	**39**	**100**	**100**

Au vu de ce tableau, nous remarquons que 32 personnes sur 40 (soit 82,1 %) confirment que ce soja contribue à la réduction de la pauvreté au sein de leurs familles, 7 personnes sur 40 (soit 17,9) ne l'acceptent pas.

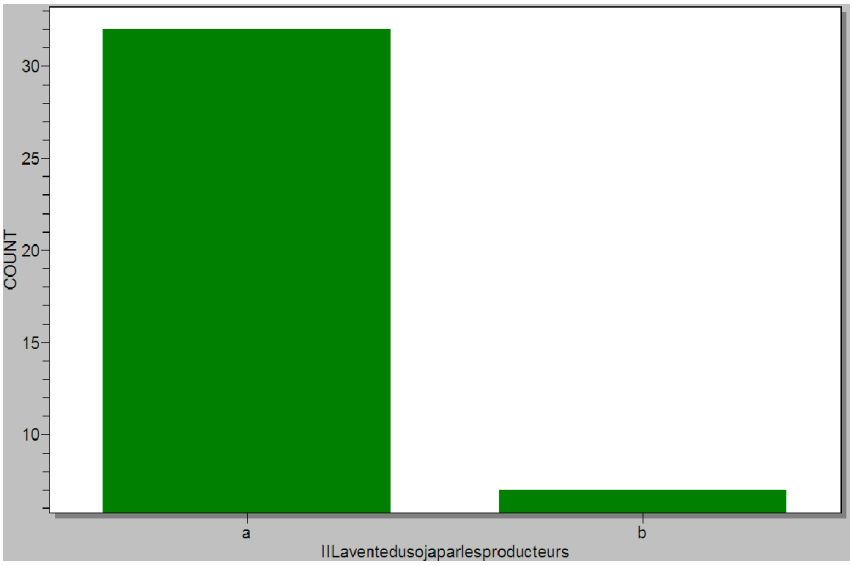

Fig 18 .Contribution à la réduction de la pauvreté

Tableau 19.Encouragement des producteurs locaux

Catégories	Fréquences	Pourcentages(%)	Pourcentages cumulés(%)
Disponibiliser les semences améliorée du soja	2	5	5
Octroyer les crédits agricoles	2	5	10
Distribuer les outils aratoires	10	25	35
Toutes les assertions sont vraies	26	65	100
Total	**40**	**100**	**100**

Au vu de ce tableau, nous nous rendons compte que 26 personnes sur 40 (soit 65 %) pensent que toutes les assertions proposées sont vraies, 10 personnes sur 40 (soit 25 %) pensent qu'il faut distribuer des outils aratoires aux producteurs, 2 personnes sur 40 (5 %) crient qu'il faut octroyer des crédits agricoles contre 2personnes sur 40 (5 %) qui affirment qu'il faille disponibiliser les semences améliorées de soja aux producteurs locaux.

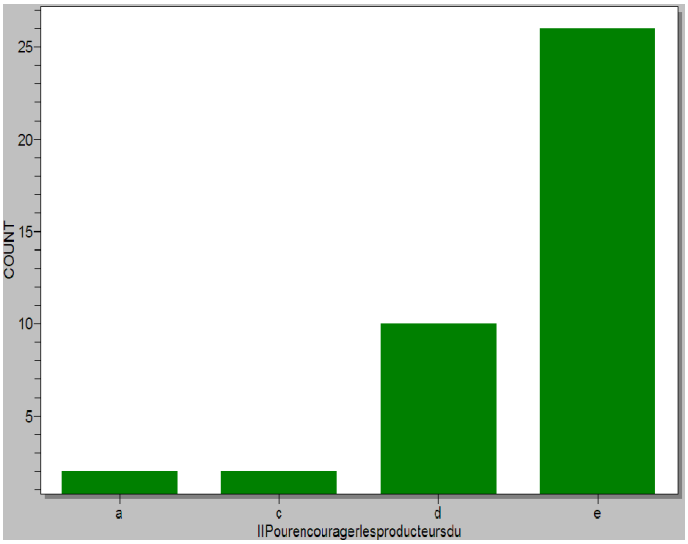

Fig 19.Encouragement des producteurs locaux

4 DISCUSSION

Quant à la connaissance de la population sur les valeurs nutritives que renferme cette culture qu'est le soja, nous constatons que 24 personnes sur 40 (60 %) témoignent qu'elles ne les connaissent pas alors que 16 personnes sur 40 (40 %) affirment connaitre cela. Nous pensons qu'il va falloir que les séances de sensibilisation sur cette culture soient renforcées dans ces contraint.

Plusieurs écrits existent sur le soja et reviennent incessamment sur ces valeurs-là. D'ailleurs, les nutritionnistes lui donnent des valeurs plus ou moins égales à celles de la viande.

Par rapport à l'existence d'une certaine corporation des producteurs du soja dans le groupement de Bushumba, nous constatons que 22 personnes sur 40 (soit 56,4 %) acceptent qu'il y a une organisation alors que 17 personnes sur 40 (43,6 %) disent ne pas le reconnaitre. Ce qui est par ailleurs une bonne chose.

Pour que les populations bénéficient de leurs produits, il est important qu'elles se constituent en corporation ; une force qui, par moment aiderait les membres à revendiquer leurs droits et même à s'entraider pour répondre aux circonstances et aux difficultés de la vie.

S'agissant de la manière dont la population consomme son produit qu'est le soja, nous nous rendons compte que 30 personnes sur 40 (soit 75%) affirment que le celui-ci est plus consommé par l'extérieur et 10 personnes sur 40 (soit 25 %) disent que ce sont les populations locales qui le consomment. Voilà une raison de plus qui confirme que réellement la population ne sait vraiment rien en ce qui concerne les valeurs nutritives de cette culture qui a sauvé tant des vies humaines, notamment les femmes enceintes et les enfants de moins de 5 ans.

En analysant le prix de ce produit, nous constatons que 32 personnes sur 40 (soit 82,1 %) le jugent dérisoire, 5 personnes sur 40 (soit 12,8 %) le considèrent acceptable alors 2 personnes sur 40 (5,1 %) le traitent d'exorbitant. Il faudra faire essayer de produire le soja de bonne qualité pour défier toute concurrence qui influencerait son prix.

Quant à la collaboration des vendeurs avec les services de l'Etat congolais, nous voyons que 15 personnes sur 40 (soit 37,5 %) refusent que ceux-ci ne favorisent pas les vendeurs de soja du milieu, 14 personnes sur 40 (35 %) l'acceptent tandis que 11 personnes sur 40 (27,5) sont septiques également. C'est ce qui, globalement bloque les initiatives locales.

L'Etat qui devrait promouvoir, créer un bon climat des affaires pour permettre aux populations d'évoluer, c'est le même qui, au travers ses services spécialisés, contraignent aux gens à être méfiant vis-à-vis de lui. De fois, on le traite d'un Etat « impitoyable ».

Par rapport à l'intervention de l'Etat vis-à-vis de la culture du soja faite dans le groupement de Bushumba, nous nous rendons compte que 26 personnes sur 40 (soit 65 %) pensent que toutes les assertions proposées sont vraies, 10 personnes sur 40 (soit 25 %) pensent qu'il faut distribuer des outils aratoires aux producteurs, 2 personnes sur 40 (5 %) crient qu'il faut

octroyer des crédits agricoles contre 2 personnes sur 40 (5 %) qui affirment qu'il faille disponibiliser les semences améliorées de soja aux producteurs locaux. Ceci témoigne, à coups sûr que les producteurs comme les vendeurs ont grandement besoin de cette intervention pour pouvoir améliorer leur activité et qu'ils y trouvent un rendement acceptable.

Comme le souligne Martin Ohlen, Directeur de pays et Représentant du PAM « …le travail du PAM ne consiste plus dans les zones où les marchés sont achalandés à distribuer non pas de la nourriture mais des coupons, qui permettent aux personnes en insécurité alimentaire de s'approvisionner localement ; Aussi, son travail consistera à mettre à la disposition de petits producteurs des compétences en logistique pour les aider à stocker et à évacuer les produits vers les marchés. Ces approches permettent à la fois de faire et d'insuffler un dynamisme à la production et à l'économie locale» [10].

Après analyse, interprétations et discutions de nos résultats, nous pouvons affirmer que notre hypothèse est confirmée car, elle a été vérifiée.

De son côté, ADER soutient que le Soja est très recherché pour l'alimentation des hommes et des animaux, etc» [11]. Nous soutenons son idée du fait que le soja est une sorte de haricot dont les graines sont petites et rondes, ces graines sont nourrissantes. Elles sont riches en protéines et contiennent beaucoup d'huile et de sel minéraux dont notre corps a besoin. Le soja contient plus de protéines que la viande, mais en plus de cela ce sont des protéines de très bonne qualité.

L'être humain satisfait ses besoins et ses désirs moyennant des produits, et ensuite un produit correspond à tout bien susceptible de satisfaire un besoin exprimé ou bien tel que les produits alimentaires comme le soja et autres oléagineux qui se distinguent de l'investissement qui constitue à utiliser d'une façon durable des biens provenant du produit fini. Le soja doit être recherché pour l'alimentation de l'homme grâce à son intervention dans une très grande et large gamme de préparation culinaire traditionnelle. Le soja intervient aussi dans l'industrie alimentaire sous multiples formes : margarine, biscuit, boulangerie, aliments de régime et divers. Les utilisations non alimentaires de l'huile sont également nombreuses tel que vernis, peinture, lubrifiants, Glycérine, huile siccative, textile artificiel, … tout ceci montre quelle place occupe le soja dans l'alimentation humaine [12].

Pour les animaux, l'on sait que les relations humaines doivent comprendre en ordre principal et en proposition variable, des matières albuminoïdes, des graisses et des hydrates de carbone. Les premières sont les plus importantes et parmi celles-ci, les protéines occupent la première place. Il existe des protéines animales (viande) et des protéines végétales ; ces dernières ont une valeur biologique élevée, mais leur coefficient de digestibilité est moins élevé que celui de la viande.

Les différences de valeur biologique de diverses protéines sont dues aux amino-acides qui les composent ; on connait parmi ces amino-acides la tyrosine, la cystine, la leucine, le tryptophane, etc. qui ont une importance marquée pour le remplacement et le renouvellement des matières albuminoïdes ou protéiques dans l'organisme. Tandis que le glycocolle qui se trouve dans les nombreuses protéines a une valeur plutôt inférieure, et peut être produit par l'organisme lui-même.

Les protéines végétales sont celles de céréales, des légumineuses, mais les produits végétaux sont, à cet égard, bien inférieurs aux produits animaux, car ils ne contiennent de protéines qu'en petite quantité. Le soja constitue cependant une exception remarquable à cette règle : sous forme de farine, il contient par kilo 415 grammes de matières protéiques, 200 grammes de graisses et donne un total de 4600 calories. Tandis qu'un kilo de viande donne 206 grammes de protéines, 350 grammes de graisse et 2600 calories. La différence en matière protéique est donc en faveur du Soja [13].

Pour MAYER, dans son ouvrage « soja au Congo - Belge », les classifications botaniques sont généralement très incomplètes ou irrationnellement hiérarchisées. Pour cette idée, nous le contestons parce que le soja pousse partout : on peut donc cultiver à proximité des habitations ; ce qui alors permet d'éliminer les emballages, les frais de transport et le bénéfice des commerçants. Le soja donne dans certains endroits deux récoltes par an. Pour le même résultat nutritif, il coûte beaucoup moins. Il améliore et résiste mieux aux maladies et aux insectes que les autres légumineuses.

Fallon Baron dans son ouvrage « Soja propagande et vulgarisation agricole », souligne que soja s'adapte à tous les sols qui produisent des plantes comestibles. Il s'accommode aux différents sols, et préfère les terres légères et profondes. Un terrain qui convient également pour le soja peut aussi convenir pour les arachides. D'où nous devons éviter les terrains compacts, et de l'eau stagnante. Si on enfouit les graines vertes, il est préférable de labourer un ou deux mois avant de semer pour laisser la matière organique se décomposer.

Pour Claude AUBERT, il dit, dans son ouvrage « Onze questions clés sur l'agriculture et l'alimentation », qu'en trois jours de germination, la teneur en vitamine C des graines de soja passe de 0 à 72mg/ 100 mg. En même temps, la teneur en carotène (provitamine A) des graines de céréales et des légumineuses est multipliée par 2 à 4.

5 CONCLUSION

Au terme de cette étude dont l'objet est d'évaluer la production et la commercialisation du soja dans le groupement de Bushumba, les résultats montrent la production du soja contribue au développement socio-économique dans le groupement de Bushumba car cette culture de soja, étant une des légumineuses (d'ailleurs la plus cultivée) pratiquée dans ce milieu, elle procure des avantages non négligeables aux agriculteurs lorsque le rendement a été bon.

Nombreux ménages résolvent leurs problèmes vitaux (paiement des primes scolaires de leurs enfants, construction et/ou réhabilitation de logements, paiement des factures de soins médicaux, etc.) à partir des dividendes dégagées par cette culture, une fois mise sur le marché.

Mais, les efforts doivent encore entre consentis d'une part par ces agriculteurs en ce qui concerne certaines méthodes culturales, le stockage des produits et autres techniques agricoles pour que le rendement soit maximal afin de répondre valablement à la panoplie des problèmes qui sont les leurs.

D'autre part, le gouvernement devrait, au travers ses services spécialisés, apporté de l'assistance financière, matérielle, technique et morale à ces agriculteurs pour qu'ils s'investissent avec assurance dans cette noble activité.

C'est à ce titre seulement que cette culture pourra contribuer, d'une manière satisfaisante au développement du Territoire de Kabare dont le groupement de Bushumba fait partie en particulier et celui de la province en général.

En bref, nous remarquons que 32 personnes sur 40 (soit 82,1 %) confirment que ce soja contribue à la réduction de la pauvreté au sein de leurs familles, 7 personnes sur 40 (soit 17,9) ne l'acceptent pas.

Les recommandations suivantes peuvent être formulées : Que les séances de sensibilisation sur les valeurs nutritives du soja soient organisées par le personnel médical du milieu pour aider les agriculteurs à consommer ce qu'ils produisent localement ensuite que les services étatiques collaborent étroitement avec les producteurs et vendeurs de manière à les stimuler à la créativité pour leur auto-prise en charge et enfin, que les populations accueillent à bras ouverts d'autres semences améliorées de soja pouvant leur permettre de produire davantage et de se conformer à l'évolution de la science.

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REFERENTIEL METIER DE L'AUTOENTREPRENEUR D'UNE PETITE ENTRPRISE AGRICOLE COMME STRATEGIE DE REDUCTION DU CHOMAGE EN MILIEU RURAL : COMMUNE RURALE DE KAVUMU, COTE OCCIDENTAL DU LAC KIVU, EST DE LA REPUBLIQUE DEMOCRATIQUE DU CONGO

[JOB REFERENCE TO A SMALL AUTOENTREPRENOR ENTRPRISE AS AGRICULTURAL STRATEGY FOR REDUCING UNEMPLOYMENT IN RURAL AREAS: RURAL MUNICIPALITY KAVUMU, WESTERN COAST OF LAKE KIVU,DEMOCRATIC REPUBLIC OF CONGO]

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ABSTRACT: The research went on in KAVUMU Rural Commune and aims at designing a duty reference of self-entrepreneur in a small agri-company as a strategy to reduce the unemployment rate in this area. Through this study we show how the unemployment rate is high for the schooled young aged of 15 and 35.The number of street children may also be increased by this situation which becomes now adays a more theatful than before. The young run the risk of being recruited in different army group that can promise them a well being in future. Trying to find an intermediate solution to fight against un employment of the young in KAVUMU Commune, we mention the following result: more than 50% of population chose the self entrepreneur but they face the problem of skills (needed skills) for resulting to a lasting management (the capacity to manage a firm) is the most important so there is the need of a professional training to clarify and the strengthen the self entrepreneurship in a perfect development.This may be implemented only by a curriculum of duty reference about self entrepreneur which integrate all the processor of training such as: Activities-Skills-how to do things-how to behave and the reassessment criteria and rules required to manage a company through small may it be.

KEYWORDS: The young, unemployment, duty curriculum (reference), professional training, agri-company (agriculture firm)

RESUME: L'étude s'est déroulée dans la Commune Rurale de Kavumu et dont l'objet est de mettre en place un référentiel métier de l'auto-entrepreneur d'une petite entrepris agricole comme stratégie de réduction du chômage dans la Commune Rurale de Kavumu, Province du Sud-Kivu, République Démocratique du Congo. Dans cette étude, nous montré comment dans la Commune Rurale de Kavumu le taux de chômage des jeunes est très élevé chez les jeunes diplômés âgés de 15 à 35 ans, que cette situation risque de gonfler l'effectif des enfants de la rue qu'il est fort probable que ce chômage, à Kabare, dans les jours avenir, devienne une menace pire qu'on ne le pensait pas parce que dans une situation d'incertitude et d'exclusion de ces jeunes, situation qui n'inquiète pas les dirigeants du pays, ils risquent de se faire enrôler et recruter par les bandes armées incontrôlées des tueurs et des violeurs en leur promettant un mieux-être ailleurs que dans leur milieu. Dans une tentative de trouver une solution intermédiaire pour lutter contre ce chômage inquiétant dans la Commune Rurale de Kavumu, nous montrons comment plus d'une personne ont beaucoup réfléchi sans aboutir à des solutions attendues ; situation qui a poussé plus de 50% de cette population à s'orienter vers le métier d'auto-entrepreneur mais se bute au problème de compétence recherchées pour aboutir à des résultats satisfaisants pour un développement durable car créer et

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gérer une entreprise demande une forte dose d'énergie et de compétences. Quelques soient les moyens dans les contextes changeants, dans des univers complexes, manager est délicat. D'où la nécessité d'une formation professionnelle pour clarifier les choses et accompagner l'auto entrepreneur dans un développement marginal ; Et ceci ne peut être mis en œuvre que par un référentiel métier d'un auto-entrepreneur qui intègre la quantité du processus de la chaine de formation, notamment : les activités, les compétences, le savoir-faire, le savoir-être, les modalités d'évaluation et les critères d'évaluation car gérer une organisation, même de petite taille qu'elle soit, formelle ou informelle exige de savoir-faire et de savoir être basés sur des cas très concrets des mises en situations vécues.

MOTS-CLEFS: Jeunes, chômage, Référentiel-métier, formation professionnelle, entreprise agricole.

1 INTRODUCTION

L'Afrique regorge une population pauvre, laquelle population cède sans projection du futur aux influences cadrant avec la corruption à cause de la pauvreté [1]. Selon le même document, la population africaine est beaucoup touchée par la misère, les troubles moraux parce qu'une grande partie de leurs mains d'œuvre est en chômage et manque des initiatives à cause de l'insécurité enregistrée sur plusieurs paramètres de la vie.

Ceci étant, la République Démocratique du Congo vit dans une situation déplorable remarquée sur le plan social et économique. Ainsi, le 02 mai 2013, pendant le débat tenu à la radio Okapi en interaction avec la population, le Ministre de l'Emploi, Travail et Prévoyance Sociale, Son Excellence Modeste Bahati Lukwebo, a confirmé que chaque année la République Démocratique du Congo présente 9.000 finalistes universitaires, mais, moins de 100 finalistes accèdent à l'emploi rémunérateur. C'est une situation qui nécessite une attention particulière [2].

La rareté de l'emploi au Congo est à l'origine du chômage aigu tout en provoquant l'économie informelle. Actuellement, beaucoup d'ONG sont visibles partout en RDC, mais le taux du Chômage ne cesse de s'accroitre parce que, la majorité de ces ONG ne visent pas le développement du pays, mais plutôt, s'accaparer de la richesse potentielle de la RDC. Les nationaux intégrés dans ces ONG marchent dans la philosophie de ces dernières au détriment du pays. De ce fait, il devient impossible de promouvoir le développement endogène car, le développement exogène s'articule dans l'ensemble du pays.

Comme retombé, on trouve dans un certain nombre des villages du Sud-Kivu une population marginalisée et paupérisée dans tous les sens et cela, suite à la mauvaise gestion observée de la part des leaders politiques du pays et caractérisés par l'égoïsme alarmant.

Le chômage est déstabilisant pour l'individu concerné, qui perd ses repères, qui se déstructure. Pour les jeunes, en particulier, ce chômage s'inscrit dans un cercle vicieux, les entraînant souvent à la délinquance et à d'autres comportements déviants vers la consommation de la drogue [3]. C'est le cas de la Commune Rurale de Kavumu où le taux de chômage des jeunes est très élevé ; situation qui risque de gonfler l'effectif des enfants de la rue. Il est fort probable que ce chômage, à Kabare, dans les jours avenir, devienne une menace pire qu'on ne le pensait pas parce que dans une situation d'incertitude et d'exclusion de ces jeunes, situation qui n'inquiète pas les dirigeants du pays, ils sont enclins à des actes de destruction massive des biens de l'Etat. D'autres parts, ils risquent de se faire enrôler et recruter par les bandes armées incontrôlées des tueurs et des violeurs en leur promettant un mieux-être ailleurs que dans leur milieu. C'est la tranche de 15 à 35 ans des jeunes dont les uns ont fini les études secondaires et les autres les études universitaires mais sans perspective d'avenir et qui sont contraints de rester auprès de leurs parents qui, malgré leurs maigres revenu, doivent les prendre en charge au grand mépris du gouvernement qui fait la sourde oreille[4] .

Face à cette situation, que nous pouvons qualifier de désastreuse pour certains coins du Sud-Kivu, il est temps que le gouvernement se penche réellement sur le problème pour essayer de trouver des voies et moyens permettant de juguler cette menace imminente au moment où le même gouvernement continue à parles de « 5 chantiers » [5].

Dans une tentative de trouver une solution intermédiaire pour lutter contre ce chômage inquiétant dans la Commune Rurale de Kavumu, plus d'une personne ont beaucoup réfléchi sans aboutir à des solutions attendues. Ceci a poussé plus de 50% de cette population à s'orienter vers le métier d'auto-entrepreneur mais se bute au problème de compétence recherchées pour aboutir à des résultats satisfaisants pour un développement durable. A leurs risques et périls, ces chômeurs créent et gèrent leurs entreprises formelles ou informelles ; D'où la nécessité d'une formation axée sur l'approche par compétence pour clarifier les choses et accompagner l'auto-entrepreneur dans un développement managérial.

Gérer une telle entreprise (petite) exige un mélange de savoir-faire et de savoir-être basé sur les cas très concrets de mises en situations vécues ; d'où la démarche qualité lui confère l'aptitude à satisfaire des besoins exprimés et implicites [6]

Au vue de ce qui précède, qu'exige ce contexte pour créer l'envie de mieux manager, développer son leadership pour mener une formation professionnelle adéquate ? Qui est concerné ? Pourquoi ? Quand ? Où ? Comment ? Combien ?

Ceci ne peut être mis en œuvre que par un référentiel métier d'un auto-entrepreneur qui intègre la quantité du processus de la chaine de formation, notamment : les activités, les compétences, le savoir-faire, le savoir-être, les modalités d'évaluation et les critères d'évaluation [7]. Il constituerait un outil indispensable pour organiser et piloter une formation professionnelle en tenant compte des activités du métier concerné, des expériences requises, du savoir-faire, du savoir, du savoir-être et de modalités et critères d'évaluation. Ce référentiel contribue à l'élaboration d'une référentielle formation pour le prochain article.

L'.objectif de ce travail est de produire à l'aide de l'approche par compétence un référentiel de métier d'auto entrepreneur qui va faciliter l'élaboration d'un référentiel de formation et d'évaluation afin de renforcer les compétences attendues. Tout en créant et / ou en gérant une entreprise agricole et aussi en commercialisant les produits ou les services.

2 MATERIEL ET METHODES

2.1 MILIEU D'ETUDE

L'étude a été réalisée dans le territoire de Kabare, Commune Rurale de Kavumu (groupement de Miti, groupement de Bugorhe/Kavumu, groupement d'Irhambi/Katana, groupement de Luhihi, groupement de Bushumba, groupement de Lugendo et groupement d'Ishungu), Province du Sud-Kivu, République Démocratique du Congo.

Le territoire de Kabare est situé à l'Est de la République Démocratique du Congo près de la frontière Congolo-Rwandaise. Il a une superficie de 1.960 km^2 et fait partie de la Province du Sud-Kivu [8].Il est composé de deux collectivités dont la collectivité de Kabare et la collectivité de Nindja. Kabare est localisé entre 28°45' et 28°55' de longitude Nord et 2°30' et 2°50' de latitude Sud et se trouve au Sud - Ouest du Lac Kivu. Le territoire de Kabare ainsi que la ville de Bukavu connaissent deux saisons à savoir la saison sèche qui dure trois mois (de Juin à Septembre) et la saison de pluie qui dure neuf mois(de octobre à mai). A Kabare Centre, le sol est argileux et de plus en plus pauvre à cause des érosions et de la surpopulation, l'élevage diminue sensiblement par manque de pâturage. Par contre à Kabare Nord, Commune Rurale de Kavumu, le sol est fertile pour l'agriculture. Il s'est développé surtout sur des substrats volcaniques [9]. A Nindja, on trouve des espèces propices à l'élevage du gros bétail.

La végétation à Kabare est constituée d'une savane herbeuse de montagne dominée par des graminées fortement diversifiées et quelques arbustes. Cette végétation a remplacé une végétation primitive constituée de la forêt primaire à *Albiziagrandibracteata* dont les reliques sont encore visibles dans les stations de Mugeri, Kakondo et Lwiro [10].

Les contraintes majeures de la communauté sont liées à la surpopulation car le territoire de Kabare compte 461.511 habitants, soit une densité de 235ha/km^2 ; situation qui prouve l'accès difficile à la propriété de la terre : plus de 60 % de citoyens sont des paysans sans terre, forcés au système agricole de type féodal. Les terres appartiennent exclusivement aux églises, aux institutions gouvernementales, et aux chefs locaux. Cette situation est une des causes majeures de la pauvreté au niveau des ménages malgré les potentialités géo climatiques offertes disponibles.

2.2 MATERIEL

Pour la récolte des données sur le terrain, nous avons utilisé un questionnaire d'enquête que nous avons administré aux jeunes intellectuels et sans emplois de la Commune Rurale de Kavumu ayant intéressé notre recherche sur le terrain.

2.3 METHODES

La méthode d'analyse systématique nous a facilité à cueillir des éléments en interaction dynamique en vue d'un but d'élaborer un référentiel outillé.

Comme technique, à partir de notre échantillon de hasard simple nous avons utilisé les instruments suivants :

- L'observation documentaire pour consulter les ouvrages et tout document approprié;

- L'entrevue avec les professionnels de métier et de formation (Institut National de Préparation Professionnelle, l'Agence Française de Développement, les Petites et Moyennes Entreprises, etc.) ;
- L'enquête auprès de la population cible.

3 RESULTATS

Tableau 1 . Modèle proposé de référentiel métier

METIER : AUTO-ENTREPRENEUR	
Appellation du métier (Concepteur) et autres appellations (marché) :	AUTO-ENTREPRENEUR
Niveau : Facilité de compréhension et de contrôle	
Mission : La mission de l'auto-entrepreneur consiste à créer et gérer une entreprise	
Pré requis (condition d'accès à l'emploi) : Savoir lire, écrire et calculer	
Formation de base : Formation technique (formel ou informel) Autres formations : - Expérience professionnelle : Un an Conditions de travail : Esprit d'initiative, engagement, volonté d'entreprendre	
Relations Relations internes : Salariés Relations externes : Clients, les agriculteurs et éleveurs du milieu, les autorités politico-administratives, le Ministère de l'Agriculture, Elevage et Pêche, les Organisations Non Gouvernementales de Développement, les fournisseurs, les organismes de micro-finance, etc.	

Ce tableau présente la fixation du métier d'auto entrepreneur par des concepts requis lorsqu'il s'agit d'une formation professionnelle attrait à l'apprentissage par compétence.

Tableau 2 . Flux métier

ACTIVITES	COMPETENCES	SAVOIR FAIRE	SAVOIR	SAVOIR ETRE	MODALITES EVALUATION	CRITERES EVALUATION
Création d'entreprise	Identifier le marché	Identifier les clients, les concurrents	- Type de clientèle ; - Les concurrents : prix de leurs prestations et de leurs produits, qualité des produits des concurrents.	- Bon sens Rigueur ; - Sens des responsabilités ; - Zèle ; - Engagement ; - Capacité de persuasion ; Honnêteté.	Entretien oral d'explicitation sur le projet et les démarches de création de son entreprise à partir d'un rapport comprenant : * marché * prix de revient * immatricu-lation * statut juridique * Mise en situation : le stagiaire présente le classeur des documents officiels	- Client et concurrents sont correctement identifiés ; - Les charges fixes, le chiffre d'affaire prévisionnel et les charges variables sont correctement calculés ; - Les différents services de l'Etat et les documents y afférant sont cités ; - Choix pertinent du statut juridique ; - Classement correct des documents officiels par ordre alphabétique ou alphanumérique ; - L'ensemble des éléments présentés par le candidat permet de vérifier la viabilité technico-
		Réaliser une étude du marché et de son environnement	Techniques de rédaction du rapport : Descriptif de son activité avec son lieu d'implantation			
		Déterminer la forme juridique de l'entreprise	Les différents statuts Stratégie de choix			
	Calculer son prix de revient	Lister les charges et les recettes de l'entreprise	- Charges fixes ; - Charges variables ; - Chiffre d'affaire prévisionnel.			
		Calculer le seuil de rentabilité	- Calcul de prix horaire ; - Calcul de prix de vente ; - Calcul de prix d'exploitation ;			

			- Calcul des amortissements Calcul de marge bénéficiaire.			économique du projet ;
	Immatriculer son enterprise	Identifier les services étatiques	Service environnement DGI – DGM - Service PME INSS INPP Tribunal de Commerce			
		Classer les documents de création	Liste des documents officiels Méthode de classement des documents			
Gestion d'entreprise	Gérer les ressources financiers	Tenir la comptabilité journalière.	- Normes de tenue de la comptabilité - Journal de caisse ; Comptabilité OHADA ; - Utilisation des documents.	- Visionnaire ; - Leadership ; -Esprit d'initiative ; - Créativité ; - Bon sens ; - Honnêteté; - Coopératif ; - Bienveillance ; - Flexibilité.	Test écrit sur les modalités de gestion financière de son entreprise : Comptabilité journalière Etats financiers Tableaux d'amortissement Mise en situation sur la gestion des RH : droits et devoirs de l'employeur vis-à-vis des salariés Rapport et mise en situation de présentation de gestion des ressources matérielles à partir d'une étude de cas (tous les documents vierges seront fournis)	- Les documents comptables sont remplis dans le respect de la réglementation : - Bilan, tableau de formation des résultats, tableaux de financements sont justes ; - Calcul des amortissements linéaires et dégressifs sont corrects ; - Note de 7/10 exigée ; - Le candidat cite de manière exhaustive les obligations d'un employeur vis-à-vis d'un employé. - Les flux des stocks sont répertoriés sur fiches de stock - Les techniques d'inventaire sont correctement utilisées - Note de 6/10 exigée.
		Elaborer les états financiers.	- Bilan, Tableau de formation des résultats, tableau de financement ; - Techniques d'inventaires.			
		Elaborer des tableaux d'amortissements	Les amortissements.			
		Anticiper les paiements des charges fixes	- Fiscalité - Eau, électricité, etc. - Salaire.			
		Solliciter un credit	Plan d'investissement ; Plan de financement.			
	Gérer les ressources humaines	Mettre en œuvre un management des RH	- La politique salariale ; - Le plan de formation de l'entreprise ; - Les entretiens d'évaluation ; - Les plans de carrière ; - Gestion des conflits ; - Techniques de réunion ; - Techniques de recrutement.			
		Calculer les salaries	- Technique de calcul d'un salaire : temps de travail, charges sociales et taxes ; - Décompte final ; - Le bulletin de paie ;			

			- La politique salariale			
		Appliquer la législation sociale	- Droits et obligations des travailleurs et de l'employeur ; - La sécurité et l'hygiène en milieu de travail.	- Initiative ; - Bon sens ; - Anticipation ; - Rigueur ; - Honnêteté ; - Sens de la négociation.		
	Gérer les ressources matérielles	Gérer les stocks	- Achats et commandes ; - Gestion des dépôts ; – Livraisons; – Réception.			
		Réaliser les inventaires	Techniques d'inventaire			
Commercialisation des produits et/ou des services	Communiquer selon un plan marketing	Rédiger un plan marketing	- Plan de promotion listant les actions à mener et le calendrier d'exécution dans son environnement - Intégrer les innovations technologiques	- Visionnaire ; - Créativité/ Innovation ; - Courageux ; Avisé.	Mise en situation de plan marketing et de stratégie de fidélisation de clients à partir du cas de l'auto-entreprise en cours de création	- Plan de support bien élaboré comportant : actions, calendrier et durée - Le support promotionnel est convaincant ; - Les indicateurs de mesure d'impact du plan marketing permettent de mesurer son efficacité ; - Les techniques d'animation et de promotion utilisées donnent envie d'acheter ; - Note de 6/10 exigée.
		Elaborer un support promotionnel	Techniques de conception et de rédaction de supports promotionnels			
		Présenter ses produits et services de manière attractive	Techniques d'emballage, et de conditionnement, offres tarifaires, etc.			
		Evaluer l'impact du plan marketing	Outils de mesure : CA, nombre de nouveaux clients, taux de satisfaction sur les prestations et produits			
	Fidéliser ses clients	Organiser des rencontres promotionnelles	Technique d'animation Techniques de promotion			

Il s'agit du processus de réalisation du référentiel métier ou processus opérationnel pour contribuer directement à la réalisation du produit (auto entrepreneur) depuis la détection du besoin jusqu'à la réalisation finale, c'est – à- dire la satisfaction du client. Ce flux comprend : Les activités du métier, les compétences recherchées (escomptées), le savoir-faire, le savoir, le savoir-être, les modalités d'évaluation et les critères d'évaluation.

Ce référentiel joue le rôle du processus de soutien car il contribue à la disponibilité des moyens nécessaires aux processus de réalisation.

Le processus d'évaluation apporte le comportement à afficher et quantifie l'écart entre les résultats obtenus et les objectifs préalablement définis, les moyens consommés par rapport aux moyens programmés. La donnée de sortie est la mesure.

Comme les processus sont identifiés, ils sont fractionnés en séquences ou sous processus. Dans ce cas, ce tableau schématise toutes les activités liées au métier d'auto entrepreneur rural depuis l'entrée et jusqu'à la sortie. C'est donc la cartographie du processus.

4 DISCUSSION

La réalisation du référentiel de métier d'auto entrepreneur est le fondement de la démarche. Il permet de construire son plan d'action formation. Le diagnostic du besoin du demandeur doit être mené dans une large mesure en collaboration avec le formateur. D'après Antoinette DESCAMPS et François PERRIN, une démarche qualité débute généralement par la mise en œuvre d'actions ciblées [11].

L'élément absolument primordial est alors de veiller à la cohérence et la pertinence entre les actions et de développer un système global organisé et formalisé qui intègre toutes les actions qualités.

Ce référentiel qui va être bâti et enrichi au fur et à mesure correspond au système qualité qui comprend l'ensemble de l'organisation, des procédures, des processus et des moyens nécessaires à la mise en œuvre du management formation [12]

Ce document formalise le système d'assurance qualité mis à la disposition du demandeur, il lui garantit que le fournisseur a écrit ce qu'il fait et fera ce qu'il écrit.

5 CONCLUSION

L'objectif de la présente étude était de mettre sur place un référentiel métier de l'Auto-entrepreneur d'une petite entreprise agricole comme stratégie de réduction du chômage dans la Commune Rurale de Kavumu, Côte Occidentale du Lac Kivu, à l'Est de la République Démocratique du Congo.

Dans la Commune Rurale de Kavumu, le problème de chômage se situe au niveau social et économique. Pour le cas des jeunes, son taux est très élevé et prolongé. Les causes principales de ce chômage résideraient dans le fait que les autorités gouvernementales de notre pays ne créent pas l'emploi et les investisseurs ne sont pas motivés de promouvoir l'emploi.

Hormis la pauvreté, comme incidences dues au chômage dans ce milieu, nous observons les mouvements politiques, la prostitution, la jalousie/haine, les conflits tribaux, l'insécurité, le gonflement de l'effectif des enfants de la rue et Il est fort probable que ce chômage, dans les jours avenir, devienne une menace pire qu'on ne le pensait pas parce que dans une situation d'incertitude et d'exclusion de ces jeunes, situation qui n'inquiète pas les dirigeants du pays, ils sont enclins à des actes de destruction massive des biens de l'Etat. D'autres parts, ils risquent de se faire enrôler et recruter par les bandes armées incontrôlées des tueurs et des violeurs en leur promettant un mieux-être ailleurs que dans leur milieu. C'est la tranche de 15 à 35 ans des jeunes dont les uns ont fini les études secondaires et les autres les études universitaires mais sans perspective d'avenir et qui sont contraints de rester auprès de leurs parents qui, malgré leurs maigres revenu, doivent les prendre en charge au grand mépris du gouvernement qui fait la sourde oreille.

Il s'ensuit que le manque d'esprit d'initiative dans le chef des cadres universitaires serait aussi un frein à la création de l'emploi. D'où ils devraient fournir un effort afin d'élaborer des stratégies efficaces de lutte contre ce chômage. Raison pour la quelle nous avons proposé un référentiel métier de l'auto-entrepreneur d'une petite entreprise agricole ou processus opérationnel pour contribuer directement à la réalisation du produit (auto entrepreneur) depuis la détection du besoin jusqu'à la réalisation finale, c'est – à- dire la satisfaction du client. Ce flux comprend les activités du métier, les compétences recherchées (escomptées), le savoir-faire, le savoir, le savoir-être, les modalités d'évaluation et les critères d'évaluation.

Les résultats obtenus de notre analyse montrent que ce référentiel joue le rôle du processus de soutien car il contribue à la disponibilité des moyens nécessaires aux processus de réalisation. Le processus d'évaluation apporte le comportement à afficher et quantifie l'écart entre les résultats obtenus et les objectifs préalablement définis, les moyens consommés par rapport aux moyens programmés.

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Evaluation des sources d'eau dans le groupement rural d'Irhambi/Katana

[Assessment of water springs in rural area of Irhambi/Katana]

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ABSTRACT: This study was undertaken in the Irhambi/Katana grouping. The purpose is to inventory sources for to determine the flow or theirs spatial distributions, to liberate the correlation between water quantity and household also presenting state source that is to say source hawk and not hawk also those dying up the grouping. The direct observation method and interview was used as a stopwatch and the global positioning system (GPS) for the geographic coordinates and the measurement of flow.

The results of this work demonstrate that geographically, sources are unevenly distributed across the grouping. From a quantities point of view most of sources in Irhambi/Katana produces little water. And according to altitude, the finding is that there are fewer sources upstream (high altitude) and more sources downstream, the shores of lakes –Kivu.

Water supply sources are very affected by seasonal variation of their flow during the year and this explains occasionally the use of water stream and Water Lake in spite of the latter condition that is polluted and therefore undesirable consumption.

KEYWORDS: sources, groundwater, sheaf, household, outcrops, flow.

RESUME: Cette étude a été effectuée dans le groupement d'Irhambi-Katana. L'objet est d'inventorier les sources d'eau tout en déterminant leur débit et/ou distribution spatiale, en dégageant la corrélation entre quantité d'eau et ménage aussi en présentant l'état de ces sources c'est-à-dire les sources aménages et/ou non aménages et aussi celles en voie de tarissement dans le dit groupement. La méthode d'observation directe et d'interview ont été utilisées ainsi qu'un chronomètre et un GPS nous ont aidés respectivement pour la mensuration du débit et la prise des coordonnées géographiques. Les résultats de ce travail démontrent que sur le plan géographique, les sources sont inégalement réparties sur l'ensemble du groupement. Du point de vue quantitatif, la majorité des sources d'Irhambi produisent peu d'eau. Et suivant l'altitude, le constat est qu'il y a moins de sources en amont (haute altitude) et plus de sources en aval, aux abords du lac Kivu. La fourniture d'eau de ces sources est très affectée par la variation saisonnière de leurs débits au cours de l'année ce qui explique des temps en temps le recours à des eaux des ruisseaux et du lac par la population malgré l'état de ces dernières qui sont polluées et par conséquent indésirables à la consommation.

MOTS-CLEFS: nappe aquifère, source, ménage, affleurement, débit.

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1 INTRODUCTION

L'étude des sources d'eau est importante pour comprendre les mécanismes de leur fonctionnement afin de prévenir les différentes menaces qui peuvent conduire soit à leur tarissement et/ou à la détérioration de la qualité de leurs eaux. En milieu rural comme dans certains coin des viles africaines, l'eau potable provient en majeure partie des sources subvenant aux besoins en eau d'approximativement 90 pour cent de la population.

Si autrefois le besoin en eau était satisfait sur le plan local sous nos climats tropicaux, actuellement ce n'est plus le cas. La denrée eaux est devenue un problème sérieux dans plusieurs pays du monde et spécialement en Afrique [1].

En effet, depuis 1990, la population du globe a doublé, mais la consommation en eau a été multipliée par 7 [2]. Par conséquent, la surveillance des variations du débit des sources et la définition des règles de gestion des prélèvements s'avèrent donc nécessaires car le développement de l'exploitation est subordonné à la maitrise des ressources disponibles, condition préalable à une bonne gestion de cette ressource. Cette maitrise suppose non seulement la connaissance très poussée du milieu physique naturel, des lois et des mécanismes qui régissent leur formation et leur renouvellement, de leur évolution dans le temps et dans l'espace, mais aussi de l'identification de toutes les exploitations existantes souvent nombreuses, diverses et la précision correcte de l'évolution de la demande en eau.

Comme ces ressources en eau et les nappes phréatiques sont limitées alors que la consommation s'accroit par suite de l'augmentation de la population et sa concentration sur un petit espace, il conviendrait de faire l'inventaire de ces ressources pour une cartographie correcte, une protection et une exploitation rationnelle de cette richesse afin de rééquilibrer l'approvisionnement et la consommation.

En République Démocratique du Congo, malgré l'abondance des eaux de surface, la majorité de la population congolaise dépend des nappes phréatiques (47 % des ressources hydriques renouvelables) pour s'approvisionner en eau potable [3].L'information sur la quantité et la qualité de ces réserves hydriques souterraines de l'eau des sources est rare excepté quelques travaux comme le Projet de réhabilitation de sources d'eau potable dans la Région de Kitutu (Mwenga - Sud Kivu, RDC) en 2010 [4] , the ''water issues in the Democratic Republic of the Congo'' : challenges and Opportunities en 2011. [5]

Dans le groupement d'Irhambi-Katana, les eaux souterraines affleurent presque partout dans tous les villages. Elles alimentent bon nombre d'affluent du lac Kivu et desservent en eau potable les habitants des villages où elles se trouvent. Cependant, l'information sur leur nombre, leur quantité et leur répartition géographique est rare et c'est de là que cette étude trouve son importance. Ainsi, l'objet de cette étude est d'inventorier toutes les sources d'eau du groupement d'Irhambi-Katana, de déterminer leurs débits, leur distribution spatiale, de dégager la corrélation entre quantité d'eau par rapport au ménage et l'état des sources c'est-à-dire les sources aménages et/ou non aménages dans ledit groupement.

2 MATERIEL ET METHODES

2.1 MILIEU D'ÉTUDE

2.1.1 SITUATION GÉOGRAPHIQUE

Le groupement d'Irhambi- Katana est à l'Est de la République Démocratique du Congo(RDC) à quelques 40 km de la ville de Bukavu, Chef lieu de la Province du Sud-Kivu. Il est situé dans le Territoire de Kabare et est constituée de 6 villages à savoir Kadjucu, Mabingu, Kabamba, Mwanda, Kabushwa et Kahungu. Il est situé entre 2° 23'19'' et 2°15'55''latitude Sud et entre 28°8'30'' et 28°39'' longitude Est et est limité au Nord par la rivière Nyabarongo qui le sépare du territoire de Kalehe, au Sud par le cours d'eau Kamilonge qui le sépare du groupement de Bugorhe à l'Est par le lac Kivu et à l'Ouest par le Parc National de Kahuzi-Biega[6].

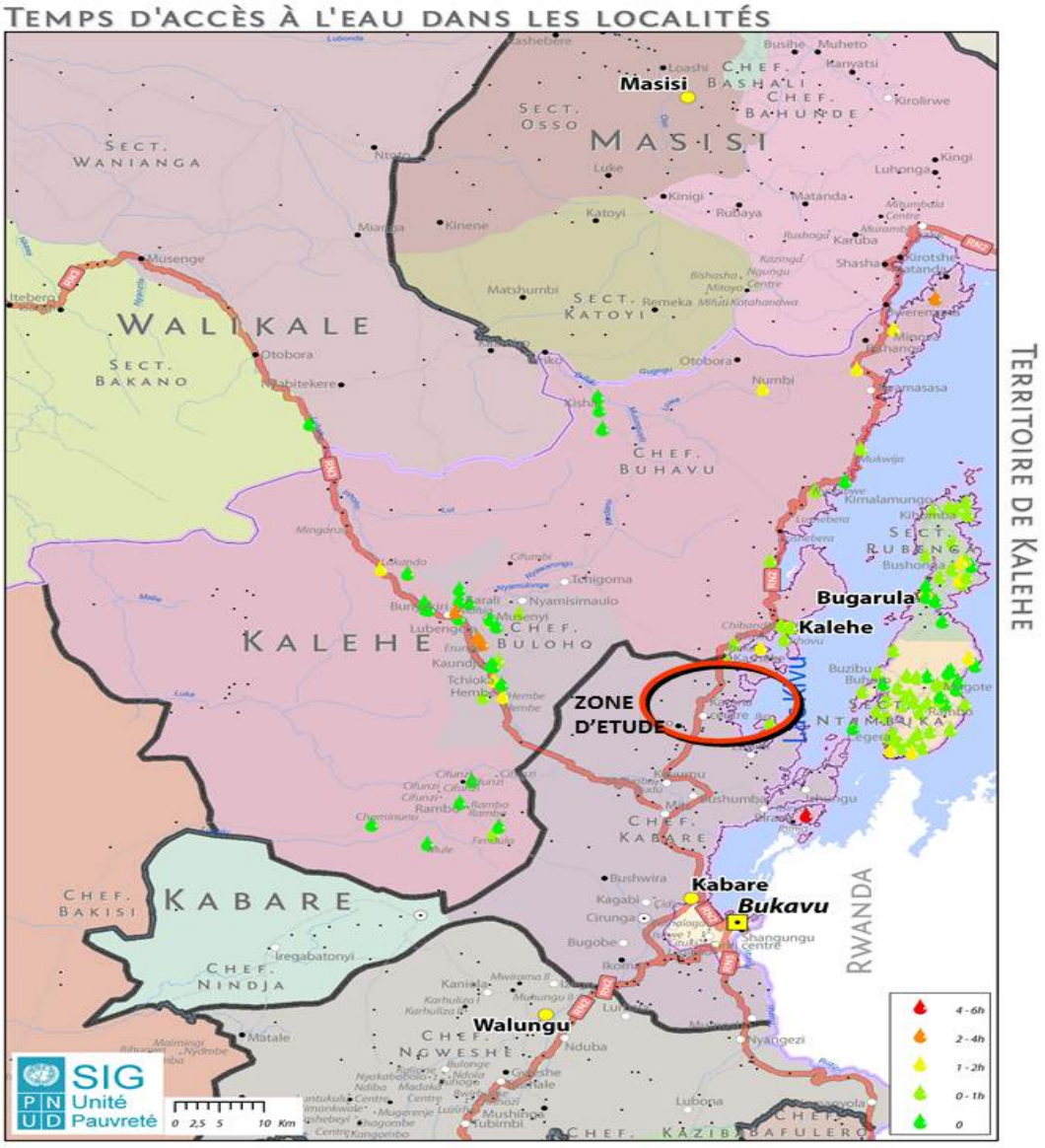


Fig 1. Zone d'étude ,Irhambi-Katana

2.1.2 RELIEF

D'une manière générale**,** le relief du groupement d'Irhambi-Katana fait partie des hautes terres du Kivu et se présente en marche d'escalier comprenant cinq paliers d'altitude augmentant progressivement de l'Est vers l'Ouest correspondant aux anciens fonds du Graben :

- Premier palier : 1470m d'altitude, correspondant à la paroisse de Mwanda ;
- Deuxième palier : 1580m d'altitude correspondant au centre commercial de Katana ;
- Troisième palier : 1800 m d'altitude, correspondant au Centre de Recherche en Sciences Naturelles de Lwiro ;
- Quatrième palier: 2400m d'altitude, correspondant au gîte du CRSN/LWIRO à Tshibati.
- Cinquième palier: 3308m d'altitude, correspondant au sommet du Mont Kahuzi.

2.1.3 CLIMAT

La région de Katana jouit d'un climat doux de type tropical humide. Les fortes températures qui devraient y régner sont modérées par l'altitude et la proximité du lac Kivu. Ainsi sa température moyenne annuelle oscille entre 18°C et 20°C .Un fait climatique important est celui de la décroissance thermique altitudinale. D'une façon générale, on observe une corrélation étroite entre l'altitude et la température [7] .Au niveau du lac (plus ou moins 1490m); la température moyenne annuelle est de 20°c. A 1800m d'altitude, elle passe à 17.5°C ; à 2200m à 15°C environ. La région connait deux saisons : une courte saison sèche allant de Juin en Août et une longue saison de pluie allant de Septembre en Mai. On y enregistre une précipitation moyenne annuelle de plus de 1500 mm et une humidité relative proche de 76% .Pendant la saison pluvieuse, les eaux superficielles s'infiltrent dans le sol et le sous sol jusqu'à ce qu'elles rencontrent une formation géologique imperméable. Elles remplissent alors les interstices ou les fissures de la roche perméable située au-dessus: On appelle aquifère une telle roche réservoir dans laquelle l'eau circule et forme une nappe.

2.1.4 VÉGÉTATION

Dans les régions montagneuses comme celles-ci, la répartition altitudinale des formations végétales est fonction des gradients thermiques des versants et des conditions édaphiques locales. Au cours du temps, mais surtout pendant les dernières siècles et plus encore au cours des dernières décennies, la végétation de la dorsale du Congo a été fortement dégradée par l'action anthropique, de sorte qu'il devient difficile de se représenter aujourd'hui ce qu'étaient la distribution et les aspects originels des milieux montagnards, une grande partie des forets étant réduite à une mosaïque de groupement divers secondarisée ; exception faite à une partie de la dorsale qui a quelque peu échappé à la déforestation intense, une étroite zone de la crête classée comme réserve forestière pour être ensuite transformée en parc national de Kahuzi-Biega. [8]

2.1.5 FORMATIONS GÉOLOGIQUES DU SECTEUR

Selon [9], les travaux antérieurs réalisés dans ce secteur nous prouvent l'existence de trois grandes catégories de roches :

- **Les formations précambriennes**

Ces formations affleurent sur la bordure occidentale du lac Kivu, au Sud du deuxième parallèle Sud. Elles affleurent dans des boutonnières en relief positif par rapport à la couverture basaltique.

- **La couverture basaltique**

Le nombre exact des coulées dans cette région de Katana n'est pas jusque là connu suite à une altération très poussée qui handicape une bonne cartographie. Les analyses structurales des différents vulcanologues distinguent les basaltes de Kange, de coulées de Mahyuza ; tandis que la coulée de FOMULAC serait rattachée aux cônes volcaniques de TSHIBINDA-TSHIBATI à l'Ouest de Lwiro.

- **La couverture sédimentaire**

Cette unité est réduite aux formations carbonatées superficielles de Mahyuza-Kakondo, Mudogo, Ciranga, Fomulac et quelques petits affleurements peu significatifs à Lwiro et Mwanda. On signale toutefois des minuscules terrasses de ruisseaux actuels présentant quelques dépôts détritiques sans importance litho stratigraphiques. A l'échelle de notre travail, il existe une relation entre roches et eaux souterraines. Un réservoir aquifère est situé dans des roches capables de contenir de l'eau, mais aussi de la céder. C'est le cas des roches poreuses (sables, grès, certains calcaires), des roches fissurées (calcaires et basaltes).

2.1.6 LES SOLS

Dans notre secteur d'étude, la chaleur et l'humidité détermine un système morphogénique dominé par les altérations physico-chimiques et biochimiques. D'abord les actions météoriques combinent les effets de la dissolution, de l'hydratation et de l'hydrolyse des silicates. Cette dégradation continue, encore beaucoup intensifié avec les produits agressifs fournis par la décomposition de l'humus, est une latéritisation(ou allitisation). Elle engendre des sols ferralitiques typiques. Ainsi on distingue dans notre secteur les sols sur roches éruptives et les sols sur roches sédimentaires [10].

2.1.7 DONNÉES DÉMOGRAPHIQUES: TAILLE DE LA POPULATION

En Août 2012, la population du groupement d'Irhambi-Katana s'élevait à 79118 habitants dont 43881 femmes et 35237 hommes, soit les proportions de 55,46% de femmes contre 44,53% d'hommes dans le tableau 1,ci dessous.

Tableau 1: Population du groupement d'Irhambi-Katana [11]

VILLAGES	POPULATION	MENAGES	FEMMES
MWANDA	19184	3239	10750
KADJUCU	18784	2697	10520
MABINGU	11942	1706	6688
KABAMBA	11847	1876	6634
KABUSHWA	8640	1357	4838
KAHUNGU	8721	1246	4451
TOTAL	79118	11937	43881

Cette population est inégalement répartie sur l'ensemble du groupement. Les villages les plus peuplées sont: MWANDA (24, 24%), KADJUCU (23, 7%), MABINGU (14, 9%) et KABAMBA (14, 86%) qui ont seules 78, 05% de toute la population d'Irhambi-Katana et, les moins peuplées sont KAHUNGU et KABUSHWA. De même, en examinant la concentration de la population, on trouve que les villages riverains du Parc National de Kahuzi-Biega sont moins peuplés que les autres. En effet, depuis 1994, la guerre dite de libération a donné naissance à des groupes armés basés dans le Parc National de Kahuzi qui ont déstabilisés la population par des attaques nocturnes causant beaucoup de morts et des déplacés.

2.1.8 ASPECT ÉCONOMIQUE

L'économie de Katana repose sur l'agriculture, l'élevage, la pêche, l'artisanat et le petit commerce. La majeure partie des terres sont consacrées aux cultures vivrières (haricots, patate douce, sorgho, banane plantain et manioc. En général on sème vers septembre et vers la fin de février. L'élevage occupe une place modeste [11]

2.2 METHODES

Les méthodes d'observation l'interview directe à la population ont été utilisées pour la connaissance des sources d'eau du milieu. Elles ont consisté à visiter les sources et à interviewer la population rencontrée sur chacune des sources dans les 6 villages dont KADJUCU, MABINGU, KABAMBA, MWANDA, KABUSHWA et KAHUNGU. Suite à cette interview nous avons pris connaissance de nom du président du comité de gestion de la source auprès de qui nous avons récolté des données sur le nombre des ménages utilisant l'eau de la source. Dans l'ensemble, 56 sources ont été visitées.

Pour la réalisation de cette visite, une équipe constituée de 12 agents du département de l'environnement a été déployée dans les 6 villages. Elles ont été conduites en suivant des axes partant de la route BUKAVU-GOMA et en incluant des visites dans les sous-villages et les coins les plus isolés.

Leurs coordonnées géographiques ont été prélevées à l'aide d'un Geographic Position System (GPS) et la mensuration du débit des sources était faite à l'aide d' un seau de 5litres et un chronomètre pour la prise du temps nécessaire pour remplissage de ce seau et aussi la mensuration de la distance entre la maison et la source a été mesurée à l'aide d'un décamètre .La corrélation a été obtenue par :

$$\frac{\text{Débit journalier}}{\text{Nombre des ménages}}$$

L'analyse statistique a été faite à l'aide du Microsoft Excel et du logiciel Past.

3 RESULTATS

3.1 INVENTAIRE DES SOURCES D'EAU SE TROUVANT DANS LE GROUPEMENT D'IRHAMBI-KATANA

Tableau 2 : Sources d'eau du groupement d'Irhambi-Katana

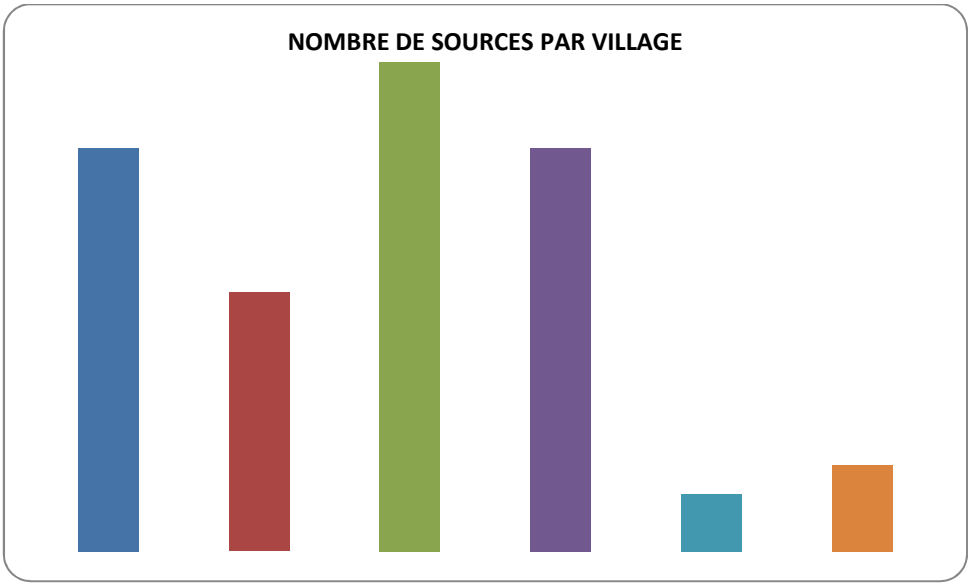
Sources	Villages	Sous/Villages	Altitude	Débits en litres par seconde
BIDABANGA	MWANDA	BIDABANGA	1600m	1 L/SEC
BUFA	MABINGU	MANTU	1754,1m	1 L/SEC
BYUMA	MABINGU	KANYAMWERA	1679m	0,05 L/SEC
MUKENGE	MABINGU	KAHOGO	1625m	0,0505L/SE
CANDAKU	MWANDA	BURHALANGE	1580m	2,5 L/SEC
CENTWALI	MWANDA	BUHENGERE	1543m	2 L / SEC
CEYA	KABAMBA	CEYA	1462m	0,31 L/SEC
CHIHEMBYE	MWANDA	CIHEMBYE	1492.8m	0,5555L/SEC
CIHONGA	KABAMBA	CIHONGA	1478,6m	0,076L/SEC
CIRANGWA	MWANDA	NYABINKONG	1595m	0.25 L/SEC
CIROJO	KABAMBA	CIROJ0	1508 m	0,1666l/sec
KABAGAYA	MWANDA	BUHENGERE	1515.7m	2,5 L/SEC
KABIHAGO	KABUSHWA	LUSHASHA	1948m	Non aménagé
KABUGADE	KABAMBA	LUKAYU	1604m	0,25L/SEC
KABUGUBA	MABINGU	SIRHEMBO	1676m	0,160 L/SEC
KABUHULA	KADJUCU	IRANGIRA	1572,1m	0,13157 L/SEC
KABUHULA 2	KADJUCU	IRANGIRA	1572,4m	0,1315 L/SEC
KAHUMBA	MABINGU	SIRHEMBO	1705,1m	0,08 L/SEC
KAJABWE	MABINGU	KAJABWE	1695 m	0.8 L/SEC
KALEBA II	MABINGU	MANTU	1718,8m	1,6 L/SEC
KALENG01	KAHUNGU	BUSANDWE	1887m	2 L/SEC
KALENG02	KAHUNGU	MAZIBA	1888m	2 L/SEC
KALENGO3	KAHUNGU	CIHANA	1872m	1,5 L/SEC
KALIMBI	MABINGU	KALIMBI	1666,0m	O,25 L/SEC
KAMBOGO	KABAMBA	KAMBOGO	1584.7m	0,052631L/SEC
KAMILONGE	MWANDA	CAHOBOKA	1590m	O.52 L/SEC
KAMUNYERERE	KABUSHW	KAMUNYERE	1635.2m	1 L/SEC
KAMYANZI	KABUSHW	LUSHESHA	1986m	2,5 L/SEC
KANYA.WERAII	MABINGU	KANYAMWERA	1679,m	0,0617 L/SEC
KARUNGU	MWANDA	BUHENGERE	1492.6m	0,3333L/SEC
KAYICUYA	KABAMBA	KAMBOGO	1617m	0,032L/SEC
LUDUNDAGANA	MABINGU	BULINDI	1794,6m	0,5 L/SEC
LULIBA	MABINGU	CANYENA	1710m	0.113636
MAGEGE	MABINGU	MAGEGE	1614m	0,1162 L/SEC
MAGEGE II	MABINGU	MAGEGE	1613 m	3 L/SEC
MAHYAHYA	MWANDA	BUHENGERE	1579,2m	0.5 L /SEC
MASHALI	MABINGU	MANTU	1700m	0,0416 L/SEC
MAZIBA2	KABAMBA	BUSHABAGA	1484m	0,25 l/sec
MIRASANE	MWANDA	CIBIMBI	1589m	0.20 L/SEC
MUGANZA	KABAMBA	RUVOMA	1478m	0,333L/SEC
MUNYENA	KADJUCU	TCHOFI	1553,1m	0,3333 I/SEC
MURAMBI	KABAMBA	NGOMA	1487.9m	0,106L/SEC
NKENE	MWANDA	NKENE I	1502m	0.7 L/SEC
NKENE 1	MWANDA	NKENE	1502m	1 L /SEC
NKENE 3	MWANDA	NKENE	1464m	0.29 L/SEC
NKENE II	MWANDA	NKENE I	1488m	0.42 L/SEC
NYABALINDA	KABAMBA	NYABALINDA	1470m	0,31L/SEC

NYABIREHE	MWANDA	CAHOBOKA	1670m	0.4 L/SEC
NYAKAHONGA	MABINGU	CANYENA	1726m	0,15625 L/SEC
NYAKAHONGA	MABINGU	CANYENA	1746m	0,33333 L/SEC
NYAKATORWA	KABAMBA	NYAKATORWA	1588,7m	0,15L/SEC
NYAKISHI	KADJUCU	BUVUNYI	1567	0,3333L/SEC
NYANTANDA	MABINGU	KALENGERA	1697m	0,01 L/SEC
NZIRAMYANDO	KABAMBA	IGUNDU	1623m	0,033L/SEC
TCHIVANGA	KABAMBA	KABONEKE	1543,1m	0,032L/SEC
KALEBA I	MABINGU	CANYENA	1762 m	0,22 L/SEC
CANYENA	MABINGU	NYASHEMBE	1712 m	0,45 L/SEC

Un total de 56 sources d'eau a été identifié et inventorié réparties dans 6 villages dans le groupement d'Irhambi- Katana.

3.2 REPARTITION DES SOURCES PAR VILLAGES

Cette distribution se présente de la manière suivante dans la figue2 : Mabingu 17, Kabamba (KAB) 14, Mwanda 14, Kabushwa 2 et Kahungu 3. Les villages Mabingu, Mwanda et Kabamba renferment 45 sources sur 56 soit 80,3% des sources d'Irhambi-Katana. 3 autres villages' n'en possèdent que 11 seulement.



LEGENDE: KAB= KABAMBA; KJ= KADJUCU; MAB= MABINGU; MW= MWANDA; KABU= KABUSHWA; KAHU= KAHUNGU

Fig 2. Distribution des sources par village

3.3 DISTRIBUTION DES SOURCES EN FONCTION DES DEBITS

Dans l'ensemble, les sources d'eau d'Irhambi- Katana produisent 35,22 litres par seconde.Les sources du village de Mwanda sont au nombre de 14 et totalisent un débit de 20,68 litres par seconde soit 58,71% et celles du village de Kabamba sont au nombre de 14 et ont le plus faible débit d'eau de 0,77 litres par seconde soit 2,18% de la production totale.

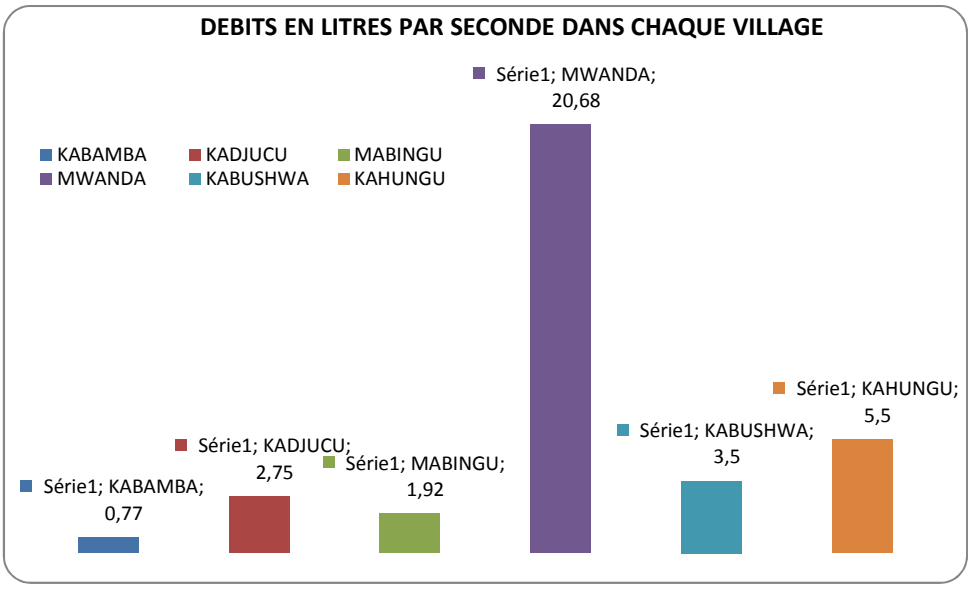


Fig 3.Distribution des sources par village en fonction du débit

3.4 CORRELATION ENTRE LA QUANTITE D'EAU PRODUITE PAR JOUR ET LA POPULATION

Tableau 3. Quantité d'eau produite par jour par rapport à la population

VILLAGES	QTE/SEC	QTE/MIN	QTE/H	QTE/JOUR	MENAGES	RAP/MEN	OBSERV
KABAMBA	0,778	46,6	2796	167760	1876	89,4	INSUF
KADJUCU	2,75	165	9900	59400	2697	22	INSUF
MABINGU	1,92	115,2	6912	414720	1706	243	SUFFIS
MWANDA	20,68	1240	74448	4466880	3239	1379	SUFFIS
KABUSHWA	3,5	210	12600	756000	1357	557,1	SUFFIS
KAHUNGU	5,5	330	19800	1188000	1246	953,4	SUFF
TOTAL	35,1	2106	126360	7581600	12121	625,4	SUFFIS

Il ressort de ce tableau ce qui suit: La somme des débits par seconde de toutes les sources du groupement d'Irhambi donne 35,1 litres par seconde. Ce qui donne 2106 litres d'eau par minute lorsqu'on multiplie 35,1 par 60, 126360 litres par heure et 7581600 litres par jour. Le rapport Quantité journalière d'eau sur nombre des ménages donne 625,4 dans l'ensemble. Dans les villages de Kabamba et Kadjucu, le rapport est faible parce que inférieur à 120.

La corrélation des données du tableau 3 se présente dans le tableau 4

Tableau 4.Corrélation quantité d'eau produite par jour par rapport à la population

	ménages	Quantité d'eau /ménages
ménages	1	0,89109
Quantité/ménages	0,89109	1

Corrélation significative marquées à P ∠ 0,05000 N= 7;

Confrontée au nombre de ménage que nous avons dans chaque village, il a été constaté que les sources d'eau de Katana produisent trop peu d'eau. Une population de 1876 ménages nécessite 225120 litres d'eau. Il ressort de ce tableau que 2 villages sur 6 ont une quantité insuffisante d'eau à savoir KADJUCU et KABAMBA et par conséquent n'arrivent pas à couvrir les besoins de la population en eau.

3.5 CLASSIFICATION DES SOURCES PAR GROUPE DES DEBITS

La figure 4 nous montre un regroupement des sources en 14 classes de débits : 14sources sur 41 ont un débit variant entre 0 et 0,2 litres par seconde soit 34,1%

10 sources sur 41 ont un débit variant entre 0,2 et 0,4 litres par seconde soit 24,3%

3 sources sur 41 ont un débit variant entre 0,4 et 0,6 litres par seconde soit 7,3 %

1 source sur 41 a un débit variant entre 0,6 et 0,8 litres par seconde soit 2,4 %

4 sources sur 41 ont un débit variant entre 0,8 et 1 litres par seconde soit 9,8 %

2 sources sur 41 ont un débit moyen allant de 1,4 à 1,6 litres par seconde soit 4,9 %

3 sources sur 41 ont un débit moyen variant entre 1,8 à 2 litres par seconde soit 7,3 %

3 sources sur 41 ont un débit moyen allant de 2 à 2,2 litres par seconde soit 7,3 %

1 source sur 41 a un débit moyen variant entre 2,6 à 2,8 litres par seconde soit 2,4 %

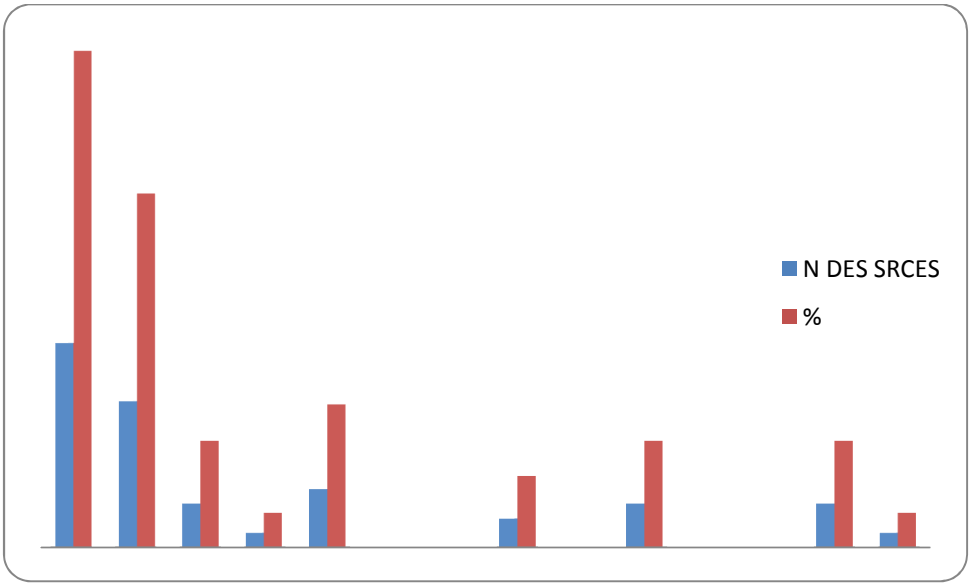


Fig 4. Distribution des sources par groupe de débit

3.6 REPARTITION DES SOURCES SUIVANT L'ALTITUDE

La figure 5 nous montre la distribution des sources suivant l'altitude. Il ressort de ce graphique que :

Entre 1400 et 1600 m d'altitude, nous avons 27 sources sur 56 soit 48,2%

Entre 1600 et 1800 m d'altitude, nous avons 21 sources soit 37,5 %

Entre 1800 et 2000m d'altitude, nous avons 8 sources soit 14,2 % : BUFA avec un débit de 5 Litres par seconde n'est pas aménagé ; Kamyanzi (1960m) avec un débit de 3 litres par seconde n'est pas aménagé ; Magege II (1700 m) avec un débit de 5 litres par seconde n'est pas aménagé, Kalengo (1800 m), Tshibati (2000m), Kamunogonogo (2000m) etc. Une fois ces sources sont aménagées par une adduction, elles peuvent arrosées tous les villages de Katana.

Nous trouvons qu'il ya plus de sources en aval (moyenne altitude) qu'en amont (très haute altitude). Mais pour la plupart d'entre elles, ce sont des sourcins ou suintements et non des véritables sources. Les meilleures sources sont celles qui sont en amont et qui diffèrent des précédentes par leurs débits très fort et régulier.

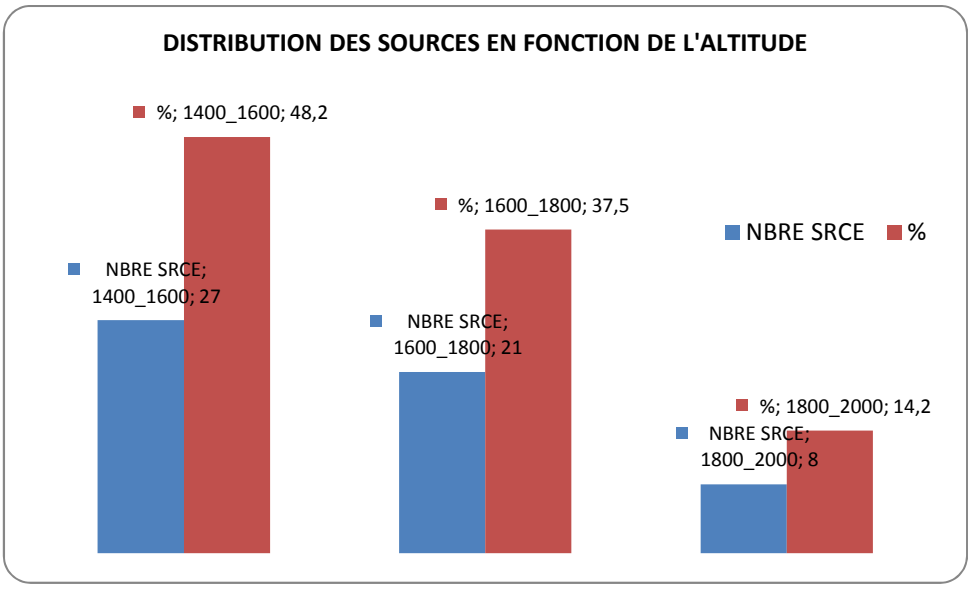


Fig 5. Distribution des sources suivant l'altitude

3.7 ETAT DES SOURCES

Cette figure nous montre les sources aménagées, les sources non aménagées et les sources en voie de tarissement. Il ressort de cette figure que 46 sources sur 56 sont aménagées (soit 82,1%), 15 sources sur 56(soit 26,7%) ne sont pas aménagées et 14 sources sur 56 soit 25 % sont en voie de tarissement.

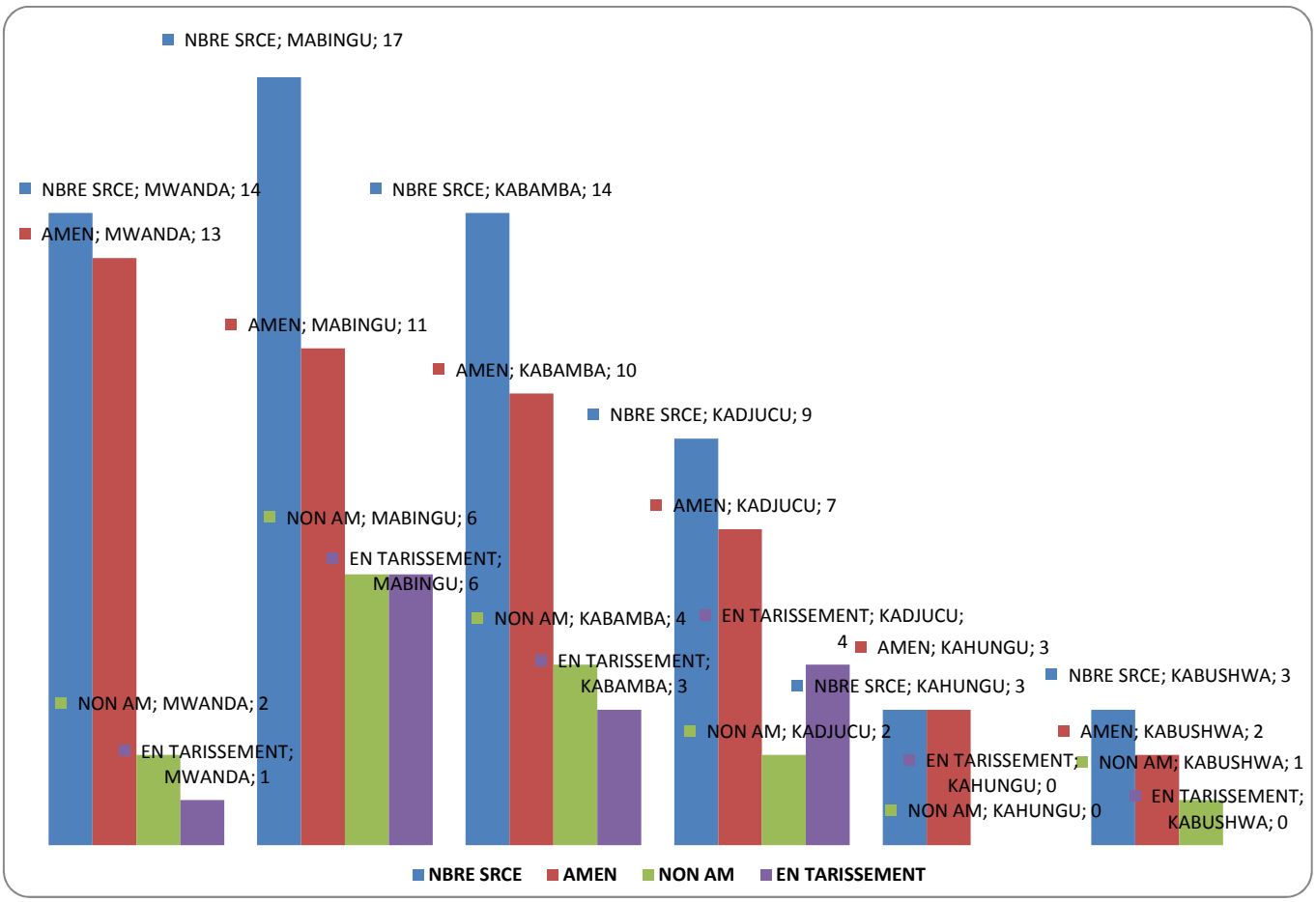


Fig 6.Etat des sources

3.8 DISTANCE ENTRE SOURCES D'EAU ET POPULATION

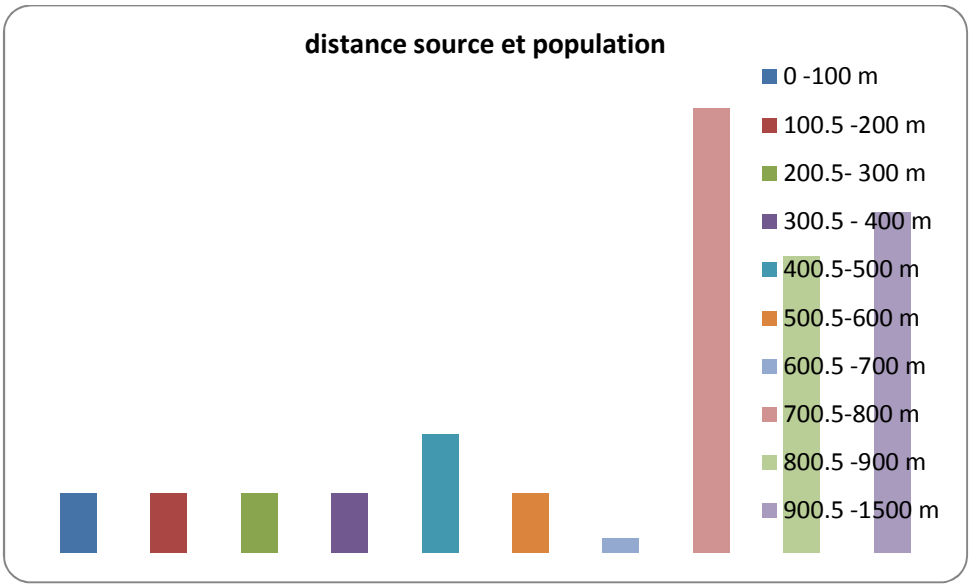


Fig 7.Distance entre sources d'eau et population

La figure 7 montre les distances parcourues en m pour accéder à une eau de source par village. L'on constate que la population effectue entre 800 m et 1.200 m pour accéder à une source d'eau potable dans les villages, Kabamba, kadjucu, Mabingu, Kabushwa et Kahungu.

4 DISCUSSION

Le présent travail visait à faire la distribution des sources d'eau, la corrélation entre la quantité d'eau produite par ces sources et la population et à déterminer l'état des sources d'eau (celles qui sont aménagées, non aménagées et celles qui sont en voie de tarissement).

Cette étude a démontré clairement que le groupement d'Irhambi-Katana compte 56 sources d'eau inégalement réparties sur l'ensemble du Groupement d'Irhambi- Katana. Selon l'altitude, nous avons trouvé moins de source en haute altitude(en amont) et plus de source aux abords du lac Kivu(en aval). Selon le débit, la présence des sources à grand débit en haute altitude s'explique par le fait qu'à ce niveau il pleut beaucoup (pluies orographiques) et la végétation naturelle y est encore intacte. D'après [9] en 1990 dans son livre intitulé les Chemins de l'eau, le couvert végétal exerce une influence directe sur l'économie en eau des terroirs. Cette influence directe se manifeste sur trois plans différents : Celui de la production agricole, celui de la préservation des sols et des nappes d'eau, celui du climat et des microclimats. Herbes et arbres protègent les pentes contre le ruissellement. L'eau de pluie est entièrement absorbée par l'infiltration et la nappe d'eau sous-jacente est régulièrement approvisionnée. D'autre part, nous avons constaté qu'au fur et à mesure qu'on passe de l'ouest à l'Est, les sources d'eau augmentent en nombre mais leur débit diminue (voir tableau 3). En effet, aux abords du lac Kivu nous avons beaucoup de sources de débit très faible (0,03 à 0,08 litres par seconde) et difficilement accessibles à cause d'une topographie fortement escarpée. Cette diminution du débit s'explique d'une part par le fait que cette partie du Groupement connait une forte explosion démographique qui exerce une forte pression sur le relief et provoquer des érosion, sur les sols par surexploitation, compaction, piétinement et constructions anarchiques, sur la végétation par la déforestation et sur les ressources hydriques par prélèvements excessifs et pollution. La compaction du sol par piétinement et constructions anarchiques fait que les pluies qui tombent ruissellent plus qu'elles ne s'infiltrent et par conséquent le rechargement des nappes n'est plus effectif [13] et d'autre part, les précipitations qui alimentent les nappes ne sont pas régulières toute l'année. Il est donc normal que l'on assiste à des fluctuations du niveau piézométrique et à des tarissements des sources pendant la saison sèche. Cependant, les visites répétées faites aux sources d'eau dans ce bassin versant du lac Kivu nous ont amenées à constater que certaines sources d'eau étaient en voie de tarissement. Auparavant nous faisions allusion à l'allongement de la saison sèche pour expliquer cette tendance des sources au tarissement, mais comme aux temps des pluies le débit ne remonte pas, il ya lieu de croire qu'il ya un problème non identifié dans le bassin d'alimentation des sources. Une connaissance précise des toutes les activités qui s'y déroulent constituerait peut être un préalable

indispensable à la découverte du problème. En effet, pour tout captage il existe **une zone** d'alimentation qui correspond à toute la surface de sol sur laquelle une goutte d'eau qui s'infiltre pourra alimenter le captage. Cette zone d'alimentation peut s'étendre sur tout un bassin versant si le captage est situé à l'exutoire, elle sert de base à l'établissement du périmètre de protection éloigné. L'exploitation intensive des matières premières dans la zone d'alimentation entraine une déformation de la surface piézométrique et modifie l'équilibre des nappes [14].

Partant de la corrélation source et population, sachant qu'une personne a besoin de 20 litres d'eau par jour [15] et que dans chaque ménage il ya 6 personnes en moyenne, on en déduit qu'il faut donc 120 litres dans un ménage. Ce qui n'est pas le cas dans les villages de Kabamba, Kadjucu, Kabushwa et Kahungu qui ne se contentent que de quelques 30 à 40 litres d'eau par jour par ménage. Quant aux sources d'eau de notre milieu d'étude, la quantité d'eau ne constituerait pas en soi un problème majeur, car la saison sèche ne dure que 3 mois. Dans la plupart de villages, l'eau reste disponible toute l'année. Mais c'est la difficulté d'accès aux sources d'eau qui pose un problème du fait de la distance qui sépare la source à la maison la plus isolée du village. Aussi, nous trouvant dans la zone de haute altitude, le relief montagneux très escarpé rend la source difficilement accessible suite à la forte pente.

5 CONCLUSION

Les objectifs de cette étude étaient d'inventorier toutes les sources d'eau du groupement d'Irhambi-Katana, d'en décrire l'état et déterminer la quantité d'eau produite de façon à dégager la corrélation entre cette quantité d'eau et les ménages.

Les prospections effectuées dans le milieu d'étude ont montré l'existence d'une cinquantaine des sources dont 82,1% de sources aménagées, 15% non encore aménagées et 25 % tarissable en saison sèche. Leurs nappes étant directement alimentées par l'eau de pluie qui s'est infiltrée dans le sol puis dans le sous-sol à travers les terrains aquifères ; ce qui suppose une bonne perméabilité du sol mais aussi une circulation facile des substances polluantes.

Leurs débits n'étant pas réguliers toute l'année (alternance des crues et des étiages), le rythme d'approvisionnement en eau dans les ménages en est affecté et, explique pourquoi pendant la période d'étiage, la population recours des temps en temps à des eaux des ruisseaux et du lac qui sont polluées. Quatorze sources sur 56 ont un débit variant entre 0 et 0,2 litres par seconde soit 34,1% et se trouvent en grand nombre dans les villages de Kabamba, Kadjucu et Mabingu. Pour ce genre de sources, l'approvisionnement en eau à toute la population n'est pas assuré.

Le bassin versant du lac Kivu concerné par cette étude ainsi que les sources d'eau qui affleurent dans les bas-fonds des vallées et au pied des pentes surplombant le lac Kivu nécessitent une protection. Nous suggérons à la population de respecter scrupuleusement le périmètre de protection de chaque source en envisageant un reboisement pour chaque site.

Malgré la quantité plus ou moins suffisante de l'eau dans le bassin, il s'avère nécessaire de penser à la gestion rationnelle des sources d'eau par la conception des réservoirs trop plein et grâce au positionnement des sources à très grand débit à une altitude très élevées, songer à les parvenir à la population jusqu'à domicile et pallier de la sorte au problème d'eau dans le groupement d'Irhambi-Katana.

Dans ce bassin versant, une étude bactériologique pourrait être importante pour déceler les éventuels cas des sources polluées en vue d'interdire la consommation de leurs eaux.

Dans le cadre de captage, il faudra songer à une étude hydrogéologique approfondie avant tout aménagement ou captage d'une source ou des travaux liés aux eaux souterraines pour éviter le tarissement ou les pertes d'eau.

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SOIL ERODIBILITY ASSESSMENT IN SELECTED PART OF EKWUSIGO LOCAL GOVERNMENT AREA ANAMBRA STATE SOUTH-EASTERN NIGERIA

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ABSTRACT: Erosion related problems has been on the increase in some part of Ekwusigo local government area and its environs in particular and southestern Nigeria at large for some decades now and all past attempts at solving the problem have proved ineffective and thus constituting risk to the people living in such area or erosion prone area. The research was embarked upon to assess the erodibility of soil over different parent materials in selected part of study area. Soil samples were collected from profile pits dugs in three different locations namely: Egbema, Nza and Ifite Oraifite. A total of fifteen soil samples in all comprising five samples from each profile pit with a depth of 2m and according to the clarity of the different horizons was collected. The samples were air dried, crushed and sieved in 2mm before subjected to test in the laboratory for both physical and chemical. Sand fraction in all the three locations showed porosity below 50%, the ECEC were found to be low likewise the organic content and the $_{P}$H in the three locations. The properties exhibited by this soil indicate that the soil has been subjected to high rate of weathering and leaching they are easily detachable and transported by runoff, hence there stability is low.

KEYWORDS: vulnerability, soil erosion, chemical parameters, Physical parameters and Moisture Content.

1 BACKGROUND INFORMATION

Adinna (2001) defines erosion as the gradual or forceful removal of weathered rock from the point of weathering. It is an inevitable natural process in sedimentary and often metamorphic rock formations, which is necessary for the formation of the medium for crop production and plant growth. Soil erosion as a denudation process involves the three stages of rock decay (decomposition), transportation and deposition (aggradations). Soil erosion is a well-known environmental problem in southeastern Nigeria. It is the removal of soil particles from surface of the earth, transportation and deposition of the particles by the action of wind, heat, and water. Soil erosion encompasses all activities by water in all forms (rain, flood, ice, sea) resulting in soil erosion. Socio-economic problems caused by soil erosion include removal of nutrients from soil leading to low farm produce, destruction of farms, it also resulting in collapse of buildings. Soil erosion by water is a continuing, long-term problem related to south-eastern part of Nigeria forming a threat to infrastructure and agricultural production (Grove, 1951; Ofomata, 1964; Idike, 1992). Gully erosion in Anambra state, South East Nigeria has continued to pose a challenge to Geoscientist and other environmental scientist. The menace has taken its toll on the socioeconomic well being of the people living in the study area, such that lands used for agricultural and industrial purposes, ancestral homes, crops, livestock and other infrastructure are lost to the hazard at alarming rate. Soils of south eastern Nigeria have high erodibility and are classed as structurally unstable (Idowu and Oluwatosin, 2008). Therefore erosion forms a major type of soil degradation in the area. According to Lal et al, (1994), the susceptibility of soil to erosion depends on soil properties which may include the soil texture, structure, organic matter, oxides of irons and aluminium and predominantly clay minerals there are also the topographic factors which influences soil loss.

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Different types of erosions, such as sheet, rill and gully, are pervasive in Anambra. However, gully erosion constitutes the most significant threat to the survival of individuals and communities. Human activities, such as bush burning, deforestation, improper farm practices, and, more importantly, construction activities (building of roads, houses, industries), that undermine natural landscape or drainage systems account for much of the erosion menace plaguing the States. A number of researchers have investigated the magnitude of erosion in various parts of Anambra State (Obiadi. I. I et al,(2011), Chuks Okpala-Okaka, (2010), Ndukwe Chiemelu et al.,(2013) and Eze, et al,(2012) but detail study of erosion and its effect has not been carried out.

1.1 Statement Of Problem

As a matter of fact, erosion is natural and inevitable process. It becomes serious when the process is accelerated by human activities and it relate exceed the three hold value equivalent to the count, balancing and compensating rate new soil formation this depletes soil productivity and causes soil degradation, On the effect of erosion, agriculturally speaking both erosion and sedimentation affect soil productivity by decrease the rooting depth and depleting nutrient and water reserves. The adverse effect of erosion on the economy of south-eastern Nigeria became more prominent through drastic reduction in availability of cultivated land for agriculture. About 54% of the cultivated lands in Anambra state are affected by either sheet, rill and gully erosion. The following research questions would be answered after this study:

- What are the parameters required for assessing erodibility of soil in the study area.
- What are the measures for erosion control in the area of the study area.

1.2 Scope Of Study

The scope of the study area is based on the assessment of erodibility of soil formed over three different parent materials in Ekwusigo local government of Anambra state. Soil samples were collected from profile pit dugs in three different location namely Egbema, Ifiite Oraifite and Nza. The soils samples were analyzed to get the physical and chemical properties of erodibility of soil in the study area using laboratory test analysis

1.3 Aim And Objectives Of Study

The aim is to determine the presence and extent of erosion of the three different parent materials. To achieve the above aim, the following objectives were required:

- To investigate the vulnerability of soil on the study area.
- To relate erodibility of soils to some selected soil properties.
- To suggests improved management practices that will improve agricultural productivity and reduced the incidence of erosion.

1.4 Research Hypothesis

Ho: There is no significant differences in the erodibility of the soils which the three parent materials.
Hi: There is significant difference in the erodibility of soils within the three parent materials.

1.5 Justification Of Study

- This study will produce documentation on the assessment of soil in three different parent materials.
- The result of research will aid in the identification of soils that are easily erodible.
- It enables the hazards and problems of erodible soil in the area to be avoided at the early stage of planning.
- The study will identify the three parent materials and their erodibility potentials.

1.6 Literature Review

Soil erosion with its numerous forms of occurrence in varying degree has been identified as the major impendent of agricultural productivity in most part of the world. The south-eastern Nigeria is not an exemption in this trend where gully have taken catastrophic dimension threatening farmlands, streams and even entire human settlement thereby hindering

increased agricultural output. Following the ordinary definition of the world gully (i.e. an erosion channel too deep to be crossed by a wheeled vehicle), the gullies in Anambra State in particular and South East Nigeria would modestly be described as catastrophic. With many of them having depth and width exceeding tens of kilometres, they would better be called canyon (Okagbue and Ezechi, 1988). Several workers have attributed the development of gullies in Anambra State to the influence of human activities on natural and geologic processes while others suggested that gullies are linked with concentrated runoff processes. Nwajide and Hogue (1979) attributed the causes of gullies to the combination of physical, biotic and anthropogenic factors. Egboka and Nwankwor (1982) are of the opinion that gullies are caused by hydrogeological, hydrogeochemical and geotechnical properties of the rocks in the affected area. Okagbue (1986), Uma and Onuoha (1986) are in agreement with Nwajide and Hogue on the causes of gullies in South Eastern Nigeria. South-eastern Nigeria is dominated by acidic soils as in all humid regions that records very high rainfall of up to 200mm and above annually. The soils are formed from mostly sandstones and are variably classified as ferralitic soil, dystic, Nitossis (EC), organic matter, base saturation, both available and total phosphorous then acidity dominates and makes the soil susceptible to erosion Enmezor et al (1981). On the other hand they have high exchangeable Al, which leads to low $_{P}H$ that rarely exceed 6.0 hence a net negative charge. These acidic soils are mostly coarse textured with low specific surface areas, they poses waek structure ranging from weak crumb, crumb to granular for the first 2m (Babalola et al 1981).

1.7 STUDY AREA

The study was carried out in Ekwusigo local government area of Anambra state, Nigeria at three different location namely: Egbema, Ifitie Oraifite and Nza. It geographically bounded between longitude $6^{0}50^{l}E$ and $6^{0}55^{l}E$, latitude $5^{0}22^{l}N$ and $5^{0}57^{l}N$ and bounded by Nnewi north at the north and Idemili at the north, Ihiala local government in the south, Nnewi south local government in the east and Ogbaru local government at the west as shown in **Fig.1**

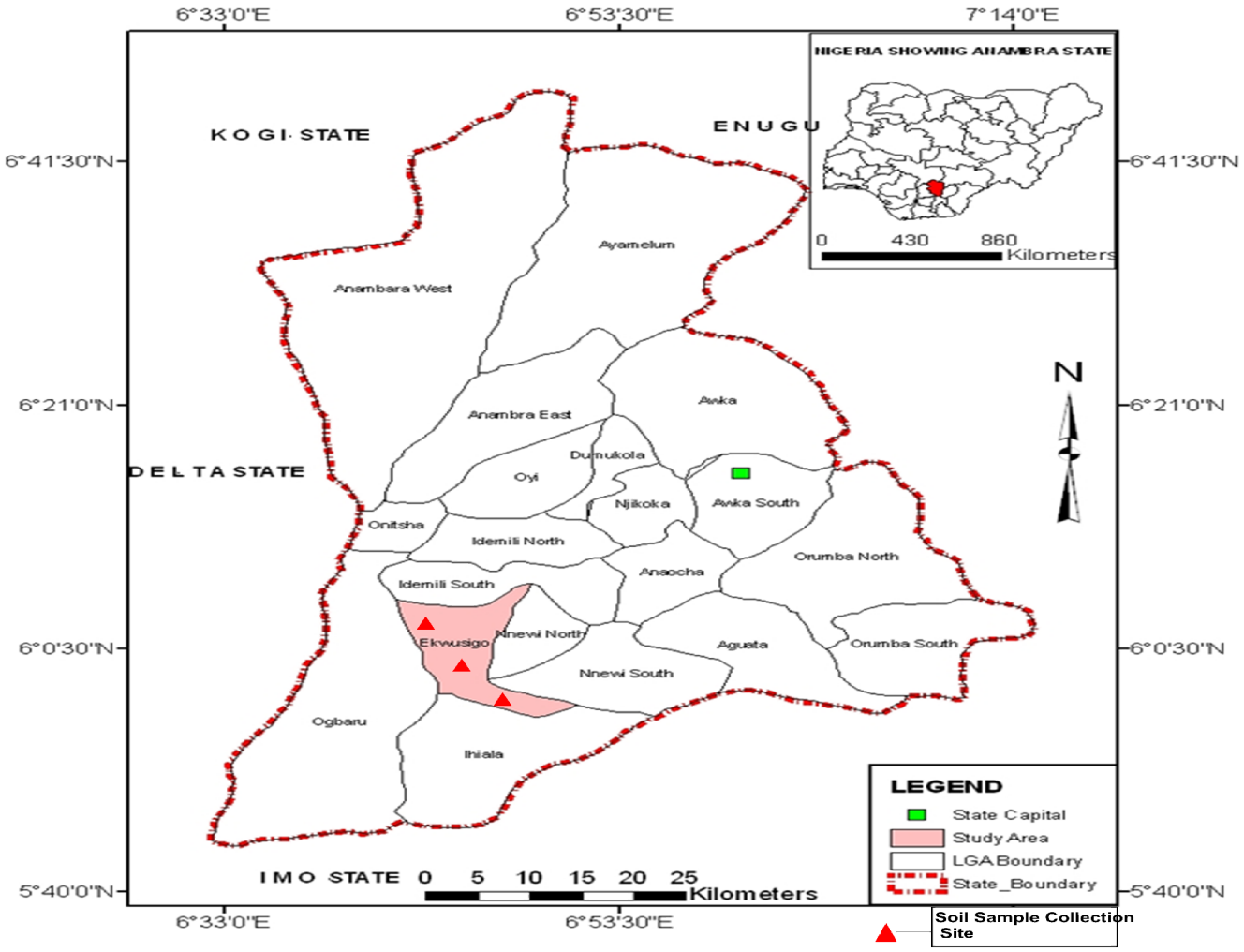

Fig. 1 Map of Anambra State Showing the Study Area. Source: (Joel et al, 2012.)

2 Soil And Geology Of The Study Area

The soils are lateritic in nature and derived from the underlying Sandstone and Shale units. The soils derived from Shales on lower slopes where drainage is poor. There is dark reddish brown clayey at the surface and a strongly mottled light grey and red soil. It varies from reddish to brownish and it is underlain by yellowish, dark red sandy clay in the lower horizons. The thickness varies from a few centimetres to more than 10m. The soils are well drained and weakly consolidated in most part of the study area. The study area falls within the Ogwashi-Asaba Formation which is Oligocene to Miocene in age, it lithology consists of alteration of clayey shale with seam lignite.

3 Research Methodology

Material used in the study are topographic map covering Ekwusigo, shovel that was used for digging the profile pit, steel tape for taking measurement of different horizons and annual soil colour chart for describing the colour of various soil samples in the horizon. Other materials are polyethene used for storing soil samples and a field note for recording the data collected from the field.

3.1 PRELIMINARY FIELD STUDY

One profile pit each was dug on the three different locations to a depth of 2m. Soil samples were according to clear horizon differentiation. A total of fifteen (15) samples, comprising of five (5) from each profile pits were collected in polythene bags and labelled both inside and outside. The samples use air dried at room temperature crushed and sieved in a 2mm sieve for determination of physical and chemical property in the laboratory. Soil samples were analyzed at the federal university of science and technology Owerri, Imo state, department of soil science laboratory.

3.2 LABORATORY PROCEDURE

3.2.1 DETERMINATION OF PHYSICAL PROPERTIES OF SOIL

Bulk density: It was determined using the core sample (Blake 1964) and calculated from:

$\rho_b = M_s/V_t$

Where

ρ_b =Bulk Density (g/cm^3)

M_s=Mass of oven- dried sample (g)

V_t = Total Soil Volume (same as v of core) cm3.

Moisture Content: It was determined gravimetrically, by first over drying representative soil samples, collected from each horizon, at a temperature of 1050c until a constant weight is obtained. Then calculation was done from this formula

$$Mc(\%) = \frac{W_s - D_s * 100}{D_s}$$

Where M_c = Moisture Content, W_s = Wet Sample and D_s = Dried Sample.

Clay Ratio (Boyoucos, 1935)

This was calculated as follows:

$$\frac{\text{Sand (\%)}}{\text{Silt (\%) + Clay (\%)}}$$

Porosity (F)

It was calculated using density values, thus

$$F = \frac{1 - Bd}{Ps}$$

Where

F = Porosity

Bd= Bulk Density

Ps = Particle Density (2.56 cm^3).

❖ **Particle Size Distribution**

This was determined using the hydrometer method describing Boyoucos (1935). Textural class was determined using soil textural triangle.

❖ **Shear Strength**

It was calculated using;

$TE = C + \sqrt{n} \tan\emptyset (KN/M^{-2})$

Where

$\sqrt{n}$ = Maximum x Normal stress

C = cohesion

tanØ = Angle of Internal Friction.

❖ **Aggregate Stability**

It was determined using the percent mean weight diameter.

Where

W1 = mi/mt

X_1 = Mean diameter range of aggregate

m_1 = Soil sample in the respective sieve after oven dry

m_t = Total weight of initial material (samples)

DATA PRESENTATION AND ANALYSIS

The results data obtained for purpose of this study are shown in tables, graph and histogram. Statistical analyses were summarized using four measures: mean range, standard deviation and the coefficient of variation. The measurements used in summarizing the data are expressed as follows

Mean

$$(x) = \frac{\sum x}{N}$$

Where:

X = Arithmetic Mean, $\sum x$ =Total Measurement and N = Total measurement.

Standard Deviation

$$SD = \sqrt{\frac{\sum f(x-x)^2}{\sum f}}$$

Where: SD = Standard Deviation, $\sum f$ = Total numbers of items and $(x\text{-}x)^2$

The coefficient of variation is determined by relating standard deviation to the mean, this express the standard deviation to the mean, this expressed the standard deviation as a percentage of the mean.

Where

$$CV = \frac{SD}{X} \times 100$$

Table 1 – 6 shows information obtained from soil data laboratory analysis. While (Table.1) shows analysis of the variable

4 RESULTS AND DISCUSSION

TABLE.1. ANALYSIS OF THE VARIABLE TABLE

	SOURCE OF VARIATION	SUM OF SQUARES	DEGREE OF FREEDOM	VARIANCE ESTIMATE	F-CAL	F 0.05	F 0.01	CONCLUSION
Sand	Between Group	412.16	2	206.08	2.25	3.89	6.93	Not
	Within	1101.26	12	91.77				Significant
	Total	1513.42	14					
Silt	Between Group	595.8	2	297.6	94	3.83	6.93	Significant
	Within Group	390.4	12	32.5				
	Total	986.2	14					
Clay	Between Group	409.2	2	204.5	4.9	3.89	6.93	Probably
	Within Group	503	12	41.9				Significant
	Total	913.0	14					
Sand	Between Group	727.3	2	363.7	2.8	3.89	6.93	Not
	Within Group	1558.8	12	129.9				Significant
	Total	2286.1	14					
Silt	Between Group	114.35	2	57.18	5.27	3.89	6.93	Probably
	Within Group	130.3	12	10.85				Significant
	Total	244.65	14					
Clay	Between Group	1051.0	2	525.5	5.9	3.89	6.93	Probably
	Within Group	1065.3	12	88.8				Significant
	Total	2.116	14					
Pr	Between Group	241.3	2	120.7	7.9	3.89	6.93	Significant
	Within Group	181.7	12	15.14				
	Total	423.0	14					
St/Cr	Between Group	9.39	2	4.69	1.2	3.89	6.93	Not
	Within Group	46.91	12	3.91				Significant
	Total	56.30	14					
AS	Between Group	3853.1	2	1926.6	2.8	3.89	6.93	Not
	Within Group	8266.2	12	688.8				Significant
	Total	12119.3	14					
IR	Between Group	3949.0	2	1974.5	4.7	3.89	6.93	Not
	Within Group	14916.4	12	1243.0				Significant
	Total	8865.4	14					
SS	Between Group	428.90	2	214.45	8.6	3.89	6.93	Not
	Within Group	196.2	12	24.71				Significant
	Total	925.10	14					
OC	Between Group	3.1	2	1.5	1.1	3.89	6.93	Not
	Within Group	16.5	12	1.3				Significant
	Total	19.60	14					
OM	Between Group	30.4	2	15.2	3.6	3.89	6.93	Not
	Within Group	50.7	12	4.23				Significant
	Total	81.1	14					
TEB	Between Group	7.71	2	3.85	2.4	3.89	6.93	Not
	Within Group	9.40	12	1.6				Significant
	Total	17.1	14					
ECEC	Between Group	46.2	2	23.1	3.9	3.89	6.93	Not
	Within Group	70.5	12	5.86				Significant
	Total	116.7	14					
$_{p}$H	Between Group	0.10	2	0.05	1.7	3.89	6.93	Not
	Within Group	0.39	12	0.03				Significant
	Total	0.49	14					

TABLE. 2 SHOWING STATISTICAL DESCRIPTION OF PHYSICAL PROPERITIES OF THE SOIL AT EGBEMA

SITE NO.1 EGBEMA	DEPTH	Bd (gcm)	Mc(%)	Porosity(%)	Sand(%)	Clay(%)	Silt(%)	Sand(%)	Clay(%)	Silt(%)	Textural Class	Silt/Clay ratio	Infiltration Ratio (%)	Aggreagate Stability(%)	Shear strength (KN/M^2)
A_P	0-15	1.52	12	42.64	93.7	2.2	4.1	86.08	4.92	9	S	1.83	50	49	109
A_B	15-57	1.49	11.21	43.77	90.2	6.6	3.2	89.66	4.54	5.8	S	1.28	54	47	95
B_{t1}	57-89	1.42	11.82	46.42	91.4	10.6	6.2	90.11	2.5	7.39	S	2.96	52	43	101
B_{t2}	89-105	1.39	13.52	47.55	83.68	11.6	7.72	75.94	12.43	11.63	SL	0.94	47	45	81
Bt_3	105-124	1.47	13.72	44.53	80.68	5.79	2.81	71.8	16.8	11.4	SL	0.68	41	42	72
Max		1.52	13.72	47.55	93.7	11.6	7.72	90.11	16.8	11.63		2.96	54	49	109
Min		1.39	12	42.64	80.68	2.2	3.2	71.8	2.5	5.8		0.69	41	42	72
Range		0.13	2.52	4.91	13.02	9.4	4.91	18.31	9.93	5.6		2.96	13	7	37
Mean		1.468	12.45	44.982	87.932	7.358	4.086	82.718	82.718	9.044		1.538	48.8	45.8	91.6
STDEV		0.071		1.783	4.922	3.409	2.99	7.472	7.472	2.18		0.808	5.562	5.562	13.412
COVAR	4.86		27.91	3.964	5.598	46.62	62.16	9.033	9.033	24.20		52.47	11.169	11.169	14.642

TABLE.3 SHOWING STATISTICAL DESCRIPTION OF PHYSICAL PROPERITIES OF THE SOIL AT NZA

SITE NO.2 NZA	DEPTH	Bd (gcm)	Mc (%)	Porosity (%)	Sand (%)	Clay (%)	Silt (%)	Sand (%)	Clay (%)	Silt (%)	Textural Class	Silt/Clay ratio	Infiltration Ratio (%)	Aggreagate Stability (%)	Shear strength (KN/M^2)
A_P	0-16	1.68	11.2	36.6	92	2.5	5.5	85.22	8.22	6.56	SL	0.8	46	42	102
A_B	16-45	1.62	11.7	38.87	93.6	3.2	3.3	84.1	7.99	7.91	S	0.9	44	42	92
B_{t1}	45-71	1.52	12.01	42.64	91.22	3.3	5.48	90.02	4.3	5.68	SCL	1.31	40	43	90
B_{t2}	71-94	1.41	12.51	46.79	83.1	9.7	7.1	75.25	13.2	11.55	SL	0.88	39	41	81
Bt_3	94-118	1.57	12.9	40.75	81.18	8.7	10.12	72.5	15.8	11.7	SL	0.74	39	40	71
Max		1.68	12.9	46.76	93.6	9.8	10.12	90.02	15.8	11.7		1.31	46	43	102
Min		1.41	11.2	36.6	81.6	2.5	3.3	72.25	4.3	5.68		0.74	39	40	71
Range		0.27	1.7	10.19	12	7.3	6.82	17.97	11.5	6.02		0.54	7	3	49.6
Mean		1.56	12.06	41.13	88.22	27.5	6.3	81.418	9.9	8.68		0.926	41.6	41.6	87.2
STDEV		0.223	1.029	3.465	5.059	3.095	2.261	6.529	4.084	2.507		0.200	2.872	1.019	10.5
COVAR		14.29	8.008	8.425	5.736	56.27	35.89	8.012	41.234	28.88		21.51	6.904	2.449	12.04

TABLE. 4 SHOWING STATISTICAL DESCRIPTION OF PHYSICAL PROPERITIES OF THE SOIL AT ORAIFITE

SITE NO.3 Ifite	DEPTH	Bd (gcm)	Mc (%)	Porosity (%)	Sand (%)	Clay (%)	Silt (%)	Sand (%)	Silt (%)	Clay (%)	Textural Class	Silt/Clay ratio	Infiltration Ratio (%)	Aggreagate Stability (%)	Shear strength (KN/M^2)
A_P	0-19	1.47	12.02	44.53	90.8	7.2	2	88.24	8.04	3.72	SCL	0.46	56	57	117
A_B	19-42	1.42	12.25	46.42	90.2	5.1	4.7	87.77	9.04	3.19	SL	0.35	52	55	108
B_{t1}	42-69	1.42	11.9	64.42	87.8	7.4	4.8	90.2	7.05	2.73	S	0.39	50	49	102
B_{t2}	69-91	1.41	13.52	46.79	86.77	7.4	5.83	85.2	7.6	7.2	CL	0.94	48	46	96
Bt_3	91-115	1.39	14.55	47.55	85.25	6.2	8.55	86.44	7.55	6.01	S	0.8	45	41	81
Max		1.47	14.55	47.55	90.8	7.2	8.55	90.2	9.04	7.2		0.94	56	57	117
Min		1.39	12.02	44.53	85.25	5.1	2	85.2	7.05	2.73		0.35	48	41	81
Range		0.08	2.53	3.02	5.55	2.1	6.55	5	1.99	4.47		0.59	8	16	76
Mean		1.422	12.848	46.342	88.164	6.66	5.176	437.85	7.856	4.571		0.588	50.2	49.6	36
STDEV		0.026	0.598	0.996	2.081	0.898	2.111	1.692	0.6701	1.735		0.239	3.709	5.851	12.089
COVAR		1.831	4.959	2.149	2.360	13.48	40.78	1.932	8.529	37.96		40.51	7.388	11.79	11.993

TABLE. 5. SHOWING STATISTICAL DESCRIPTION OF THE SOIL CHEMICAL CHARACTERTICS AT EGBEMA

SITE NO.1 HORIZON	Depth (cm)	O.C (%)	O.M (%)	pH	Na (mol/kg)	Mg^{2+} (mol/kg)	K^{+} (mol/kg)	Ca^{+} (mol/kg)	TEB (mol/kh)	$Al3^{+}$ (mol/kg)	H^{+} (mol/kg)	E.A (mol/kg)	E.C.E.C (mol/kg)	N (%)	P(PPM)
A_P	0-15	1.04	1.79	5.06	0.15	0.09	0.48	0.19	0.91	0.66	0.24	0.9	1.81	0.21	25.1
A_B	15-57	1.01	1.74	5.2	0.12	0.1	0.42	0.12	0.76	0.42	0.51	0.93	1.69	0.18	20.22
B_{t1}	57-89	0.97	1.67	5.04	0.1	0.21	0.52	0.21	1.04	0.32	0.82	1.14	2.18	0.17	21.44
B_{t2}	89-105	0.99	1.71	5.01	0.14	0.32	0.48	0.24	1.18	0.45	0.62	0.07	2.25	0.13	20
Bt_3	105-124	0.95	1.64	4.9	0.13	0.2	0.52	0.18	1.03	0.31	0.51	0.82	1.85	0.1	19.02
Max		1.04	1.79	5.2	0.15	0.32	0.52	0.24	1.18	0.66	0.82	1.14	2.25	0.12	25.11
Min		0.95	1.64	4.9	0.1	0.09	0.42	0.12	0.76	0.31	0.24	0.82	1.69	0.13	19.02
Range		0.09	0.015	0.3	0.05	0.23	0.1	0.12	0.42	0.35	0.54	0.32	0.56	0.08	6.09
Mean		0.992	1.71	5.042	0.128	0.184	0.484	0.188	0.984	0.432	0.54	0.772	1.956	0.158	21.16
STDEV		0.031	0.058	1.100	0.0173	0.1043	0.0369	0.0405	0.1407	0.124	0.1877	0.1179	0.22	0.0395	2.119
COVAR		3.55	3.4038	1.983	13.308	56.68	7.624	21.543	14.299	28.70	34.76	12.13	11.247	25.00	10.015

TABLE. 6. SHOWING STATISTICAL DESCRIPTION OF THE SOIL CHEMICAL CHARACTERTICS AT NTA

SITE NO.2 HORIZON	Depth (cm)	O.C (%)	O. M (%)	pH	Na (mol/kg)	Mg^{2+} (mol/kg)	K^{+} (mol/kg)	Ca^{+} (mol/kg)	TEB (mol/kh)	Al^{3+} (mol/kg)	H^{+} (mol/kg)	E.A (mol/kg)	E.C.E.C (mol/kg)	N (%)	P(PPM)
A_P	0-16	1.05	1.81	5.4	0.17	0.08	0.47	0.81	0.9	0.52	0.62	1.14	2.02	0.22	23.24
A_B	16-45	1.02	1.76	5.5	0.19	0.09	0.42	0.17	0.87	0.51	0.59	1.1	1.97	0.19	22.44
B_{t1}	45-71	0.94	1.62	5.3	0.14	0.07	0.45	0.15	0.81	0.42	0.62	1.04	1.85	1.85	22.82
B_{t2}	71-94	0.92	1.59	5.08	0.15	0.1	0.37	0.15	0.77	0.32	0.52	0.84	1.61	1.61	21.01
Bt_3	94-118	0.82	1.41	4.99	0.14	0.11	0.44	0.14	0.83	0.31	0.49	0.8	1.63	1.63	21.01
Max		1.05	1.81	5.5	0.19	0.11	0.47	0.18	0.9	0.52	0.26	1.14	2.04	2.04	23.24
Min		0.82	1.41	4.99	0.14	0.07	0.37	0.14	0.77	0.31	0.49	0.8	1.61	1.61	21.01
Range		0.23	0.4	0.51	0.05	0.04	0.1	0.04	0.13	0.21	0.13	0.34	0.43	0.43	2.23
Mean		0.95	1.638	5.254	0.158	0.09	0.43	0.158	0.836	0.416	0.568	0.984	1.82	1.82	22.12
STDEV		0.0811	0.139	0.193	0.023	0.014	0.034	0.015	0.046	0.097	0.053	0.139	0.178	0.178	0.909
COVAR		8.537	8.476	3.676	14.557	15.56	7.907	9.375	5.502	23.32	9.298	14.184	9.780	9.780	4.109

TABLE. 7. SHOWING STATISTICAL DESCRIPTION OF THE SOIL CHEMICAL CHARACTERTICS AT IFITE ORAIFITE

SITE NO.3 HORIZON	Depth (cm)	O.C (%)	O. M (%)	pH	Na (mol/kg)	Mg^{2+} (mol/kg)	K^{+} (mol/kg)	Ca^{+} (mol/kg)	TEB (mol/kh)	Al^{3+} (mol/kg)	H^{+} (mol/kg)	E.A (mol/kg)	E.C.E.C (mol/kg)	N (%)	P (PPM)
A_P	0-19	1.06	1.83	5.51	0.19	0.09	0.61	0.2	1.28	0.67	0.52	1.19	2.47	0.23	26.2
A_B	19-42	1.03	1.78	5.32	0.15	0.1	0.71	0.19	1.15	0.59	0.42	1.01	2.16	0.21	21.2
B_{t1}	42-69	0.99	1.71	5.01	0.16	0.08	0.42	0.19	0.85	0.51	0.66	1.17	2.02	0.18	24.2
B_{t2}	69-91	0.85	1.47	4.92	0.15	0.12	0.51	0.16	0.94	0.42	0.67	1.09	2.03	0.17	20.1
Bt_3	91-115	0.62	1.07	4.92	0.14	0.13	0.41	0.17	0.85	0.45	0.7	1.15	2	0.15	20
Max		1.06	1.83	5.51	0.19	0.13	0.81	0.2	1.28	0.67	0.7	1.19	2.47	0.23	26.22
Min		0.62	1.07	4.92	0.14	0.08	0.41	0.16	0.85	0.42	0.42	1.01	2	0.15	20
Range		0.44	0.76	0.59	0.05	0.05	0.4	0.04	0.43	0.25	0.28	0.18	0.47	0.08	6
Mean		0.19	1.572	5.136	0.158	0.104	0.572	0.182	1.014	0.628	0.594	1.122	2.136	0.188	22.4
STDEV		0.159	0.279	0.24	0.017	0.019	0.163	0.015	0.369	0.092	0.059	0.069	0.179	0.029	2.5
COVAR		17.47	17.75	4.67	10.63	19.00	25.597	8.333	45.33	17.36	12.04	6.273	8.380	15.26	10.9

Where O.C = Organic Content, Organic Matter, TEB =Total Exchangeable Base, E.C.E.C =Effective Cation Exchange Capacity

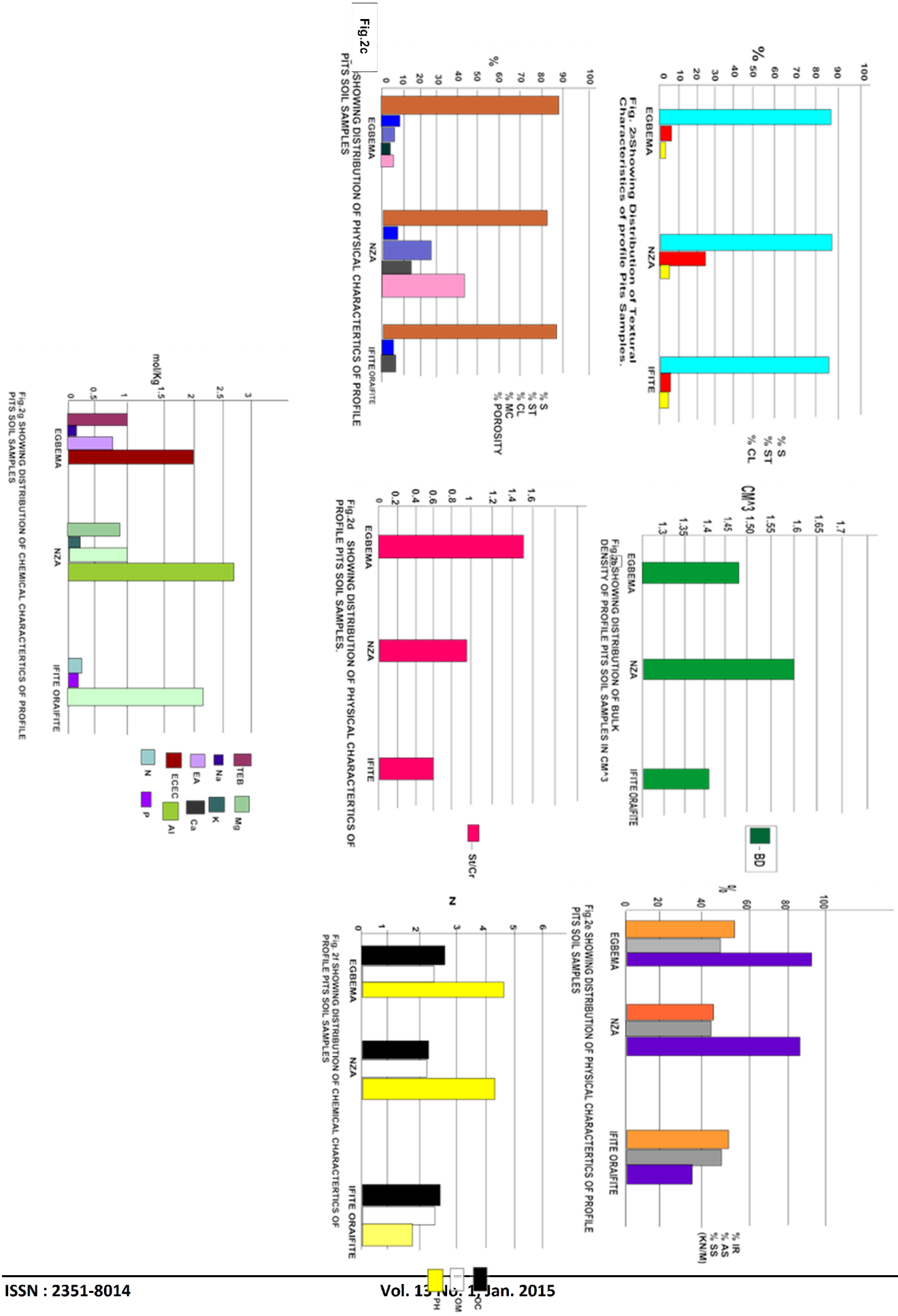
Fig. 2a Showing Distribution of Textural Characteristics of profile Pits Samples.
EGBEMA
NZA
IFITE
% S
% ST
% CL
Fig.2b SHOWING DISTRIBUTION OF BULK DENSITY OF PROFILE PITS SOIL SAMPLES IN CM^3
CM^3
BD
Fig.2c SHOWING DISTRIBUTION OF PHYSICAL CHARACTERTICS OF PROFILE PITS SOIL SAMPLES
% S
% ST
% CL
% MC
% POROSITY
Fig.2d SHOWING DISTRIBUTION OF PHYSICAL CHARACTERTICS OF PROFILE PITS SOIL SAMPLES.
St/Cr
Fig.2e SHOWING DISTRIBUTION OF PHYSICAL CHARACTERTICS OF PROFILE PITS SOIL SAMPLES
% IR
% AS
% SS
(KN/M)
Fig. 2f SHOWING DISTRIBUTION OF CHEMICAL CHARACTERTICS OF PROFILE PITS SOIL SAMPLES
N
PH
OM
OC
Fig.2g SHOWING DISTRIBUTION OF CHEMICAL CHARACTERTICS OF PROFILE PITS SOIL SAMPLES
mol/Kg
TEB
Mg
Na
K
EA
Ca
ECEC
Al
N
P

4.1 PHYSICAL PROPERITIES

4.1.1 BULK DENSITY

There was slight increase in bulk density with in depth as observed in all three locations (profile pits). The mean bulk densities obtained are 1.45gcm^{-3}, 1.45gcm^{-3} and 1.42gcm^{-3} for Egbema, Nza and Ifitie Oraifite respectively as shown in (Table 3, 4 and 5). Nza has the highest bulk density which can be attributed to sand fraction which is as a result of high rainfall witnesses and its consequent leaching problem (Fig.2b).

4.1.2 POROSITY

The mean porosity values are 44.982%, 41.13% and 46.342% for Egbema, Nza and Ifite Oraifite respectively. Porosity of less than 50% is not desirable so the poor porosity is attributed to high bulk density of soils of these locations (Table 3, 4 and 5) respectively.

4.1.3 PARTICLE SIZE DISTRIBUTION OF SAND

It revealed a dominance of sand fraction in all three locations through Ifite Oraifite has the greatest value. The mean value of sand is 82.718%, 81.418% and 437.85% for Egbema, Nza and Ifite Oraifite as shown in (Table 3, 4 and 5) respectively.

4.1.4 MOISTURE CONTENT

The mean moisture content (%) obtained are 12.5%, 12.8% and 12.1% for Egbema, Nza and Ifite Oraifite respectively (Table 3, 4 and 5). Ifite Oraifite has the lowest value because of its poor structural stability as indicated by its highest sand content.

4.1.5 CLAY RATIO

This is also known as mechanical ratio and according to Bouyouces(1935) a high clay ratio indicates a low structural stability. This is because it is ratio of sand over silt over silt plus clay. The mean clay ratio values obtained are 1.54, 0.93 and 0.58 for Egbema, Nza and Ifite Oraifite respectively (Table 3, 4 and 5).

4.2 CHEMICAL PROPERTIES

4.2.1 $_{P}$H

The $_{P}$H mean values obtained are 5.042, 5.254 and 5.136 respectively for Egbema, Nza and Ifite Oraifite respectively (Table 6, 7 and 8). This indicates acidity rates very strongly acidic to strongly acidic. This is due to the constant leaching by rainfall which leaves the soil saturated with more Al^{3+} and H^{+} (Table 6, 7 and 8) respectively.

4.2.2 ORGANIC CARBON

The mean value for organic carbon contained is 0.992, 0.95 and 0.19 % respectively for Egbema, Nza and Ifite Oraifite respectively. The low organic carbon content indicates low organic matter in all the three location as shown in (Table 6, 7 and 8) respectively.

4.2.3 TOTAL EXCHANGEABLE BASES

The mean value are 0.98, 0.84and 0.81 mol/kg respectively for Egbema, Nza and Ifite Oraifite. The low value recorded was due to excessive rainfall and its consequent leaching action as shown in (Table 6, 7 and 8) respectively. Egbema has the highest value of total exchangeable base as shown in Fig.2g.

4.2.4 TOTAL EXCHANGEABLE ACIDITY

The mean exchangeable acidity values obtained are 0.984, 0.836 and 1.014 mol/kg respectively for Egbema, Nza and Ifite Oraifite respectively as shown in (Fig). This is quite higher than the exchangeable bases; hence there is a reason for the aciity nature of the soil as shown in (Table.5, 6 and 7) respectively.

4.2.5 EFFECTIVE CATION EXCHANGE CAPACITY

The mean values for ECEC are 2.96, 1.82 and 2.14 mol/kg respectively for Egbema, Nza and Ifite Oraifite as shown in (Table.). The ECEC of all the soils were of low values ranging from 1.96 – 2.14 which can be attributed to the low level of organic matter in these soils of the acid soils of southern Nigeria to the type of clay minerals found in the soils as shown in (Table.4, 5 and 6) respectively. Egbema has the highest effective cation exchange value as shown in Fig. 2g.

5 CONCLUSION

Result from the study revealed that soils formed over the afore mentioned soils are all erodible. This attributed to high annual rainfall amounting to 2000mm (Ofomata, 1964) which increase low structural stability as indicated by high sand fraction (%).This raises the dispersion ratio to above 15%. Soil PH, organic matter and effective exchangeable cation were all found to be low indicating that the soils are quite below their potential productivity level. There is also apparently low amount of cation as a result of low level of organic matter in the soil. The physical and chemical values of the soil influencing soil erodibility do not differ significantly. Since the soil charactertics are obtained from the same locality their properties are highly related. It was observed that soils in three areas are high in sand fraction and was generally low in clay content. It is therefore conclude from the above study that the relationship observed among the soils charactertics and soil erodibility could not have occurred by chance. Thus erodibility of soils is therefore significantly influenced by soil charactertics as shown in Table.1. From these observations one can conclude by saying that the erodibility of the soil in the study area is high.

6 RECOMMEDATIONS

Owing to the fact and considerations of the result of the study the following recommendations are hereby made:

- Practices such as mulching, alley cropping, minimum or zero tillage, cover cropping, crop rotation and high density, cropping which are all effective agronomic methods of controlling soil erosion should be practiced.
- Organic manure instead of fertilizer should be used during agronomic practices, this helps to stabilize the structure by improving the binding charactertics and compensating for soil nutrient loss, causes by high intensive rain and leaching
- Practices that will encourage vegetative cover on the surface should be applied and this will reduce surface runoff velocity, force of flow and transports capacity of flow, thereby encouraging sediment deposition. This practice is very important because of its high sand fraction (%) which indicates low aggregate stability, as it will reduce the direct current and impact of heavy rains with the soil surface.
- Finally from the statistical and laboratory analysis carried out, any factor that will increase the amount of sodium in the soil, increase soil $_{P}$H, decrease bulk density, decrease organic carbon and moisture content should be avoided. Mechanical structures can also be put in place to help silt trapping and vegetation establishment properly constructed drainage facilities should be built in the study area.

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Smart Object Finder by Using Android and Bluetooth Low Energy

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ABSTRACT: The main goal of this project is to help people who lose their objects frequently and also to avoid stolen of object. Usually people get frustrated when they lose something such as wallets, keys, pen drives, laptop, etc. An object finder is capable of locating an object of interest in a 150 meters range. In this project we use android latest version 4.4 kitkat with Bluetooth low energy technology which having 4.0 version. Android powers hundreds of millions of mobile devices in more than 190 countries around the world. This project relates in general to systems and devices for enabling persons to easily locate and find lost or misplaced objects or items common to a household or office environment, and more particularly to a system utilizing a wireless transmitter (Android app) and plurality of wireless receiver (Bluetooth tag) attachable to objects or item needing to be located at various times. The object could be anything such as luggage, a car, a bicycle or even a person. We write code for android app in Eclipse Juno. Then the .apk file is installed in Smart Phone. The BLE 113 Bluetooth module is developed by Bluegiga technologies which is use in the tag. It will be programmed by smartbasic. There are two possible mode of project one is when user wants to find the object which having attached tag by using app then he have to open the app. Connect Bluetooth & transfer data to tag then tag will beep loudly. By hearing voice we can reach towards the object. So by using this we can find out our misplaced object. The another mode is when we activate the tag already by app and whenever the Smartphone is goes out of range then app will beep loudly by showing message you are not with your object. The first mode is explained in this paper. Our smart object finder is low cost effective. Because android is open source. So app is almost free of cost. Tag contains Bluetooth module with buzzer. CR2032 AAA size battery is required for supplying a tag.

KEYWORDS: Bluetooth Low Energy (BLE), Software development kit, Eclipse, Integrated development environment (IDE).

1 INTRODUCTION

Electronics plays a very important role in developing simple to complex devices used for any purpose. In every field electronic equipments are required. The best achievement as well as future example of integrated electronics in technical field is Smart Phone. Today most of the smart phone uses Android operating system. Android powers hundreds of millions of mobile devices in more than 190 countries around the world. It's the largest installed base of any mobile platform and growing fast—every day other million user's power up their Android devices for the first time and start looking for apps, games, and other digital content. Android gives you a world-class platform for creating apps and games for Android users everywhere, as well as an open marketplace for distributing to them instantly.

People get frustrated when they lose something such as keys, pen drives, laptop, etc.

An object finder is capable of locating an object of interest in an adjustable range. This project relates in general to systems and devices for enabling persons to easily locate and find lost or misplaced objects or items common to a household or office environment, and more particularly to a system utilizing a wireless transmitter (Android app) and plurality of wireless receiver (Bluetooth tag) attachable to objects or item needing to be located at various times. The object could be anything such as luggage, a car, a bicycle or even a person .The problem of finding an object could be the problem of finding a specific car in car park, finding luggage on a luggage conveyer in an air port, finding a specific bike in a school yard or finding

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a person such as child in a school yard or in shopping centre. The problem of detecting the loss of an object could be detecting whether object is being stolen or whether the object has been forgotten.

Fig. 1. Scenario of Project

Called finder tags are the most advanced object finder to locate objects directly from your smart phone. It uses the *Bluetooth* 4.0 technology (also called *Bluetooth Low Energy* - BLE) which can last over 12 months on a coin cell battery. The BLE 112 Bluetooth module is developed by 'Bluegiga' technologies which is use in the tag. The system can be used to locate objects up to 150 meters. You can attach the Called finder tags to easily misplaced objects, such as keys, wallets, purses, remote controls, canes and umbrellas, etc. When the System is activated on your smart phone, the Called finder tag will beep and flash. The object Finder app has a unique feature to guide you towards the lost object. It has a signal strength indicator which gives you a sense of distance between you and the lost object.

The Electronic Leash service ties your Called finder attached object to your smart phone. Alerts will be sounded if the two are separated at a distance on the smart Phone, the Called finder or both. The location is also recorded to help you return to look for the lost object. Electronic Leash is perfect for situations such as keeping any eye on wandering kids/pets in a park or your valuables when travelling.

1.1 NECESSITY

- Generally speaking methods and devices for the identification and detection of objects exists.
- Considering the example of luggage which is typically labelled with hand written or bar-coded label indicating the identity of the owner of the luggage. However the hand written label can be impossible to read either due to hand writing that is difficult to read and the label may be destroyed by the humidity or by the transported by the luggage.
- The hand written label does not by itself constitute a guarantee for identity of the owner of the luggage since it is easy to change the label or to write a label with wrong name or address.
- More ever the label does not alert the owner if the luggage is either forgotten or stolen.
- A badly written tag can cause that the object ends up in a wrong destination. A system for identification of person exists but they also have drawback in detection.

1.2 THEME

- Idea: Borrowed from frustrating people who lose their object frequently.
- This system works equivalently like when we want to find someone then we call him or her by calling their name and if he or she is present in range of our call he or she will give reply to us. In the same way, our system will also call an object by their ID's which are set by the system for them.
- All these things can be achieved by creating an application using Android operating system as transmitter in our system and Bluetooth version 4.0 modules as a tag which is attached to an object which works as a receiver in our system.

2 EXISTING SYSTEM

The present systems generally relates to an object finder and, more particularly, to an object finder capable of locating an object of interest in an adjustable range. An object finder may include a transmitter and a receiver. The transmitter is generally attached to an object of interest, for example, a child, while the receiver is held by an adult. In operation, the

transmitter periodically sends signals to the receiver, which is able to receive the signals in an available range. Once the receiver loses contact from the transmitter, an alarm device of the receiver may be activated to signal the receiver party that the object is out of the range.

Some receivers of object finders on the market may not be user friendly. For example, a super-regenerative receiver may have low signal sensitivity, undesirable stability and low signal-to-noise ratio. To solve this problem, an additional amplifier circuit may be integrated into such receiver product and thus results in higher power consumption and circuit complexity. As to a super-heterodyne receiver, signals can only be received in a range of a fixed distance from the transmitter. If the transmitter and the super-heterodyne receiver draw closer or go beyond the range, signals coming from the transmitter would no longer be received. It may therefore be desirable to have an object finder that has a receiver capable of receiving signals in an adjustable distance from the transmitter. It may also be desirable to have an object finder that has a power-saving receiver of relatively high signal sensitivity, desirable stability and signal-to-noise ratio.

- Smaller Range.
- Larger in Size.
- Not User friendly.
- Low security.
- Only one object could be located with the system.
- Complex in design.
- No alarm facility.
- Low signal Sensitivity

3 PROPOSED SYSTEM

The aim of proposed system is to develop a system of improved facilities. The proposed system can overcome all the limitations of the existing system. The system provides proper security and reduces the manual work.

- Security of data.
- Ensure data accuracy's.
- Minimum time needed for the various processing.
- Greater efficiency.
- Better service.
- User friendliness and interactive.
- Minimum time required.
- Comparatively less price.

Android is used as an operating system which is present in near about all smart phones.

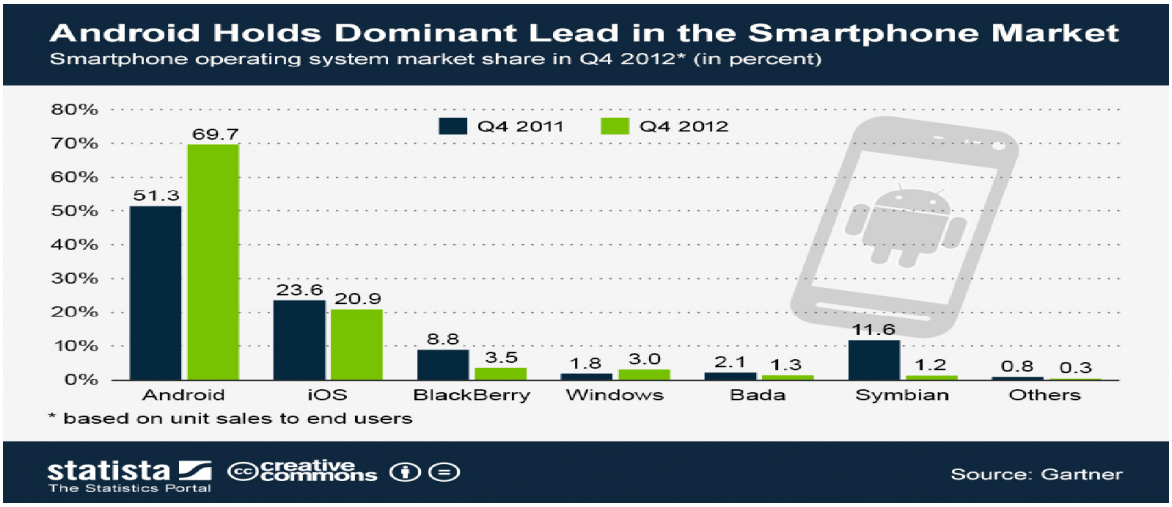


Fig. 2. Graphical representation of android user

Android powers hundreds of millions of mobile devices in more than 190 countries around the world. It's the largest installed base of any mobile platform and growing fast—every day another million users power up their Android devices for the first time and start looking for apps, games, and other digital content. Android gives you a world-class platform for creating apps and games for Android users everywhere, as well as an open marketplace for distributing to them instantly [4]. Building on the contributions of the open-source Linux community and more than 300 hardware, software, and carrier partners, Android has rapidly become the fastest-growing mobile OS. Every day more than 1 million new Android devices are activated worldwide. Android's openness has made it a favourite for consumers and developers alike, driving strong growth in app consumption. Android users download more than 1.5 billion apps and games from Google Play each month. With its partners, Android is continuously pushing the boundaries of hardware and software forward to bring new capabilities to users and developers. For developers, Android innovation lets you build powerful, differentiated applications that use the latest mobile technologies [4].

3.1 POWERFUL DEVELOPMENT FRAMEWORK

Easily optimize a single binary for phones, tablets, and other devices. Android gives you everything you need to build best-in-class app experiences. It gives you a single application model that lets you deploy your apps broadly to hundreds of millions of users across a wide range of devices—from phones to tablets and beyond. Android also gives you tools for creating apps that look great and take advantage of the hardware capabilities available on each device. It automatically adapts your UI to look its best on each device, while giving you as much control as you want over your UI on different device types. For example, you can create a single app binary that's optimized for both phone and tablet form factors. You declare your UI in lightweight sets of XML resources, one set for parts of the UI that are common to all form factors and other sets for optimizations specific to phones or tablets. At runtime, Android applies the correct resource sets based on its screen size, density, locale, and so on [7].

To help you develop efficiently, the Android Developer Tools offer a full Java IDE with advanced features for developing, debugging, and packaging Android apps. Using the IDE, you can develop on any available Android device or create virtual devices that emulate any hardware configuration.

3.2 ANDROID 4.3

Android 4.3 gives you a single, standard API for interacting with Bluetooth Smart devices. Android 4.3 introduces built-in platform support for **Bluetooth Smart Ready** in the central role and provides a standard set of APIs that apps can use to discover nearby devices, query for GATT services, and read/write characteristics.

With the new APIs, your apps can efficiently scan for devices and services of interest. For each device, you can check for supported GATT services by UUID and manage connections by device ID and signal strength. You can connect to a GATT server hosted on the device and read or write characteristics, or register a listener to receive notifications whenever those characteristics change. You can implement support for any GATT profile. You can read or write standard characteristics or add support for custom characteristics as needed. Your app can function as either client or server and can transmit and receive data in either mode. The APIs are generic, so you'll be able to support interactions with a variety of devices such as proximity tags, watches, fitness meters, game controllers, remote controls, health devices, and more [4]. Following are the features of android 4.3:

1. Bluetooth low energy support.
2. OpenGL ES 3.0 support, allowing for improved game graphics
3. Restricted access mode for new user profiles
4. File system write performance improvement
5. Dial pad auto-complete in the Phone application
6. Improvements to Photo Sphere
7. Reworked camera UI, previously introduced on Google Play edition phones
8. Addition of "App Ops", a fine-grained application permissions control system (hidden by default)

3.3 BLUETOOTH 4.0

Bluetooth technology is the global wireless standard enabling, convenient, secure connectivity for an expanding range of devices and serves. It is an essential element for bringing everyday objects into the connected world. Created by Ericsson in 1994, Bluetooth wireless technology was originally conceived as a wireless alternative to RS-232 data cables. Bluetooth

technology exchanges data over short distances using radio transmissions. Bluetooth technology operates in the unlicensed industrial, scientific and medical (ISM) band at 2.4 to 2.485 GHz, using a spread spectrum, frequency hopping, full-duplex signal at a nominal rate of 1600 hops/sec. The 2.4 GHz ISM band is available and unlicensed in most countries [5].

4 SYSTEM DEVELOPMENT OF PROPOSED SYSTEM

The transmitter is nothing but a Smartphone and receiver is a Bluetooth low energy device which is about the size of a matchbook which aims to use the community of Smartphone users to keep track of your items. It is basically android based project in which Bluetooth smart 4.0 technologies is used. And we assign a name for app is Object Finder. In this app we can click the pictures of object and when it is lost then log in to Find me app and search for object when object is in range 0f 50m then audio sound is generated & also the distance of object from smart phone is also located.

4.1 BLOCK DIAGRAM

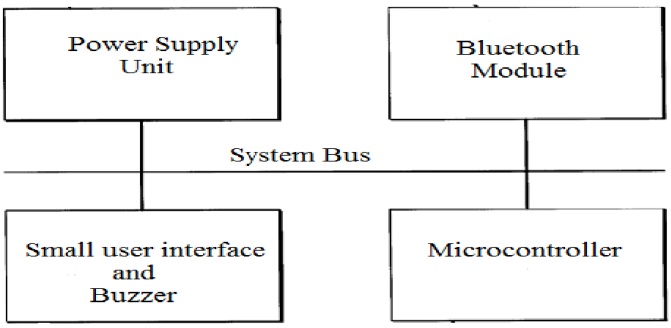


Fig. 3. Block Diagram of Project

Android-powered Bluetooth Smart Ready devices running the latest OS will be compatible with virtually any Bluetooth enabled product—from the keyboards or headphones consumers already own, to the latest generation of power-efficient Bluetooth Smart appcessories (accessories + companion apps) like the Pebble watch. With more than three billion Bluetooth devices in the world today and all leading OS players (Apple, Android, Microsoft and Blackberry) providing native support, Bluetooth technology connects to almost anything.

4.2 BLUETOOTH MODULE: BLE112

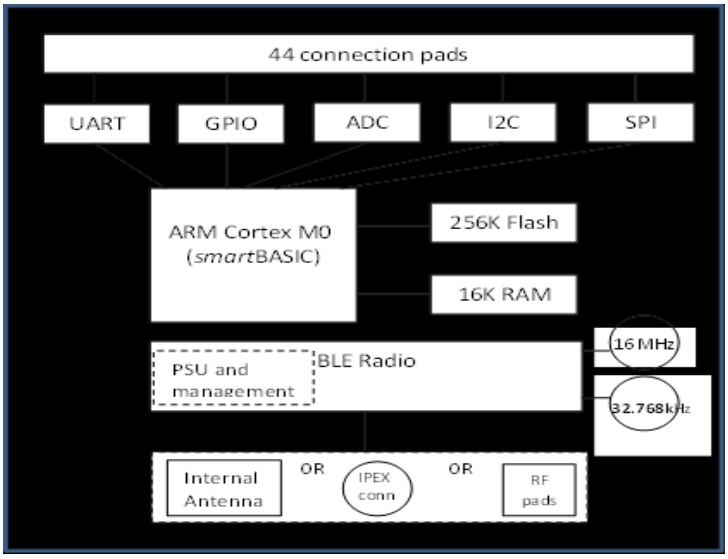
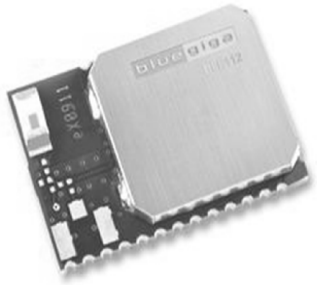


Fig. 4 Architecture of Tag

- Hardware Features:



1. Bluetooth low energy radio
2. Integrated antenna, U.FL connector or RF pin
3. 8051 microcontroller - 8 KB RAM & 128 KB flash

- Key Features:

1. Bluetooth 4.0, single mode compliant supports master and slave modes
2. Integrated Bluetooth low energy stack GAP, GATT, L2CAP, SMP
3. Flexible & simple in-built development:BG Profile Toolkit™,C language
4. Radio performance: TX power: +4 dBm to -23dBm and RX sensitivity: -87dBm to -93dBm
5. Ultra low current consumption: Transmit: 27mA (0 dBm) and - Sleep mode 3: 0.4uA
6. Programmable 8051 processor for embedding full applications
7. The BLE112 modules are available with three different antenna types: integrated antenna (BLE112-A), U. FL connector (BLE112-E) & 50 ohm RF pin (BLE112-N)

5 RESULT AND ANALYSIS

1) Graphical Layout of Android App in Eclipse:

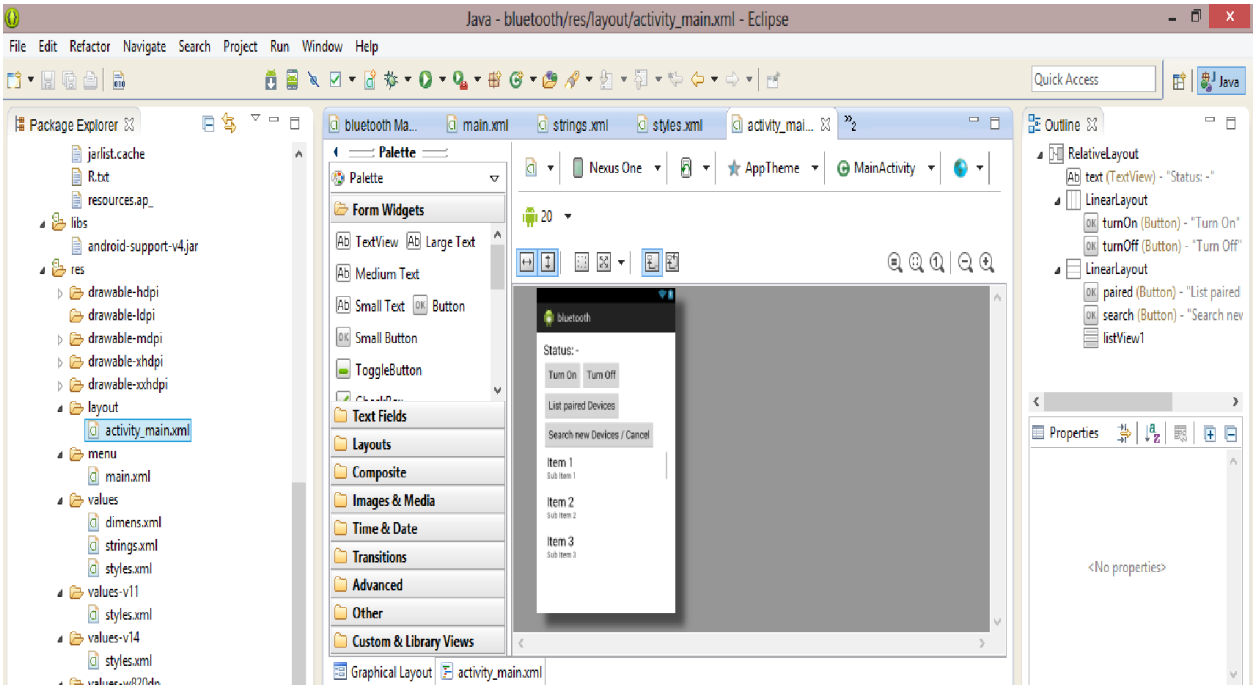
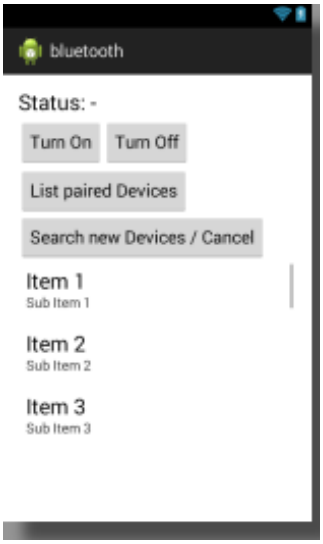


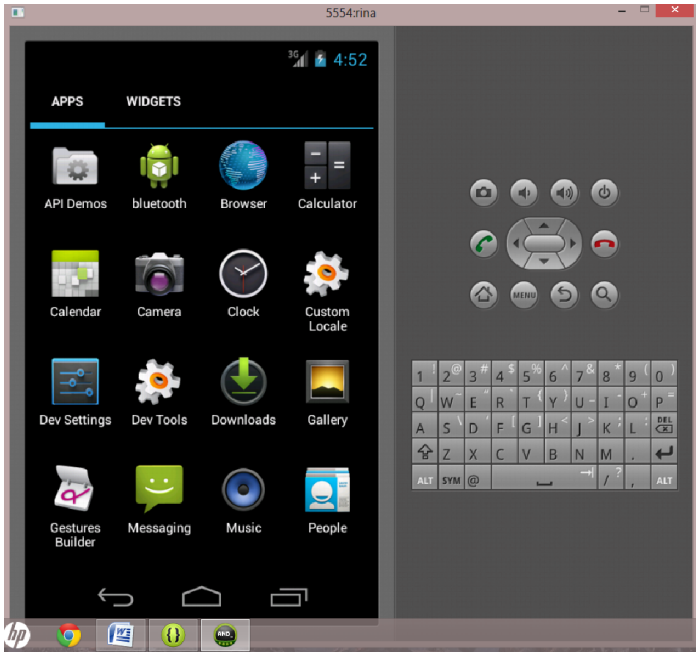
Fig. 5 android app of object finder

In our smart object finder we develop an android app which is compatible to all smartphones. This system is not limited to iOS only. The range is about 100m so it also overcome this problem of existing system in our system. Though we use android so no. of tags we can use at a time. No limitation in that. The size and weight of tag is also small with high sensitivity. The code of android app is written in Eclipse.

2) Screenshot of app:



3) Bluetooth app is launched:



4) This app is communicate with following tag for finding object:

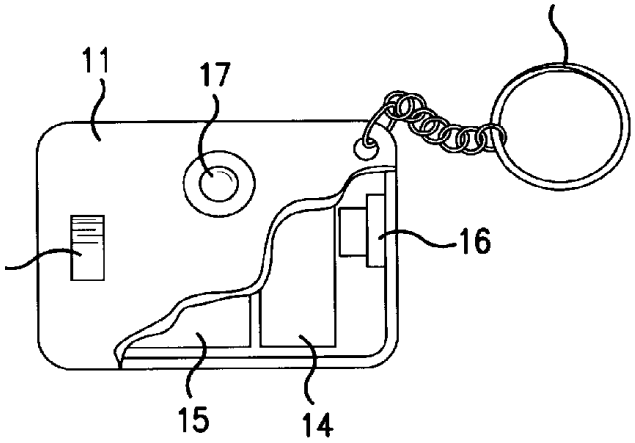


Fig. 6 Tag which attaches to object as keychain

6 CONCLUSION

This proposed system Smart Object Finder overcomes all the problems of existing systems. We already study comparison of existing system So, the cost point of view Smart Object Finder is much better than that because of Android app which is free of cost. The Bluetooth used in tag having inbuilt controller which reduces complexity.

6.1 ADVANTAGES

- Security of data.
- Ensure data accuracy's.
- Minimum time needed for the various processing.
- Greater efficiency.
- Better service.
- User friendliness and interactive.
- Minimum time required.
- Comparatively less price.
- Android is used as an operating system which is present in near about all smart phones.

6.2 APPLICATIONS

- For finding house hold objects and also office stuffs.
- This system will allow the user to keep track of many objects.
- This system will solve the problem of finding a specific car in car park.
- Also the problem of finding luggage on a luggage conveyer in an air port.
- Finding a specific bike in a school yard.
- Finding a person such as child in a school yard or in shopping centre.
- Finding pets.

6.3 FUTURE SCOPE

In future, an advanced object finder will release with more facilities such as finding a people or objects with their locations and distance. It will provide higher security by increasing the version of Bluetooth module with higher range and it will find the object in small amount time. The size of Tag will be reduced and it will available in less cost.

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Extractions Séquentielles du phosphore des sédiments Aquatiques : Cas des principaux Oueds de la région de Meknès

[Sequential Extraction of Aquatic Sediment Phosphorus : Case of the main Rivers in the Area of Meknes]

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ABSTRACT: The use of water from streams depends on their quality in often degraded by excessive nutrient loads such as phosphorus. The study of this nutrient by a method of sequential analysis in sediments aims to provide information on environmental quality, while determining the form of bioavailable phosphorus.
This work aims to put the focus on the different forms phosphorus could be found in the aquatic sediments of the main rivers in the region of Meknes (Morocco).
The determination of total phosphorus level in sediments is made using spectrophotometry applied on the supernatant after mineralization of the sediment with ($H_2SO_4/K_2S_2O_8$) according to ammonium molybdate method using ascorbic acid as reagent. The chemical fractioning of phosphorus in the sediment is done following the Golterman fractionation scheme that uses EDTA as specific chelating agent that extract the mineral fraction without disturbing the organic phosphorus by adjusting the pH of extracting solutions to that of the sediment.
This scheme will allow us to determine the proportions of five forms of phosphorus: water-soluble phosphorus (o-P), iron-bound phosphorus (Fe (OOH)-P), calcium-bound phosphorus ($CaCO_3$-P), acid-soluble organic phosphorus (ASOP) and residual organic phosphorus (ROP).
The results of these extractions showed that the sediment phosphorus of studied samples is mainly under its mineral form [Fe(OOH)-P + $CaCO_3$-P]. These forms represent around 77% of total phosphorus with a predominance of the $CaCO_3$-P fraction. The organic forms (ASOP + ROP) represent only 23%.

KEYWORDS: Sediment, watercourse, phosphorus forms, chemical fractionation.

RESUME: L'utilisation des eaux des cours d'eau dépend étroitement de leur qualité souvent dégradées par des charges excessives en éléments nutritifs tel que le phosphore. L'étude de cet élément nutritif par une méthode d'analyse séquentielle dans les sédiments a pour objectif d'apporter des informations sur la qualité du milieu, tout en déterminant la forme de phosphore biodisponible.
Ce travail a pour but de faire le point sur les différentes formes sous lesquelles se présente le phosphore dans les sédiments aquatiques des principaux oueds de la région de Meknès (Maroc).
La détermination des teneurs en phosphore total des sédiments se fait par l'analyse spectrophotométrique des surnageants récupérés après la minéralisation des sédiments par ($H_2SO_4/K_2S_2O_8$), selon la méthode de molybdate d'ammonium et en utilisant l'acide ascorbique comme réactif. Le fractionnement chimique du phosphore dans le sédiment est réalisé en suivant le schéma de fractionnement de Golterman, qui utilise l'EDTA comme chélateur spécifique, destiné à extraire la fraction minérale sans perturber le phosphore organique en ajustant le pH des solutions extractantes à celui de sédiment. Ce schéma nous a permi de déterminer les proportions de cinq formes du phosphore : le phosphore soluble dans l'eau (o-P),

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le phosphore lié au fer (Fe(OOH)-P), le phosphore lié au calcium ($CaCO_3$-P), le phosphore organique soluble dans l'acide (POSA),et le phosphore organique résiduel (POR).
Les résultats de ces extractions ont montré que le phosphore sédimentaire des échantillons étudiés est essentiellement sous la forme minérale [Fe(OOH)-P + $CaCO_3$-P]. Ces formes représentent près de 77 % en moyenne du phosphore total, avec la prédominance de la fraction $CaCO_3$-P. Les formes organiques (POSA + POR) représentent seulement 23%.

MOTS-CLEFS: Sédiment, cours d'eau, formes de phosphore, fractionnement chimique.

1 INTRODUCTION

La ville de Meknès est la seconde plus grande ville de la plaine de Saïss située au centre du Maroc. La population de Meknès et son agglomération est estimée actuellement à un million d'habitants. Elle est l'une des plus importantes régions agricoles du Royaume et abrite chaque année, depuis 2006, « Le Salon International d'Agriculture au Maroc ».

La ville connait donc une concentration démographique importante et une activité agricole intense, générant des formes de pollutions de plus en plus avérées. D'autant plus que le développement industriel de la région accentue davantage les problèmes environnementaux liés à ces différentes formes de pollution.

Dans cette étude, nous nous sommes focalisés sur la pollution de l'eau dans cette région, et plus particulièrement celle de son réseau hydrographique superficiel, par le phosphore. Nous avons choisi comme milieux d'étude les principaux oueds de cette région à savoir Ouislane, Boufkrane et Toulal. Les deux premiers cours d'eau ont suscité l'intérêt de nombreux chercheurs [1], [2], [3].

Par ailleurs, l'accumulation de phosphore dans les sédiments de ces cours d'eau à cause des rejets domestiques, agricoles et industriels, n'est pas définitive. Sous l'influence de certaines conditions et par la variation des propriétés physico-chimiques du milieu, une quantité importante de ce phosphore peut de nouveau repasser dans la phase aqueuse, ce qui pose parfois, de sérieux problèmes au niveau de la qualité des eaux de ces cours d'eau.

Il est donc indispensable de spécifier les formes de phosphore dans les sédiments de ces cours d'eau, pour pouvoir identifier la fraction du phosphore biodisponible.

2 MATÉRIEL ET MÉTHODES

2.1 SITES D'ÉTUDE

L'Oued Boufkrane est un cours d'eau permanent du Moyen Atlas, il prend sa source à l'Ouest d'El Hajeb, dans le causse Moyen Atlasique à 750 m d'altitude [4]. La partie amont du réseau traverse des terrains calcaires, dolomitiques et sableux, et la partie aval du cours d'eau s'écoule dans des vallées ouvertes délimitées par des collines marneuses. A son cours moyen, il reçoit des rejets domestiques et industriels non traités de la ville de Meknès [5].

L'Oued Boufkrane prend d'abord le nom d'Ain Maârouf, ensuite celui de Boufkrane à 10 km de la source, enfin celui de R'Dom après sa confluence d'abord avec l'Oued Toulal qui traverse la commune de Toulal, et ensuite avec l'Oued Ouislane qui appartient au réseau hydrographique superficiel de la région de Meknès prenant naissance au sud-est du village de Boufkrane.

2.2 PRÉLÈVEMENTS DES ÉCHANTILLONS

Le prélèvement des échantillons de sédiment a été effectué à l'aide d'une benne à main qui a permis de prélever les cinq premiers centimètres de sédiments. Pour obtenir un échantillon représentatif de chaque station étudiée, chaque échantillon de sédiment est le mélange d'au moins trois prélèvements effectués au niveau de points espacés de quelques mètres. Ces échantillons sont conservés dans des sachets en plastique lors de leur transport au laboratoire où ils sont traités dans les 24 heures.

Les prélèvements de sédiments ont été effectués au niveau de neuf stations situées sur le lit naturel des principaux oueds de la région de Meknès : Ouislane, Boufkrane et Toulal, en hiver 2013 (campagne 1), et au printemps 2014 (campagne 2). Les situations des stations de prélèvement de l'amont vers l'aval et aux confluences ainsi que leur localisations sont représentées respectivement dans le tableau 1 et la Figure 1.

Tableau 1. Localisation des stations de prélèvement des échantillons

Stations	Situations
S_1	Ouislane en amont
S_2	Ouislane au milieu
S_3	Ouislane en aval
S_4	Boufkrane en amont
S_5	Boufkrane en aval
S_6	Toulal en amont
S_7	Toulal en aval
S_8	Toulal + Boufkrane
S_9	Toulal+Boufkrane+Ouislane

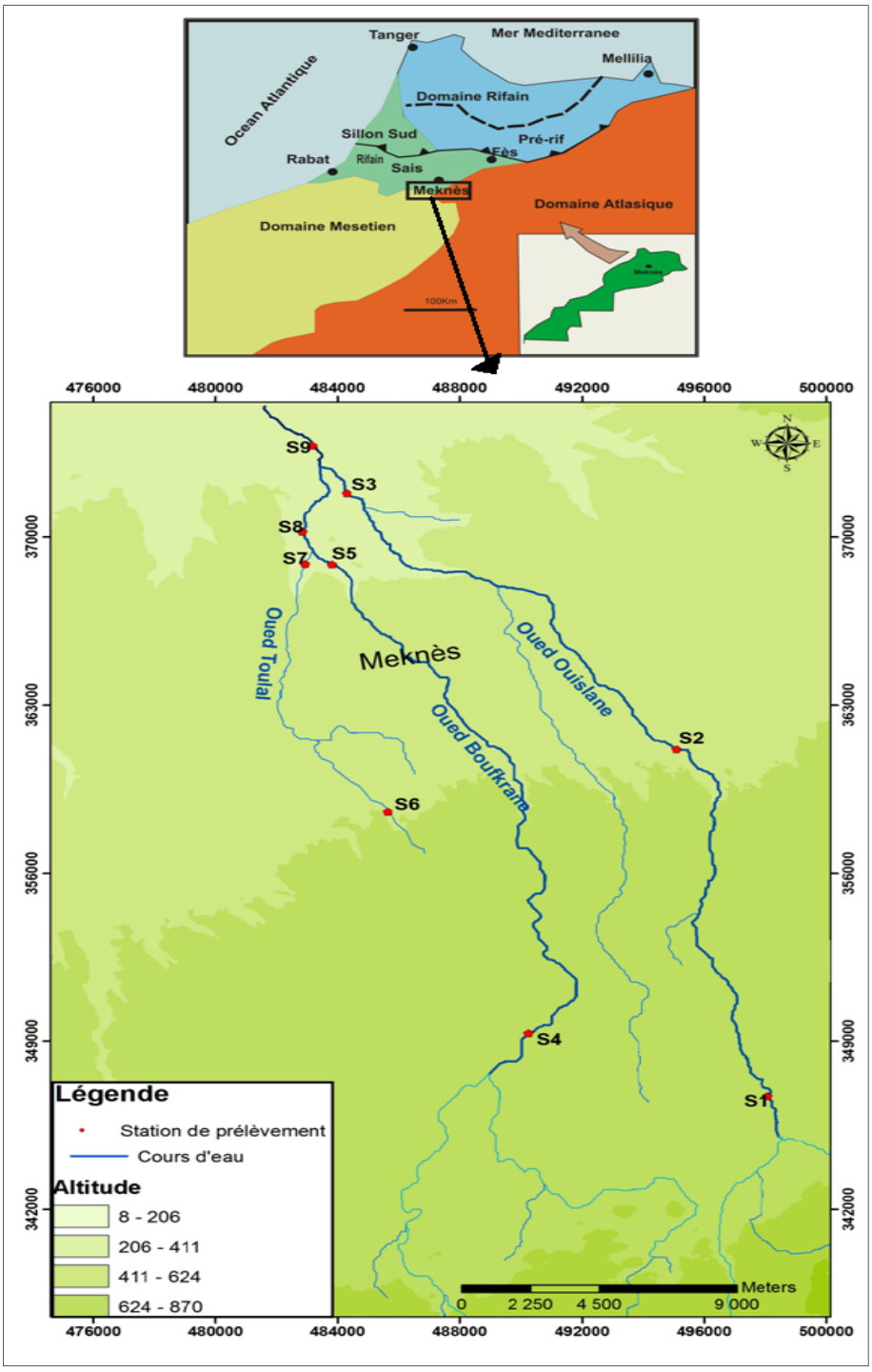

Fig. 1. Localisation des stations étudiées

2.3 FRACTIONNEMENT CHIMIQUE DU PHOSPHORE

Au niveau de nos stations d'étude, le phosphore est très abondant et provient surtout des activités agricoles et des rejets industriels et urbains. Le sédiment en piégeant ce phosphore constitue une menace certaine à la dégradation de la qualité de l'eau de ces cours d'eau. En conséquence, il importe de chercher dans le sédiment les différentes fractions du phosphore, étant donné que la biodisponibilité de ce dernier est fortement liée à sa forme chimique [6], [7].

Le phosphore est souvent présent dans les sédiments sous forme organique et inorganique [8]. Les fractions inorganiques sont constituées des complexes du phosphore avec le fer ou avec le calcium [9].

Les travaux liés aux techniques d'extraction séquentielle cités dans la littérature sont essentiellement ceux qui utilisent des extractants classiques [9], [10], [11], [12], [13], [14]. Cependant, récemment d'autres travaux ont été cités et préconisent l'utilisation des agents chélateurs spécifiques pour extraire le phosphore inorganique [15], [16], [17], [18].

Nous avons présenté sur la Figure 2 le schéma de fractionnement inspiré des travaux de Golterman [17] en utilisant une faible masse de la prise d'essai afin de minimiser le nombre d'extraction, le temps d'extraction, et le volume des extractants. Golterman utilise comme chélateur l'EDTA destiné à extraire la fraction minérale sans perturber le phosphore organique en ajustant le pH à celui du sédiment [19], [20]. Ce schéma s'appuie sur un protocole en 5 étapes comportant chacune un nombre de manipulations différent. Le principe est d'appliqué au sédiment des extractants spécifiques qui vont agir de façon sélective sur chaque réservoir de sédiment, sans interférer sur les autres. Cette approche nécessite un certain nombre de précaution et une méthodologie parfaitement contrôlée, afin de ne pas attaquer un autre réservoir que celui ciblé. A ce titre, les extractants sont utilisés de façon à extraire séquentiellement le phosphore sous une forme bien déterminée. Cinq formes de phosphore vont être déterminées:

- Phosphore soluble dans l'eau (o-P),
- Phosphore lié au fer Fe(OOH)-P,
- Phosphore lié au calcium $CaCO_3$-P,
- Phosphore organique soluble dans l'acide (POSA),
- Phosphore organique résiduel (POR).

Phosphore soluble dans l'eau : (o-P)

Cette forme soluble dans l'eau (o-P) est extraite en centrifugeant une suspension de 0,5 g de sédiment sec de fraction <200µm, dans 25 ml d'eau distillée, restée en contact pendant 5 min.

Phosphore lié au fer : Fe (OOH)-P

Au résidu de l'étape précédente, nous ajoutons 25 ml d'une solution de Ca-EDTA (0,05 M) [18,6 g Na_2-EDTA.$2H_2O$ avec 7,35 g de $CaCl_2$, H_2O dissous dans 1l de H_2O] tamponnée à pH=8 avec du TRIS (2-amino-2-hydroxyméthyl-1,3-propanediol), et du dithionite (1g de $Na_2S_2O_4$/100 ml de solution), juste avant l'extraction afin de réduire les ions Fe^{3+} en ions Fe^{2+}. Cette opération permet d'extraire le phosphore lié au fer Fe(OOH)-P. Cette extraction est répétée jusqu'à épuisement du fer dans l'extrait.

Phosphore lié au Calcium : $CaCO_3$-P

Dans cette étape, nous avons utilisé comme extractant une solution de Na_2-EDTA (0,1M) [37,2g de Na_2-EDTA.$2H_2O$ dissous dans 1 l de H_2O] à pH=8. Nous ajoutons 25 ml de cette solution sur le sédiment déjà débarrassé du fer lors de l'étape précédente. Le temps d'extraction est de 17h. Cette opération est répétée plusieurs fois jusqu'à épuisement du phosphore extrait. Cette étape permet d'extraire le phosphore lié au calcium ($CaCO_3$-P).

Phosphore organique soluble dans l'acide : POSA

Lors de cette étape, nous effectuons une seule extraction de 30 min sur le résidu de l'étape précédente, avec 25 ml de H_2SO_4 (0,25M) [16]. Cette opération permet d'extraire le phosphore organique soluble dans l'acide.

Phosphore organique résiduel : POR

Cette dernière étape consiste à minéraliser totalement le résidu restant, en présence de 10 ml d'eau distillée, 1ml de H_2SO_4 et 1g de $K_2S_2O_8$. Cette minéralisation s'effectue à l'autoclave pendant une heure à 120°C ; ce qui permet la solubilisation du phosphore correspondant au phosphore organique résiduel.

2.4 L'ANALYSE COLORIMÉTRIQUE DES SURNAGEANTS

Après avoir centrifugé les suspensions (3800 trs/min pendant 20 min) et filtré les surnageants de chaque étape citée plus haut, la détermination de la teneur en phosphore des surnageants récupérés se fait par spectrophotométrie utilisant la

méthode classique de Murphy et Riley [20]. Il s'agit d'une analyse colorimétrique où les ions orthophosphates réagissent avec le molybdate pour former un complexe phospho-molybdique jaune. Les silicates pourraient interférer avec cette réaction, mais l'utilisation de l'acide ascorbique réduit de façon spécifique le complexe phospho-molybdique, pour donner une forme bleue permettant un dosage colorimétrique à 700 nm.

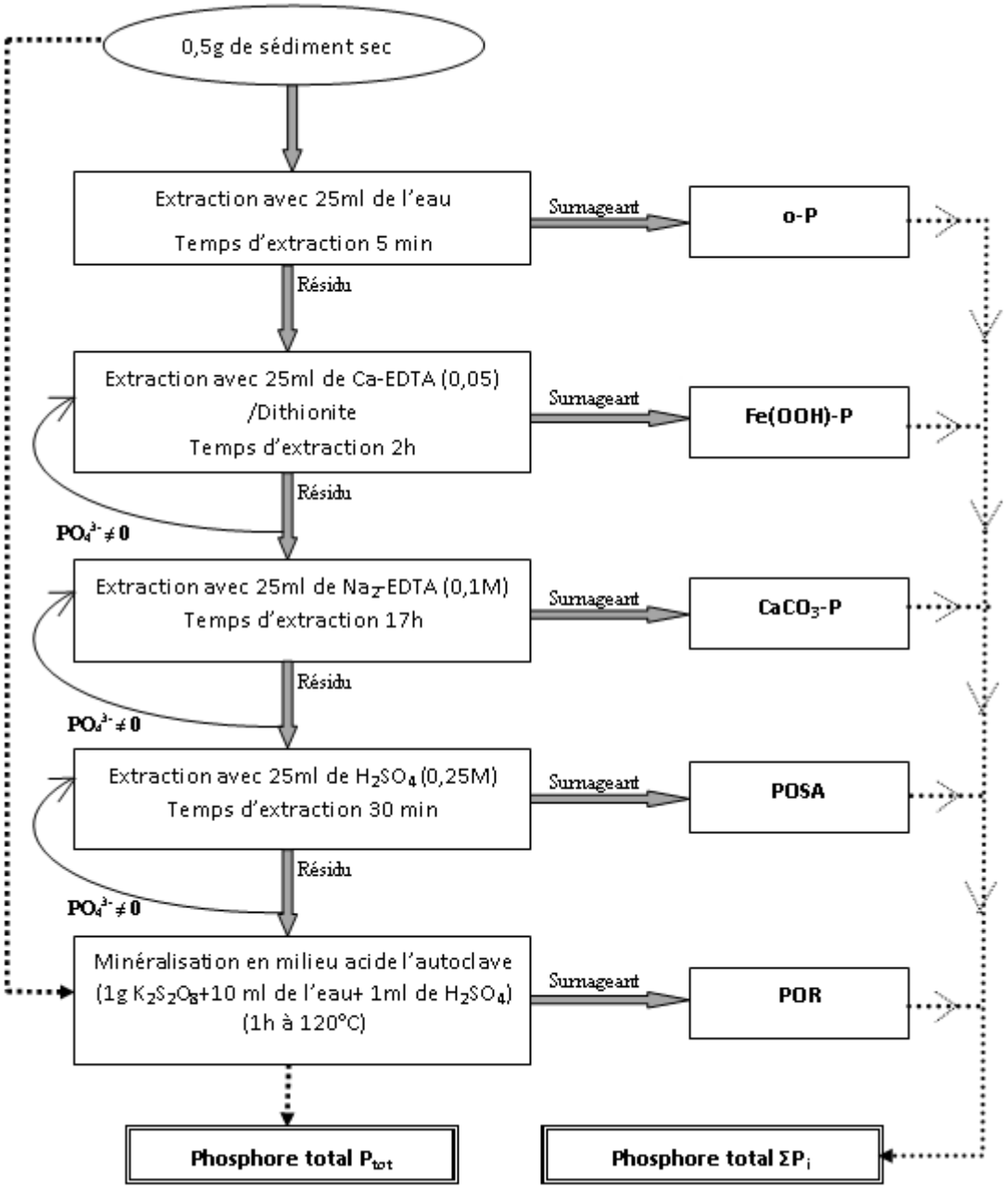

Fig. 2. Schéma d'extractions sélectives du phosphore réalisées sur les sédiments étudiés

3 RÉSULTATS ET DISCUSSION

Comme nous l'avons signalé, il existe plusieurs protocoles pour l'extraction des formes du phosphore dans les sédiments aquatiques. Afin de tester la validité du protocole expérimental à appliquer à nos sédiments (Figure 2), il était indispensable que nous fassions des tests pour confirmer la performance de protocole choisi et la reproductibilité des analyses effectuées pour la détermination des concentrations de chaque forme de phosphore.

Pour trois différents échantillons de sédiments, nous avons réalisé sur chaque échantillon, trois essais indépendants menés en même temps et dans les mêmes conditions (la masse de la prise d'essai, le temps d'extraction, le volume des extractants spécifiques pour chaque étape, …).

Le tableau 2 résume les résultats obtenu lors de ces essais d'extraction des différentes formes du phosphore dans ces trois échantillons (E_1, E_2, E_3).

Tableau 2. Résultats en µg/g de l'étude de la reproductibilité de l'analyse séquentielle du phosphore sur trois échantillons

		o-P	Fe(OOH)-P	$CaCO_3$-P	POSA	POR	ΣP_i
E_1	Essai 1	< L.D	152,54	265,55	43,12	64,43	525,64
	Essai 2	< L.D	156,32	267,32	41,54	66,12	531,30
	Essai 3	< L.D	160,01	269,98	46,76	69,01	545,76
	Moy.		156,29	267,62	43,81	66,52	534,23
	σ		3,74	2,23	2,68	2,32	10,38
	% C.V		**2,39**	**0,83**	**6,11**	**3,48**	**1,94**
E_2	Essai 1	< L.D	165,23	284,45	40,12	79,24	569,04
	Essai 2	< L.D	172,76	276,56	37,76	82,79	569,87
	Essai 3	< L.D	168,98	281,54	42,23	74,23	566,98
	Moy.		168,99	280,85	40,04	78,75	568,63
	σ		3,77	3,99	2,24	4,30	1,49
	% C.V		**2,23**	**1,42**	**5,59**	**5,46**	**0,26**
E_3	Essai 1	< L.D	118,43	157,45	40,12	67,45	383,45
	Essai 2	< L.D	120,38	142,33	47,98	70,09	380,78
	Essai 3	< L.D	121,56	140,87	43,17	72,66	378,26
	Moy.		120,12	146,88	43,76	70,07	380,83
	σ		1,58	9,18	3,96	2,61	2,60
	% C.V		**1,32**	**6,25**	**9,06**	**3,72**	**0,68**

Avec :
- **E_1** : Echantillon de sédiment de la station 2 ;
- **E_2** : Echantillon de sédiment de la station 3 ;
- **E_3** : Echantillon de sédiment de la station 7 ;
- **Moy :** Moyenne ;
- **σ** Ecart-type ;
- **C.V** : Coefficient de variation ;
- **L.D** : Limite de Détection ;
- **ΣPi :** Somme des fractions déterminée {o-P + Fe(OOH)-P + $CaCO_3$-P + POSA + POR}.

Il ressort des résultats rassemblés dans le tableau ci-dessus que les valeurs des écart-types sont faibles, et les coefficients de variation pour les sommes de fraction des formes de phosphore correspond à chaque échantillon sont meilleurs que celui qui est relatif à chaque forme du phosphore qui ne dépasse pas 1,94. Ce qui confirme la validité du protocole choisi. Pour vérifier encore que ce protocole est valable pour tous nos échantillons, nous avons comparé la teneur en phosphore total (P_{tot}) obtenue par minéralisation total ($H_2SO_4/K_2S_2O_8$) [21], avec la somme des fractions obtenues (ΣPi) en suivant le protocole de spéciation séquentielle de la Figure 2.

Cette comparaison a été faite par le calcul du rapport R qui présente le pourcentage de (ΣPi) par rapport à P_{tot} :

$$\mathbf{R= (\Sigma P_i / P_{tot})* 100}$$

Pour 18 échantillons, 9 de la campagne 1 et 9 de la campagne 2, nous avons calculé ce rapport R. Les résultats de ces calculs sont représentés dans le tableau 3 :

Tableau 3. Sommes (ΣP_i) des fractions des formes de phosphore, teneurs en phosphore total (P_{tot}) et valeurs du rapport R des sédiments étudiés

	Stations	ΣP_i (µg/g)	P_{tot} (µg/g)	R (%)
Campagne 1	S_1	381,05	410,12	92,91
	S_2	392,83	390,43	100,61
	S_3	444,20	467,78	94,96
	S_4	396,39	429,33	92,33
	S_5	554,68	635,43	87,29
	S_6	250,28	253,12	98,88
	S_7	301,23	335,87	89,69
	S_8	409,55	438,22	93,46
	S_9	487,81	505,01	96,59
Campagne 2	S_1	493,87	513,25	96,22
	S_2	536,21	565,85	94,76
	S_3	572,63	609,05	94,02
	S_4	497,72	500,60	99,42
	S_5	651,60	700,30	93,05
	S_6	338,45	297,49	113,77
	S_7	405,71	435,53	93,15
	S_8	592,67	610,78	97,03
	S_9	589,29	649,29	90,76
Moyenne		460,90	485,97	**95,34**

Les meilleures valeurs du rapport R sont proche de 100%, mais nous pouvons admettre une petite marge d'erreur, dans le cas de nos échantillons vu les pertes ou les contaminations lors des analyses effectuées dans les cinq étapes des extractions sélectives du phosphore. Ainsi les valeurs de R varient entre 87,29 et 113,77 %, avec une moyenne de 95,34%, ce qui signifie que nous avons une légère perte de l'ordre de 4,66 % en moyenne, qui peut être significativement acceptable sur le plan analytique suivie, qui nécessite plusieurs étapes.

Les résultats de fractionnement séquentiel du phosphore dans les sédiments étudiés sont regroupés dans le tableau 4.

Tableau 4. Résultats des différentes fractions de phosphore des sédiments étudiées

		Fe(OOH)-P	$CaCO_3$-P	POSA	POR	P_{tot}
Campagne 1	Minimum	92,59	100,36	14,01	42,23	253,12
	Moyenne	126,26	184,55	21,58	69,61	429,48
	Maximum	160,46	280,41	29,12	86,34	635,43
	Ecart-type	25,57	56,70	5,85	12,67	106,90
Campagne 2	Minimum	97,34	147,32	27,67	63,17	297,49
	Moyenne	142,13	256,85	44,85	75,97	549,46
	Maximum	170,67	335,55	59,23	92,26	700,30
	Ecart-type	25,93	61,51	9,82	10,03	122,49

Les résultats représentés ci-dessus ainsi que la figure 3, montrent que le phosphore présent dans nos échantillons est essentiellement sous formes inorganiques {Fe(OOH)-P + $CaCO_3$-P} (en moyenne 77%), avec la prédominance de la fraction calcique ($CaCO_3$-P) (48%), ce qui est en accord aves les caractéristiques géologiques de Saïss où les formations carbonatées sont importantes, pour la fraction organique (POSA + POR), elle représente seulement 23%.

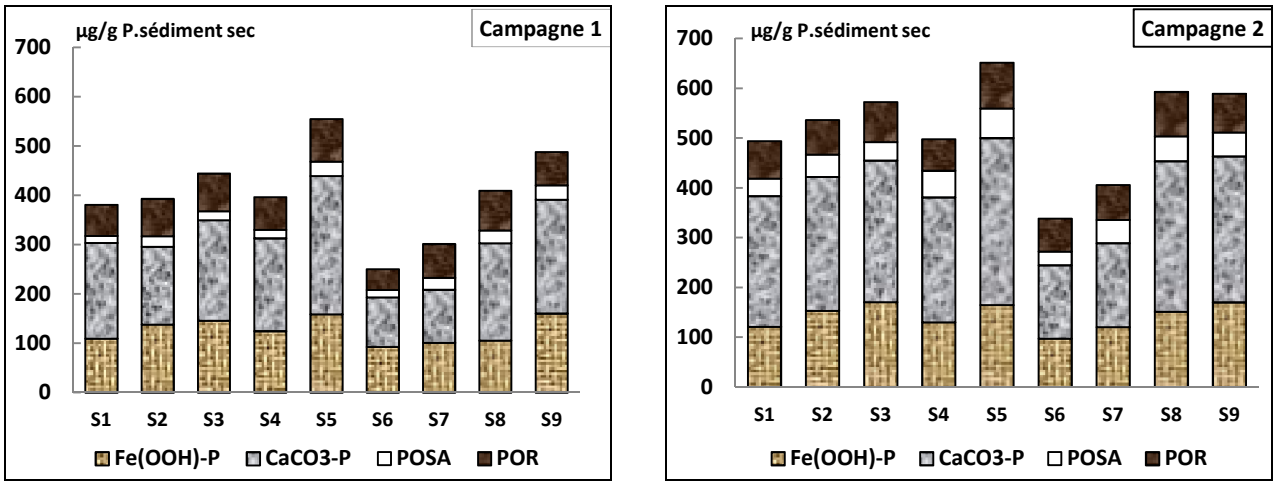

Fig. 3. Variation des Concentrations des différentes formes de phosphore des sédiments étudiées

La fraction $CaCO_3$-P est considérée en générale comme la voie principale de stockage de phosphore dans les sédiments [22], [23], Cette fraction fait l'objet de discussion quant à sa mobilisation et donc sa disponibilité. Elle a été longtemps considérée comme peu mobilisable, mais les travaux de Böstrom et al. [24] ont montré que cette fraction est mobilisable tout comme les fractions lié au fer quand le pH du sédiment diminue.

Les variations saisonnières des teneurs en $CaCO_3$-P enregistrées entre les deux campagnes (Figure 3), peuvent être expliquées par les fluctuations du pH qui joue un rôle important dans le mécanisme de rétention ou de libération des phosphates [25]. En période printanière, campagne 2, due à l'augmentation des valeurs du pH dans la colonne d'eau par l'augmentation d'activité photosynthétique [26] favorise la précipitation de la calcite et la coprécipitation du phosphore [27], [28], d'où les grandes teneurs en $CaCO_3$-P mesurées en cette période.

La fraction liée au fer Fe(OOH)-P constitue la seconde réserve en phosphore sédimentaire. Elle est très sensible aux variations des conditions rédox et du pH à l'interface eau-sédiment [15]. Les concentrations maximales de Fe(OOH)-P dans les sédiments peuvent être expliquées par des teneurs élevées en carbone organique, ceci peut s'expliquer par la formation de complexes « matière organique – fer – phosphate », cette explication est suggérée par plusieurs auteurs [29], [30].

La fraction POSA ne montre aucune tendance temporelle significative. Elle est considérée comme une fraction disponible qui peut être mobilisée [14], la nature exacte de cette fraction n'est pas encore bien élucidée [31].

Par ailleurs, le comportement de la fraction POR présente de fortes similitudes avec la fraction liée au fer (Figure 3), les valeurs élevées de ces fractions au printemps correspondent à des valeurs élevées du carbone organique [29]. Les travaux récents ont montré que la fraction POR est formée par le phosphore associé à des substances humiques comme les phytates et les phosphanates [32].

4 CONCLUSION

Au cours de ce travail nous avons déterminé les teneurs en phosphore total ainsi que les différentes formes de phosphore liées aux sédiments. Le protocole expérimental que nous avons utilisé dans la spéciation de ces formes a été légèrement modifié par rapport à celui proposé par Golterman [17], pour confirmer la performance de protocole choisi et la validité des analyses effectuées pour la détermination des concentrations de chaque forme de phosphore nous avons réalisé des tests de reproductibilité du protocole de fractionnement chimique du phosphore dans nos sédiments.

Ces tests ont bien montré la validité et la bonne reproductibilité de schéma suivi pour les extractions du phosphore.

Les résultats de fractionnement du phosphore dans les sédiments étudiés ont montré la dominance des formes minérales du phosphore par rapport aux formes organiques. Ils ont montré aussi que la fraction du phosphore lié au calcium ($CaCO_3$-P) est plus majoritaire par rapport à la fraction du phosphore lié au fer [Fe(OOH)-P].

La caractérisation du phosphore sédimentaire par le fractionnement chimique, peut améliorer la possibilité de prédiction de la libération ou de fixation du phosphore sédimentaire et par là même permettre d'évaluer les quantités de phosphore biodisponible.

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Problématique des incursions de babouins du Parc National de Kahuzi-Biega (PNKB) vers les sites agricoles du groupement de Bugorhe, Sud-Kivu, RD Congo

[Problematic of Baboons incursions of Kahuzi Biega National Park (KBNP) to agricultural sites of Bugorhe's village, Souf-Kivu, DRC]

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ABSTRACT: This work is a contribution to the study of faun-human interactions in the surroundings of the Kahuzi-Biega National Park.
The subject matter of our study focuses on human reports on the fauna, in the situation where will animals predators being plants, present some risks of human contamination.
In fact, our investigation has shown that certain plants preferred by KBNP primates constitute a common point between the PBNK faun and Bugorhe population.
The microscope analyses done in the laboratory show that the KBNP done in the laboratory show that the KBNP Baboons, pets and Bugorhe citizens have parasites, sometimes common to different groups. This presets the risks of zoo noses and other occasional diseases for both the PNKB faun and the Bugorhe population.

KEYWORDS: Faun-human, agricultural sites, parasitizes, zoo noses, emergent illness.

RÉSUMÉ: Ce travail est une contribution à l 'étude des interactions faune-homme dans les environs du PNKB.
La problématique de notre travail porte sur les rapports humains à la faune dans les situations où les animaux sauvages prédateurs des cultures vivrières présentent des risques de contaminations chez l'homme.
En effet, nos investigations ont montré que certaines cultures préférées par les primates (Babouins) du PNKB constituent le point de jonction entre la faune sauvage du PNKB et la population du groupement de Bugorhe.
Les analyses microscopiques faites au laboratoire montrent que les Babouins du PNKB, les animaux domestiques et l'homme du groupement de Bugorhe hébergent des parasites, et parfois des parasites communs à ces 3groupes zoologiques différents. Ce qui dénote le risque d'expansion de zoonoses et des maladies émergentes pour la faune sauvage du PNKB et pour la population de Bugorhe.

MOTS-CLEFS: Faune-homme, sites agricoles, parasites, zoonoses, maladies émergentes.

1 INTRODUCTION

L'homme et l'animal cohabitent dans l'espace, mais cette cohabitation ne s'effectue pas sans heurt : de nombreux conflits territoriaux peuvent apparaitre quant à la place de chacun sur un même espace, entre rivalité et concurrence **[1]**.

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L'animal permet de mieux comprendre le rapport de l'homme à la nature. On peut élaborer un classement des espèces animales ; certaines espèces animales sont dites **naturelles** ; ce sont des espèces sauvages. D'autres sont dites **culturelles** ; ce sont des espèces domestiques. Dans ce classement intervient la notion de distance à l'homme : les espèces domestiques vivent dans un cercle humain, dans le «**domus** », au contact direct et immédiat des hommes qui les voient naitre, grandir et mourir. Ces espèces composées parfois d'animaux familiers, ont des caractères anthropomorphiques données par les hommes. Les espèces sauvages elles, sont perçues comme étant lointaines, vivant en périphérie de l'espèce humaine, sur cette marge. Ainsi, les hommes attribuent une place précise dans l'espace à l'animal. Si l'animal ne respecte pas la place qui lui est dévolue par l'homme, s'il transgresse cette frontière virtuel, alors il est perçu comme nuisible et doit être sanctionné. Cependant l'animal « **naturel** » sauvage est aussi un emblème de son milieu naturel **[2]**

Le problème des incursions des animaux sauvages dans les cultures se posent avec acuité en RD Congo et notamment au Sud-Kivu.

Dans le groupement de Bugorhe, territoire de kabare, il a été signalé dans les environs du PNKB où les Babouins causent de dégâts importants aux cultures. Ils dévastent une grande variété de cultures vivrières dont les effets sont bien évidents et dramatiques (**POPOF&COOPERA, 2009, Etat civil de Bugorhe 2009, PNKB 2009**)

Ces cultures, régime alimentaire de Babouins constituent le point de jonction entre les paysans de Bugorhe et les animaux sauvage du PNKB, qui les ravagent pour leur alimentation et détruisent d'autres.

Comme l'indique **[3],** les conflits ayant pour objet des animaux sont nombreux et ont souvent pour origine la transgression par l'animal, de la place que l'homme lui a attribuée. Ces conflits avant tout humains, mettent en jeu différents types d'acteurs aux positions souvent opposées, dont les discours prennent les animaux en otage. Ces conflits soulèvent la question de la place de la faune sauvage dans le coupage de l'espace par les activités humaines.

Certains animaux commensaux et sauvages sont à l'origine de diverses maladies. Ils contribuent à la propagation d'un certain nombre de maladies dangereuses. Ils interviennent par :

- Par leurs parasites vecteurs qui transmettent à l'homme des germes pathogènes.
- Par leurs excrétas (urine et excréments) qui souillent les aliments et l'eau **[4].**

En effet, pour appréhender cette étude, nous avons été guidés par l'hypothèse selon laquelle les incursions des primates(Babouins) vers les sites agricoles permettraient l'expansion des zoonoses et des maladies émergentes.

Ainsi, l'objectif de notre étude consiste à une mise en place de stratégies et techniques pour minimiser les conflits homme-animal et de réduire les risques d'expansion des zoonoses et des maladies émergentes.

2 MATERIEL ET METHODE

Pour réaliser cette étude nous avons utilisé un équipement de terrain et de laboratoire comprenant :

- une machette pour le déblayage de champs.
- mettre canne pour mesurer la distance.
- Des flacons pour garder les échantillons (crottes)
- un marqueur pour numéroter les flacons contenant les échantillons.
- un cahier et un stylo pour enregistrer les données.

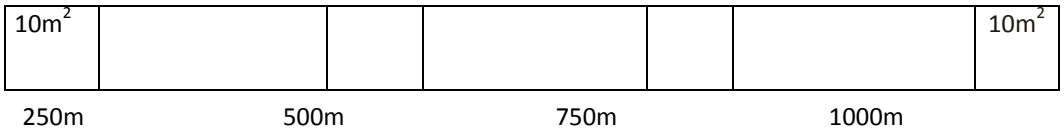
Le matériel du laboratoire était constitué:

- des gans pour éviter les infections cutanées des mains.
- des tigettes pour nous protéger contre les infections.
- des tubes et solutions physiologiques (NaCl et eau desionisées) pour homogénéiser l'échantillon.
- des lames porte-objet et lamelles couvre-objet
- le microscope pour les observations.
- des clés d'identification des parasites (**clés du laboratoire Coopéra-CRSN/LWIRO et ce lui de hôpital BIOSADEC/Bukavu).**

RÉCOLTE DES ÉCHANTILLONS

Nous avons récolté les échantillons (crottes) dans les champs de villages riverains au PNKB et les plus visités par les animaux du PNKB qui ravagent les cultures (**rapport Popof-Coopéra, 2009)**.

Nous avons, tout au long des transect, utilisé la méthode d'observation, balayage et récolte des échantillons dont les crottes des animaux domestiques, les crottes de Babouins et les excréments humains. Les échantillons sont récoltés dans les placeaux circulaires. Cette méthode décrite par WHITE et HYAND(2002) consiste à récolter les échantillons dans les placeaux circulaires de dix mètres carré pour tout le 250m (10m2/250m2) « DATA point » le long de transect.



Sur chaque flacon nous avons pris soins de mettre un numéro pour indiquer les renseignements ci- après :

Date de récolte, lieu de récolte [adresse], type d'échantillon [selon l'espèce], distance (par rapport à la limite du PNKB) et l'état de l'échantillon (frais ou sec).

Pendant notre étude, nous avons récolté et analysé au laboratoire 21 échantillons durant la période de 10 mois.

3 RESULTAT

Au cours de nos investigations sur terrain, nous avons récolté en général 21 échantillons dont 9 pour le Babouins, 2 pour la vache, 6 pour la chèvre et 4 pour l'homme. Ces échantillons ont été analysés au laboratoire coopéra/CRCN LWIRO.

Tableau1. Détermination de taux d'infestation

ANIMAUX	Nombre des cottes	Nombre de crottes parasités	Nombre de crottes non parasités	Taux d'infestation	Nombre total des parasites observés
Babouin	9	6	3	66 ,7%	12
Chèvre	6	6	0	100%	10
Homme	4	2	2	5O%	3
vache	2	2	0	100%	6

*Le taux d'infestation est un nombre exprimé en pourcentage du nombre d'animaux parasités sur l'ensemble examiné**: Ti =NAP/EAE [5]***

A la lumière de ce tableau nous avons déterminé le taux d'infestation pour chaque espèce : Il est de 66.7% Pour le babouin, 100% Pour la chèvre et la vache et 50% pour l'homme.

Tableau 2. Identification des types de parasites observés dans les différents groupes zoologiques expérimentaux.

N°	Parasites	Babouin	Homme	Chèvre	Vache
1	**Ascaris**	2	1	1	0
2	**Coccidie (Isospora)**	4	0	5	2
3	**Trichomonas**	0	0	0	1
4	**Strongiloides sterchoralis**	5	0	2	1
5	**Trichostrongylus**	1	0	1	0
6	**Entamoeba coli**	0	1	1	2
	Total	12	2	10	6

Il ressort de ce tableau que :

- 4ypes de parasites ont été observés dans les crottes de Babouins. Il s'agit de Strongiloides, Stercoralis, Coccidies (isospora), Trichostrongylus et ascaris limbrocoides.
- 4types de parasites sont observés dans les crottes de vaches, ce sont : Coccidies, Strongyloides Stercoralis, Entamoeba coli et trichomonas.

- 5 types de parasites identifiés dans les crottes de chèvres : Trichostrongylus, coccidies, Strongyloides sterchoyalis et Entamoeba coli.
- Dans les excréments humains, récoltés à l'état frais, deux types de parasites ont été observés : Ascaris et Entamoeba coli

Tableau n°3 : Résultat en pourcentage du parasitisme

N°	Parasites	Babouin	Chèvre	Homme	Vache
1	**Ascaris**	33,3	16,7	50	0
2	**Coccidie (isospora)**	66,7	83,3	0	100
3	**Trichomonas**	0	16,7	0	0
4	**Strongiloides sterchoralis**	83,3	16,7	0	50
5	**Trichostrongylus**	0	16,7	0	0
6	**Entamoeba coli**	0	16,7	50	50

4 DISCUSSION DES RESULTATS

A la lumière de résultats obtenus après analyse microscopique de nos échantillons, il s'avère que les babouins du PNKB et l'homme de Bugorhe et ses animaux domestiques hébergent de parasites. Par nos investigations, nous avons constaté que certains parasites sont présents à la fois dans les crottes de différentes espèces examinées tel que l'indique le tableau ci-après:

N°	parasites	babouin	chèvre	homme	vache
1	**Ascaris**	+	+	++	-
2	**Coccidies**	+++	+++	-	++++
3	**Entamoeba coli**	-	+	-	++
4	**Trichomonas**	-	+	-	--
5	**Trichostrongylus**	-	+	-	-
6	**Strongyloides stercoralis**	+++	+	++	++

En nous référant à ces résultats, nous constatons que coccidie (isospora) et strongyloides stercoralis sont les parasites les plus fréquents et se trouvent chez tous les animaux dont les crottes ont été examinées.

La présence des parasites communs entre les animaux sauvages(Babouins) et les animaux domestiques (chèvre, vache) indique qu'ils peuvent s'échanger des parasites et s'entre-contaminer. L'homme n'échappe pas à cette règle. D'où le risque d'expansion des maladies émergentes et des zoonoses

4.1 HYPOTHÈSES EXPLICATIVES

Comme tous les êtres vivants, les micro-organismes pathogènes mutent, se transforment, ce qui peut se traduire par une extension de leur pouvoir infectieux au sein d'une même espèce, l'apparition d'une nouvelle espèce de micro-organisme pathogène (provoquant celle d'une nouvelle maladie) ou encore l'acquisition de la capacité à infecter de nouvelles espèces d'hôtes. Ainsi, il est probable que le virus du sida, dont des formes proches existent chez une trentaine d'espèce de singes, trouve son origine dans une mutation ayant permis à un ou plusieurs des rétrovirus responsables de franchir la barrière interspécifique et d'infecter l'espèce humaine (à la faveur de morsures par des animaux vivants ou de coupures accidentelles chez des personnes découpant de la viande de singe) **[6]. L**'une des causes ou facteurs aggravants des maladies émergentes est la promiscuité ; la promiscuité entre les personnes et les animaux domestiques et/ou sauvages, et la promiscuité entre les animaux domestiques et les animaux sauvages : En groupement de Bugorhe, Territoire de Kabare ; Les cultures vivrières constituent le point de jonction entre les babouins du PNKB et les agriculteurs des champs périphériques. Après ravage des cultures, les babouins rentrent dans leurs habitats(PNKB) et les agriculteurs dans leurs villages (à domiciles) après leurs travaux champêtres ou après récoltes.

Nos investigations sur terrain nous ont montré que :

- Les babouins, les animaux domestiques et même l'homme laissent les crottes ou excréments parasités dans les champs, parfois au même endroit. Le piétinement de ces déchets les amène jusqu'à l'intérieur du PNKB par les babouins et jusqu'à domicile par les animaux domestiques et les cultivateurs.
- Les restes de cultures ravagées par les babouins sont récoltées par les cultivateurs et utilisées par la famille à domicile
- Les babouins retournent vers le PNKB avec les cultures (maïs, pommes de terre, manioc,…).

A l'issue de cette hypothèse, force est de croire que la faune sauvage du PNKB et la population de Bugorhe sont en contact :

- **Direct** : entre les Babouins du PNKB et les cultivateurs et/ou les animaux domestiques de Bugorhe.
- **Indirect** : entre la faune sauvage du PNKB et la population de Bugorhe par l'intermédiaire des Babouins vers le PNKB et les animaux domestiques et/ou les cultivateurs vers les domiciles.

4.2 ASPECTS ÉCO-ÉPIDÉMIOLOGIQUE [7]

L'OIE définit(en 2006) les maladies émergentes comme des infections nouvelles, causées par l'évolution ou la modification d'un agent pathogène ou d'un parasite existant. Le caractère « nouveau »de la maladie se traduit par exemple par un changement d'hôtes, de vecteurs, de pathogénies ou de souches

L'étude mondiale publiée dans nature en février 2008 a montré que :

- Les maladies émergentes récentes sont presque toutes des zoonoses.
- Leurs apparitions sont nettement plus fréquentes depuis 30 ans (depuis les années 1980)
- 60.3%de cas nouvelles maladies étaient de zoonoses (transmises à l'homme par l'animal)

Et plus de 71% de ces zoonoses avaient un animal sauvage comme origine.

Selon l'OMS(2008), les mammifères, car génétiquement et physiologiquement plus proches de l'homme, seraient statistiquement les premières sources de risque, mais on sait que les oiseaux en sont une autre pour certaines maladies, dont la grippe que beaucoup de mammifères peuvent aussi contracter et diffuser. Les humains et leurs animaux d'élevage et de compagnie sont sensibles aux nombreux virus grippaux.

Etant donné ce qui précède, un danger sanitaire bilatéral guette la population de Bugorhe et la faune sauvage du PNKB.

5 CONCLUSION ET SUGGESTION

Notre sujet d'étude porte sur le rapport entre l'homme et le faune sauvage ayant pour point de jonction les cultures vivrières. L'objectif assigné à ce travail est de minimiser les conflits du type homme- animal et réduire les risques d'expansion de Zoonoses et des maladies émergentes.

Par l'incursion de Babouins vers les zones cultivées, l'homme de Bugorhe entre de plus en plus en contact avec une faune sauvage qui lui est immunitairement « étrangère ». Il prend contact avec des nouveaux parasites qui peuvent contribuer à diffuser des maladies émergentes, en occurrence les zoonoses.

Pour éviter le pire, la lutte engagée contre l'incursion de Babouins vers les zones cultivées est extrêmement vitale à l'homme.

L'expression « **lutte contre les animaux** » implique une idée de destruction, cependant l'animal « naturel », sauvage est aussi un emblème de son milieu naturel. En tant qu'icône, il est perçu comme un chef-d'œuvre de la nature à protéger comme tel. Mais gare à lui s'il quitte le territoire qui lui est propre. L'animal est d' « autant plus apprécié » qu'il est à sa place.

Ainsi, nous suggérons ce qui suit :

1. **Au PNKB** :

- D'ériger une clôture à fil électrique tout autour de cette aire protégée(PNKB)
- D'établir des gardes et Veil chaque matin et le soir au tour du PNKB.

2. A LA POPULATION

- De cultiver les cultures moins préférées par les Babouins du PNKB.

3. A L'ETAT CONGOLAIS

- De créer une zone tampon entre le PNKB et le groupement de Bugorhe.

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Hashing String Keys Using NFO and NOF Collision Resolution Strategies

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ABSTRACT: This paper presents the systematic way of hashing string values using NFO and NOF collision resolution strategies. NFO and NOF are techniques used for hashing numeric keys. The same principles and techniques for hashing numeric keys are deployed in the hashing of string values but with slight modifications in the hashing process and implementations. These variants followed the standard ways of evaluating and implementing algorithms to resolve collisions in hash tables. They are very effective in resolving the problem of collisions of string keys or values in the same slot of a hash table.

KEYWORDS: NFO Strategy, NOF Strategy, Hash Function, Hash Tables, Collision Resolution, ASCII Value, Algorithm.

1 INTRODUCTION

NFO and NOF are collision resolution strategies to be reviewed in this paper. They play a vital role in the results, analysis and discussions. Over the years, various collision resolution techniques have been developed. The goal of collision resolution is to find a free slot in the hash table when the home position for the key is already occupied. The various collision resolution strategies generate a sequence of hash table slots that can hold a value or key. A probe function is used by any collision strategy or policy to generate probe sequences (sequence of slots) for keys to occupy. The collision resolution policy generates a next slot if the home position is occupied. If this is occupied as well, then another slot must be found, and so on. The ideal behavior for a collision resolution mechanism is that each empty slot in the table will have equal probability of receiving the next record inserted (assuming that every slot in the table has equal probability of being hashed to initially). Its probe sequence should be able to cycle through slots in the hash table before returning to the home position [1].

1.1 NFO STRATEGY

NFO is a dot strategy technique for collision resolution based on single dimensional arrays. The dot feature which is incorporated as part of the implementation of this technique helps in the placement of numeric key values in appropriate slots of the bucket array or hash table after they have been hashed. It is very efficient storage-wise, and does not require use of 3 state flag in cells. This technique has no primary clustering, no long probe sequences and no deterioration in hash table efficiency. Collision resolution is very efficient. Tracking an element and its slot number is made very easy by means of the dot feature. It has a running time of $O(n^2)$ [2].

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1.2 NOF STRATEGY

NOF is a technique for collision resolution based on multidimensional arrays (n x n array). It was discussed that an n x m array is used for better and more efficient implementations. In this case, n is equal to the number of rows and m is equal to the number of columns. The use of the multidimensional array ensures that elements are placed in appropriate slots by matching each of the slot numbers with a specific row of the multidimensional array. The primary issue of concern of this technique is that there are unutilized empty spaces or slots which makes the scheme not efficient storage-wise. Despite this concern, it is proven to be very effective in collision resolution. In the implementation of NOF, a further and better representation of the array size which was trimmed down or resized enhanced the space utilization though it could not eliminate it completely. An optimal implementation of the above technique is to remove or deallocate the empty spaces. Tracking an element and its slot number is made very easy by means of the multidimensional array. It has a running time of $O(n^2)$ [3].

2 MATERIALS AND METHODS

Secondary data was used for the analysis basically from literature, journals, websites, and lecture notes. The Variants of NFO and NOF algorithms for string hashing were implemented in C++ programming language using Dev-C++ IDE. The concepts of single and multi-dimensional arrays were adopted in this paper just as in the ones for numeric keys.

3 RESULTS

The variants are implemented using C++ programming language. Further illustration is given with respect to how the algorithms function.

3.1 C++ IMPLEMENTATION USING NFO

```
#include<iostream>
#include<iomanip>
using namespace std;
int main()
{
	int size, chk, sum;
	string key="";

	cout<<"please specify the size of hash table:";
	cin>>size;
	double h[size],  val=0.0;

	for(int i=0;i<size;i++)
	{
		cout<<"please enter the keys to be hashed:";
		cin>>key;

	  sum=0;
		for(int d=0;d<key.length();d++)
			sum=sum+int(key[d]);
```

```
                chk= val = sum;

                while(chk>0)
                {
                        chk/=10;
                        val*=0.1;
                }
                h[i]=(sum%size)*1.0+val;
        }

        cout<<endl;
        cout << std::fixed;
        for (int i=0;i<size;i++)
                cout<<i<<setw(7)<<setprecision(3)<<h[i]<<"\n";

        cout<<endl;
    system("pause");
        return 0;
}
```

3.2 C++ IMPLEMENTATION USING NOF

```
#include<iostream>
#include<iomanip>
#include<string>
using namespace std;
int main()
{
        int  size, rem=0, j=0, val=0;
        bool assign;
    string key="";

        //Accepting the size of the hash table
        cout<<"Please specify the size of hash table:";
        cin>>size;
        int h[size];
        string arr[size][size];
```

```
//Initializing the array
for(int a=0;a<size;a++)
        for(int b=0;b<size;b++)
                arr[a][b]="0";

//Accepting the keys, hashing and placing them in appropriate location in array
for(int i=0;i<size;i++)
{
        cout<<"Please enter the keys to be hashed:";
        cin>>key;

        val=0;
        for(int d=0;d<key.length();d++)
             val=val+int(key[d]);

        rem=val%size;
        j=0;
        assign=false;

                        do
                        {
                                if(arr[rem][j]=="0")
                                {
                                        arr[rem][j]=key;
                                        assign=true;
                                }
                                else
                                        j++;

                        }while(assign==false);
}

cout<<endl;

//Displaying the contents of the array
for(int a=0;a<size;a++)
```

```
        {
                cout<<a;
                for(int b=0;b<size;b++)
                        if(arr[a][b]!="0")
                                cout<<"  "<<arr[a][b];
                cout<<endl;
        }

        cout<<endl;
        system("pause");
        return 0;
}
```

3.3 BIG O NOTATION

Big O-Notation Time Efficiency Analyses for Variant of NFO

$T(N) = O(N)\ [O(1) + O(N)(O(1))\ + O(1)\ + O(N)[O(1) + O(1)] + O(1)] + O(N)$

$T(N) = O(N)\ [O(1) + O(N) + O(1) + O(N) + O(N) + O(1)] + O(N)$

$T(N) = [O(N) + O(N^2) + O(N) + O(N^2) + O(N^2) + O(N)] + O(N)$

$T(N) = [O(N^2) + O(N^2) + O(N^2) + O(N) + O(N) + O(N) + O(N)]$

As $N \rightarrow \infty$ all constants can be ignored

$T(N) \approx [O(3N^2) + O(4N)]$

In this case as N becomes very large $O(N^2)$ is considered the most significant factor of the Big O-Notation obtained from the above T(N) deductions. Hence in the worst case scenario the algorithm's time efficiency complexity can be measured by $T(N) = O(N^2)$

Big O-Notation Time Efficiency Analyses for Variant of NOF

$T(N) = [O(N)(O(N)+O(1))] + [O(N)(O(1) + O(N)(O(1)) +O(1) + O(1) + O(1) + O(N)(O(1)+O(1)+O(1))] + [O(N)(O(N))]$

$T(N) = [O(N^2) + O(N)] + O(N) + O(N) + O(N^2)(O(1))+O(N)+O(N)+ O(N)) + O(N^2)+O(N^2)+O(N^2)) + O(N^2)]$

$T(N) = [O(N^2) + O(N) + O(N) + O(N) + O(N^2) + O(N) + O(N) + O(N) + O(N^2) + O(N^2) + O(N^2) + O(N^2)]$

$T(N) = [O(N^2) + O(N^2) + O(N^2) + O(N^2)+ O(N^2) + O(N^2) + O(N) + O(N) + O(N) + O(N) + O(N)\ + O(N)]$

As $N \rightarrow \infty$ all constants can be ignored

$T(N) \approx [O(6N^2) + O(6N)]$

In this case as N becomes very large $O(N^2)$ is considered the most significant factor of the Big O-Notation obtained from the above T(N) deductions. Hence in the worst case scenario the algorithm's time efficiency complexity can be measured by $T(N) = O(N^2)$

3.4 ILLUSTRATION

Step by step operations are outlined using the variants of NFO and NOF. The string elements to be hashed are mellon, tomato, orange, potato, okra, carrot, banana, olive, salt, mushroom, onion, cabbage and cucumber. The ASCII values of the

characters in the string elements will be used in the computation process. The various characters and their ASCII code is given below [4].

Table 1. Characters and their ASCII Code

Character	a	b	c	d	e	f	g	h	i	j	k	l	m
ASCII Code	97	98	99	100	101	102	103	104	105	106	107	108	109

Character	n	o	p	q	r	s	t	u	v	w	x	y	Z
ASCII Code	110	111	112	113	114	115	116	117	118	119	120	121	122

3.4.1 NFO

The hash function is given by h(x) = x%13, where x is the sum of all the ASCII values for the characters in a particular string. The value 13 here represents the size or number of slots of the bucket array.

For the 1st Element

h(mellon) = (109 + 101 + 108 + 108 + 111 + 110) % 13 = 647 % 13 = 10

This implies the 1st element will be stored in slot 10 of bucket array.

For the 2nd Element

h(tomato) = (116 + 111 + 109 + 97 + 116 + 111) % 13 = 660 % 13 = 10

This implies the 2nd element will be stored in slot 10 of bucket array.

For the 3rd Element

h(orange) = (111 + 114 + 97 + 110 + 103 + 101) % 13 = 636 % 13 = 12

This implies the 3rd element will be stored in slot 12 of bucket array.

Applying the same process above the table below is generated:

Table 2. String elements, sum of ASCII values of the characters and slots

	Element	**X**	**h(x)**
1.	mellon	647	10
2.	tomato	660	10
3.	orange	636	12
4.	potato	663	0
5.	Okra	429	0
6.	carrot	651	1
7.	banana	609	11
8.	olive	543	10
9.	Salt	436	7
10.	mushroom	890	6
11.	Onion	547	1
12.	Cabbage	693	4
13.	Cucumber	854	9

Table 3. Hash Table Representation (NFO)

0	10.647	1st Element
1	10.660	2nd Element
2	12.636	3rd Element
3	0.663	4th Element
4	0.429	5th Element
5	1.651	6th Element
6	11.609	7th Element
7	10.543	8th Element
8	7.436	9th Element
9	6.890	10th Element
10	1.547	11th Element
11	4.693	12th Element
12	9.854	13th Element

The snapshot below is the results displayed after the hashing of the string elements using the NFO technique.

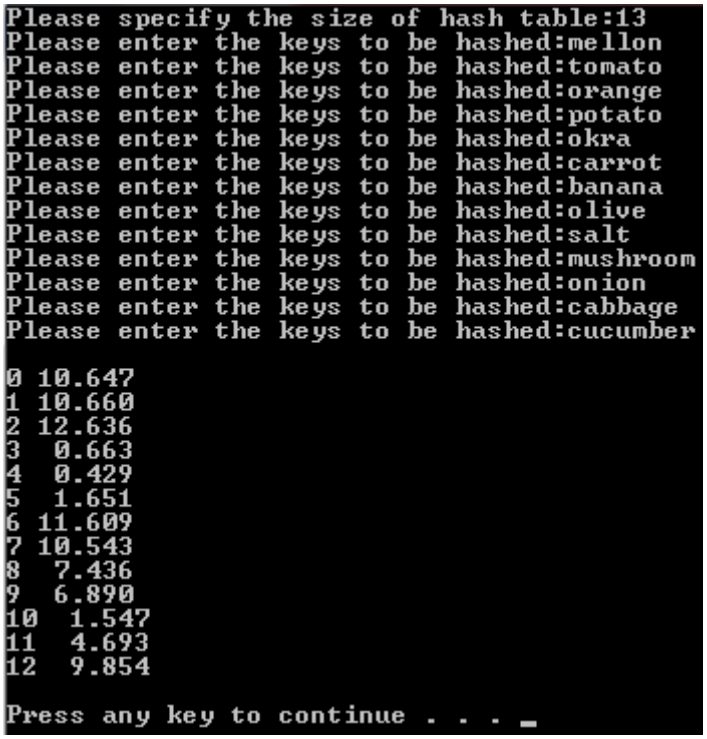

Fig. 1. Output from a Console (NFO)

ANALYSIS

Assuming we have two string values to be hashed i.e. “abc” and “bac”. This will return the same slot number after the hashing process is complete. The numeric representations of the string is then kept in the hash table. The question therefore is which of the values is “abc” or “bac”? The answer is any of them could be “abc” or “bac” and does not really make any difference if any of them is presented as “abc” or “bac”. All that needs to be done in searching for a string element is to compute the sum of the ASCII values of the characters in the string and searching through the hash table for that value.

Table 4. Hash Table Representation (NOF) – n x m array

0		potato	okra	
1		carrot	onion	
2				
3				
4		cabbage		
5				
6		mushroom		
7		salt		
8				
9		cucumber		
10		mellon	tomato	olive
11		banana		
12		orange		

The snapshot below is the results displayed after the hashing of the string elements using NOF technique.

```
Please specify the size of hash table:13
Please enter the keys to be hashed:mellon
Please enter the keys to be hashed:tomato
Please enter the keys to be hashed:orange
Please enter the keys to be hashed:potato
Please enter the keys to be hashed:okra
Please enter the keys to be hashed:carrot
Please enter the keys to be hashed:banana
Please enter the keys to be hashed:olive
Please enter the keys to be hashed:salt
Please enter the keys to be hashed:mushroom
Please enter the keys to be hashed:onion
Please enter the keys to be hashed:cabbage
Please enter the keys to be hashed:cucumber

0  potato  okra
1  carrot  onion
2
3
4  cabbage
5
6  mushroom
7  salt
8
9  cucumber
10  mellon  tomato  olive
11  banana
12  orange

Press any key to continue . . .
```

Fig. 2. Output from a Console (NOF)

3.5 COMPARATIVE ANALYSIS

		NFO	NOF
1.	**Array type**	Single dimensional	Multi-dimensional
2.	**Storage-wise**	Efficient	Not efficient
3.	**Keys type hashed**	Numeric and string	Numeric and string
4.	**Technique**	Dot	Chain
5.	**Running Time**	**$O(N^2)$**	**$O(N^2)$**

4 DISCUSSION

There are a number of collision resolution strategies in hash tables which have been used for numeric and string value hashing. This paper shows the step by step process involved in hashing string values or keys into appropriate slots of a bucket array. Even though there have been slight modification or variations to the codes or implementations, the technique and processes are identical. The major concepts used in NFO and NOF strategies for numeric key hashing is basically the same for string key hashing. It could be seen that the strategies can be used for hashing string values as well. It is strongly believed that the work of NFO and NOF will not have been complete if it was unable to hash string values. Whilst NFO and NOF has been proven to be very efficient there are some problems associated with them just like any other collision resolution strategy. This paper intended to demonstrate how these 2 collision resolution strategies could be used on string values. It has been successful in terms of hashing string keys and will makes an authentic contribution to the field of data structures and computational theory.

5 CONCLUSION

NFO and NOF collisions are also very efficient for string value hashing just like in the case of numeric key values. It is earnestly hoped this paper will add to the body of knowledge due the proven nature of the two strategies to handle collision problems of both numeric and string values. The adoption of these techniques for hashing either numeric and string values or keys will help minimize high overhead incurred as a result of collision. Future works will be to design collision resolution strategies using other data structures.

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Optimal Replenishment Policies for Two-Echelon Inventory Problems with Stationary Price and Stochastic Demand

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ABSTRACT: Planning and managing replenishment policies of items plays an important role in supply chain management. In this paper, a new mathematical model is developed to optimize replenishment policies of a two-echelon inventory system under demand uncertainty. The system consists of one factory warehouse at the upper echelon and three supermarkets at the lower echelon. A special case of this model is where sales price and scheduled inventory replenishment periods are uniformly fixed over all echelons. Demand at the supermarkets is stochastic and stationary. Adopting a Markov decision process approach, the states of a Markov chain represent possible states of demand for milk powder product. The objective is to determine in each echelon of the planning horizon an optimal replenishment policy so that the long run sales revenue is maximized for a given state of demand. Using weekly equal intervals, the decisions of when to replenish additional units are made using dynamic programming over a finite period planning horizon. A numerical example demonstrates the existence of an optimal state-dependent replenishment policy and sales revenue over the echelons.

KEYWORDS: Echelon, Inventory, Stationary price, Stochastic demand.

1 INTRODUCTION

In practice, inventory may be stored at the point of manufacture (one echelon of inventory system), then at national or regional warehouse (a second echelon), then at field distribution centers (a third echelon) etc. Some coordination is needed to effectively manage replenishment policies of the product at different echelons. Since the base stock level at each echelon (except the top one) is replenished from the next higher echelon, the base stock level needed at the higher echelon is affected by how soon replenishment will be needed at the various locations for the lower echelon. To cope with current turbulent market demands, there is still need to adopt coordinated inventory control across supply chain facilities by establishing optimal replenishment policies in a stochastic demand environment. Large industries continually strive to optimize replenishment policies of products in multi-echelon inventory systems. This is a considerable challenge when the demand for manufactured items follows a stochastic trend. One major challenge is usually encountered: determining the most desirable period during which to replenish additional units of the item in question given a periodic review production-inventory system when demand is uncertain. Derek and Iyogun (1988) examined the problem of managing inventories where there is a joint fixed cost for replenishing plus an item-by-item fixed cost for each item included in the replenishment order. Due to the complexity of the optimal solution, attention is focused on fixed heuristics, and in particular 'can-order' or (s,c,S) policies.

Fangruo C(2000) illustrated effective policies in a two-stage serial inventory system with stochastic demand. An inventory system is considered where Poisson demand occurs at stage 1.

A new lower bound in the cost of the optimal policy is produced and a simple periodic policy is proposed.

Stage 1 replenishes its inventory from stage 2; which in turn orders from an outside supplier with unlimited stock.

A fixed cost is incurred at stages 1 and 2 under the assumption that the supply lead time at stage 2 is zero. A simple heuristic policy is characterized where long-run average cost is guaranteed to be within 6% of optimality. Rodney and Roman (2004) extended the optimal policies study in the context of a capacitated two-echelon inventory system. This model includes installations with production capacity limits, and demonstrates that a modified base stock policy is optimal in a two-stage

system when there is a smaller capacity at the downstream facility. This is shown by decomposing the dynamic programming value function into value functions dependent upon individual echelon stock variables. The optimal structure holds for both stationary and non stationary customer demand.

Axsater S (2005) similarly examined a simple decision rule for decentralized two-echelon inventory control. A two-echelon distribution inventory system with a central warehouse and a number of retailers is considered. The retailers face stochastic demand and the system is controlled by continuous review installation stock policies with given batch quantities. A back order cost is provided to the warehouse and the warehouse chooses the reorder point so that the sum of the expected holding and backorder costs are minimized. Given the resulting warehouse policy, the retailers similarly optimize their costs with respect to the reorder points. The study provides a simple technique for determining the backorder cost to be used by the warehouse.

In related work by Haji R (2006), a two-echelon inventory system is considered consisting of one central warehouse and a number of non-identical retailers.The warehouse uses a one-for-one policy to replenish its inventory, but the retailers apply a new policy that is each retailer orders one unit to central warehouse in a predetermined time interval; thus retailer orders are deterministic not random. In a similar context, Abhijeet S and Saroj K (2011) considered vendor managed Two-Echelon inventory system for an integrated production procurement case. Joint economic lot size models are presented for the two supply situations, namely staggered supply and uniform supply. Cases are employed that describe the inventory situation of a single vendor supplying an item to a manufacturer that is further processed before it is supplied to the end user. Using illustrative examples, the comparative advantages of a uniform sub batch supply over a staggered alternative are investigated and uniform supply models are found to be comparatively more beneficial and robust than the staggered sub batch supply.

The literature cited provide profound insights by authors that are crucial in analyzing two-echelon inventory systems in a stochastic demand setting. However, a new dynamic approach is sought in order to relate state-transitions with customers, demand and price of item at the respective echelons so as to optimize replenishment policies and sales revenue in a multistage decision setting.

In this paper, a two-echelon production- inventory system is considered whose goal is to optimize replenishment policies and the sales revenue associated with item sales. At the beginning of each period, a major decision has to be made, namely whether to replenish additional units of the item or not to replenish and keep the item at prevailing inventory position in order to sustain demand at a given echelon. The paper is organized as follows. After describing the mathematical model in §2, consideration is given to the process of estimating the model parameters. The model is solved in §3 and applied to a special case study in §4.Some final remarks lastly follow in §5.

2 MODEL FORMULATION

2.1 NOTATION AND ASSUMPTIONS

i,j	=	States of demand
F	=	Favorable state
U	=	Unfavorable state
h	=	Inventory echelon
n,N	=	Stages
Z	=	Replenishment policy
$N^Z(h)$	=	Customer matrix
$N^Z_{ij}(h)$	=	Number of customers
$D^Z(h)$	=	Demand matrix
$D^Z_{ij}(h)$	=	Quantity demanded
$Q^Z(h)$	=	Demand transition matrix
$R^Z(h)$	=	Sales revenue matrix
$R^Z_{ij}(h)$	=	Sales revenue
$e^Z_i(h)$	=	Expected sales revenue
$a^Z_i(h,n)$	=	Accumulated sales revenue
p	=	Unit sales price

$i,j \in \{F,U\}$ $h \in \{1,2\}$ $Z \in \{0,1\}$ $n=1,2,\ldots\ldots\ldots\ldots\ldots N$

We consider a two-echelon inventory system consisting of a manufacturing plant producing a single product in batches for a designated number of supermarkets at echelon 1.At echelon 2; customers demand the product at supermarkets. The demand during each time period over a fixed planning horizon for a given echelon (h) is classified as either *favorable* (denoted by state F) or *unfavorable* (denoted by state U) and the demand of any such period is assumed to depend on the demand of the preceding period. The transition probabilities over the planning horizon from one demand state to another may be described by means of a Markov chain. Suppose one is interested in determining an optimal course of action, namely to replenish additional units of the item (a decision denoted by Z=1) or not to replenish additional units of the item (a decision denoted by Z=0) during each time period over the planning horizon, where Z is a binary decision variable. Optimality is defined such that the maximum expected sales revenue is accumulated at the end of N consecutive time periods spanning the planning horizon under consideration. In this paper, a two-echelon (h =2) and two-period (N=2) planning horizon is considered.

2.2 FINITE - PERIOD DYNAMIC PROGRAMMING PROBLEM FORMULATION

Recalling that the demand can either be in state F or in state U, the problem of finding an optimal replenishment policy may be expressed as a finite period dynamic programming model.

Let $R_n(i,h)$ denote the optimal expected total sales revenue accumulated during the periods *n,n+1,……,**N*** given that the state of the system at the beginning of period *n* is *i*ϵ{ F, U }.The recursive equation relating R_n and R_{n+1} is

$$R_n(i,h) = max_Z[Q^Z_{iF}(h)R^Z_{iF}(h) + R_{n+1}(F,h), Q^Z_{iU}(h)R^Z_{iU}(h) + R_{n+1}(U,h)] \quad (1)$$

iϵ**{**F , U **}** , h={1,2} , n= 1,2,……N

together with the final conditions

$R_{N+1}(F , h) = R_{N+1}(U , h) = 0$

This recursive relationship may be justified by noting that the cumulative sales revenue $R^Z_{ij}(h)+ R_{N+1}(j)$

resulting from reaching state j ϵ{F, U} at the start of period n+1 from state i ϵ{ F, U } at the start of period n occurs with probability $Q^Z_{ij}(h)$.

Clearly, $e^Z(h) = [Q^Z_{ij}(h)] [R^Z(h)]^T$, Z ϵ{0,1} , h ϵ{1,2} (2)

where 'T' denotes matrix transposition, and hence the dynamic programming recursive equations

$$R_n(i,h) = max_Z[e^Z_i(h) + Q^Z_{iF}(h)R_{n+1}(F) + Q^Z_{iU}(h)R_{n+1}(U)] \quad (3)$$

$R_N(i, h) = max_Z \{e^Z_i(h)\}$ (4)

result where (4) represents the Markov chain stable state.

2.2.1 COMPUTING $Q^Z(H)$ AND $R^Z(H)$

The demand transition probability from state iϵ{ F, U } to state j ϵ{ F, U },given replenishment policy Z ϵ{ 0,1 } may be taken as the number of customers observed over echelon h with demand initially in state i and later with demand changing to state j, divided by the sum of customers over all states. That is,

$$Q^Z_{ij}(h) = N^Z_{ij}(h)/((N^Z_{iF}(h) + (N^Z_{iU}(h)) \quad \text{iϵ{F , U }, Z ϵ{0,1} , h= {1, 2}} \quad (4)$$

When demand outweighs on-hand inventory, the sales revenue matrix $R^Z(h)$ may be computed by means of the relation

$$R^Z(h) = p[D^Z(h) - I^Z(h)] + pI^Z(h) = pD^Z(h)$$

where p denotes the sales price of item.

Therefore,

$$R_{ij}^{Z}(h) = p[D_{ij}^{Z}(h) - I_{ij}^{Z}(h)] + pI_{ij}^{Z}(h) = pD_{ij}^{Z}(h) \quad (5)$$

for all i,jє{ F, U }, h є{1,2} and Zє{0,1}.

3 OPTIMIZATION

The optimal replenishment policy and sales revenue are found in this section for each period over echelon h separately.

3.1 OPTIMIZATION DURING PERIOD 1

When demand is favorable (ie. in state F), the optimal replenishment policy during period 1 is

$$Z = \begin{cases} 1 & if \quad e_F^Z(h) > e_U^Z(h) \\ 0 & if \quad e_F^Z(h) \leq e_U^Z(h) \end{cases}$$

The associated total sales revenue is then

$$R_1(F,h) = \begin{cases} e_F^1(h) & if \quad Z = 1 \\ e_F^0(h) & if \quad Z = 0 \end{cases}$$

Similarly, when demand is unfavorable (ie. in state U), the optimal replenishment policy during period 1 is

$$Z = \begin{cases} 1 & if \quad e_U^1(h) > e_U^0(h) \\ 0 & if \quad e_U^1(h) \leq e_U^0(h) \end{cases}$$

In this case, the associated sales revenue is

$$R_1(U,h) = \begin{cases} e_U^1(h) & if \quad Z = 1 \\ e_U^0(h) & if \quad Z = 0 \end{cases}$$

3.2 OPTIMIZATION DURING PERIOD 2

Using (2),(3) and recalling that $a^{Z}_{i}(h)$denotes the already accumulated sales revenue at the end of period 1 as a result of decisions made during that period, it follows that

$$a_i^Z(h) = e_i^Z(h) + Q_{iF}^Z(h) max[e_F^1(h), e_F^0(h)] + Q_{iU}^Z(h) max[e_U^1(h), e_U^0(h)]$$

$$= e_i^Z(h) + Q_{iF}^Z(h) R_2(F,h) + Q_{iU}^Z(h) R_2(U,h)$$

Therefore when demand is Favorable (i.e. in state F), the optimal replenishment policy during period 2 is

$$Z = \begin{cases} 1 & if \quad a_F^1(h) > a_F^0(h) \\ 0 & if \quad a_F^1(h) \leq a_F^0(h) \end{cases}$$

while the associated sales revenue is

$$R_2(F,h) = \begin{cases} a_F^1(h) & if \quad Z=1 \\ a_F^0(h) & if \quad Z=0 \end{cases}$$

Similarly, when the demand is unfavorable (ie. in state U), the optimal replenishment policy during period 2 is

$$Z = \begin{cases} 1 & if \quad a_U^1(h) > a_U^0(h) \\ 0 & if \quad a_U^1(h) \leq a_U^0(h) \end{cases}$$

In this case the associated sales revenue is

$$R_2(U,h) = \begin{cases} a_U^1(h) & if \quad Z=1 \\ a_U^0(h) & if \quad Z=0 \end{cases}$$

4 CASE STUDY

In order to demonstrate use of the model in §2-3, real case applications from *Sameer Agriculture and LivestockLtd,* a production plant for milk powder and three supermarkets: *Shoprite supermarket, Game supermarket* and *Uchumi supermarket* in Uganda are presented in this section. The production plant supplies milk powder at supermarkets (echelon 1), while end customers come to supermarkets for milk powder product (echelon 2).The demand for milk powder fluctuates every week at both echelons. The production plant and supermarkets want to avoid excess inventory when demand is Unfavorable (state U) or running out of stock when demand is Favorable (state F) and hence seek decision support in terms of an optimal replenishment policy and the associated sales revenue of milk powder product in a two-week planning period. The network topology of a two-echelon inventory system for milk powder product is illustrated in Figure 1 below:

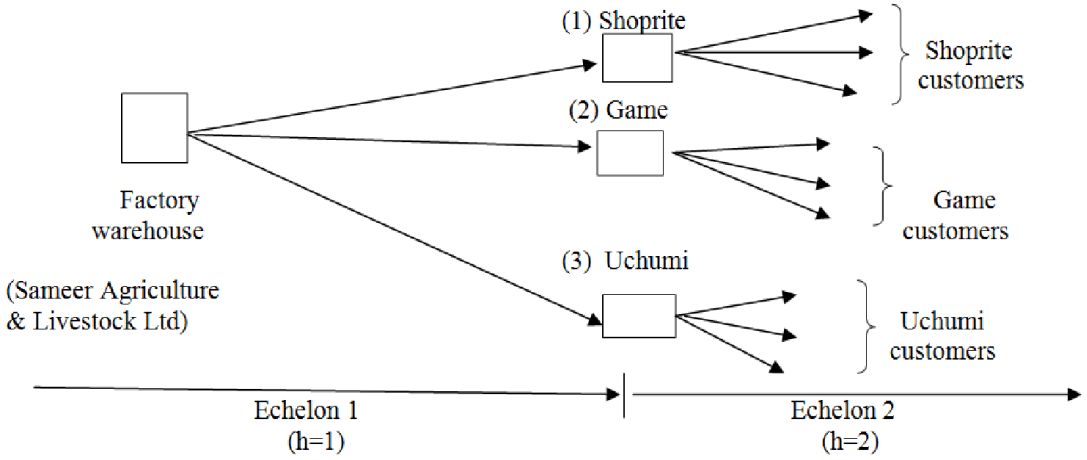

Figure 1: A two-echelon inventory system of milk powder product

4.1 DATA COLLECTION

Samples of customers, demand and inventory levels were taken for 400 gms packets of milk powder at echelons 1 and 2 over the state-transitions and the respective replenishment policies for twelve weeks.

Table 1: Customers, Demand and replenishment policies and sales price (in UGX) given state-transitions, and echelons over twelve weeks

State transition (i,j)	Echelon (h)	Replenishment Policy (Z)	Customers $N^Z_{ij}(h)$	Demand $D^Z_{ij}(h)$	Sales Price (p)
FF	1	1	91	156	6000
FU	1	1	71	15	6000
UF	1	1	64	107	6000
UU	1	1	13	11	6000
FF	1	0	82	123	6000
FU	1	0	30	78	6000
UF	1	0	55	78	6000
UU	1	0	25	15	6000
FF	2	1	45	93	6000
FU	2	1	59	60	6000
UF	2	1	59	59	6000
UU	2	1	13	11	6000
FF	2	0	54	72	6000
FU	2	0	40	77	6000
UF	2	0	45	75	6000
UU	2	0	11	11	6000

At echelon 1, when additional units were replenished (Z=1),

$$N^1(1) = \begin{bmatrix} N^1_{FF}(1) & N^1_{FU}(1) \\ N^1_{UF}(1) & N^1_{UU}(1) \end{bmatrix} \qquad N^1(1) = \begin{bmatrix} 91 & 71 \\ 64 & 13 \end{bmatrix}$$

$$D^1(1) = \begin{bmatrix} D^1_{FF}(1) & D^1_{FU}(1) \\ D^1_{UF}(1) & D^1_{UU}(1) \end{bmatrix} \qquad D^1(1) = \begin{bmatrix} 156 & 115 \\ 107 & 11 \end{bmatrix}$$

When additional units were not replenished (Z=0),

$$N^0(1) = \begin{bmatrix} N^0_{FF}(1) & N^0_{FU}(1) \\ N^0_{UF}(1) & N^0_{UU}(1) \end{bmatrix} \qquad N^0(1) = \begin{bmatrix} 82 & 50 \\ 56 & 25 \end{bmatrix}$$

$$D^0(1) = \begin{bmatrix} D^0_{FF}(1) & D^0_{FU}(1) \\ D^0_{UF}(1) & D^0_{UU}(1) \end{bmatrix} \qquad D^0(1) = \begin{bmatrix} 123 & 78 \\ 78 & 15 \end{bmatrix}$$

At echelon 2, when additional units were replenished (Z=1),

$$N^1(2) = \begin{bmatrix} N^1_{FF}(2) & N^1_{FU}(2) \\ N^1_{UF}(2) & N^1_{UU}(2) \end{bmatrix} \qquad N^1(2) = \begin{bmatrix} 48 & 55 \\ 59 & 13 \end{bmatrix}$$

$$D^1(2) = \begin{bmatrix} D^1_{FF}(2) & D^1_{FU}(2) \\ D^1_{UF}(2) & D^1_{UU}(2) \end{bmatrix} \qquad D^1(2) = \begin{bmatrix} 93 & 60 \\ 59 & 11 \end{bmatrix}$$

When additional units were not replenished (Z=0),

$$N^0(2) = \begin{bmatrix} N^0_{FF}(2) & N^0_{FU}(2) \\ N^0_{UF}(2) & N^0_{UU}(2) \end{bmatrix} \qquad N^0(2) = \begin{bmatrix} 54 & 46 \\ 45 & 11 \end{bmatrix}$$

$$D^0(2) = \begin{bmatrix} D^0_{FF}(2) & D^0_{FU}(2) \\ D^0_{UF}(2) & D^0_{UU}(2) \end{bmatrix} \qquad D^0(2) = \begin{bmatrix} 72 & 77 \\ 75 & 11 \end{bmatrix}$$

4.2 SOLUTION PROCEDURE FOR THE TWO-ECHELON INVENTORY REPLENISHMENT PROBLEM

Using (4) and (5), the state transition matrices and sales revenue matrices (in million UGX) at each respective echelon for week1 are

$$Q^1(1) = \begin{bmatrix} 0.5697 & 0.4303 \\ 0.8312 & 0.1688 \end{bmatrix} \qquad R^1(1) = \begin{bmatrix} 0.936 & 0.690 \\ 0.642 & 0.066 \end{bmatrix}$$

$$Q^1(2) = \begin{bmatrix} 0.4660 & 0.5340 \\ 0.8429 & 0.1571 \end{bmatrix} \qquad R^1(2) = \begin{bmatrix} 0.588 & 0.360 \\ 0.354 & 0.066 \end{bmatrix}$$

Respectively, for the case when additional units were replenished (Z=1) during week 1,

While these matrices are given by

$$Q^0(1) = \begin{bmatrix} 0.6212 & 0.3722 \\ 0.6914 & 0.3086 \end{bmatrix} \qquad R^0(1) = \begin{bmatrix} 0.738 & 0.468 \\ 0.468 & 0.090 \end{bmatrix}$$

$$Q^0(2) = \begin{bmatrix} 0.5400 & 0.4600 \\ 0.8036 & 0.1964 \end{bmatrix} \qquad R^0(2) = \begin{bmatrix} 0.432 & 0.462 \\ 0.450 & 0.066 \end{bmatrix}$$

Respectively, When additional units were not replenished (Z=0) during week 1.

When additional units were replenished (Z = 1), the matrices $Q^1(1)$, $R^1(1)$, $Q^1(2)$ and $R^1(2)$ yield the sales revenue (in million UGX)

$e^1_F(1) = (0.562)(0.936) + (0.438)(0.690) = 0.828$

$e^1_U(1) = (0.831)(0.642) + (0.169)(0.066) = 0.545$

$e^1_F(2) = (0.466)(0.642) + (0.5340)(0.066) = 0.334$

$e^1_U(2) = (0.8429)(0.558) + (0.1571)(0.066) = 0.527$

However, When additional units were *not* replenished (Z=0), the matrices $Q^0(1)$, $R^0(1)$, $Q^0(2)$ and $R^0(2)$ yield the sales revenue (in million UGX)

$e^0_F(1) = (0.6212)(0.738) + (0.3788)(0.468) = 0.636$

$e^0_U(1) = (0.6914)(0.468) + (0.3086)(0.090) = 0.351$

$e^0_F(2) = (0.5400)(0.432) + (0.4600)(0.462) = 0.446$

$e^0_U(2) = (0.8036)(0.450) + (0.1964)(0.066) = 0.375$

When additional units were replenished (Z = 1), the accumulated sales revenue (in million UGX) at each respective echelon follows:

Echelon 1:

$a^1_F(1) = 0.690 + (0.5697)(0.690)+(0.4303)(0.545) = 1.318$

$a^1_U(1) = 0.545 + (0.8312)(0.690)+(0.1688)(0.545) = 1.211$

Echelon 2:

$a^1_F(2) = 0.334 + (0.4660)(0.446)+(0.5340)(0.527) = 0.824$

$a^1_U(2) = 0.527 + (0.8429)(0.446)+(0.1571)(0.527) = 0.986$

When additional units were *not* replenished (Z = 0), the accumulated sales revenue (in million UGX) follows:

Echelon 1:

$a^0_F(1) = 0.636 + (0.6212)(0.690)+(0.37883)(0.545) = 1.265$

$a^0_U(1) = 0.351 + (0.6914)(0.690)+(0.3086)(0.545) = 0.996$

Echelon 2:

$a^0_F(2) = 0.446 + (0.5400)(0.446)+(0.4600)(0.527) = 0.929$

$a^0_U(2) = 0.375 + (0.8036)(0.446)+(0.1964)(0.527) = 0.836$

4.3 THE OPTIMAL REPLENISHMENT POLICY

Week1: Echelon 1

Since 0.828 > 0.636, it follows that Z=1 is an optimal replenishment policy for week 1 with associated sales revenue of 0.828 million UGX for the case of favorable demand. Since 0.545 > 0.351, it follows that Z=1 is an optimal replenishment policy for week 1 with associated sales revenue of 0.545 million UGX for the case when demand is unfavorable.

Week1: Echelon 2

Since 0.446 > 0.334, it follows that Z=0 is an optimal replenishment policy for week 1 with associated sales revenue of 0.446 million UGX when demand is favorable. Since 0.527 > 0.375, it follows that Z=1 is an optimal replenishment policy for week 1 with associated sales revenue of 0.527 million UGX if demand is unfavorable.

Week 2: Echelon 1

Since 1.318 > 1.265, it follows that Z=1 is an optimal replenishment policy for week 2 with associated accumulated sales revenue of 1.318 million UGX when demand is favorable. Since 1.211 > 0.996, it follows that Z=1 is an optimal replenishment policy for week 2 with associated accumulated sales revenue of 1.211 million UGX if demand is unfavorable.

Week 2: Echelon 2

Since 0.929 > 0.824, it follows that Z=0 is an optimal replenishment policy for week 2 with associated accumulated sales revenue of 0.929 million UGX when demand is favorable. Since 0.986 > 0.836, it follows that Z=1 is an optimal replenishment policy for week 2 with associated sales revenue of 0.986 million UGX if demand is unfavorable.

5 CONCLUSION

A two-echelon inventory model with stochastic demand was presented in this paper. The model determines an optimal replenishment policy and sales revenue of a given item with stochastic demand. The decision of whether or not to replenish additional units is modeled as a multi-period decision problem using dynamic programming over a finite planning horizon. Results from the model indicate optimal sales revenue replenishment policies over the echelons for the given problem. As a sales revenue maximization strategy in echelon-based inventory systems, computational efforts of using Markov decision process approach provide promising results. It would however be worthwhile to extend the research and examine the behavior of replenishment policies under non stationary demand conditions over the echelons. In the same spirit, the model raises a number of salient issues to consider: Lead time of milk powder during replenishment and customer response to abrupt changes in price of the product. Finally, special interest is sought in further extending our model by considering replenishment policies in the context of Continuous Time Markov Chains (CTMC).

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Heavy metals analysis in the water of Mellah, Oubeira and Tonga Lakes of El kala wetland complex, North east Algeria

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ABSTRACT: This study aims to quantify the pollution levels in the main Lakes of El Kala National Park; Mellah, Oubeira, and Tonga, which constitute an important source of water supply and a National Heritage according to Ramsar convention, by monitoring five heavy metals (Al, Cr, Zn, Cu, Pb) and the phosphates content. This park contains up to 33% of the population of El Kala district, which liquid wastes are discharged directly in the lakes ecosystem. Results revealed that the Aluminum is present in the three Lakes, Lead was detected in the lakes of Oubeira and Mellah, Zinc and Cr were inexistent in the three lakes, Copper was detected only in Oubeira Lake. Phosphates were present in three lakes with a maximal content of 6 mg/l. This value remains superior to the limit content of phosphates for a lake eutrophication (0.2 mg/l). This situation threatens seriously the Lakes water quality and then its ecosystem.

KEYWORDS: El Kala aquatic system, eutrophication, water, metal pollution.

1 INTRODUCTION

The contamination of surface water systems by heavy metal constitutes an important surface water environmental problem that has received a great deal of attention. Heavy metals in surface water systems can be from natural or anthropogenic sources [1]. Indeed, industrial wastes, agricultural wastewaters, runoffs and atmospheric deposition are major sources of contamination of many surface waters. Runoffs for example cause sedimentation problems [2]. Chemical, toxicological and ecological approaches have been studied extensively in assessing impacts of heavy metal pollution in aquatic environments [3].

Eutrophication is frequently a result of nutrient pollution such as the release of sewage effluent and run-off from lawn fertilizers into natural waters (rivers or coasts). It may also occur naturally in situations where nutrients accumulate [4] (e.g., depositional environments) or where they flow into systems on an ephemeral basis (e.g., intermittent upwelling in coastal systems). This phenomenon generally promotes excessive plant growth and decay, favors certain weedy species over others,

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and is likely to cause severe reductions in water quality. It induces many problems such as a lack of oxygen in water. The water becomes cloudy with coloring of a green, yellow, brown, or red hue. The eutrophication decreases the resource value of rivers, lakes, and estuaries such that recreation, fishing, hunting, and aesthetic enjoyment are hindered. Runoff from agriculture and development, pollution from septic systems and sewers, and other human-related activities increase the flux of both inorganic nutrients and organic substances into terrestrial, aquatic, and coastal marine ecosystems (including coral reefs) [5].

Elevated atmospheric compounds of nitrogen can increase soil nitrogen availability. Phosphorus is often regarded as the main culprit in cases of eutrophication in lakes subjected to point source pollution from sewage. The concentration of algae and the trophic state of lakes correspond to phosphorus levels in water [6, 7]. The limit content admits of phosphorus for a lake eutrophication is about 0.1 mg/l, approximately 0.3 mg/l of phosphates or 0.2 mg/l of total phosphates.

Anthropogenic toxic heavy metals that accumulate in the environment and in the food chain are threatening the world's freshwater resources used for drinking and recreational purposes [8]. Under certain environmental conditions, metals may accumulate to toxic concentration and cause ecological damage [9]. Apart from mercury toxicity and risk, other heavy metals such as cadmium, chromium, copper, nickel, lead and zinc at unacceptable concentrations can seriously affect biota in view of their persistence and bioaccumulation potential [10].

This study aims to quantify the pollution levels of El Kala Aquatic System by heavy metals (Al, Pb, Zn, Cu, and Cr) and phosphates. In the present study, the considered watershed covers an overall area of 76 438 ha. El Kala region located at the Northeast of Algeria, received 1000 mm of precipitation annually [11, 12], and it is influenced by a sub-humid Mediterranean climate. The El Kala area receives more rain the any other part of Algeria [13].

The Kroumerian Mountains rising to the South east trap the prevailing wet NNW winter winds to give an unusually moist climate (900mm on the coast, rising to 2000mm on the mountain slopes), and easily accessible ground and surface water [14]. The temperatures reach 40 °C in summer and low temperatures are recorded in winter with 5 to 6 days of hoar-frost each year in January. The humid environment considered formerly as initiatory and transmit ant of diseases, has today a great ecological, social and economical value.

There are a number of factors which are likely to influence the ecological status of the El Kala region. Each of these needs to be carefully evaluated, and proposals need to be made for the ecological management of the most important sites within and outside the National Park [14].

2 MATERIALS AND METHODS

2.1 STUDY AREA

The National Park of El Kala is situated in the North-east of Algeria and comprises of several lakes with a unique ecosystem in the Mediterranean basin. It has been classified as a part of the National Heritage of Algeria and as a biosphere reserve by UNESCO in 1990.

The Mellah, Oubeira and Tonga lakes are the final outlet of domestic wastewater. 80% of waters used by the domestic population returned to nature as wastewater. The volume of polluted water which can regain the lakes by surface or carried away by underground water, was estimated to be 42188.16 m^3/year for Mellah Lake, 205603 m^3/year for Oubeira Lake and 282077 m^3/year for Tonga Lake.

The National Park of El Kala is situated between (36°55’; 36°90’) N and (8°16’; 8°43’) E (Fig. 1). The region is bound in the North by the Mediterranean Sea, in the South by the mounts of Souk Ahras and Cheffia, in the East by the Tunisian border and in the West by the Seybousse watershed.

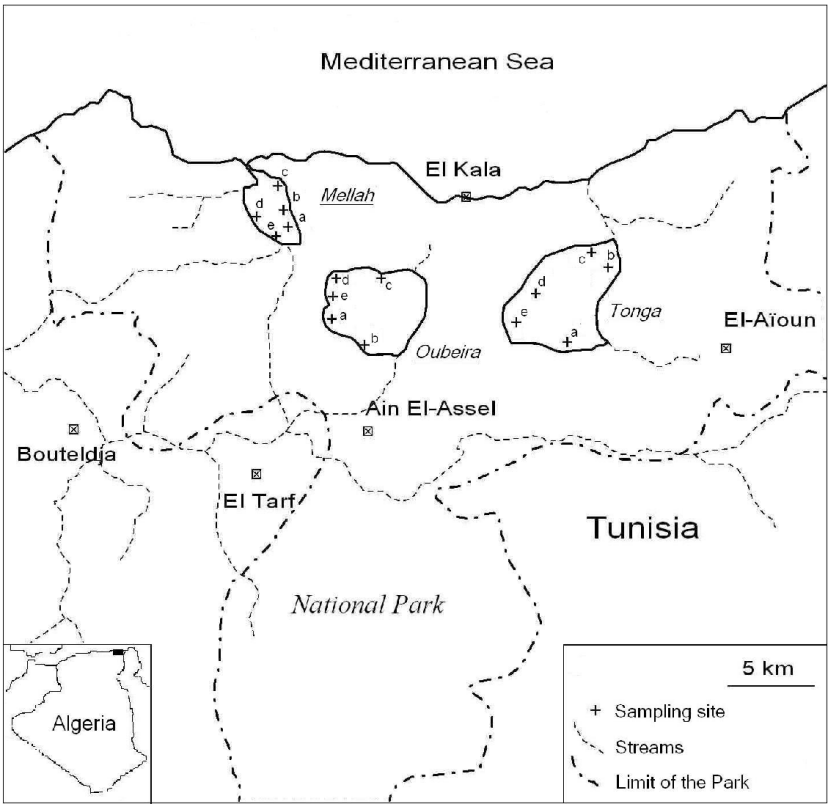

Fig. 1. Situation of study area and sampling sites

The Mellah Lake is located between the Cap Rosa and Roux. The stretch of brackish water has an ovoid form which tends towards the North. Its greatest axe is oriented NW–SE and measures approximately 5 km, with a maximal breadth of 2.5 km. This lake covers a surface of 865 ha, the medium depth is about 3.5 m, and the maximal depth does not exceed 6 m. In the Northwest exists a dune with a peak of 177 m oriented north – east [15]. Mellah Lake is inserted between hills of quaternary alluvium where frequent tectonic movements occur [16]. According to this configuration and to the rivers which flow into this lake [17], an old fluvial valley has been invaded by the sea.

The Tonga Lake is situated in the Southeast of El Kala town at 10 km; it has a surface of 2400 ha of shallow freshwater, fed by two rivers: Serhir and Messida. It constitutes an outlet long of 5 km communicating with the sea. This lake is characterized by its richness in vegetables species [18]. Geological formations of the lake are dated from Quaternary [19]. The tectonic movements of this area permit its digging up until the sea level; then it forms a navy Laguna.

The relieving of Lake Bottom until the maximal altitude of 5.75 m is due to terrigenous contributions derived by rivers along slopes of surrounding mountains. Various geological formations constitute the Tonga Lake watershed; they are represented by silt alluvium, Pontian formations, sandstones, Numidian clays, sandstones, clays, and limestone blocks.

The Oubeira Lake has a surface of 2 200 hectares and an altitude of 25 m. Its contour has a Neo-Pleistocene age; made of recent sands and silts which correspond to the actual aquifer. This Lake was shown to be amongst the 22 Ramsar sites that were most likely to suffer major ecological change [20].

2.2 GEOLOGICAL SETTING

The study region belongs to the Northeast Algerian Tell and the geological formations are from the Tertiary to Quaternary period. This unit extends from Constantine province to the Algero-tunisian border [21] and is constituted by sedimentary formations from Oligocen age with inferior Burdigalian (sandstone, clays, marls) and Quaternary deposits: some from marine origin (alluvial deposits, beach sandstone) and others from continental sedimentation (sandstone, red ground, dunes, Quaternary alluvial deposits).

Moreover, an unconfined dune aquifer is located in the Bouteldja province. The massif dune of Bouteldja is formed by wind sands with a thickness from 20 to 120 m and often with clay intercalations in the lenses form (Fig. 2). The massif dune forms an unconfined aquifer with an impermeable and semi impermeable clay and sandstone substratum [22]. Atmospheric

precipitations and marshes (Righia and Oum Agreb) streaming from favorable slopes of the Numidian formations and effluents of Kebir East River supply the aquifer. The massif dune of Bouteldja is characterized by a permeability which varies from zero in zones constituted by clay and red sand passages to 6 10^{-4} m/s in white sand formations. Measured transmissivity varies between 5 10^{-4} and 1.3 10^{-2} m^2/s.

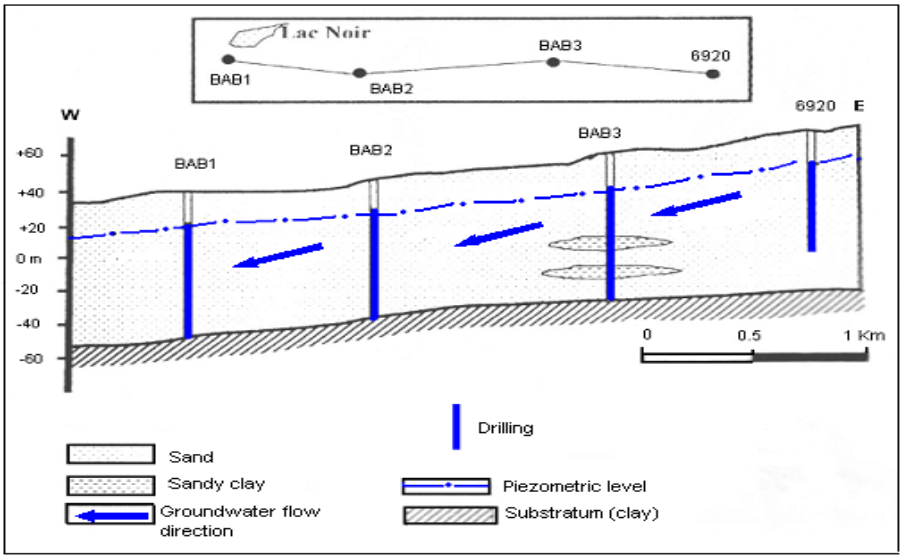

Fig. 2. Hydrogeological section of the unconfined dune aquifer

The confined deep aquifer of Bouteldja and El Tarf province extends from East to West; with a marly substratum and a clay roof. The reservoir is formed by rollers and gravels. The thickness of this aquifer varies, according to the morphology of the marly substratum, between 4 and 15 m. This aquifer is tapped by drilling (in its major part) and by wells (in its superficial part). These installations are in continual exploitation.

The Bouteldja aquifer has a clay substratum; made by gravels, rollers, and sands resulting from the Numidian complex, with marl passages. The whole is surmounted by a muddy-clay layer which constitutes the roof of the confined aquifer. The thickness of the aquifer varies from 50 to 150 m. According to [23], the transmissivity ranges between 10^{-3} and 2 10^{-3} m^2/s.

These aquifers have an important role in the drinking water supply for the local population, where it undergoes a strong solicitation which generates an anthropogenic pollution.

2.3 SAMPLING AND ANALYSES

Hydro-chemical analyses consisting in measurements of metal pollution (Al, Cr, Zn, Cu, and Pb) and eutrophication (phosphates) were performed in 15 stations located in the proximity of three lakes: Mellah, Oubeira, and Tonga (Fig. 1). Sampling was carried out during in May 2006. Samples were collected into new polyethylene flasks that had been rinsed two or three times with DI water. The flasks were filled until overflowing and closed underwater to minimize aeration. Samples were filtered by a 0.45 µm membrane filter and then acidified and diluted by HNO3 at 2%. All flasks were carefully labeled and numbered prior to transport. The sampling procedures were conformed US EPA standard method for surface water sampling [24]. Analyses of heavy metals (Al, Cr, Zn, Cu, and Pb) and phosphates were made in the central laboratory of the Direction Applied Research (D.R.A., metallurgy factory of El Hadjar–NE Algeria) according to methods in [25]. Dissolved metals were analysed with a spectrophotometer (Mark: *Shimadzu;* reference: *SAA 6501F*).

3 RESULTS AND DISCUSSIONS

In Mellah Lake, the contents of Al varied from 0.1 to 0.7 mg/l, the high concentration was found in Boumalek area (sample b). The observation of the graphic of lead variation (Fig. 3 and Fig.4) showed a concentration between 0.35 and 0.4 mg/l, which was generally superior to the WHO standards for drinking water (0.05 mg/l) [26]. For Tonga Lake, low concentrations were observed in the El Hout sample (d); this concentration did not exceed 0.3 mg/l. Thus, this water requires treatment before it can be used for human consumption. The concentration of Cu fluctuated between 0.05 and 0.4 mg/l (Fig. 4).

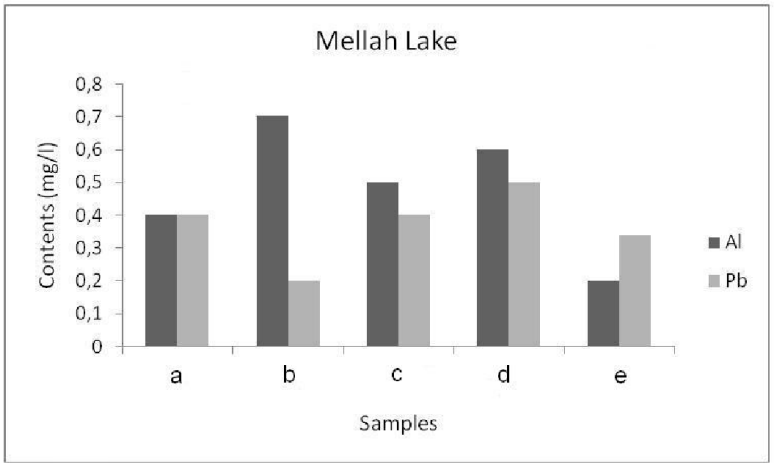

Fig. 3. Aluminum and Lead variation (Mellah Lake)

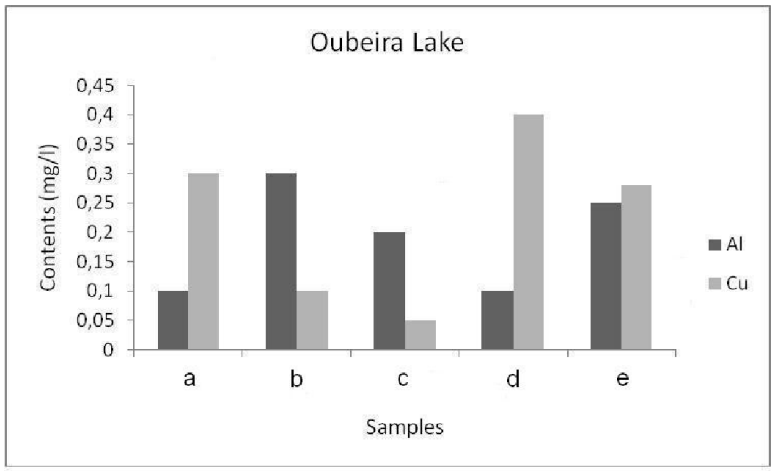

Fig. 4. Aluminium and Coper variation (Oubeira Lake)

In Oubeira Lake, aluminum concentrations fluctuated between 0.15 and 1.2 mg/l and the upper concentration was located in El Safsaf area (sample b). Lead contents surpassed required standards (0.05 mg/l) (Fig. 5).

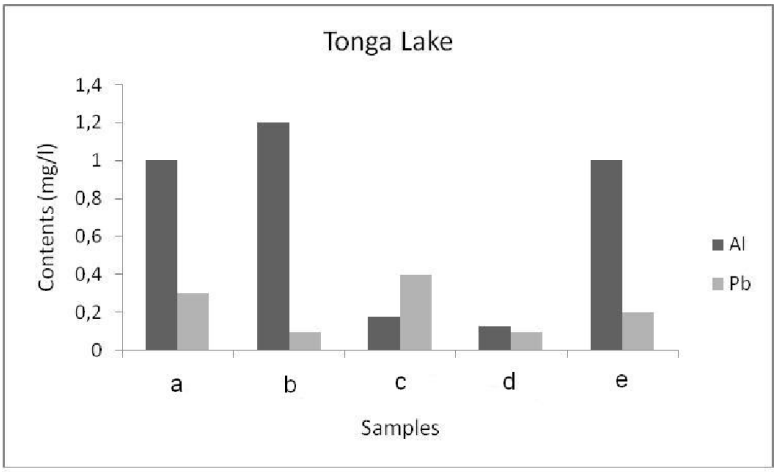

Fig. 5. Aluminum and Lead variation (Tonga Lake)

Beside wastewater, which constitute the source of the presence of lead in the two Lakes (Mellah and Oubeira); this metal may come from the atmosphere deposition.

Lead and copper were not present in Tonga Lake because this lake is located in an area which is less dense in population and in traffic.

The concentration of phosphate varied between 1.9 and 6 mg/l. High concentration was located in the Oubeira Lake at the El Safsaf area (sample 2). However, low contents of phosphate were observed in Mellah Lake (Fig. 6). The heavy metals (Al, Pb, Zn, Cu and Cr), analyses revealed that Aluminum is present in the three Lakes, Lead is detected in the lakes of Oubeira and Mellah and Copper is detected only in Oubeira Lake. However, Zinc and Chromium were not detected.

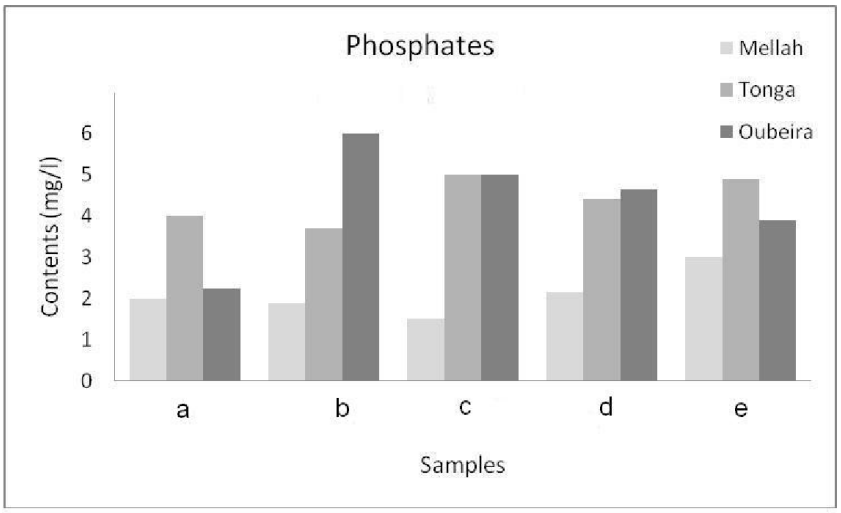

Fig. 6. Phosphates variation in the three Lakes

4 CONCLUSIONS

The hydrochemical analysis Lakes water samples reveal that the phosphates are present in three Lakes with a maximum of content of 6 mg/l. Thus, the risk of lakes eutrophication is eminent, leading to rapidly weeds growing and choking potentially the waterway and using up large amounts of precious oxygen. For the other side, Aluminum is present in the three Lakes, Lead is detected in the lakes of Oubeira and Mellah, and Copper is detected only in Oubeira Lake. Indeed, the three Lakes of El Kala region present number of factors which harm the ecological status of their ecosystem, and then water supply for riparian. The treatment of wastewater discharged into Lakes is primordial in other to preserve their aquatic ecosystem.

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INVESTIGATING THE CHALLENGES FACED BY GHANAIAN COMPANIES IN THEIR IMPLEMENTATION OF B2B APPLICATION INTEGRATION

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ABSTRACT: The global business environment of today requires companies to be flexible, in order to quickly react and respond to the ever-changing market. Business-to business application integration (B2BAI) can be seen as a tool which enables companies to stay competitive and it is often regarded by the theory as a must for survival in today's fierce business environment. Even though the employment of a B2BAI strategy can generate a lot of advantages and opportunities for companies operating within today's global business environment, there are still many challenges and problems to overcome in order to have a successful B2BAI solution.

It is based on this assertion that the researchers found it highly interesting to see whether the theories on B2BAI could be supported by an empirical research. The researchers in this study, have therefore studied and identified the underlying reasons and the contributing factors to why or why not companies choose to integrate externally, from the perspective of businesses/institutions that have integrated externally and those that are yet to implement it. Further, the practical benefits associated with B2BAI have been identified with possible strategies employed by Ghanaian companies and the reasons for choosing those strategies.

Besides this, a description and an explanation regarding the concepts covered by the field of B2BAI have been made in order to facilitate the understanding for the reader. Since the primary purpose of this study was to investigate the reasons behind and the contributing factors to why or why not companies choose to integrate, questionnaires were sent out to Thirty (30) companies within Eastern and Greater Accra regions. This was done purposely to gather information from both people who have experience in the concept in order to achieve the purpose of the essay.

As mentioned earlier, the scope for this research was all registered companies in Ghana, however it was delimited to a selection of the population, where the sample consists of thirty institutions situated in the Eastern and Greater Accra Regions.

It has been gathered from the empirical findings of this study that globalization is a central factor contributing to why companies chose to invest in B2BAI which also agrees with the theory in regards of that. However, the respondents do not discuss all the advantages of B2BAI mentioned in the theory and emphasize slightly different underlying reasons for choosing to employ a B2BAI strategy. The most central reason for not choosing to employ a B2BAI strategy was according to the respondents due to the lack of knowledge regarding issues relating to the phenomenon and this have not been discussed in the literature review.

KEYWORDS: B2BAI, API, CRM, EDI, XML, SOA, OASIS.

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1 INTRODUCTION

Information technology has become essential to the successful operation of any enterprise. Every aspect of a business relies on some form of automation. In the past automation was custom developed. Recently the use of packaged application has reduced the amount of development. Most of these applications exist as stovepipes, applications that are self-contained. The requirement for the next generation system mandates the integration of these stovepipes with new forms of business logic. (William et al, 2001). Globalization has dramatically changed the ways of conducting business, which in turn hassled to a multitude of new opportunities and challenges for companies. The ever shifting business climate of today is fierce and for this reason companies have to be able to operate proactively, flexibly, and respond quickly to the changes, in order to attain or sustain a competitive advantage (Infoscaler Technology, 2001). It is believed that Business-to-business application integration (B2BAI) is a highly topical subject today due to globalization, as the current business environment requires companies to be flexible in their business model in order to quickly respond and adapt to market changes. B2BAI is application integration done externally across company boundaries, with trading partners or suppliers, to handle requirements that businesses might have, like for example exchanging information between trading partners to support a supply chain (Linthicum, 2004).

The concept of exchanging data over networks has existed for over two decades; it is not a new phenomenon, only the techniques for doing so are different. The structure of how information is transferred electronically has evolved over time among businesses in order to support more global and open standards, so that any business can exchange documents electronically with another (IBM Redbooks, 2005a). After having individual technologies without dependencies on other companies for years, organizations now have a need of bridges that link these different technologies together. This can be done by the application of B2BAI (Linthicum, 2001a).

The application of B2BAI renders possible the automation of business processes that incorporate a variety of packaged products, custom applications, legacy applications and systems within the company and between trading partners (Linthicum, 2004). According to Linthicum (2004) B2BAI is not only a technology set but also a strategic activity which enables business process streamlining and in turn provides a competitive advantage for a company. Despite that there are a lot of advantages with B2BAI, several obstacles and integration problems still exist. Challenges for companies deciding on external application integration today are, among others, handling dissimilarities in data or information, differences in ways of conducting business and security and reliability of communications (IBM Redbooks, 2005a).

Other concerns are the many existing technologies and standards competing on the market today and the difficulty to estimate how well the existing solutions meet the requirements of the business environment. This in turn makes the task for business managers foreseeing the future direction of B2BAI very difficult (Jauhiaine et al, 2005). The theory describes and discusses B2BAI as a very important tool in order to be successful in today's competitive business environment. Is this phenomenon as admired and wide spread in practice? The application of B2BAI has a lot of advantages but at the same time there are many challenges when pursuing a B2BAI strategy. Therefore we find it highly interesting to identify central factors and underlying reasons for choosing or not choosingB2BAI. As the literature discussing the concept of B2BAI is very diffuse we find it important to begin by clarifying the different concepts covering the field of B2BAI in order to be able to create a better understanding of the subject of study.

BACKGROUND TO B2BAI

According Samtani (2002) the business landscape of today is under constant change. The digital economy has not only shaped the way companies handle their business internally but also the way they conduct business with their customers, suppliers and distributors. The author further explains that the future wave is collaborative e-commerce and this way of doing business requires trading relationships to be dynamic, automation of business processes and increased flexibility and adaptability by the use of integration middleware based on an open architecture. B2BAI focuses on processes rather than on separate activities, this as the objective with B2BAI is to streamline processes involving two or more companies. In order for a company to be competitive in today's rapidly changing business environment, Samtani (2002) believes that strategies such as EAI (Enterprise Application Integration) and B2BAI must be implemented.

Most current business strategies such as collaborative e-commerce, supply chain management (SCM) and customer relationship management (CRM) needs EAI and B2BAI in order to survive in the fierce global business climate of today. The ideal B2BAI strategy should have an integrated, real-time application-to-application, system-to-system interaction with all the current and new business partners. The business process should be free from manual steps and instead each activity and the interaction between them should be handled automatically. Moreover, the Internet commerce transactions should be conducted securely, in real-time and be adaptable and flexible. Adaptability in order to be able to adapt quickly to changes

and flexible in a way so that it can support the various interaction modes of each partner (Samtani, 2002).Over time the structure of how information is transferred electronically among businesses has evolved. This development has occurred to support more global and open standards, so that any business can exchange documents electronically with another. During the first era National and industry-oriented EDI (electronic data interchange) data structures were developed. The electronic exchange of documents started approximately some three decades ago, with the vertical industries; which helped to define the first standards for transferring information through the supply chain. Since it was vertical industries that initiated the work, the standards that were formed focused on industries such as retail, transportation, automotive, and so on. This was happening in several countries at the same time and therefore the standards that were produced had geographical characteristics and were vertical industry oriented. This resulted in the lack of interoperability among the different standards as the data structures were overlapping and reaching across numerous industries in different geographical regions (IBM Redbooks, 2005a).

The second era introduced international EDI data structures. During this time the increasing number of EDI standards raised the implementation cost of EDI. Companies suddenly had to understand and implement different EDI data structures depending on which region they were operating in and what industries they served. After a while different industries came together and decided to create an international data standard: Electronic Data Interchange for Administration, Commerce and Transport (EDIFACT). Nowadays, most companies that conduct business together over geographical areas uses the EDIFACT standard. The movement from industry-oriented or nation-oriented standards to more international standards is still in progress and will probably take years until it is achieved. The EDI world has however at this time agreed upon a common data structure, which in turn lessened the costs of implementing EDI (IBM Redbooks, 2005a).Throughout the third era, national and industry-oriented XML (eXtensible Markup Language) data structures entered the market. During the last two decades, the business focal point of the procurement of direct material and the transfer of goods has, of the greater part, been supported by EDI development and growth. The EDI data structures were a working concept for direct material acquisition, because of the structured character of the procurement process. This is a process were prices, contracts; delivery, shipping and many other details are negotiated and decided upon. When the Internet entered the e-commerce market and became the plat form for e-commerce, XML was discovered. The benefit of XML is that it makes it possible for both humans and machines to interpret data streams.

XML also provides the ability for users with a browser to receive data structures without data modifications (IBM Redbooks, 2005a). Late in the 1990s, vertical groups teamed up again, this time to create specific vertical-industry data structures, due to the lack of XML data structure organizations. A series of XML data structures for advanced supply chain was defined by the group Rosetta Net, which also was the first to complete the task. The vertical groups started to create, publish and support their own data structures driven by the lack of agreement upon XML data structures and the perceived need to generate them quickly, for example xCBL from Commerce One and cXML from Ariba (IBM Redbooks, 2005a). During the fourth time period, the national use of XML for B2B e-commerce started and close behind came the use of XML internationally.

Issues that occurred at this point were the lack of acknowledged standards. Therefore changes were made by industry groups such as Rosetta Net to see to the international needs. E-business XML (ebXML) was recognized by some of the participants in the ecommerce community as an early leader of a global standard industry set of XML standards (IBM Redbooks, 2005a).

2 OBJECTIVES

The main objectives of this study is to investigate the underlying reasons for which companies in Ghana choose or not choose to implement B2BAI.

The specific objectives are to identify:

1. Whether or not there are benefits in implementingB2B Application Integration (B2BAI) by companies in Ghana ,and
2. The challenges faced by Ghanaian companies in their implementation of B2BAI
3. The most commonly used B2BAI strategie(s) by Ghanaian Businesses and what inform their decision.

3 HYPOTHESIS

H_1: Companies that have adequate knowledge of B2BAI will use the system for its benefits notwithstanding the challenges
H_1: Ghanaian companies that do not use B2BAI will keep away because of inadequate knowledge not because of challenges

4 METHODOLOGY

For this study the researchers adopted both inductive and deductive approach. The study consists of both primary and secondary data. The primary data has been collected through the questionnaires carried out at both companies who have implemented B2BAI as well as those who have not implemented it. The secondary data has been gathered from literature sources, such as, scientific articles, papers and periodicals. Subjects within the field of technology are constantly developing and changing and therefore the Internet has been utilized in order to retrieve up-to-date and accurate information as possible. The researchers has chosen to collect views from the respondents by sending questionnaires to them. Questionnaires have been decided on for the simple reason that it is the main means of collecting quantitative primary data.

A questionnaire enables quantitative data to be collected in a standardized way so that the data are internally consistent and coherent for analysis. Imagine how difficult it would be to analyze the data of a national survey conducted by 40 different interviewers if the questions had not been asked in a standard way, that is, if the interviewers had asked different questions using different wording and order. A questionnaire ensures standardization and comparability of the data across interviewers, increases speed and accuracy of recording, and facilitates data processing. (Malhotra, 2006; Malhotra and Peterson, 2004). According to Asamoah and Duodu, (2007) in their book "Introduction to Research Methods in Education", a questionnaire permits a wide coverage for minimum expense both in money and effort. It also affords not only wider geographical coverage than any other technique, but also reaches individuals who are normally difficult to contact. The researchers has chosen to use questionnaires for the primary data collection for the reason that, questionnaires do not call for a signature or other means of identification, it may, because of its greater impersonality, elicit more candid and more objective replies.

The population for this study consists of registered companies in Ghana. The research was further narrowed down to investigate a sample of the population, where the sample consists of registered companies in both Eastern and Greater Accra regions that have implemented B2BAI and therefore have knowledge and experience of it and those that are yet to implement it. The main reason for the number of questionnaire objects is not so much due to theoretical considerations but more practical things such as time. This was the case in this investigation, companies in Eastern and Greater Accra were chosen principally, because of time limitations. The reason for choosing respondents of different types of organization is to obtain a varied responds across several business environment. Another reason for not choosing more objects of study is that, the researchers s wanted an informed result from the investigation and by administering fewer questionnaires it was possible to get a more thorough and detailed picture of them. The selection of the respondents was done by contacting the agencies and requesting to talk with their IS managers because they have experience and knowledge of B2BAI.

5 EMPIRICAL FRAME WORK / RESULT

This section presents the results of the questionnaire given out. The questionnaire was in two parts, the first part captures the demographic information of the institutions visited. The second part on the other hand captures the respondents' awareness of B2BAI, the benefits and difficulties in the implementation of B2BAI, and the most commonly B2BAI strategies employed by the companies interviewed. In order to achieve the purpose of this study, questionnaires were given to thirty (30) companies resident both in the Eastern and Greater Accra regions. The figure below shows the distribution of the questionnaires. When these companies were asked if they are aware of B2BAI, it was observed that all the respondents indicated their knowledge of B2BAI. One major issue about this study was whether or not companies in Ghana needed the implementation of B2BAI, and surprisingly all the Thirty (30) respondents which represented 100 percent unanimously agreed that for companies to stay competitive and survive in today's fierce and ever changing business environment, they are in need of B2BAI.

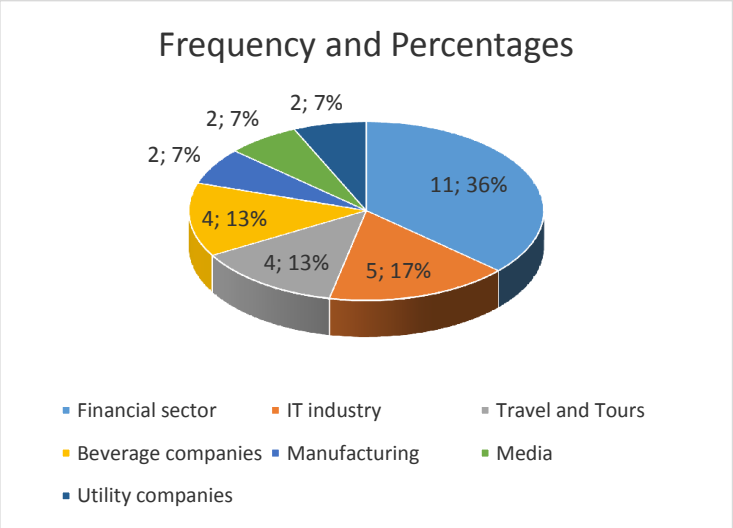

Figure 5.1 - Frequency distributions of Institutions response

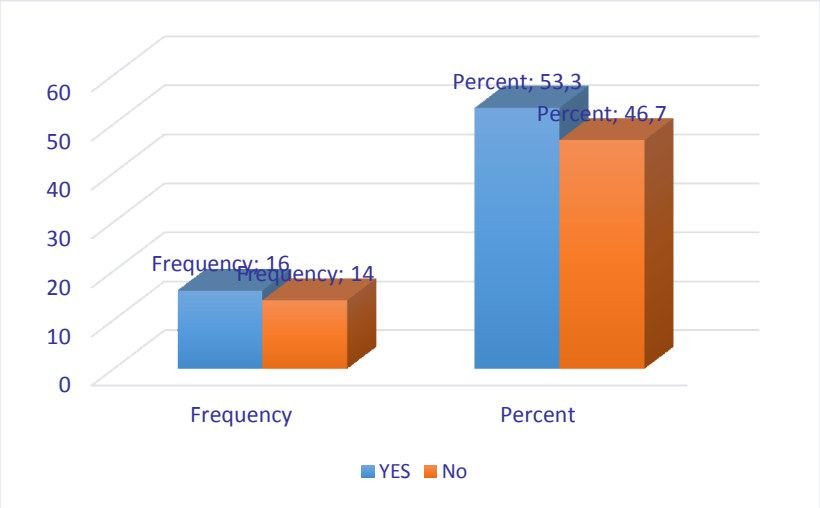

Figure 5.2 - Has your company implemented B2BAI?

As can be observed in figure 5.2, out of the Thirty (30) institutions chosen for this study, it was gathered that Sixteen (16) of them had implemented B2BAI. This represents 53.3 percent of the respondents, whereas Fourteen (14) respondents had not implemented B2BAI, and this represents 46.7 percent. The sixteen companies that admitted that their companies are indeed using B2BAI were again asked whether they were benefitting from it. Incredibly, all the sixteen (16) companies answer was yes. This represented 100 percent of the valid percentage.

One of the objectives of this research is to investigate why companies decide to implement B2BAI. Upon this objective, all the Thirty (30) respondents were asked to state the reasons that will make a company choose to implement B2BAI. Out of the thirty respondents, all sixteen (16) companies that have implemented B2BAI responded on both “Maintaining and creating existing trading relationship and “Reduce operational cost”, whereas fifteen (15) responded on “Globalisation” and “Reacting and responding quickly to market changes”

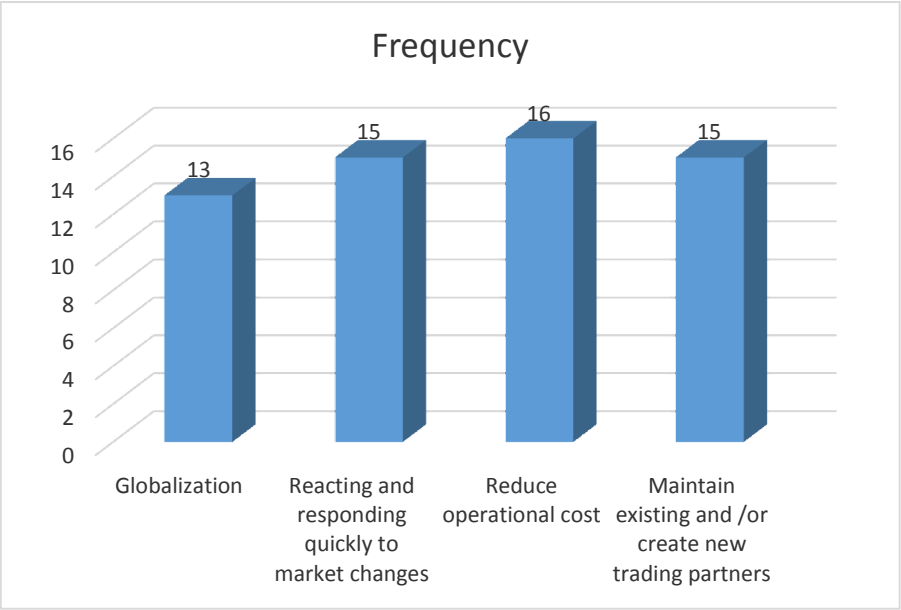

Figure 5.3 -Reasons for a company to decide to implement B2BAI

One of the objectives of this research is to investigate why companies decide to implement B2BAI. Upon this objective, all the Thirty (30) respondents were asked to state the reasons that will make a company choose to implement B2BAI. Out of the thirty respondents, all sixteen (16) companies that have implemented B2BAI responded on both "Maintaining and creating existing trading relationship and "Reduce operational cost", whereas fifteen (15) responded on "Globalisation" and "Reacting and responding quickly to market changes". This is shown in figure 5.2.

The fourteen (14) companies that had not implemented B2BAI were requested to respond to why they have decided not to implement B2BAI. All fourteen (14) companies/institutions representing 100 valid percent responded to the question. Figure 5.4 below, shows the resulting frequencies.

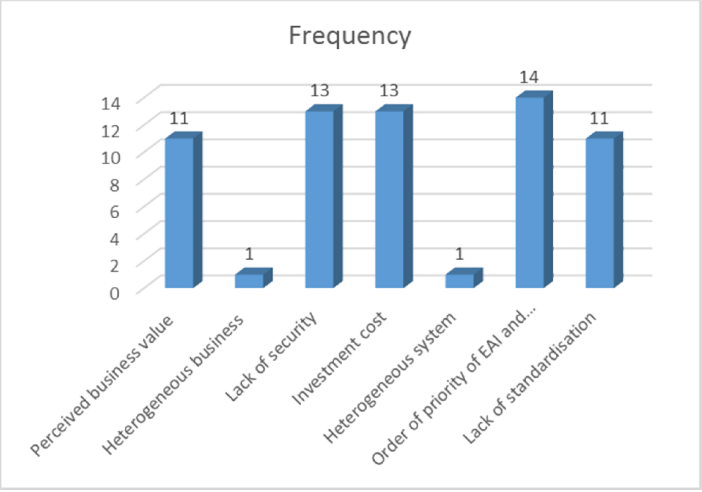

Figure 5.4 - Reasons for a company to decide not to implement B2BAI

In order to determine whether a relationship exists between the "type of institution" one belongs to and the need for B2BAI, a cross tabulation was conducted and a chi-square test was performed. From the chi-square test conducted with the results displayed in the table below, the Pearson's R indicates a value of zero, an indication that there exist no linear relationship between the "type of institution" one works in and the need for B2BAI.

Table 5.1 – Chi-Square Test.

NAME OF INSTITUTION * The need for B2BAI implementation by companies in Ghana.

Crosstabulation

		The need for B2BAI implementation by companies in Ghana.	
		AGREE	Total
NAME OF INSTITUTION	FINANCIAL INSTITUTION	11	11
	MANUFACTURING BEVERAGE	4	4
	MANUFACTURING PLANT	2	2
	TRAVEL AND TOUR	4	4
	IT	5	5
	MEDIA	2	2
	UTILITY	2	2
Total		30	30

Chi-Square Tests

	Value
Pearson Chi-Square	0.00
N of Valid Cases	30

This is a measure of the relationship that exist between the "type of institution" a respondent belongs to and how the companies are able to stay competitive and survive in today's fierce and ever changing business environment. The Pearson Chi-Square test measures the linear relationship that exists between the variables. From the table, the result of the test was 0.00 which is an indication of no relationship. This means that the type of institution one belongs to does not influence how the company stays competitive and also is able to survive in today's fierce and ever changing business environment.

6 ANALYSIS

In this section the empirical findings (result) and the theoretical framework were compared and analysed.

THE CONCEPT OF B2BAI

The concept of B2BAI is rather diffuse and many different definitions exist. According to this study's literature review, the definitions basically have the same meaning. Different authors define B2BAI as an approach which enables companies to share and exchange data and information across company borders. The indistinguishable definitions in the theory can also be mirrored in reality. It is clear that all respondents more or less agreed to the meaning of B2BAI as given by the authors in the literature review.

On the issue of companies being aware of the presence of the integration, all respondents unanimously agreed to the fact that they are aware of B2BAI. The researcher's opinion is that companies are aware of the existence of B2BAI, and that it might have any influence on whether or not they will implement it in their companies

THE NEED FOR B2BAI TODAY

According to Samtani (2002), it is essential for companies to have integration strategies in order to stay competitive. Integration strategies as EAI and B2BAI generate dynamic trading-relationships, automation of business processes and increased flexibility and adaptability, which makes it possible for companies to react and respond quickly to the constantly changing business environment. Samtani (2002) further states that most business strategies such as collaborative e-commerce, SCM and CRM, need EAI and B2BAI to be able to survive in the tough business environment of today. All of the respondents see a rapid and steady growth within the field of B2BAI and this shows that the theory alleging the necessity of employing a B2BAI strategy in order to survive in today's business environment, can be supported by the empirical findings,

as all respondent answer to the question on the need for Ghanaian companies to implement B2BAI was yes. For example, if the majority of a company's partners and competitors utilize this concept as a means for gaining a competitive advantage, it is believed that it would be in their interest to also do the same in order to not be driven out of competition.

Based on this the researchers s s believes that the increased demand could be a factor contributing to why companies at present chose to employ a B2BAI strategy. The respondents find B2BAI to be a matter for the executives, as from looking upon B2BAI as purely a technical matter, it has today become a management issue as it affects the business model and conveys large costs. The researchers thinks that this has contributed to the increased demand as the question of B2BAI has gained status by being an issue for the company management. Based on this the researchers thinks that for a company to survive todays ever changing business environment and also thrive, a B2BAI is a necessity.

REASONS FOR CHOOSING B2BAI

Not only is B2BAI a technology set, but also a strategic activity which enables business process streamlining and in turn provides a competitive advantage for a company, see section 2.8, (Linthicum, 2004). In accordance with the theory some of the respondents also believe that it has to be viewed as a strategic activity where integration becomes an important tool in order to make the internal as well as the external systems function efficiently together, as a mean for competition. Furthermore, the theory, see section 2.7, states that the application of B2BAI can improve a company's performance by having dynamic business relationships, real-time information, lower transaction costs, participation in online market places, streamlined business operations, XML-based integration, increased customer service and retention and opportunities to re-construct internal systems (IBM, 2005a).

Both the theory and the empirical findings regard B2BAI as a strategic tool in order to be competitive, but the empirical findings emphasizes slightly different aspects regarding the advantages/benefits generated when utilizing it as a means to become more competitive. Apart from the advantage of streamlining business processes on which they agree, benefits such as reducing costs were emphasized by the respondents. The desire of having dynamic business relationships was also mentioned by the respondents as a reason for why businesses choose to integrate. By having dynamic relationships companies are able to react and respond to the constantly changing business environment, in a much quicker and better way. B2BAI generates a lot of advantages, but these are not the only reason why it has become so topical. Samtani (2002), see section 2.4, believes that for companies operating globally, it has become more of a necessity as the business environment has become so fierce and fast changing that most of them would not survive without it. He stresses the importance of being able to quickly adapt to changes and have flexibility enough to support different interaction modes of each business partner. Even though the empirical findings indicate that the globalization process and the IT-market development require B2BAI, in order for companies to become more flexible to changes, some respondents are of the view that the use of the Internet can as well provide a company the opportunity to go global. In the end it seems like everything comes down to being able to stay competitive in today's fierce and ever-changing business environment and the findings indicate that this might be hard to achieve without the employment of a B2BAI strategy.

REASONS FOR NOT CHOOSING B2BAI

The theory mentions a number of obstacles that can make the implementation of B2BAI more difficult. Examples of these are; heterogeneous data or information, heterogeneous business processes, dynamic business and technology environment, security and reliability of communications, organizational autonomy and heterogeneous systems (IBM Redbooks, 2005a). Only one of the above stated problems have also been mentioned by the respondents as a contributing factor when companies choose to not implement B2BAI. This factor is lack of security and reliability of communications. The researcher is of the view that security, as mentioned both in theory and by the respondents, might have an influence on the choice of whether to integrate externally or not since majority of the respondents agreed to it. The respondents have also identified other factors influencing this choice, such as a lack of knowledge regarding for example investment costs and the lack of information provided regarding the benefits and value of B2BAI. In the researcher's opinion, the lack of perceived value could also be a reason for why companies might be hesitant and reluctant towards adopting B2BAI strategies. It is obvious that a company will find it very difficult to commit to something they do not understand or see the potential value of. According to the theory, an internal integration is necessary before moving towards an external one, this as companies might have processes ranging across several internal applications. That is why companies first have to make sure they can communicate internally, before considering B2BAI, (IBM Redbooks, 2005a). The respondents unanimously agree to the theory upon the advantage of making an internal integration before the external. The empirical findings point out that there is a specific order of priority regarding EAI and B2BAI, it is believed that companies can feel intimidated of doing an external integration before having done an internal. The reason for this might be that they have the perception that it is required to start by integrating internally in order to be able to become successful in the external integration.

HYPOTHESIS

Hypothesis One:

H_0: Companies that have adequate knowledge of B2BAI will not use the system for its benefits notwithstanding the challenges.

H_1: Companies that have adequate knowledge of B2BAI will use the system for its benefits notwithstanding the challenges

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Scoring	Equal variances assumed	5.591	.033	23.642	14	.000
	Equal variances not assumed			18.256	4.879	.000

The computed *t* of the test is 23.642 with *df* 14, the *p*-value is 0.000. Since the *p*-value of the test is 0.000 and this is less than 0.05 (i.e. P = 0.000 < 0.05 significant level) , at 0.05 level of significance, the null hypothesis is rejected and concluded in favour of the alternate hypothesis that companies that have adequate knowledge of B2BAI will use the system for its benefits notwithstanding the challenges. This confirms why the majority (16 companies out of 30) forming 53.3% chose to use B2BAI while the remaining 46.7% of them chose not to use the system. Despite the challenges identified, the most outstanding reason for using the B2BAI is business and customer requirement while few of them in addition use the system based on the fact that it is a company policy. This view is supported by Linthicum (2004); B2BAI is a strategic activity rather than a technological set that is meant to help companies have a competitive advantage. This also suggests that, there are challenges of implementing B2BAI but if the decision to use it well considered, it will in the long run have great effect on the company's competitive abilities.

Hypothesis Two:

H_0: Ghanaian companies that do not use B2BAI will not keep away because of inadequate knowledge not because of challenges.

H_1: Ghanaian companies that do not use B2BAI will keep away because of inadequate knowledge not because of challenges.

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	T	Df	Sig. (2-tailed)
Scoring1	Equal variances assumed	11.913	.005	3.724	12	.003
	Equal variances not assumed			6.034	9.000	.000

The computed *t* of the test is 3.724 with *df* 14, the *p*-value is 0.003. Since the *p*-value of the test is 0.003 and this is less than 0.05 (i.e. P= 0.003 < 0.05 significant level), at 0.05 level of significance, the null hypothesis is rejected and concluded in favour of the alternate hypothesis that Ghanaian companies that do not use B2BAI will keep away because of inadequate knowledge not because of challenges. Out of the total number of respondents, 46.7% of them do not implement B2BAI due to lack of knowledge (perceived business value, security, investment cost and the order of priority of EAI and B2BAI) and standardization (lack of flexibility). Some of the challenges associated with B2BAI include handling dissimilarity in data, differences in ways of conducting business and security and reliability of communications (IBM Redbooks 2005a). None of these challenges formed the basis for which the companies decided not to use the system

7 CONCLUSION AND RECOMMENDATIONS

The evidence gathered from the empirical research show that companies regard the concept of B2BAI more seriously nowadays. This is because it comes with a lot of benefits which will make a company stand tall among their equals and also thrives in this fierce and ever changing market. The confusion of B2BAI seems to exist in theory as well as in practice and the interpretation of it is that the phenomenon is not known by many Information System managers in the Ghanaian business terrain. Companies that have not implemented B2BAI may have their own reasons for doing so according to the empirical findings, but again the findings also indicate that they are losing a lot for not integrating externally. Furthermore, factors and reasons affecting the choice of whether to integrate externally or not and the benefits associated with B2BAI have been identified. Again, the benefits associated with B2BAI, the most commonly strategies employed and the reasons behind the choice of strategy have also been identified.

REASONS FOR CHOOSING TO IMPLEMENT B2BAI

In drawing a conclusion after analysing the data collected in this research, is that the main contributing factor for choosing to integrate externally is globalization. As in order for companies to stay competitive and survive in today's fierce and ever changing business environment they are in need of B2BAI. The reason for this is that it can be used as strategic tool to gain competitive advantage. By pursuing a B2BAI strategy companies can react and respond quickly to market changes as it generates dynamic trading relationships and increased flexibility and adaptability. Moreover, it enables the streamlining of business processes and improves the operational efficiency, which in turn can lead to possible reductions of costs. Besides this, another reason might be the pressure from trading partners; as companies might feel forced to employ a B2BAI strategy in order to maintain present trading relationships or create new ones. This is also summarised below as the benefits of B2BAI implementation.

<u>BENEFITS OF B2BAI:</u>

- Globalization
- React and respond quickly
- Dynamic trading relationships
- Flexibility and adaptability
- Reduce costs
- Improve operational efficiency
- Streamline business processes
- Maintain existing and/or create new trading relationships

REASONS FOR NOT CHOOSING TO IMPLEMENT B2BAI

It appears to be several reasons behind why companies choose to not implement B2BAI. Upon careful analysis of the results gathered from the questionnaire, the researcher came to the conclusion that the most likely reasons for why companies not choose to implement are the lack of knowledge and a lack of standardization. The lack of knowledge regards issues such as, security, perceived business value, investment costs and the order of priority of B2BAI. Even though security might not be regarded as a big issue when conducting an external integration according to the empirical findings, the interpretation is that the lack of knowledge regarding security still can be an influencing factor to why companies hesitate to invest in an external integration. Furthermore, if companies do not understand what B2BAI is and how it can generate business value, they will probably not want to invest in it. Regarding investment costs, companies might have the idea that B2BAI is something expensive and therefore feel reluctant towards it. As the theory and the empirical findings have different opinions regarding the order of priority of EAI and B2BAI it is concluded that companies might think that they need to do internal application integration before an external, which therefore could be a contributing factor to why they might chose not to integrate externally. The lack of standardization appears to be another reason behind companies' choice to not implement B2BAI, as they might have the impression that it could increase the complexity of the implementation and reduce the flexibility of the solution. This is again summarised below.

- Lack of knowledge
- Perceived business value
- Security
- Investment cost
- The order of priority of EAI and B2BAI
- Lack of standardization
  Lack of flexibility

RECOMMENDATIONS

Based on the research, the researcher offers the following suggestions;

1. The field of B2BAI is very extensive and not that widely studied, therefore several areas of this area of knowledge are yet to be explored. As earlier mentioned it could be interesting to compare this essays result with the service providers of the respondents.
2. Another idea would be to study the more technical aspect of the concept and evaluate the existing products and standards existing today on the market.
3. Ghanaian businesses should open their doors for students who undertake researches in order to make their data collection exercise smooth and easy.
4. Information system managers of businesses in Ghana should undertake upgrading causes in order to be abreast with current trends in the IT field.
5. B2BAI is a very nice phenomenon, Ghanaian businesses should embrace the concept to enhance their productivity and also trade with their partners externally.

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Experimental Investigations and Taguchi Analysis with Drilling Operation: A Review

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ABSTRACT: Surface Roughness is an important aspect in mechanical engineering design depending on the application of the component in usage. Friction, wear and power transmission depend on material surface and contact environment. Objective Consideration may be with respect to aesthetic view, stress condition, precision fits, smooth motion etc. However, the critical constraints are surface roughness, tolerances and nominal size for the selection criteria of the parts. Since Taguchi method systematically reveals the complex cause and evolves the relationship between design parameters along with taking consideration of performance. Many researchers have used Taguchi techniques for design of experimental studies. The present study focusses on the investigations made on drilling using Taguchi Techniques.

KEYWORDS: Drilling, Precision, Wear, Vibration, Thrust, Torque, Taguchi Analysis.

1 INTRODUCTION

Drilling operation can be described as a process where a multi-point tool is used for unwanted materials removal to produce a desired hole. It is an important metal cutting operations with which holes are produced in components made of metallic and non-metallic materials. The cylindrical holes of required diameter are cut out of the component with a cutting tool, called drill bit. The different machines available are portable drilling, radial drilling, upright drilling and multiple spindle drilling etc. It is essential to optimize quality and productivity of with respect to drilling operation as it being very common operation in manufacturing. Many researchers have worked on drilling operation. Optimum values of input parameters such as speed, feed, as well as different cooling condition are calculated to obtain required surface roughness value with maximum material removal rate. Most of the research in the area of drilling are mainly related to hole precision, thrust force, torque, vibrational wear, work material characteristics and drill material studies. Drill wear is an important issue since wear on drill affects the hole quality and tool life of the drill. A considerable amount of research has been done on the effects of drilling on composite materials. Most of these have been targeted toward the study of delamination. Surface Roughness is indicated as an important design feature in many situations such as parts subject to fatigue loads, precision fits, along with aesthetic requirements. In addition to tolerances, surface roughness imposes one of the most critical constraints for the selection of machines and cutting parameters in process planning. Since Taguchi method systematically reveals the complex cause and effect relationship between design parameter along with performance, so many researchers have used Taguchi techniques for design of experimental studies. The present study focusses on the investigations made on drilling using Taguchi Techniques.

2 LITERATURE REVIEW

Chih-Wei Chang and Chun-Pao Kuo [7] evaluated laser-assisted machining (LAM) as an economically viable process for manufacturing precision aluminum oxide ceramic parts. It was locally heated by an intense laser source prior to material removal, LAM lead to higher material removal rates, as well as improved control of workpiece properties and geometry. For assessing the feasibility of the LAM process and better understanding its governing physical phenomena, experiments were conducted to obtain different measures of surface roughness for Al2O3 workpieces machined by laser-assisted turning using

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a Nd:YAG laser. The experimental results were analyzed using the Taguchi method, which facilitated identification of optimum machining conditions. The findings indicated that rotational speed, with a contribution percentage as high as 42.68%, had the most dominant effect on LAM system performance, followed by feed, depth of cut, and pulsed frequency. LAM's most important advantage was its ability to produce much better workpiece surface quality than conventional machining, together with larger material removal rates (MRR) and moderate tool wear. Irfan Khan et al, [19] presented the use of Taguchi method to achieve the minimum hole size expansion in drilling of acrylic sheet. The purpose of this paper was to investigate the effect of cutting parameters, such as cutting speed and feed rate, and point angle on hole size(without considering the thermal effect). The analysis of experiments showed that Taguchi method can successfully verify the optimum cutting parameters. The level of the best of the cutting parameters on the hole expansion was determined. It was also found that cutting speed was the major factor on which hole size expansion depends. It was lower with higher cutting speed. Feed was another important factor which causes hole expansion but its dependence was lesser as compared to the speed. Tool angle was the most complex factor. It was suggested that for achieving minimum hole expansion on the Acrylic always higher feed rates and higher cutting speeds were preferred with non-standard angles.

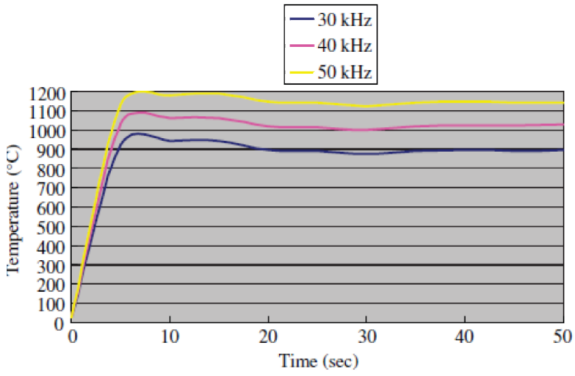

Fig. 1. Variation of surface temperature.[7]

Fig 2: Final Image of work piece [50]

Erkan Bahçe and Cihan Ozel [16] investigated, BUEs arisen on the cutting edges and the effect of drilling parameters (rotation speed, feed rate, drill diameter and point angle) on the surface roughness of the work piece experimentally in the drilling process of Al 5005 alloy on CNC milling machine. The objective of the paper is to obtain an optimal setting of the drilling process parameter (cutting speed, feed) resulting in an optimizing axial force in drilling on mild steel. The effect of drilling process parameter on axial force using Taguchi's parameter design approach. Results indicates that the selected process parameter affect the machining characteristics. The result indicate that the selected process parameter affect the mean and the variance of the optimal force. The percent contribution of parameters as quantified in the S/N pooled AVOVA. The percentage contribution of the parameters reveal that the influence of the feed (64.72%) in controlling both mean and variation of axial force is significantly larger than that of cutting speed(33.38%).The predicted optimum axial force is (720N).The result have been validated by confimation experiments.

C.C. Tsao, H. Hocheng [6] predicted and evaluated thrust force and surface roughness in drilling of composite material using candle stick drill. The approach was based on Taguchi method and the artificial neural network. The experimental results indicated that the feed rate and the drill diameter are the most significant factors affecting the thrust force, while the feed rate and spindle speed contribute the most to the surface roughness. In their study, the objective was to establish a correlation between the feed rate, spindle speed and drill diameter with the induced thrust force and surface roughness in drilling composite laminate. The correlations were obtained by multi-variable regression analysis and radial basis function network (RBFN) and compared with the experimental results. The results indicated the RBFN is more effective than multi-variable regression analysis. Turgay Kivak et al, [45] investigated the effect of cutting parameters on the hole quality (circularity and hole iameter) and tool wear during the drilling of super alloy Inconel 718 with coated and uncoated carbide drills. Drilling tests were carried out with uncoated and TiN and TiAlN coated carbide drills of 5 mm diameter using a CNC vertical machining center under dry cutting conditions by drilling blind holes of 8 mm depth and employing four different cutting speeds (10, 12.5, 15, 17.5 m/min) and three different feed rates (0.05, 0.075, 0.1 mm/rev). Regarding hole diameters and the circularity measurements a comparison has been made in terms of the quality of the hole between cutting tools. It was observed that there was a decrease of tool performance and hole quality at high cutting speed and feed rate combinations. A serious increase in tool wear was observed when increasing cutting speed. The Utmost wear type was seen in the form of flank wear and chisel edge wear. Sharad Kumar Shukla and Akhilesh Lodwal [41] proposed to analyse the vibration on radial drilling machine using piezoelectric sensor. Piezoelectric sensors are case mounted using either a permanent bolt, portable magnet or adhesive to hold them in place. They will measure the vibration of the machine and

produce output in the form of voltage or current proportional to the vibration. The study reveals that the intensity of vibration varies from point to point. Present work gives the result for a speed of 660 rpm on mild steel using 12 mm drill diameter. The maximum intensity of vibration is at casing due to minimum deflection and vibration decreases at spindle, job, H-V joint and minimum at base. At last on the basis of analysis we conclude that, due to damping (pad) vibration is minimum at the base and maximum at the casing.

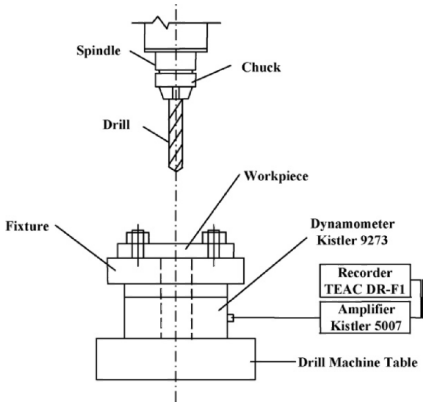

Fig. 3 – Schematic of drilling set-up [6]

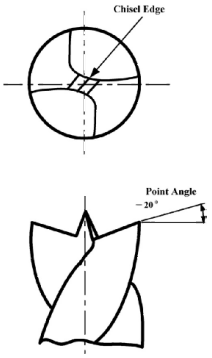

Fig. 4 – Geometry of candle stick drill [6]

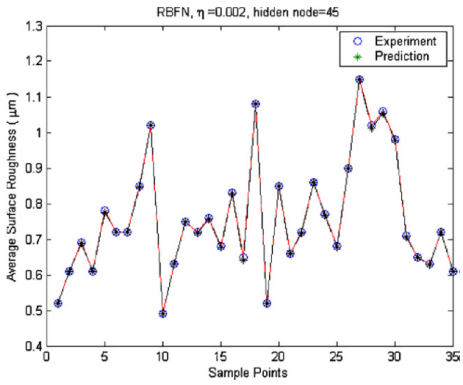

Fig. 5 – Comparison of surface roughness between prediction and experiment. [6]

M. Pirtini and I. Lazoglu [31] in their research, developed a new mathematical model based on the mechanics and dynamics of the drilling process for the prediction of cutting forces and hole quality. A new method was also proposed in order to obtain cutting coefficients directly from a set of relatively simple calibration tests. Moreover, once the drill parameters and cutting conditions are given, by considering the cutting forces and the structural dynamics of the tool and spindle system, the dynamic model can predict the radial displacements under low frequency vibration. The model was able to simulate the cutting forces for various cutting conditions in the process planning stage. In the structural dynamics module, measured frequency response functions of the spindle and tool system were integrated into the model in order to obtain drilled hole profiles. Therefore, in addition to predicting the forces, the new model allowed the determination and visualization of drilled hole profiles in 3D and to select parameters properly under the manufacturing and tolerance constraints. An extensive number of experiments were performed to validate the theoretical model outputs with the measured forces and CMM hole profiles. It was also observed that model predictions agree with the force and CMM measurements. Therefore, hole quality are also predictable in advance. It was also observed that they agree reasonably well. In today's competitive market, process simulator based on the mechanics and dynamics of drilling as presented in this paper helps to decrease cycle times and allows achieving tight hole tolerances.

M Nouari et al. [30] provided necessary information about the main factors affecting the hole quality i.e. cutting speed, temperature, feed rate, geometrical parameters as well as the influence of the cutting conditions and the temperature on the tool life in drilling. They suggested that improvement of surface quality and dimensional accuracy of the holes can be got at large cutting speed and a weak feed rate. Kanai and Kanda [25] suggested that different types of drill wear could be recognized as outer corner wear, flank wear, margin wear, crater wear, chisel wear and chipping at the lip. E. Wardany et al. [13] reported that drilling is a complex operation when compared to other machining operation as the two points of the drill wear alternately till they both have zero clearance at the margin, and become lodged within work piece. Riza A. Motorcu [35] investigated the surface roughness in the turning of AISI 8660 hardened alloy steels by ceramic based cutting tools was investigated in terms of main cutting parameters such as cutting speed, feed rate, depth of cut in addition to tool nose radius, using a statistical approach (see Table 6). Machining tests were carried out with PVD coated ceramic cutting tools under different conditions. An orthogonal design, signal-to-noise ratio and analysis of variance were employed to find out the effective cutting parameters and nose radius on the surface roughness. Show-Shyan Lin *et al.* [42], investigated the optimization of computer numerical control (CNC) boring operation parameters for aluminum alloy 6061T6 using the grey relational analysis (GRA) method. Nine experimental runs based on an orthogonal array of Taguchi method were performed. The surface properties of roughness average and roughness maximum as well as the roundness were selected as the quality targets. An optimal parameter combination of the CNC boring operation was obtained via GRA. By analyzing the grey relational grade matrix, the degree of influenced for each controllable process factor onto individual quality targets can be found. In the work done by A. Çiçek [2], the effects of deep cryogenic treatment and drilling parameters on surface roughness and roundness error were investigated in drilling of AISI 316 austenitic stainless steel with M35 HSS twist drills. In addition, optimal control factors for the hole quality were determined by using Taguchi technique. Two cutting tools, cutting

speeds and feed rates were considered as control factors, and L8(23) orthogonal array was determined for experimental trials, for the input parameters.

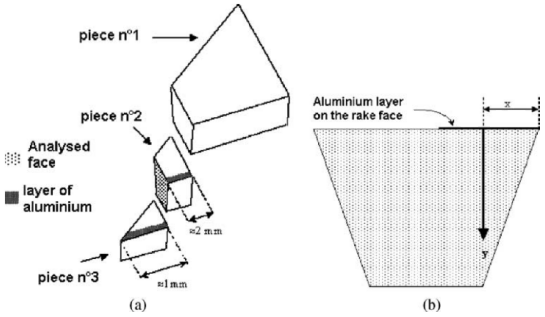

Fig. 6. Section of the carbide tool insert analysed. [30]

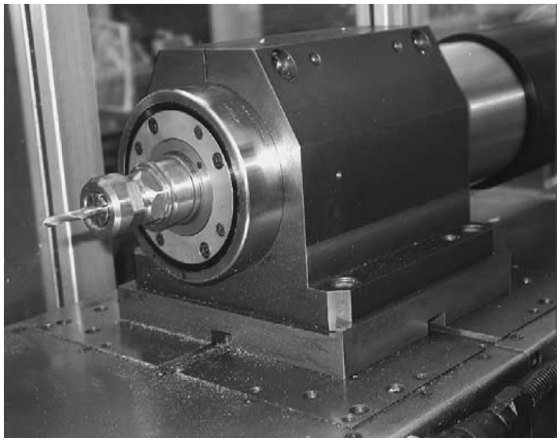

Fig. 7. Instrumented drilling bench.[30]

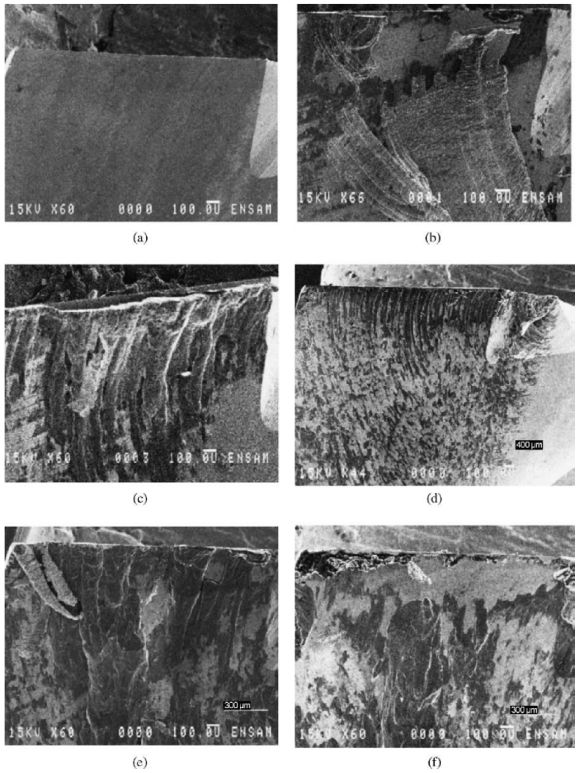

Fig. 8. SEM observations of the aluminium adhesion on the surface of the optimised carbide drill. The cutting conditions are: V = 60 m/min;f = 0.16 m/min; (a) new drill, (b) after 1 hole, (c) after 10 holes, (d) after 48 holes, (e) after 96 holes, (f) after 200 holes. [30]

Reddy Sreenivasalu and Ch.Srinivasa Rao [10], investigated the effect of drilling parameters on surface roughness and roundness error in drilling of Al6061 alloy with HSS twist drill. Optimal control factors for hole quality were determined using Taguchi grey relational analysis. Cutting speed, feed rate, drill diameter, point angle and cutting fluid mixture ratio were considered as the control factors.L18 orthogonal array was determined for experimental trials. Grey relational analysis was employed to minimize surface roughness and roundness error. In another similar work, Yogendra Tyagi, Vedansh Chaturvedi and Jyoti Vimal [50] discussed the feasibility of machining Mild Steel by CNC drilling machine with a HSS Tool by applying taguchi methodology. The signal-to-noise ratio applied to find optimum process parameter for CNC drilling machining. A L9 orthogonal array and analysis of variance (ANOVA) were used to study the performance characteristics of machining parameter (spindle speed, feed, and depth) with consideration of good surface finish as well as high material removal rate (MRR). Multiple regression equations were formulated for estimating predicted value for surface roughness and material removal rate.

Dinesh Kumar et al, [11], described the Taguchi technique for optimization of surface roughness in drilling process. In their investigation, Taguchi technique was used as one of the method for minimizing the surface roughness in drilling mild steel. The purpose of this study is to investigate the influence of cutting parameters, such as cutting speed and feed rate, and point angle on surface roughness produced when drilling Mild steel. In the study conducted by Anil Jindal and V. K. Singla [3], the Taguchi optimization methodology is applied to optimize cutting parameters in drilling of glass fibre reinforced composite (GFRC) material. Analysis of variance (ANOVA) is used to study the effect of process parameters on machining process. This procedure eliminates the need for repeated experiments, time and conserves the material by the conventional procedure. B. Shivapragash et al. [4] focused on multiple response optimization of drilling process for composite Al-TiBr2. The study provided to minimize the damage events occurring during drilling process for composite material. A statistical approach used to analyze experiment data. Taguchi method with grey relational analysis was used to optimize the machining parameters with multiple performance characteristics in drilling of MMC Al-TiBr2. The results shows that the maximum feed rate, low

spindle speed are the most significant factors which affect the drilling process and the performance in the drilling process can be effectively improved by using this approach.

E Capello and V Tagliaferri [12] studied the effect of the drilling on the residual mechanical behaviour of glass fibre reinforced plastic (GFRP) laminates when the hole is subjected to bearing load. In the first part, the influence of drilling parameters on the type and extension of the damage is analyzed. The damage was described at the macro level (delaminated area) and at the micro level (cracks, fibre-matrix debonding, etc.). The Design of Experiments and Analysis of Variance techniques are used in order to determine the statistical influence of the drilling parameters on the delamination area. Moreover, the effects of drilling with or without a support beneath the specimens are analyzed and discussed. Push-down delamination was mainly affected by the feed rate, by the presence of support beneath the specimen, and by the twist drill temperature. C.C. Tsao and H. Hocheng [8] studied the effects of backup plate on delamination in drilling composite materials using saw drill and core drill. The critical drilling thrust force at the onset of delamination is calculated and compared with that without backup. Saw drills and core drills produce less delamination than twist drills by distributing the drilling thrust toward the hole periphery. Delamination can be effectively reduced or eliminated by slowing down the feed rate when approaching the exit and by using back-up plates to support and counteract the deflection of the composite laminate leading to exit side delaminations. The use of the back-up does reduce the delamination in practice, which its effects have not been well explained in analytical fashion. C. C. Tsao and H. Hocheng [9] studied prediction and evaluation of delamination factor in use of twist drill, candle stick drill and saw drill. The approach is based on Taguchi's method and the analysis of variance (ANOVA). An ultrasonic C-Scan to examine the delamination of carbon fibre-reinforced plastic (CFRP) laminate is used in this paper. The experiments were conducted to study the delamination factor under various cutting conditions. The experimental results indicate that the feed rate and the drill diameter are recognized to make the most significant contribution to the overall performance. The objective was to establish a correlation between feed rate, spindle speed and drill diameter with the induced delamination in a CFRP laminate. The correlation was obtained by multi-variable linear regression and compared with the experimental results.

E. S. Lee [15] studied the machinability of GFRP by means of tools made of various materials and geometries was investigated experimentally. By proper selection of cutting tool material and geometry, excellent machining of the work piece is achieved. The surface quality relates closely to the feed rate and cutting tool. When using glass fibre reinforced plastics (GFRP) it is often necessary to cut the material, but the cutting of GFRP is often made difficult by the delamination of the composite and the short tool life. E. Ugo. Enemuoh et al, [14] studied new comprehensive approach to select cutting parameters for damage-free drilling in carbon fiber reinforced epoxy composite material is presented. The approach is based on a combination of Taguchi's experimental analysis technique and a multi objective optimization criterion. The optimization objective includes the contributing effects of the drilling performance measures: delamination, damage width, surface roughness, and drilling thrust force. A hybrid process model based on a database of experimental results together with numerical methods for data interpolation are used to relate drilling parameters to the drilling performance measures. Case studies are presented to demonstrate the application of this method in the determination of optimum drilling conditions for damage-free drilling in BMS 8-256 composite laminate. H. Hocheng and C.C. Tsao [18] studied the critical thrust force at the onset of delamination, and compares the effects of these different drill bits. The results confirm the analytical findings and are consistent with the industrial experience. Ultrasonic scanning is used to evaluate the extent of drilling-induced delamination in fiber-reinforced materials. The advantage of these special drills is illustrated mathematically as well as experimentally, that their thrust force is distributed toward the drill periphery instead of being concentrated at the center. The allowable feed rate without causing delamination is also increased. The analysis can be extended to examine the effects of other future innovative drill bits.

R. S. Jadoun et al, [23] studied the effect of process parameters on production accuracy obtained through ultrasonic drilling of holes in alumina based ceramics using silicon carbide abrasive. Production accuracy in ultrasonic drilling involved both dimensional accuracy (hole oversize) and formed accuracy (out-of roundness and conicity). The parameters considered were workpiece material, tool material, grit size of the abrasive, power rating and slurry concentration. Taguchi's optimization approach was used to obtain the optimal parameters. The significant parameters were also identified and their effect on oversize, out-of-roundness and conicity were studied. The results obtained were validated by conducting the confirmation experiments. Fig. 10 shows a) Bar graphs showing percentage contributions of significant process parameters for hole oversize. b) Bar graphs showing percentage contributions of significant process parameters for out of roundness data. c) Bar graphs showing percentage contributions of significant process parameters for conicity. A Workpiece, B tool, C grit size, D power rating, E slurry concentration. I. Singh and N. Bhatnagar [43] studied to correlate drilling-induced damage with drilling parameters. Tool point geometry is considered a major factor that influences drilling-induced damage. Experiments were conducted and drilling induced damage was quantified using the digital image processing technique. The results also reestablished the cutting speed to feed ratio as an important variable that influences drilling-induced damage. Mathematical models for thrust, torque, and damage are proposed that agree well with the experiments. J. Rubioa et. al [39]

studied HSM to realize high performance drilling of glass fibre reinforced plastics (GFRP) with reduced damage. In order to establish the damage level, digital analysis is used to assess delamination. A comparison between the conventional (Fd) and adjusted (Fda) delamination factor is presented. The experimental results indicate that the use of HSM carried out for drilling GFRP ensuring low damage levels.

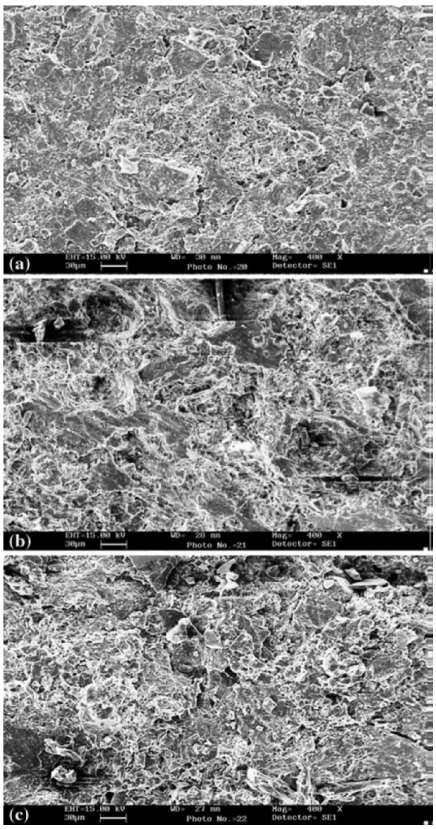

Fig. 9 SEM photographs of workpiece materials before drilling a 50% Alumina, b 60% Alumina and c 70% Alumina [23]

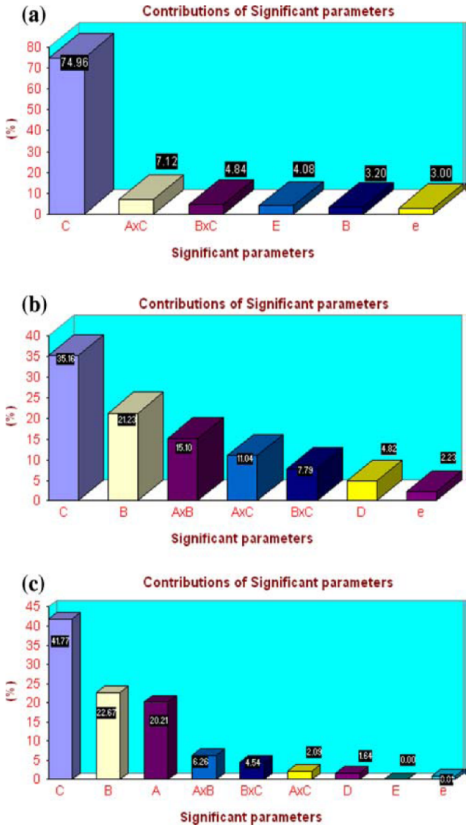

Fig. 10 Bar graphs. A Workpiece, B tool, C grit size, D power rating, E slurry concentration. [23]

Drilling is probably the machining process most widely applied to composite materials; nevertheless, the damage induced by this operation may reduce drastically the component performance. J. Mathew et al, [22] studied that thrust is a major factor responsible for delamination and it mainly depends on tool geometry and feed rate. Trepanning tools, which were used in this study, were found to give reduced thrust while making holes on thin laminated composites. In this work the peculiarities of trepanning over drilling of unidirectional composites has been emphasized. The models for prediction of critical thrust and critical feed rate at the onset of delamination during trepanning of uni-directional composites based on fracture mechanics and plate theory also have been presented. Mathematical models correlating thrust and torque with tool diameter and feed rate have been developed through statistically designed experiments and effect of various parameters on them have been discussed. It is observed that sub-laminate thickness is the most decisive parameter from the viewpoint of critical feed rates. J. Paulo Davim and Pedro Reis [20] studied the cutting parameters (cutting velocity and feed rate) on power (*P*c), specific cutting pressure (*K*s), and delamination in carbon fibre reinforced plastics (CFRPs). A plan of experiments, based on the techniques of Taguchi, was established considering drilling with prefixed cutting parameters in an autoclave CFRP composite laminate. The analysis of variance was preformed to investigate the cutting characteristics of CFRPs using cemented carbide (K10) drills with appropriate geometries. The objective was to establish a correlation between cutting velocity and feed rate with the power (*P*c) specific cutting pressure (*K*s) and delamination factor (*F*d) in a CFRP material. Finally, this correlation was obtained by multiple linear regressions. L-B Zhang, L-J Wang and X-Y Liu [29] studied the analysis for multidirectional composite laminates is based on linear elastic fracture mechanics (LEFM), classical bending plate theory and the mechanics of composites. This paper presents a general closed-form mechanical model for predicting the critical thrust force at which delamination is initiated at different ply locations. Good correlation is observed between the model and the experimental results. L.M.P. Durao et.al [28]studied to minimization of axial thrust force during drilling reduces the probability of delamination onset, as it has been demonstrated by analytical models based on linear elastic fracture mechanics (LEFM). A finite element model considering solid elements of the ABAQUS software library and interface elements

including a cohesive damage model was developed in order to simulate thrust forces and delamination onset during drilling. Thrust force results for delamination onset are compared with existing analytical models. N.S. Mohan et al, [32] studied the drilling parameters and specimen parameters evaluated were speed, feed rate, drill size and specimen thickness on FRP. A signal-to-noise ratio is employed to analyze the influence of various parameters on peel up and push down delamination factor in drilling of glass fibre reinforced plastic (GFRP) composite laminates. The main objective of this study was to determine factors and combination of factors that influence the delamination using Taguchi and response surface methodology and to achieve the optimization machining conditions that would result in minimum delamination. From the analysis it is evident that among the all significant parameters, specimen thickness and cutting speed have significant influence on peel up delamination and the specimen thickness and feed have more significant influence on push down delamination.

Mustafa Kurt et al, [24] investigated the effect of cutting parameters and changes in the diameter of the drill on drilling temperature, cutting forces and surface roughness in dry drilling of Al 2024 alloy using diamond like carbon coated drills. The cutting temperature was measured by using a thermocouple. Kistler dynamometer was used for the measurements of the cutting forces during drilling process. The surface roughness of drilled hole surface was determined by using MARH-Perthometer. Finally, the Taguchi technique was employed for the optimization of drilling process. R. Stone and K. Krishnamurthy [36] studied the linear-elastic fracture mechanics theory which proposed critical cutting and thrust forces in the various drilling regions that can be used as a guide in preventing crack growth or delamination. Using these critical force curves as a guide, a thrust force controller was developed to minimize the delamination while drilling a graphite epoxy laminate. A neural network control scheme was implemented which re network identifier to model the drilling dynamics and a neural network controller to learn the relationship between feed rate and the desired thrust force. Experimental results verifying the validity of this control approach as well as the robustness of the design are presented. Visual measurements of the delamination zones were used to quantify the benefits of the thrust force controlled drilling process versus the conventional constant feed rate drilling process. Redouane Zitoun and Francis Collombe [37] studied a numerical FE analysis is proposed to calculate the thrust forces responsible for the defect at the exit of the hole during the drilling phase of long-fibre composite structures, within a quasi-static framework. This numerical model compared with the analytical models studied in the literature – takes into account the tool point geometry as well as the shear force effects in the laminate. F. Lachaud, et. al [17] studied the drilling with a twist drill and a specific cutting tool of structural thin backing plates in carbon/epoxy. The possibility to manufacture carbon/epoxy with a conventional cutting tool was analysed and the limits of the twist drill were shown. Consequently we defined a specific cutting tool. Series of comparative experiments were carried out using a conventional twist drill and this specific cutting tool. The results shown the capabilities of the 18 specific cutting tool because several defects and damages usually encountered in twist drilled holes were minimised or avoided (entrance damage, roundness and diameter defects and plate exit damage). Redouane Zitoune et al, [38] studied the parametric influences on thrust force, torque as well as surface finish, the experimental results shown that the quality of holes can be improved by proper selection of cutting parameters. This is substantiated by monitoring thrust force, torque, surface finish, circularity and hole diameter. For the CFRP, the circularity is found to be around 6 lm at low feed rates, when the feed is increased the circularity increases to 25 lm. The wear tests carried out show that, during first 30 holes, thrust force in CFRP undergoes a more important increase (90%) than thrust force of aluminium (6%).

S.R. Karnik et.al [26] studied the delamination behaviour as a function of drilling process parameters at the entrance of the CFRP plates. The delamination analysis in high speed drilling is performed by developing an artificial neural network (ANN) model with spindle speed, feed rate and point angle as the affecting parameters. A multilayer feed forward ANN architecture, trained using error-back propagation training algorithm (EBPTA) is employed for this purpose. Drilling experiments were conducted as per full factorial design using cemented carbide (grade K20) twist drills that serve as input–output patterns for ANN training. The validated ANN model is then used to generate the direct and interaction effect plots to analyze the delamination behavior. The simulation results illustrate the effectiveness of the ANN models to analyze the effects of drilling process parameters on delamination factor. The analysis also demonstrates the advantage of employing higher speed in controlling the delamination during drilling. S. C. Lin and I. K. Chen [40] studied the effects of increasing cutting speed on drilling characteristics of carbon fiber-reinforced composite materials. The effects of increasing cutting speed ranging from 9550 up to 38650 rev min”1 (from 210 to 850 m min”1) on average thrust force, torque, tool wear and hole quality for both multifacet drill and twist drill are studied. It was found that increasing cutting speed will accelerate tool wear. And the thrust force increases as drill wear increases. Although tool geometries change quickly due to the fast development of tool wear and the thrust force increases drastically as cutting speed increases, an acceptable hole entry and exit quality is maintained. This is because relatively small feeds are used in these tests. It was concluded that tool wear was the major problem encountered when drilling carbon fiber reinforced composite materials at high speed. U. A. Khashaba studied the [27] Delamination-free in drilling different fiber reinforced thermoset composites was the main objective of research. Therefore the influence of drilling and material variables on thrust force, torque and delamination of GFRP

composites was investigated experimentally. Drilling variables were cutting speed and feed. Material variable include matrix type, filler and fibre shape. Drilling process was carried out on cross-winding/polyester, continuous-winding with filler/polyester, chopped/polyester, woven/polyester and woven/epoxy composites. A simple inexpensive accurate technique was developed to measure delamination size. The thrust forces in drilling continuous-winding composite are more than three orders of magnitude higher than those in the crosswinding composites. Delamination, chipping and spalling damage mechanisms. A. Çiçek et al, [1] investigated the effects of deep cryogenic treatment and drilling parameters on surface roughness and roundness error were in drilling of AISI 316 austenitic stainless steel with M35 HSS twist drills. In addition, optimal control factors for the hole quality were determined by using Taguchi technique. Two cutting tools, cutting speeds and feed rates were considered as control factors, and L8 (23) orthogonal array was determined for experimental trials. Multiple regression analysis was employed to derive the predictive equations of the surface roughness and roundness error achieved via experimental design. Minimum surface roughness and roundness error were obtained with treated drills at 14 m/min cutting speed and 0.08 mm/rev feed rate. Confirmation experiments showed that Taguchi method precisely optimized the drilling parameters in drilling of stainless steel.

U.A. Khashaba et al, [46] studied the effects of the drilling parameters, speed, and feed, on the required cutting forces and torques in drilling chopped composites with different fibre volume fractions. Three speeds, five feeds, and five fiber volume fractures are used in this study. The results show that feeds and fibre volumes have direct effects on thrust forces and torques. On the other hand, increasing the cutting speed reduces the associated thrust force and torque, especially at high feed values. Using multivariable linear regression analysis, empirical formulas that correlate favorably with the obtained results have been developed. These formulas would be useful in drilling chopped composites. The influence of cutting parameters on peel-up and push-out delaminations that occurs at drill entrance and drill exit respectively the specimen surfaces have been investigated. No clear effect of the cutting speed on the delamination size is observed, while the delamination size decreases with decreasing the feed. Delamination-free in drilling chopped composites with high fibre volume fraction remains as a problem to be further investigated. Velayudham A, Krishnamurthy R and Soundara pandian T [48] studied the dynamics of drilling of high volume fraction glass fibre reinforced composite. At high fibre volume, fibres do not show much relaxation and normal hole shrinkage associated with polymeric composites was not observed during drilling. Peak drilling thrust, dimension of holes drilled and vibration induced during drilling are observed to correlate with each other. Vibrations study has been attempted through wavelet packet transform and the results demonstrated its capability in signal characterisation.V. Krishnaraj, S. Vijayarangan and A. Ramesh Kumar [47] studied the damage generated during the drilling of Glass Fibre Reinforced Plastics (GFRP) which was detrimental for the mechanical behaviour of the composite structure. This work was focused on analysing the influence of drilling parameters (spindle speed and feed) on the strength of the GFR woven fabric laminates and further tostudy the residual stress distribution around the hole after drilling. Holes were drilled at the centre of the specimens in a CNC machining centre using 6 mm diameter micro grain carbide drill for various spindle speeds (1000 4000 rpm) and feed rates (0.02, 0.06, 0.10 and 0.20 rev/min). Degree of damage depends on the feed rate and spindle speed. Experimental results indicate that failure strength and stress concentration are related to the drilling parameters and a drilling parameter (3000 rpm and 0.02 mm/rev), which gives better mechanical strength. Wen-Chou Chen [49] studied the concept of delamination factor *F*d (i.e. the ratio of the maximum diameter Dmax. in the damage zone to the hole diameter *D*)is proposed to analyze and compare easily the delamination degree in the drilling of carbon fiber-reinforced plastic (CFRP) composite laminates. Experiments were performed to investigate the variations of cutting forces with or without onset of delamination during the drilling operations. The effects of tool geometry and drilling parameters on cutting force variations in CFRP composite materials drilling were also experimentally examined. The experimental results shown the delamination free drilling processes may be obtained by the proper selections of tool geometry and drilling parameters.

3 CONCLUSIONS

Out of the studies made the important conclusions may be drawn as: In industrial applications, it is essential to determine the optimal cutting conditions for a given tool–workpiece combination. Taguchi technique has proved to be the best tool for determining the optimum machining conditions, improving performance characteristics, their main effects and in finding out other significant factors. The multiple performance characteristics such as tool life, cutting force, surface roughness as well as the overall productivity can be improved by using Taguchi Techniques. It can also be concluded that at quite large cutting speeds with smaller feed rate, good surface quality along with dimensional accuracy can be achieved.

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The Use of Plant Extract as Shrinkage Reducing Admixture (SRA) to Reduce Early Age Shrinkage and Cracking on Cement Mortar

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ABSTRACT: Concrete shrinkage is a main concern of engineers due to its direct relation to cracking. Shrinkage and shrinkage cracks jeopardize durability and increase maintenance as well as rehabilitation cost. To enhance the durability, normally shrinkage reducing admixtures is used, but the chemical admixtures are not eco-friendly and economical. The chemicals are patented and manufactured in developed countries and soled to developing countries at exorbitant price. The manufacturing also emits toxic chemicals which significantly contribute to global warming. To alleviate this situation, research work was undertaken to determine the suitability of plant extract (Blue Gum extract) as shrinkage reducing admixture (SRA) for concrete. Extracts from the bark of blue gum tree was prepared by boiling the bark in water. Mortar slabs were prepared for different percentage of dosage and flow level, which were then exposed to the environment, thus permitting measurement of shrinkage and cracks for different times (5hour, 3day, 7 day & 28 day). Results obtained indicate that the use of Blue Gum plant extract reduced shrinkage and cracks due to shrinkage on cement mortar.

KEYWORDS: Eco-Friendly, Plant Extract, Shrinkage, Cracking, Shrinkage Reducing admixture.

1 INTRODUCTION

The durability of concrete is affected by the presence of cracks. Concrete cracking is mainly due to shrinkage. Crack in concrete due to shrinkage make ways for aggressive substances from the environment to percolate and dissolve the concrete, and hence, later on degrade the concrete and diminish the service life of the concrete. During hydration, the cement undergoes volumetric contraction due to chemical reaction and, the water moves towards the external surface due to surface tension. The movement of water towards outside leaves the cement paste, mortar or concrete in unsaturated condition leading to drying and shrinkage. Chemical shrinkage is also early age shrinkage due to cement reaction [1]. In concrete a map-like cracks exist due to the inhibition of volumetric reduction of the outer layer by the inner part [2]. Drying shrinkage occurs after the concrete set and is due to the exposure to different environment which contributes to the volumetric change of concrete [3]. Plastering with cement mortar was an essential part of finishing concrete structures. One of the problems in finishing is crack due to early age or later age shrinkage. Cracks in the finished layer decrease the beauty and quality of the structure [4]. Different promising researches were done on different shrinkage reducing supplementary materials. Replacement of cement with fly ash decreased both plastic and drying shrinkage, but mostly autogenous shrinkage. As the replacement of cement with fly ash increased, the shrinkage of the concrete decreased, however the effect was not much for drying shrinkage. The reduction in shrinkage was more effective when using shrinkage reducing admixture. The use of silka control 40(shrinkage reducing admixture) was more efficient in reducing all types of shrinkage [5]. When shrinkage reducing admixtures added to concrete during batching stage, it significantly reduced both early and long term

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drying shrinkage. Glycol ether is one of shrinkage reducing admixture and mainly they are glycol derivatives [6]. Polypropylene glycol reduced authgenous and drying shrinkage by 85% and 50% respectively. Shrinkage reducing admixture (polypropylene glycol) reduced shrinkage and shrinkage cracking by reducing the surface tension at the [7].

2 MATERIALS AND METHODS

2.1 MATERIALS

2.1.1 PLANT EXTRACT

The plant extract used as an admixture was prepared by boiling Blue Gum bark in water. The bark of Blue Gum was cut into very small pieces and then 1kg of the bark was boiled with four litters of water for two hours under pressure. From successive boiling an average of 700ml/kg was obtained. The elemental analysis of the boiled plant extract was done by X-ray fluorescence and the results are shown in the Table 1

Table 1: Chemical concentration in ppm or µg/g

Element	Bark of Blue Gum Extract	Element	Bark of Blue Gum Extract
Potassium (K)	837 ±29	Copper (Cu)	<0.10
Calcium (Ca)	31.6 ±1.2	Zink(Zn)	0.514 ±0.030
Titanium (Ti)	<0.15	Arsenic(As)	0.334 ±0.022
Vanadium(V)	<0.10	Bromine(Br)	<0.01
Chromium(Cr)	<0.10	Rubidium(Rb)	1.38 ±0.06
Manganese (Mn)	22 ±0.80	Strontium(Sr)	5.14 ±0.19
Iron(Fe)	2.74 ±0.12	Yttrium(Y)	0.280 ±0.020
Nickel	<0.10		0.343 ±0.027

The elemental analysis shows the extract was not toxic to human body. The level of bromine, rubidium, arsenic and nickel are insignificant as compared to their toxic level.

2.1.2 CEMENT

The cement used was Ordinary Portland cement (OPC) of grade 42.5. It was manufactured by Bamburi cement Ltd, Kenya. The product conforms to European Norm EN 197 cement.

2.1.3 FINE AGGREGATE

Locally available river sand was used. The aggregate was graded through sieving and curve plotting according to BS 812:1992. The physical properties of fine aggregate were done based on their respective BS standard: The specific gravity (BS 812-102:1995), Bulk density (BS 812-2:1995), water absorption (BS 813-2:1995) and moisture content (BS 812-109:1990). The results are shown in Table 2.

Table 2: Physical properties and sieve analysis of fine aggregate

Sieve Designation mm	Weight retained (gm)	percent weight retained	Cumulative percent weight retained	percent weight passing
5	2.5	0.5	0.5	99.5
2.36	5	1	1.5	98.5
1.18	58.75	11.75	13.25	86.75
0.6	142.5	28.5	41.75	58.25
0.3	172.5	34.5	76.25	23.75
0.15	98.75	19.75	96	4
Residue	20	4	100	-
Physical properties:				
Grading = Zone II				
Fineness modulus = 3.3				
Specific gravity = 2.62				
Bulk Density = 1470 kg/m^3				
Water Absorption = 8.63%				
Moisture Content = 8.1%				

2.1.4 WATER

The water used for concrete mix and curing the specimen was the water available in the laboratory form the tap.

2.2 METHODOLOGY

2.2.1 SHRINKAGE AND CRACKS DUE TO PLASTIC SHRINKAGE ON CEMENT MORTAR

To measure shrinkage, and cracks due to plastic shrinkage on mortar slabs, a wooden molds of size 500x500x15mm was prepared. A total of 10 mortar slabs were cast for two different mix ratios and three different percentage plants extract dosage. The mortar mixtures were proportioned with cement to sand ratio of 1:3 and 1:4. The mortar slabs were cast for the same flow level but different percentages of plant extract (0, 5, 10 & 15%) dosage. Three mortar slabs for a mix ratio of 1:3 (Cement: sand) were exposed to direct heat from the sun and, four mortar slabs for each mix ratio of 1:3 and 1:4 (cement: sand) were kept away from direct heat. The shrinkage and cracks were measured using the aid of measuring scale and use of magnifying lens. The data's were recorded for plastic shrinkage at 5 hours and drying shrinkage at 3, 7, and 28 days.

3 RESULTS AND DISCUSSION

3.1 THE EFFECT OF BLUE GUM EXTRACT ON SHRINKAGE

The shrinkage was measured as the sum of all types of shrinkage occurred on the specimen. The shrinkage was measured based on the change in length of the test specimen over time and presented in the figure 1-6 below. Figure 1&2 shows the effect of the blue gum extract on the shrinkage of the mortal slab with a mix ratio of 1:3 (cement: sand) controlled from direct heat of the sun. The average wind speed, temperature and humidity were measured within the 5 hours from the cast and were 16km/h, 26^0C and 51% respectively. The use of blue gum extract decreased both early age shrinkage as well as shrinkage through time. Since the mortar slabs were kept away from direct heat of the sun, the variation in early age shrinkage was not much. However, for the later age or drying shrinkage, as the dosage of blue gum extract increased the shrinkage also decreased. A dosage of 15% plant extract decreased the early age and drying shrinkage in average by 15 and 25% respectively for controlled case. Figure 2 shows shrinkage for different time interval and dosage. Shrinkage for early age and later was very less for the slab mortar with plant extract as compared to the control. The shrinkage increased from 5 hours to 3 days, but followed a constant trend then after, hence showing that drying shrinkage was also affected by early age shrinkage. For the controlled case the early age shrinkage and drying shrinkage have a direct relation. For different percentage dosage blue gum extract, early age and later age shrinkage decreased as compared to the control.

Figure 3 and 4 shows the effect of the blue gum extract on shrinkage of the mortar slab with a mix ratio of 1:3 (cement: sand) exposed to direct heat from the sun. The average wind speed, temperature and humidity were measured within the 5 hours from the cast and were 13km/h, 22^{0}C and 57% respectively. The effect of plant extract on early age shrinkage was very high. The use of blue gum extract decreased the early age and drying shrinkage in average by 20 and 14% respectively for mortar slab exposed to direct heat from the sun. The use of plant extract reduced excessive loss of the moisture from the surface of the concrete by its ability of reducing surface tension. In addition the plant extract was effective in reducing the movement of water towards the outside surface by decreasing the surface tension in the capillary tube.

Figure 5&6 shows the effect of plant extract on shrinkage of the metal slab with a mix ratio of 1:4 (cement: sand) controlled from direct heat of the sun. The average wind speed, temperature and humidity were measured within the 5 hours from the cast and were 16km/h, 26^{0}C and 51% respectively. As compared to mix ratio of 1:3, the shrinkage for mortar slabs with a mix ratio of 1:4 was very small. The shrinkage of the mortar slab for 5% blue gum extract was greater than that of control and less for 10 and 15% dosage. From the graph there is no direct relation between dosage and shrinkage. For a mix ratio of 1:4 by cement to sand ratio, the amount of binder in the mortar mix is very small i.e. Shrinkage decreases as the quantity of binder material decrease and quantity of aggregate increase. Due to the above reason the effect of plant extract on shrinkage was not effectively seen as the dosage increase.

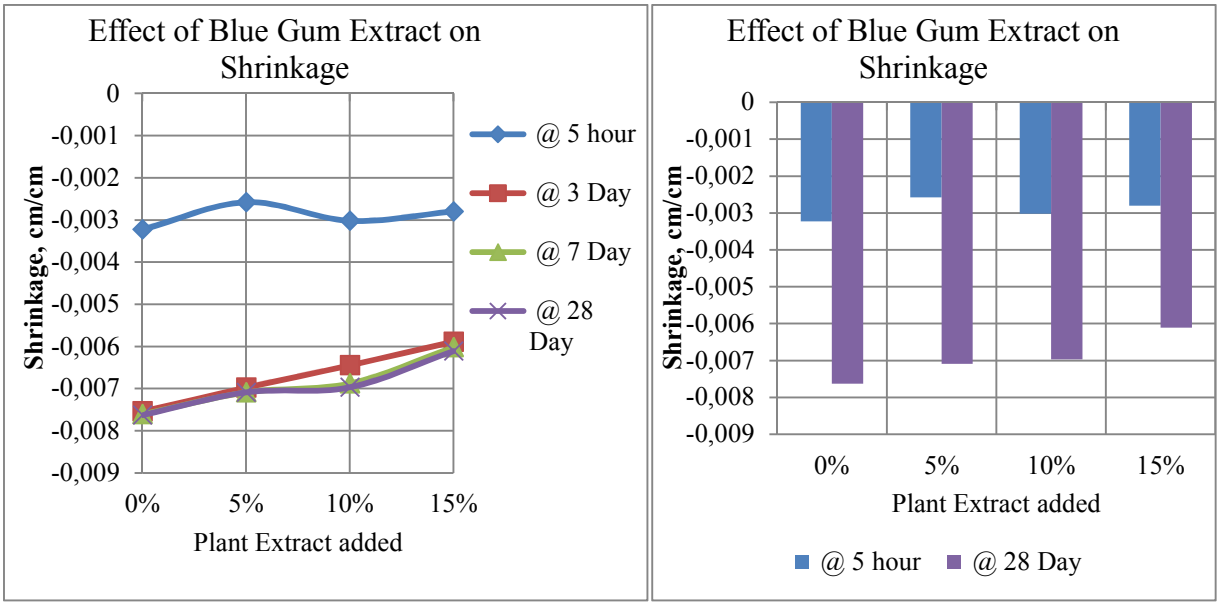

Figure 1: The Effect blue gum extract on shrinkage for controlled from direct heat from the sun

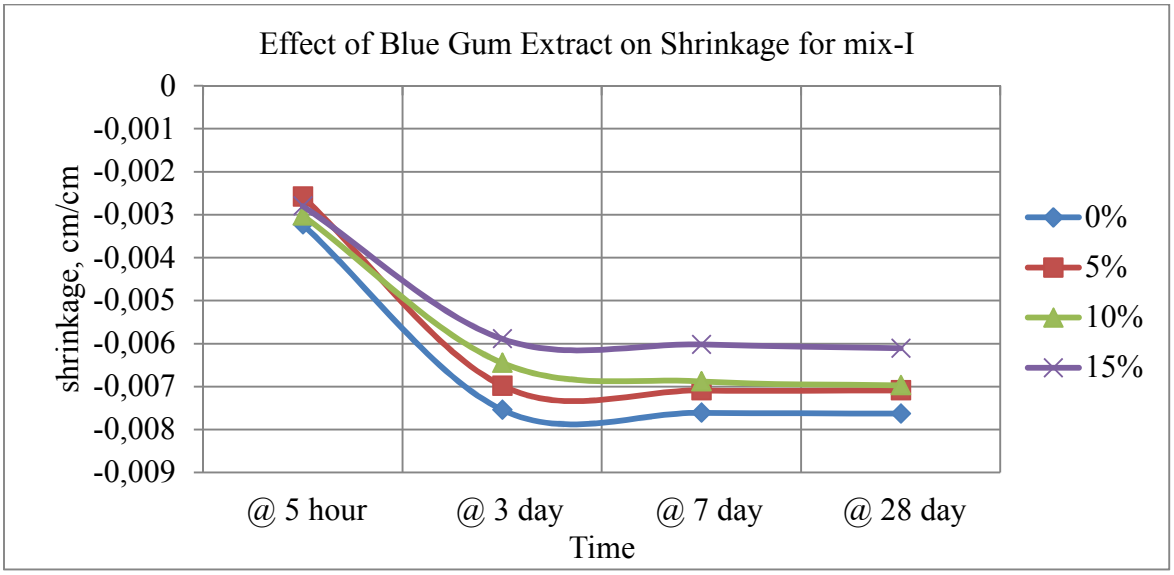

Figure 2: Shrinkage through time for different dosage for controlled from direct heat from the sun

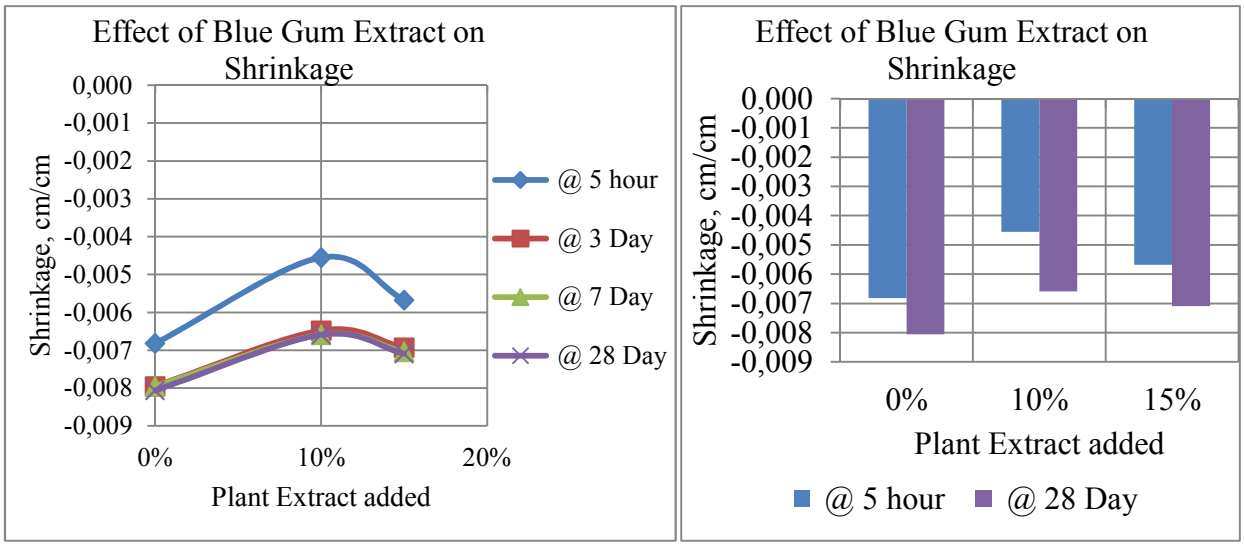

Figure 3: The Effect on shrinkage for exposed to direct heat from the sun

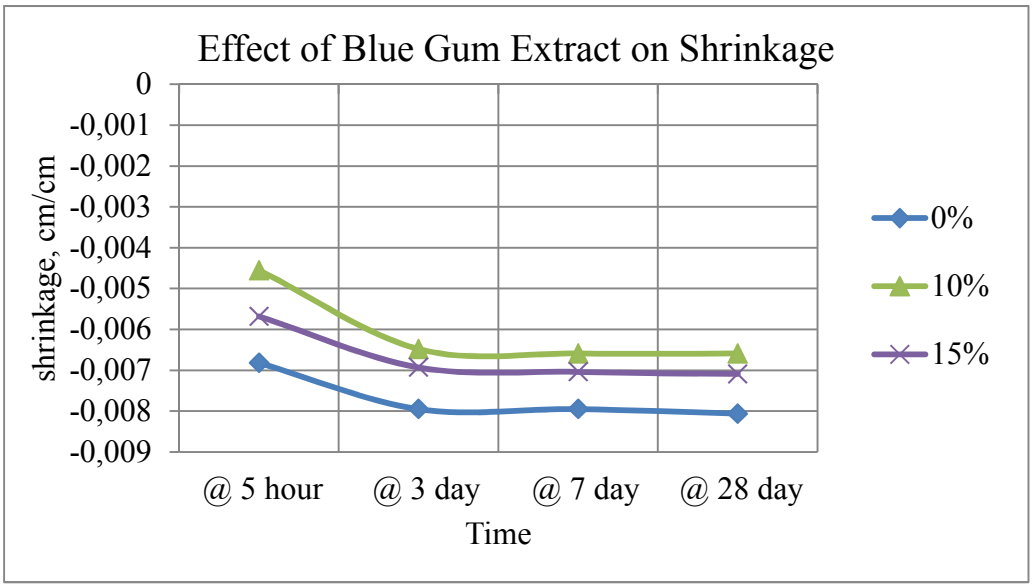

Figure 4: Shrinkage through time for different dosage for slab exposed to direct heat from the sun

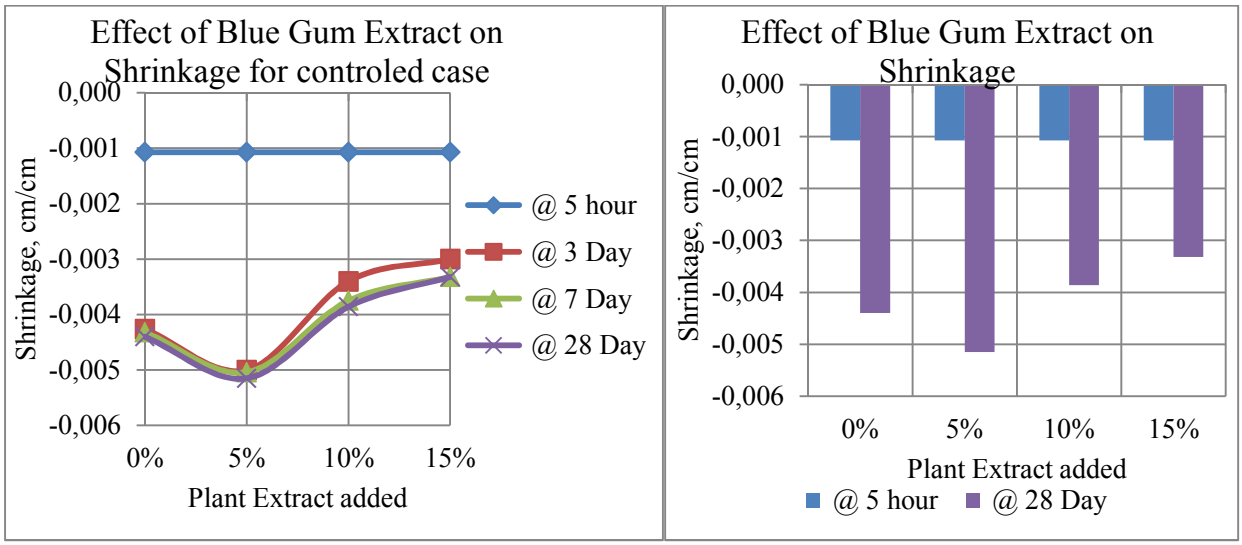

Figure 1: The Effect placontrolled on shrinkage for contrthe suned from direct heat from sun

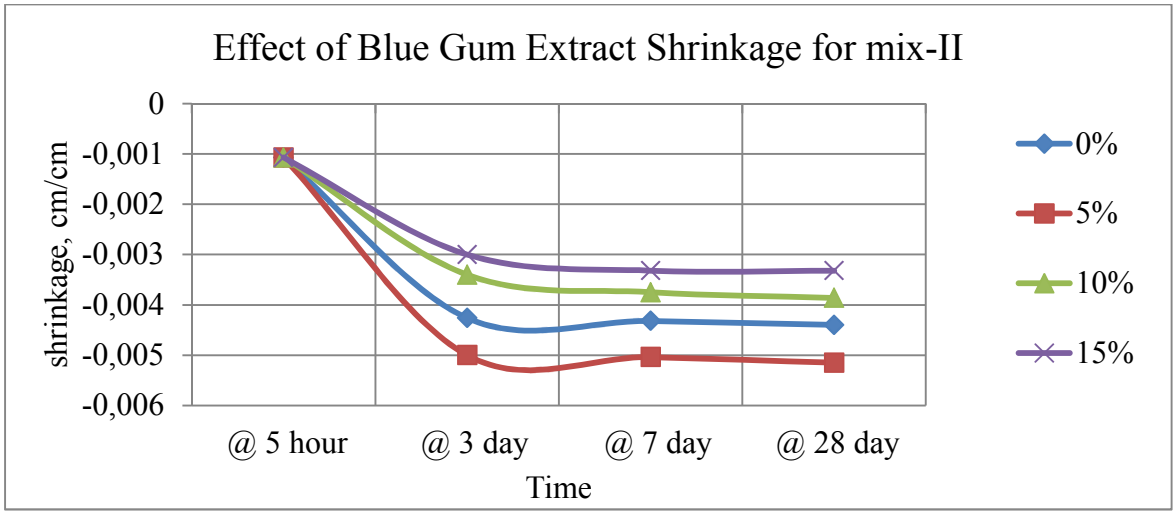

Figure 6: Shrinkage through time for mix-II controlled from direct heat from sun

3.2 THE EFFECT OF BLUE GUM EXTRACT ON CRACKING DUE TO SHRINKAGE

The cracks formed on the surface of mortar slab were due to early age shrinkage. The crack width and length was measured for early age at 5 hour and later at 3, 7 and 28 days. The result shows all the cracks occurred due to early age shrinkage and not increased through time.

Table 3 shows a mortar slab cast for mix-I and cured away from direct heat of the sun. The average wind speed, temperature and humidity were measured with in the 5 hours from the cast and were 16 km/h, 26^0C and 51% respectively. The results from 5 hour measurement, one crack were seen on the surface of the mortar slab with 5% blue gum extract and two cracks on control (mortar slab without plant extract). The two cracks on control mortar were measured at 5 hour and have a (width, length) of (1, 130) mm and (1, 170) mm. Cracks due to shrinkage were also measured for 3, 7, 28 day and have the same dimension (width, length) of (1, 133) and (1, 175). The mortar slab with 5% plant extract cracked due to shrinkage. The crack was measured for both early and drying shrinkage in (width, length); and were (0.5, 58) and (0.75, 60). The crack was occurred due to early age shrinkage and not increasing much through time. The shrinkage was reduced for a mortar slab with plant extract as compared to the control (Mortar slab without plant extract).

Table 4 show a mortar slab cast for mix-II and cured away from direct heat of the sun. No crack occurred on the surface of the mortar slab and the shrinkage was very small compared to that of mix-I. No crack was occurred for both mortar slabs with and without plant extract. Shrinkage and shrinkage cracks are dependent on concrete constituent and hence, increased in quantity of sand decreased shrinkage in mortar slabs.

Table 5 shows a mortar slab cast for mix-I and were measured at 5 hour. The wind speed, temperature and humidity from the mix to measurement were in average 13 km/h, 22^0C and 57% respectively. The cracks were occurred on both control and mortar slab with 10% blue gum extract. The crack (width, length) on a control mortar slab and with 10% blue gum extract was measured at 5 hour and were (1, 150)mm and (0.5,55)mm. The cracks were also measured for 3, 7, 28 day for both control and with 10% blue gum extract. The cracks (width, length) were not increased in dimension and were (1, 155) mm and (0.75, 70) mm for control and with 10% blue gum extract respectively. The crack was occurred due to early age shrinkage and not increased much through time. No crack occurred on mortar slab with 15% blue gum extract and shrinkage was reduced for a mortar slab with plant extract as compared to the control (Mortar slab without plant extract).

Table 5.3: Crack due to shrinkage for mortar slabs of mix-I controlled from direct heat from the sun

Crack width and length for different percentage of blue gum extract added				
Mix-I: 1:3, N= number, L = length and W = width				
% Plant extract added	@ 5 hour	@ 3 day	@ 7day	@28 day
	Crack (N,L,W)	Crack (N,L,W)	Crack (N,L,W)	Crack (N,L,W)
	mm	mm	mm	mm
0	2, (130, 170), (1,1)	2, (133, 175), (1,1)	2, (133, 175), (1,1)	2, (133, 175), (1,1)
5	1, 58, 0.5	1, 60, 0.75	1, 60, 0.75	1, 60, 0.75
10	No Crack	No Crack	No Crack	No Crack
15	No Crack	No Crack	No Crack	No Crack

Table 5.4: Crack due to shrinkage for mortar slabs of mix-II controlled from direct heat from the sun

Crack width and length for different percentage of blue gum extract added				
Mix-II: 1:4 , N= number, L = length and W = width				
% Plant extract added	@ 5 hour	@ 3 day	@ 7day	@28 day
	Crack (N,L,W)	Crack (N,L,W)	Crack (N,L,W)	Crack (N,L,W)
	mm	mm	mm	mm
0%	No Crack	No Crack	No Crack	No Crack
5%	No Crack	No Crack	No Crack	No Crack
10%	No Crack	No Crack	No Crack	No Crack
15%	No Crack	No Crack	No Crack	No Crack

Table 5.5: Crack due to shrinkage for mortar slabs of mix-I exposed to direct heat from the sun

Crack width and length for different percentage of Blue Gum extract added				
Mix-I: 1:3 , N= number, L = length and W = width				
% Plant extract added	@ 5 hour	@ 3 day	@ 7day	@28 day
	Crack (N,L,W)	Crack (N,L,W)	Crack (N,L,W)	Crack (N,L,W)
	mm	mm	mm	mm
0%	1, 150,1	1, 155, 1	1, 155,1	1,155,1
10%	1,55, 0.5	1, 70, 0.75	1, 70, 0.75	1, 70, 0.75
15%	No Crack	No Crack	No Crack	No Crack

4 CONCLUSIONS

Based on the experiments carried out and the results on the effect of plants extracts on shrinkage and cracks due to shrinkage, the following conclusions are made:

a) The plant extract decreased shrinkage and, hence blue gum extract can be used as shrinkage reducing admixture in concrete.

b) Cracks in concrete is a main concern of engineers and plant extract has a capability of reducing early age cracks and hence, it can be used as shrinkage reducing admixture in concrete to reduce cracks.

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A Correlative Study of Mother Parenting Style and Emotional Intelligence of Adolescent Learner

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ABSTRACT: In the past the success of individual often has been equated with high IQ. But in the last two decades Gardener, Salvoey and Meyer, Goleman and other has researched in the area and found out that it is not IQ but EQ which determines one's success in life. The one who has high on emotional intelligence is found to be better in handling the situations of life than one who has low level of emotional intelligence. The parents who had high influence in the life of children especially at the initial phase of life are responsible to enhance EQ with good social and emotional environment. This will help the child to cope future exigencies. As, the children in the age group of 14-16 years pass through the phase of life which is considered to be crucial therefore, it is imperative that they are able to handle and control their emotions as it has implications for their immediate and future life. Children of this age share a different kind of relationship with their parents. Therefore, it is very pertinent that parents should understand their emotions and try to act according to it. Parents adopt different parenting style to rear their child. Authoritative parenting has been considered as optimum parenting style for the various developmental parameters of a child and it has been true in case of emotional intelligence. But most of the researches are being done in western population. The present study was conducted in the Indian urban setting wherein students and their educated mothers had participated. The result indicated that authoritative parenting style was not all correlated with emotional intelligence of the boys, girls or students. Though, some components were correlated with emotional intelligence.

KEYWORDS: Parenting style, Emotional Intelligence, Emotions, Gender, Adolescent.

1 INTRODUCTION

In the last decade or so, science has discovered a tremendous amount about the role emotions play in our lives. Researchers have found that even more than IQ, your emotional awareness and ability to handle feelings will determine your success and happiness in all walks of life. EI moderates conflict by promoting understanding and relationships, and fostering stability, continuity and harmony. It also links strongly with concepts of love and spirituality. EI adds emotional stability that makes us more capable and efficient in establishing successful interpersonal relationships as, it is a requirement for dispute resolution. When EQ is high, one is able to experience feelings fully as they happen. Emotional awareness brings inner world into focus which enables the person to make good choices and how to strike a mutually healthy balance between own needs and that of others. Some of the characteristics of those with high EQ, as identified [1], encompassed clarity in thoughts and expressions, high optimism, ability to read non-verbal communication, emotional resilience, moral autonomy and high levels of self-motivation. Those people having high emotional intelligence balance their feelings with reason, logic and reality. During stressful and terrible situations "emotionally intelligent" people manage their emotions better and react with clearer, more rational minds and make better decisions. In difficult situations, transmitting positive emotions can help people cope with negative circumstances. People with high EQ know the art of expressing emotions as much as controlling them [2] whereas, people with lower EQ tend to blame others for their feelings and do not articulate their feelings and are more prone to criticize and judge others. When such is the importance of emotional intelligence and it is not inherited, then, how do we make our children emotionally intelligent so that they can handle the toughest situation with ease? Can we raise

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emotionally intelligent children? John Gottman in his book, *Raising an Emotionally Intelligent children* has stressed that for parents emotional intelligence means making them aware of their children's feelings, and being able to empathize, soothe, and guide them. For children, who learn most lessons about emotion from their parents, it includes the ability to control impulses, delay gratification, motivate them, read other people's social cues, and cope with life's ups and downs. Normally, first lesson of expressing emotions is leant by child in his family. This is being learnt through interaction between himself and his family members especially the parents. Family life is our first school for emotional learning--not just through things parents say and do directly to their children, but in the modeling they offer for handling their own feelings. The relationship between affective and emotional aspects of parental behaviour and the child's emotional adjustment is family and culture specific [3].

The emotional expressiveness of parents in the course of every day interaction provides guidelines to the child for the use of emotion in ongoing social interchanges. Emotional expressiveness is the style of parents or patterns of behaviours in the process of parent child interaction in the socialization process. The expressiveness of parents extends emotional learning beyond the acquisition of social skills, such as coding and decoding, to the utilization of rules about emotion in multiple contexts. Goleman[4] reviewing hundred's of studies that how parents treat their children-whether with harsh discipline or empathic understanding, with indifference or warmth and so on has deep and lasting consequences for the child's emotional life. Parent healthy and warm relationships were found to develop social and emotional potentialities and get an advantage of getting parental suggestions, ideas and communication skills and critical sense of security [5]. The emotional intelligence of the child depends on parental love and affection and depending on the child rearing practices, interactions with them [6].

Emotional learning foremost among them takes place most readily in the early years of life, and severe stress can impair the brain's learning centers. Based on very earliest learning experiences, a child learns that people can be trusted to meet her needs, or that no one really cares, and all efforts to induce comfort will fail. These lessons impact how secure and effective he feels in the world, and whether or not he views others as dependable. During the first three or four years of life, a toddler's brain grows to about two-thirds of its full size and evolves in complexity at its greatest rate. While the first and most critical opportunities to shape emotional intelligence are in the earliest years, opportunities continue throughout the school years. The emotional abilities children acquire later in life build on those of the earliest years, and form the essential foundation for all learning. Early abuse extinguishes empathy and creates violence in even very young children, who learn to respond like miniature versions of their own parents. Early experiences--of brutality or of love--leave a lasting imprint on the brain. Tracing the impact of trauma on emotional learning, the manner in which vivid, terrifying moments become memories "emblazoned in the emotional circuitry, impelling vivid memories of a traumatic moment to continue to intrude on awareness" becomes apparent. These "emotional hair-triggers" sound an alarm when there is the slightest hint that a trauma may be about to reoccur. This hair-trigger phenomenon is the hallmark of emotional trauma of all kinds, including repeated physical abuse in childhood. Can these experiences be healed? It appears so--at least, to a point--for emotional learning is lifelong. The way a couple handles the feelings between them in addition to their direct dealings with a child impart powerful lessons to their children, who are astute learners, attuned to the subtlest emotional recharges in the family. Parents can help children with the basics of emotional intelligence by: learning how to recognize, manage, and harness their feelings; empathizing; and handling the feelings that arise in relationships. The impact of such parenting is "extraordinarily sweeping." The advantages are social, cognitive, and biological. This emotional schooling operates not just through the things that parents say and do directly to children but also in the models they offer for handling their own feelings and those that pass between husband and wife.

Though early years of emotional coaching by parents help the child in the later stage of development but it is of more important that adolescence is the crucial age where there is a heightened level of emotions. Youth is a period of physical and psychological maturity, when an individual is expected to establish his or her own identity and to develop necessary skills for socially responsible behaviour. It is also a period of heightened emotionality that they feel the emotions in a stronger and more persistent manner. It is important that at this stage it is necessary that a children needs to control or regulate emotions. Adolescence need to be emotionally stabilized. The youth's transition to adulthood can be a smooth process facilitated by the guidance of securing, nurturing and understanding parents in an emotionally conducive environment [7]. An emotional stabilized adolescence carries out his responsibilities and his relationships with empathetic manner. A family where emotional bonding and communication between youth and parents are adequate with clear behavioural standards, then youths can become emotionally competent, responsible, independent, confident and socially competent [8]. Parents send affective messages to the child, with increasing expectation that child will be able to interpret and respond to them. The emotional expressiveness of parents in the course of every day interaction provides guidelines to the child for the use of emotion in ongoing social interchanges. Emotional expressiveness is the style of parents or patterns of behaviours in the process of parent child interaction in the socialization process. The expressiveness of parents extends emotional learning beyond the acquisition of social skills, such as coding and decoding, to the utilization of rules about emotion in multiple

contexts. Thus, parenting helps the children to be more equipped with pro-social skills and thus one is more accepted in the society whereas inept parenting actually translates the behaviour of children of this age group into more unsocialized, unadjusted.

2 OBJECTIVES OF THE STUDY

1- To study the relationship between parenting style of mothers' and emotional intelligence of girls students
2- To study the relationship between parenting style of mothers' and emotional intelligence of boys students
3- To study the relationship between mothers' parenting style and emotional intelligence of secondary students.

3 HYPOTHESES OF THE STUDY

1- There is no significant relationship between the mothers' parenting style and emotional intelligence of girls students
2- There is no significant relationship between the mothers' parenting style and emotional intelligence of boys students
3- There is no significant relationship between the mothers' parenting style and emotional intelligence of students.

4 METHODOLOGY

4.1 DESIGN OF THE STUDY

The present study is descriptive but correlative in nature to find out the relationship between the mother parenting style and emotional intelligence.

4.2 SAMPLE OF THE STUDY

Multistage random sampling technique was adopted to select the sample of two hundred forty six class tenth students from eight schools. This includes 115 girls and 131 boys in the age group of 13-15 years. Students of mother were contacted to collect the data for parenting style questionnaire.

4.3 TOOL USED

Dr Ekta Sharma tool for emotional intelligence and Robinson et al (2001) Parenting Style Dimension Questionnaire (PSDQ) (Hindi Version) tool were used. Dr Ekta Sharma tool consists of 60 items spread over in five different dimensions of emotional intelligence. The dimensions were self awareness, motivating oneself, managing emotions, empathy and handling relationship. Each dimension has a score which was categorized as below average, average and above average. The PSDQ tool was consists of 32 items spread over three parenting style i.e. authoritative, authoritarian and permissive. The highest mean score among the three parenting style determine the parenting style of mother. As, the parenting style constellation of all kinds of behavior of parents towards their children therefore, for analysis it is taken as whole. Both the tool has high reliability and validity.

4.4 DATA ANALYSIS

As the present study was correlative in nature therefore, correlation between the various dimension of emotional intelligence and mother parenting style was computed through SPSS 17.0.

5 RESULTS OF THE STUDY

Following are the results of the study:

(i) Given below is the table of coefficient of correlation between parenting style of mother and emotional intelligence of boys.

Table 1: Correlation between Parenting Style of Mother and Emotional Intelligence of Boys

S.No	Parenting Style of Mother	Components of Emotional Intelligence					
		SA	ME	MO	EM	HR	EI
1.	Authoritarian	.019	.069	-.036	.091	.019	.042
2.	Authoritative	-.024	-.005	.139	-.082	.064	.057
3.	Permissive	-.034	.040	-.034	.118	-.033	.001

**P<.05, **P<.01*

The table 1 revealed that:

Authoritarian parenting: Amongst the various sub dimensions of emotional intelligence, none of the sub dimensions of emotional intelligence was significantly correlated with authoritarian parenting.

Authoritative parenting: Amongst the various sub dimensions of emotional intelligence, none of the sub dimensions of emotional intelligence was significantly correlated with authoritative parenting.

Permissive parenting: The dimension Indulgence was not significantly correlated with emotional intelligence and its dimension.

It was found out that none of the other parenting style (authoritative authoritarian and permissive) of mother was significantly correlated with the overall emotional intelligence of students. Thus the hypothesis there is no significant relationship between the parenting style of father and emotional intelligence of students stand accepted.

(ii) Given below is the table of coefficient of correlation between parenting style of mother and emotional intelligence of girls.

Table 2: Correlation between Parenting Style of Mother and Emotional Intelligence of Girls

S.No	Parenting Style of Mother	Components of Emotional Intelligence					
		SA	ME	MO	EM	HR	EI
1	Authoritarian	.310**	-.103	-.093	.135	.017	.101
2.	Authoritative	-.199*	-.213*	.267**	-.036	.207*	.079
3.	Permissive	.283	.079	.012	.154	.066	.201

**P<.05, **P<.01*

The table 2 revealed that:

Authoritarian parenting: The authoritarian parenting was significantly positively correlated with self-awareness (.310**) dimension of emotional intelligence.

Authoritative parenting: Amongst the various sub dimensions of emotional intelligence, motivating oneself (.267**) and handling relationship (.207*) were significantly positively correlated whereas self-awareness (-.199*) and managing emotions (-.213*) were significantly negatively correlated with authoritative parenting.

Permissive parenting: The permissive was not all significantly correlated with all the dimension of emotional intelligence including overall emotional intelligence.

It was found out that none of the other parenting style (authoritative authoritarian and permissive) of mother was significantly correlated with the overall emotional intelligence of students. Thus the hypothesis there is no significant relationship between the parenting style of father and emotional intelligence of students stand accepted.

(iii) Given below is the table of coefficient of correlation between parenting style of mother and emotional intelligence of students.

Table 3: Correlation between Parenting Style of Mother and Emotional Intelligence of Students

S.No.	Parenting Style of Mother	Components of Emotional Intelligence					
		SA	ME	MO	EM	HR	EI
1.	Authoritarian	.158*	-.005	-.064	.112	.016	.067
2.	Authoritative	-.090	-.077	.196**	-.060	.129*	.074
3.	Permissive	.134	.057	-.005	.137	.024	.106

**P<.05, **P<.01*

The table 3 revealed that:

Authoritarian parenting: The authoritarian parenting was positively correlated only with self-awareness (.158*) dimension.

Authoritative parenting: The authoritative parenting was significantly positively correlated with only motivating oneself (.196**) and handling relationship (.129*) of emotional intelligence.

Permissive parenting: The permissive parenting was not correlated with any of the dimension of emotional intelligence including overall emotional intelligence.

It was found out that none of the other parenting style (authoritative authoritarian and permissive) of mother was significantly correlated with the overall emotional intelligence of students. Thus the hypothesis there is no significant relationship between the parenting style of mother and emotional intelligence of students stand accepted.

6 DISCUSSIONS OF RESULTS

Emotional intelligence has been increasingly receiving attention as a factor for predicting child's behaviours since it is the ability to perceive, understand, and manage one's emotion. For an adolescent to develop the ability to perceive accurately the emotions in self, others, and also manage their own emotions and as well as that of others, family plays a pivotal role. As Goleman [8] has rightly pointed out "Family is our first school for emotional learning. A close emotional bonding and adequate communication between children and parents with clear specifications for behaviour can make children emotionally and socially competent, responsible, independent and confident". This highlights the importance of family and specifically the role of parents in bringing up emotionally intelligent children. Though parents want to help their children to successfully move through different developmental stages, they may not be certain about what form and to what extent they need to involve themselves. Research has shown that the influence of parents on children does not decline as they grow into adolescents [9], [10], 11]) but the style could vary with the developmental stage[12]. Most of the studies on the outcomes of parenting styles on adolescents have been based upon the perceived parenting wherein adolescents had reported about their parents parenting style through self-report measures. Moreover, most of the studies on the outcomes of parenting styles on adolescents have pre pondered on mothers influence on emotional and social development [13],[14],15]. But the new millennium as a result of globalization has brought a lot of changes in Indian families from changes in family structure, parental socialization goals, and to more women joining the workforce [16]. A review of literature indicates that all along father's role in the family has been that of a bread winner but the changes in Indian families due to globalization calls for a need to look at the role of fathers as more nurturing [17].The present research on parenting and its relationship with emotional intelligence takes into account the parents (both father and mother) self-reporting on their parenting and its relationship with emotional intelligence and its various dimension. The researches carried out globally have reported mixed results related to emotional intelligence relationship with parenting style. In the present research, overall emotional intelligence is not significantly correlated neither with mother nor father parenting style [18], [19]. But if we look from the gender perspective of parent, father's authoritative parenting style was positively correlated with motivating oneself dimension irrespective of the gender of the students and it has been positively correlated with handling relationship for girls and all students. This is in consonance with the theoretical model and also earlier research which shows authoritative style as contributing to motivation [20], [21]. The managing emotions dimension of emotional intelligence has been negatively correlated with authoritative parenting in case of girls and for all students. This was in contradiction with the models of parenting. It has also found that father's authoritarian parenting is positively correlated with self-awareness in case of girls and all students. This is contrary to the theoretical model given by Baumrind [22] which showed authoritarian style as having negative outcome. Earlier studies showed authoritarian style as negatively influencing self-awareness [23],[21]. Although domination is a component implicit in authoritarian style as described by Baumrind [24], this element of control may be seen as involvement and closeness in Asian cultures [25]. In Indian families, cultural conformity, parental regulation is an expected

behaviour of parents [26] and the finding is a reflection of Indian culture where adolescents see parents' strictness and demand for obedience as warmth and concern as opposed to the West. In case of mother it has been found out that for girls and all students, authoritative parenting is positively correlated with motivating oneself and handling relationship whereas it was negatively correlated with managing emotions and self-awareness. The authoritarian parenting was positively correlated with self-awareness for girls and students. Boys did not show any kind of correlation with any of the dimensions of emotional intelligence with any of the parenting of mother. Traditionally, mother has been authoritative in nature and it is more so for females than males [27],[28]). Therefore, positive correlation with girls and all students was expected. Chao [25] and Chao and Tseng [29] while analysing the parenting style of Asian families had reported that the role of mother is more of nurturance and warmth providing; therefore influence to the various social behavioural outcomes was positive. The negative correlation with self-awareness and positive correlation with authoritarian parenting indicates emotional climate prevails in home had low awareness of girls about themselves which was quite in contradiction with the findings provided in the literature wherein females were far recognized more superior than males to be aware of their emotions. This may be attributed to the transitions phase with which Indian society is moving wherein parents provided freedom as per the requirement of the needs of their girl child.

Though traditional India is predominantly collectivistic, the finding is reflective of changes in a societal trend towards more authoritative style of parenting which may be due to globalization or multiculturalism [30]. Moreover parenting which involves value systems is subjected to change from one generation to the next [31].When parents adopt an authoritative style they set very clear standards and make sure rules are enforced and are consistent using sanctions whenever necessary. They attune to the feelings of their children and may be use the emotional situation to understand what exactly is upsetting them and also show them an alternative way of responding to the situation. At the same time adolescents are given opportunity to experience emotional openness, independence and help them to see reason in what they are doing rather than imposing their will on them. Authoritative style [32], the specific features of the authoritative style such as warmth, emotional support [33] acceptance, involvement [34] a combination of freedom and control [35] communicates and creates such an emotional climate those adolescents are able to deal with their own feelings as well as that of others. It helps them to become aware of the feelings embedded in whatever is being communicated by the parents. The self-awareness results in autonomous regulations of one's own emotions.

7 CONCLUSION

Emotional intelligence a key predictor for success in human life is highly influenced by the way parenting. It is the parents in the initial phase of life which trains them to handle and manage it in a proper way. Researches have been carried out wherein it has been shown that emotional intelligence by the different parenting style in a different manner. In western countries it is the authoritative parenting style which results into high emotional intelligence. But in Asian and mainly in south Asian countries most of the researches it has an area to be researched. Indian which is going through transition phase of modernity and traditionalism a mixed approach of parenting has been adopted therefore it is necessary to find out which parenting style has been correlated high with emotional intelligence. Present research indicates authoritative parenting was neither correlated with authoritative, authoritarian or permissive parenting but some of the components of emotional intelligence were correlated with authoritative or authoritarian parenting style.

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EFFECTS OF FLOW CHANNEL GEOMETRY ON THE PERFORMANCE OF PEM FUEL CELL

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ABSTRACT: To generate greener environment, the alternative sources are necessary. In alternative sources, less emission energy sources are needed to control the emission and fossil fuel depletions. Proton exchange membrane fuel cells have the benefit of zero emission, quick start up, easy implementation, long lifetime and low operating temperature. Performance of PEM fuel cell is depending upon the various operating parameters and geometrical parameters. The performance is mainly caused by the geometrical parameters such as flow field, flow channel, catalyst layers. In this paper, the different flow channel cross sectional shape and the effects of the flow channel designs on the performance of proton exchange membrane fuel cell are reviewed. The major performance increment is depending upon the flow channel cross section. Because of the varying cross sectional areas, the fuel is forced on the gas diffusion layer and enhances the chemical reaction that increase the performance of proton exchange membrane fuel cell.

KEYWORDS: Alternative source, Flow channel, Fuel cell, PEM fuel cell, Zero emission.

1 INTRODUCTION

Now a days the world is concerned about the alternative sources to produce a cleaner environment by overcoming the emissions due to pollution and depletion of fossil fuels. One of the best alternative sources is a fuel cell. Due to the advantages and reliability of the fuel cell, it considered as the best alternative source. Depending upon the electrolyte used in the fuel cell, it has to be classified as follows, 1. Proton exchange membrane fuel cell, 2.Solid oxide fuel cell, 3.Phosphoric acid fuel cell, 4.Molten carbonate fuel cell. Due to the benefit of zero emission the PEM fuel cell has to be chased as best alternative instead of energy sources.

Fuel cells are the one which converts the chemical reaction in the fuel cell into electrical energy. PEM fuel cell consists of three segments; anode, membrane, cathode. Anode is made up of platinum powder and cathode is made up of Nickel and nano material based catalyst membrane that is used to separate the anode an cathode side. Bipolar plates, catalyst, membrane and the hardware are the secondary components of PEM fuel cell. Hydrogen diffuses to the anode catalyst that changed the protons and electrons. The protons are conducted from side to side the membrane and arrive at the cathode side. Due to the electrical insulating on the membrane, the electrons are forced to travel in external circuits on the cathode catalyst, oxygen reacts with electrons and produce water as a byproduct.

2 FUEL CELL DEVELOPMENTS

The fuel cell has invited at 1858 by the welsh physicist Willaim Groove. In 1955, the electrolyte had been interchanged as membrane by W. Thomas Grubb. The 15KW fuel cell was built by Hasey Ihrig in the year of 1959. Fuel cells were introduced in automotive applications in 1991. UTC power is the first company to create the fuel cell. By the development of fuel cell, the best fuel cell vehicles are demonstrated. So it is needed to improve the fuel cell performance.

3 VARIOUS FLOW CHANNEL DESIGNS

In many research papers, the performance improved by changing the parameters of the PEM fuel cell. The performance of the fuel cell depending on the operating conditions, transport phenomena inside the cell, electrochemical reactions and the physical components such as membrane electrode assembling and bipolar plates [1].

Many of the research projects focused on the performance of PEM fuel cell, due to the applications such as power back up systems, automobiles, forklifts and motor industries, portable and stationary applications. Because of the advantage of emission control, transportation applications are concentrated on fuel cells. Fuel cells are having low operating temperature and high power density, so motor companies focused on fuel cell vehicles. Toyota FCHV, Honda FCX-V3, Hyundai SANTA Fe FCV, etc. [2].

Flow field and flow channel are also important parameters to improve the performance of PEM fuel cell. Performance improved by studies on the effect on a single channels, double channels, cyclic single channels and symmetric singles channel serpentine flow field configurations [3].

By varying flow channel dimension may improve the performance, modification of length or height in the outlet flow channel of the serpentine flow field was designed by the dimension of 23mm*23mm*2.645mm at different voltages [4].

The tapered straight flow channel has been numerically analyzed by changing the height or width of the channel with 1 ATM pressure and operating temperature of 50`C, in this cell performance improved by a reduction in outlet height and enlarged flow channel length [5].

Using the tapered flow channel design, reduction in channel depth in the BPs, forced the reactant gas on GDL to enhance the electrochemical reaction that leads to performance improvement by numerical predictions at the operating conditions such as low operating voltages or high current densities [6].

Shiang-Wu Perng and Horng-Wen Wu proposed that the finite element analysis of the tapered flow channel design with a baffle plate by the method of element-by-element preconditioned conjugate gradient. The results show that the model gives a good convection heat transfer performance and high fuel flow velocity. It depicts that the taper ratio and gap ratio of the cell give the performance improvement in the range of 12.86% and 15.48% respectively [7].

The method of simplified conjugate gradient is implemented to 3D, non-isothermal model.By varying the channel heights and widths. Due to that removing of liquid water and oxygen transport in the gas diffusion layer has increased. The performance improvement is 22.51% compared with basic design [8].

Water flooding in cathodes is the main cause to hinder the PEMFC commercialization to decrease flow field and flow channel optimization is needed and to design the BPs for maximum performance. Finally the small channel with varying heights, rib size and baffles could give the performance at low operating temperatures. By using the commercial software like FLUENT CFD, FEMLAB, COMSOL Multi-physics, CEDRC flow field and flow channel designs were analyzed at the operating voltages from 0.3 to 0.7V [9].

To optimize the designs by changing the dimensions of channel of flow field plate with the help of CED technique and the computational domain dimensions have 6, 7, 6 elements in x, y, z-directions respectively, totally 2556 elements are considered. The results predict the velocity distribution, pressure drop and the influence of length, curvature, depth of the channel, 4 and 6 channels is given that smooth and sharp curve in channel curvature and density respectively are 900 and 1200 mA/cm^2 at 0.6V. Finally, 6 channels are 25% better than 4 channels. So flow field provides better performance [10].

By the Richards equations, different liquid water mechanisms and two fluid methodhave been analyzed of PEM fuel cell. To investigate the effect of the flow channel aspect ratio on PEM fuel cell with single and triple serpentine flow field, the results concluded that the cell performance is independent of channel aspect ratio of operating voltage above 0.7V. Due to the electro-chemical reaction, lower operating voltage below 0.7V gives the slight improvement in performance due to the increment of oxygen transport [11].

In the stack of fuel cell, the flow field is depending on the inflow and outflow headers uniformity and non-uniformity. The non-uniformity headers have the some significant differences in stack performance by the confinement of outflow headers within two counter rotating vertical tubes with the separation of jets. The results concluded that stack configurations of U-stack (with the inflow and outflow headers opening in same directions) and Z-stack (with the inflow and outflow headers opening in opposite directions) used to share the flow in the fuel cells [12].

A PEM fuel cell with a 25 cm^2 active area and a Nafion 117 membrane with 4 mgpt cm^{-2} have been experimentally investigated and enhance the cell performance. A single cell with the size of 45*95*101 mm^2 and serpentine and triangular

flow field channels with the weight of 1300g are the dimensions of the fuel cell. Due to the cell temperature increment, the exergy efficiency is varied from 58% to 42% at the temperature of 40^{o}C, under the current density from 0.2 to 0.6 A/cm [13].

The gas flow (laminar, unsteady, isothermal and compressible) and straight channels for both anode and cathode are considered and simulated by a finite volume method. The inlet pressure is weaker because of oxygen and hydrogen concentration decrement from admission to exit with the Reynolds number considerations. When the height of the flow channel is decreased, the hydrogen and the oxygen concentrationisincreased in the high Reynolds number. So the influence of the channel height becomes important for a high Reynolds number, because the consumption of oxygen to the catalyst layer [14].

Cathode flow channel effect area ratio with parallel and interdigitated flow was numerically analyzed in the areas of 0.3, 0.4, 0.522, 0.6, 0.7. The parallel flow performance gets increased due to increase the contact area between GDL and catalyst layer. In interdigitated flow, flow channel ratio is not considered because of less effect baffle forced the fuel on porous layers to enhance the participation is helping to increase the performance [15].

Owejan et al. [16] proposed a study on multiple serpentine flow field design on the performance of PEM fuel cell with the active area of 50cm^{2}and also developed 0.52 mm^{2}triangular and rectangular geometry flow channel designs. Toray and SGL gas diffusion layers are to develop the special effects on the overall volume and distribution of accumulated water. By considering these channel geometries, results revealed that the triangular shaped geometry recollects minimum water than the rectangular cross sectional area.

By using the different manufacturing process, the effect of channel tolerances on the cell performance had been analyzed by Shimpalee et al. [17] in this article, the bipolar plates are fabricated with the aid of chemical and electroetching processes. Evaluation of the result was the influence of draft angle or etch factor exaggerated the cell performance over the changes in heat transfer, gas distribution uniformity and pressure drop.

Scholta et al. [18] investigated the parallel and counter flow fields with a model of 100 mm^2 active area and the effect of channel dimensions on the performance of PEM fuel cell with the aid of simple flow field designs. The channel geometry has been taken between the values of 0.7 and 1 mm. At low current densities, broader geometries are suitable to increase the performance, at high operating current densities and tapered design channels are preferred.

Shimpalee et al. [19] numerically analyzed the effect of the channel and rib width on the performance of the cell. The active area of 25 cm^2 was analyzed with the serpentine flow fields and several fluid flow arrangements. The tapered channel had more performance increment than the wider channel geometries because of the heat transfer enhancement and increased pressure drop. The further investigation showed that the design of the wider channel with tapered rib incites the reactants of local distribution kept non-uniformly to the entire channel and the reactants of global distribution kept uniform. The counter flow design of the PEM fuel cell exhibits more power increment than the co-flow design of the cell.

Seong-Ho Han et al. [20] designed the wave form cathode flow channel and analyzed in terms of numerical and experimental. Due to the design modifications, the velocity gradient of the flow increased, that enhance the performance of the cell. In numerical analysis, the active area of the cell taken as 84 cm^2, the performance increment of the cell was 5.17%. An experimental analysis, the active area taken as 25 cm^2, the performance increment was 5.76%.

Wang et al. [21] evaluated the effect of the cathode channel at different cross sectional areas of the flow channel designs with the parallel and interdigitated flow fields. The five flow channel area ratios were 0.3, 0.4, 0.522, 0.6 and 0.7. The result concluded that both of the parallel and interdigitated flow fields increased the performance of PEM fuel cell by the way of forcing the fuel into the porous layer increasing the fuel participation in the chemical reaction. An increment in the fuel transport rate and liquid water removal also enhanced.

Yan et al. [22] investigated the tapered flow channel designs with the active area of 198.87 cm^{2}and tapered channels was reduced either height or width of the channel. The results revealed that the novel tapered flow channel design increased the cell performance by the way of increases the fuel rate, fuel transport rate and liquid water removal.

Abhishek Raj et al. [23] analyzed the influence of multidimensional effect is investigated by creating the 2D and 3D models with the aid of COMSOL at parallel geometry under same operating conditions. With the aid of species concentration the multidimensionality is analyzed at several inlet stoichiometries, membrane conductivities and relative humidity values. The maximum effect is appeared due to the water concentration at the cathode, the slope of the large water concentration is more on the 3D model then 2D model.

An effective area of 25 cm^2 with 1mm and 1.5mm depth of the anode and cathode of flow channels were analyzed experimentally and compared with the numerical solutions by Hong Liu et al. [24]. The experimental result has been taken

from the different values of the total width and rib ratio. By decreasing the total width of flow channels, there was slight improvement in the performance of the cell when compared to the normal flow channel. The results concluded that the optimized design of the PEM fuel cell has more advantage than the without optimized flow channel design.

The effect of the flow channel reduction in the PEM fuel cell was numerically investigated by Liu et al. [25] depending upon the operating voltages the cell performance varied. For low operating voltages, the fluid was forced to the gas diffusion layer in order to increase the electrochemical reaction. Due to the increased chemical reaction, the PEM fuel cell performance enhanced.

Yang et al. [26] analyzed the influence of outlet flow channel area reduction on the cell performance and compared the reduction flow field design with the conventional serpentine flow field design. Due to that the electrochemical reaction was improved by forcing the fuel on the GDL. The results concluded that the performance increased with the increment of reactant transport and liquid water removal, but the pressure loss enhancement reduced the performance. By concerning the pressure losses, at the height ratio and width ratio of 0.4 and 0.4 was optimum design to increase the PEM fuel cell performance. Fig.14 shows a height and width ratio of the channel outlet.

4 CONCLUSIONS

The fuel cell is the alternative source to build the green environment. This review paper revealed the investigation of different flow channel cross section designs of Proton exchange membrane fuel cell and the influences of the different cross sectional shape of the fuel cell is also reviewed. When the flow channel areas are varied the performance is increased, because the fuel is forced on the gas diffusion layer with the enhancement of the performance.The serpentine gas flow channels of proton exchange membrane fuel cell have lengthier straightchannel sections thatharvest higher gas pressure increases on the adjacent channels and enhances the fuel cell performance with the convection of rib. The comparison of different flow channel cross section shaped such as rectangular, triangular and trapezoidal are considered. In that case, the rectangular cross section has, the more power generated than the triangular geometry. The reactant distribution can also make some part of performance increment at the concentration of shorter, longer path lengths and number of flow channels increased. Commonly, the narrower gas flow channels increased the cell performance with the better output power generation. Wider rib width displays a better power generation on the fuel cell performance.

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GROWTH PERFORMANCE AND HEMATO-BIOCHEMICAL PARAMETERS IN BROILER DURING HIGH ENVIRONMENTAL TEMPERATURE BY THE APPLICATION OF SYNBIOTIC

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ABSTRACT: The experiment was carried out to investigate the effect of synbiotic on growth performance, hematological (TEC, Hb, PCV, ESR) and biochemical (Cholesterol, Uric acid) parameters in broilers during high environmental temperature. A total of 30, at 7 days old (Cobb-500) broilers were randomly divided into 3 groups (n=6). Heat stress broilers were held at 35 ± 2°C temperature and 70±5% relative humidity respectively where as normal temperature was 25 ± 2°C and relative humidity was 60 ± 5%. Normal control group (NE-T) fed the normal diet with normal environmental temperature. Heat stress groups consisted of HS-A as heat stress control group fed the normal diet; HS-B as synbiotics group fed 0.1g prebiotic and 0.1g probiotic with normal diet. The results revealed that supplementation of synbiotic produced a significantly (p<0.01) increased of the live body weight as compared to normal and heat stress control group. The highest weight gain was recorded in HS-B as synbiotic group (1710.00a ± 3.54 gm) and the lowest weight gain was recorded in HS-A as heat stress group (1303.00e ± 4.899 gm). The hematological parameters (TEC, Hb, PCV, ESR) also significantly (p<0.01) differ compared to the both control. The biochemical parameters in uric acid was a significant (p<0.05) difference among groups and there was no significant (p>0.05) difference among the groups in serum cholesterol after treating with synbiotic. Therefore, it is concluded that synbiotic is essential for the maintainance of broilers performance under heat stress condition.

KEYWORDS: Prebiotics, Probiotics, Synbiotics, Blood parameters, Heat stress, Broilers.

1 INTRODUCTION

The poultry industry during the past two decades has been one of the most dynamic and ever expanding sectors in the world. It helps to fill the gap between requirement and availability of high quality protein for human consumption. The demand for a higher and safer protein source, free of infectious agents, is getting increased. However, during intensive growth, poultry industry has always been confronted with challenges in the form of various diseases. Among these conditions, the major economic losses are due to infectious diseases which could be caused by viruses, bacteria, fungi, protozoa, and the cost of preventive medication. This led to increased use of antibiotics in the poultry industry for therapeutic, prophylactic and growth promotion purposes. The presence of antibiotic residues in poultry meat and eggs may have deleterious effects on human consumers. The residues of antibiotics can cause resistance of human flora and pathogenic microbes to those groups of antibiotics. Bangladesh is an agro-based country where 80 percent of the population depends on agriculture. Poultry plays a vital role in the income generating framework of the rural people of Bangladesh. It is therefore the fact that its contribution towards promoting resources for improving the life style and livelihood of landless and marginal farmers is noted worthy. Heat stress **(**HS**)** is one of the most serious climate problems of tropical and subtropical regions of world negatively affects the production performance of poultry. A synbiotic is a combination of prebiotics and probiotics [1]. Probiotics are live bacteria which are intended to colonize the large intestine and confer physiological health benefits to the host [2]. A prebiotic is a food or dietary supplement product that confers a health benefit on the host associated with modulating the microbiota [3]. Synbiotic plays a vital role in the poultry feed industry. A well-balanced ration sufficient in energy and nutrients is also of great importance in maintaining a healthy gut [4]. Use of synbiotic

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for prevention of bacterial diseases in poultry as well as demonstrating the potential growth performance and immune response of poultry during high environmental temperature was not available in the world [5]. Antibiotics as a growth promoter have been widely used extensively in poultry feed for more than 50 years but it band on in some parts of the world legislations has promoted to the search for alternatives. Therefore, prebiotics and probiotics are considered to be the alternatives as non-antibiotic growth promoters are being more popular in poultry industry. But recently, the prebiotic and probiotic which are combinedly known as synbiotic used in the poultry industry are new concept [6].

2 MATERIALS AND METHODS

2.1 STATEMENT OF THE EXPERIMENT

The experiment on effects of synbiotic on growth performance and hemato-biochemical parameters in broilers during high environmental temperature was carried out in poultry farm, BAU and laboratory of the Department of Physiology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202, during summer season. The research work was carried out during the period from 28th July, 2013 to 31th August, 2013 for 35 days to study the hemato-biochemical effects and growth performance in broilers.

2.2 EXPERIMENTAL DESIGN

A total of 30, at day old broiler chicks were collected from Renata Hatchery. Broiler chicks were randomly selected for the experiment and were divided into following groups:

- **Normal control group (NE-T)** - Normal feeding & watering with normal environmental temperature (T= 25 ± 2°C, RH=60 ± 5%) daily up to 5 weeks under normal condition.
- **Heat stress control group (HS-A)** - Normal feeding & watering daily up to 5 weeks during high environmental temperature (T= 35 ± 2°C, RH= 70 ± 5%).
- **Heat stress synbiotic group (HS-B)** - Normal feeding & 0.1g prebiotics with 0.1g probiotics in per liter of drinking water as synbiotic daily up to 5 weeks during high environmental temperature (T= 35 ± 2°C, RH= 70 ± 5%).

2.3 EXPERIMENTAL BIRDS

A total of 30, at day old Cob-500 strains were collected from Renata Hatchery. At day 7, broiler chicks were randomly divided into 3 treatment groups. Each group contains 6 birds. Birds were housed in 3ft x 2ft floor pens on fresh rice husk litter with a 24-h lighting plan. The height of litter was 3 cm. Before being used in the experiment, birds were adapted for 7 days in order to acclimatize in the environment. The collected birds have neither developmental disorders, detectable genital diseases nor other diseases that may cause any problem in the experiment or affect the result of the experiment.

2.4 BLOOD COLLECTION

After 5 weeks, blood sample was collected from wing vein to test of effects of synbiotic on RBC, Hb, PCV, and ESR from 3 birds in each group (9 birds) by JMI syringe. Three (3) ml blood collected from each bird at a time within a series of sterile test tube containing anticoagulant 4% sodium citrate at a ratio of 1: 10. The hematological studies were performed within two hours of blood collection.

2.5 STATISTICAL ANALYSIS

During the study period we were regularly collect the data of daily feed intake and body weight weakly. After study period we were analyzed hemato-biochemical and physiological data. All the collected data were analyzed with the help of computer package MSTAT. The mean differences among the treatments were determined as per Duncan's Multiple Range Test.

3 RESULTS

3.1 EFFECT OF SYNBIOTIC ON GROWTH PERFORMANCE

Table 1. Effects of synbiotic on body weight (Mean ±SE) gain in broilers during heat stress

Groups	Pretreated body weight (gm)	Post treated body weight (gm)			
	Day 7	Day 14	Day 21	Day 28	Day 35
NE-T (Normal control)	424.00a ± 2.92	659.00c ± 4.30	1050.00c ± 3.54	1407.00c ± 3.742	1623.00c ± 7.176
HS-A (Heat stress control)	427.00a ± 2.55	540.00e ± 7.07	830.00e ± 6.52	1121.00e ± 5.788	1303.00e ± 4.899
HS-B (Synbiotic)	425.00a ± 3.54^{NS}	752.00a ± 4.64**	1141.00a ± 6.78**	1512.00a ± 8.60**	1710.00a ± 3.54**

*** indicates p<0.01 and NS indicates non significant*

3.2 EFFECTS OF SYNBIOTIC ON BLOOD PARAMETERS

Table 2. Effects of synbiotic on hematological parameters in broilers during heat stress

Groups	TEC (Millions/mm^3)	Hb (gm/dl)	PCV (%)	ESR (mm in 1st hour)
NE-T (Normal control)	2.22bc ± 0.073	7.40c ± 0.071	23.80c ± 0.860	3.86b ± 0.186
HS-A (Heat stress control)	2.12c ± 0.097	7.18c ± 0.066	21.00d ± 0.707	4.62a ± 0.058
HS-B (Synbiotic)	2.76a ± 0.051**	8.62a ± 0.107**	28.80a ± 0.860**	3.90b ± 0.158**

*** indicates p<0.01*

3.3 EFFECTS OF SYNBIOTIC ON BIOCHEMICAL PARAMETERS

Table 3. Effects of synbiotic on biochemical parameters in broilers during heat stress

Treatment groups	Uric acid (mg/dl)	Cholesterol (mg/dl)
NE-T (Normal control)	5.88b ± 0.177	138.20a ± 2.417
HS-A (Heat stress control)	6.10b ± 0.333	132.80a ± 2.437
HS-B (Synbiotic group)	7.14a ± 0.331*	135.00a ± 4.183^{NS}

** indicates p<0.05 and NS indicates non significant*

4 DISCUSSION

4.1 EFFECT OF SYNBIOTIC ON GROWTH PERFORMANCE

The present findings showed that when supplementation of synbiotic in broilers during high environmental temperature the body weight increased significantly (p<0.01) among the treated groups and suppress the stressful condition. It was stated that appropriate administration of the prebiotic and probiotic mixture which are considered as synbiotic increased body weight gain in broilers when they are exposed to high environmental temperature or stressful condition [7]. Normally, heat stress suppresses body weight gain in broilers due to less feed intake, less metabolic activity and intestinal microbial dysbiosis. Heat stress is one of the most serious climate problems of tropical and subtropical regions of world, negatively affects the production performance of poultry and livestock as heat stress is characterized by endocrine disorders, reduced metabolic rate, lipid peroxidation, decreased feed consumption, decreased body weight gain, higher feed conversion ratio **(**FCR**),** immunosuppression and intestinal microbial dysbiosis [8],[9],[10],[11]. Our experiment stated that prebiotic (MOS) may be stimulated and modulated the beneficial micro-organisms which are present in intestinal tract results increase appetite, intestinal digestion and absorption ultimately, increased growth performance. Gibson and Roberfroid, 1995

observed a prebiotic is a food or dietary supplement product that confers a health benefit on the host associated with modulating the microbiota. Probiotic (Protexin® Boost) also plays an important role to increased body weight gain during high environmental temperature because probiotic may colonized in upper part of intestinal mucosa to prevent adhering the harmful bacteria results increased intestinal villus width. Thus, probiotic may helps to stimulate more feed intake, more nutrient absorption, more metabolic activity results body weight gradually (p<0.01) increased. Probiotics are live bacteria which are intended to colonize the large intestine and confer physiological health benefits to the host Fuller (1989). Probiotic bacteria may colonise the upper part of the intestine to avoid the adhering of pathogens to the intestinal tract and may help in digestion which are agreed to the present study.But when preboitic and probiotic are combinedly used as synbiotic in broilers the body weight significantly (p<0.01) increased than all others treated and control groups due to combined action of preboitic and probiotic during high environmental temperature. The rise in body weight gain in supplemented broilers is believed to be a cumulative effects of prebiotic and probiotic foods which serve to promote beneficial bacteria, intestinal function and disease resistance [12, 13]. Moreover, reported that synbiotics have a good impact on the poultry performance improve microbial balance, synthesize vitamins, decrease p^H, and improve feed consumption in broilers during high environmental temperature [14, 15] which are agreed to the present study. So the present study states that synbiotic influences the higher growth performance in broilers under heat stress condition than other experimental and control groups. All the treatment groups of broilers showed numerically (p<0.01) higher body weight gain as compared to control group.

4.2 EFFECTS OF SYNBIOTIC ON BLOOD PARAMETERS

The present findings showed that when supplementation of synbiotic in broilers during high environmental temperature the hematological parameters (TEC, Hb, PCV, ESR) significantly (p<0.01) differ compared to both control groups. The synbiotic supplementation caused statistically significant increase in the erythrocyte count, hemoglobin concentration and haematocrit values of broilers under chronic heat stress condition [16]. Moreover, it has been also observed synbiotic supplementation in broilers reared under heat stress significantly improved hematological activity and appetite for feed intake, which could eventually increase body weight growth and feed efficiency[17] which are support to the present study. The significantly increases (p<0.01) hematological parameters (TEC, Hb, PCV, ESR) of broilers under heat stress condition in experimental and control groups may due to the initiative effects of prebiotic and probiotic on hemopoitic organs. There are some probiotics which are essential for normal growth of the hemopoitic organs and erythropoiesis. The given probiotics (Protexin® Boost) may stimulate the hemopoitic organs and causes erythropoiesis results increase the hematological parameters during high environmental temperature. The hematological parameters of present finding resembles to that of Dukes[18] who reported that the number of erythrocytes and other components of blood varied due to the influence of age, sex, environment, exercise, nutritional status and climate. The hematological indices are affected by multiple environmental stresses and conditions. These effects differed according to age, period of exposure, single or concurrent stresses, the intensity and the environmental management programs. But synbiotic supplementation caused statistically significant increase in the erythrocyte count, hemoglobin concentration and haematocrit values of broilers during high environmental temperature. The present findings suggested that supplementation of synbiotic in broilers ration of treatment groups caused significantly (p<0.01) increase in most hematological parameters as compared to that of control group of broilers under heat stress condition.

4.3 EFFECTS OF SYNBIOTIC ON BIOCHEMICAL PARAMETERS

The present findings showed that when supplementation of synbiotic in broilers during high environmental temperature, the biochemical parameters in uric acid was a significantly (p<0.05) increases in treated groups than control groups and there was no significant (p>0.05) difference among groups in serum cholesterol after treating with synbiotic. Increased uric acid in the treated group resembles [19] who detected the uric acid level increased significantly (p<0.01) with synbiotics supplementation. Moreover, it has been also reported that supplementation of synbiotics increased uric acid and creatinine level[20] which are support to the present study.

The significantly increases (p<0.05) uric acid level in broilers under heat stress condition than other experimental and control groups may due to the initiative effects of prebiotic and probiotic on organs of urinary system. There are some prebiotics and probiotics which are essential for normal growth of the of urinary organs and stimulate that enzyme which are responsible for uric acid formation[21]. The given probiotics may (Protexin® Boost) stimulate the renal enzyme which is responsible for uric acid formation results increase the uric acid level in broilers during high environmental temperature. On the other hand, the present findings showed that when supplementation synbiotic in broilers during high environmental

temperature, the biochemical parameters in cholesterol concentration was a significantly (p<0.05) decreases in treated groups than control groups. It was stated the synthesis of bile acids from cholesterol in the liver is the most important way of cholesterol excretion and when synbiotic supplementation in broilers during high environmental temperature the cholesterol level gradually decreased[22] which is support to the present study. The given probiotics (Protexin® Boost) may stimulate the disintegrating bile salts and de-conjugate production of enzymes by their activity as well as reduction of the pH in the intestinal tract can be effective in reducing the cholesterol concentration during high environmental temperature. The use of probiotics and prebiotics can disintegrating bile salts and de-conjugate production of enzymes by the activity of lactic acid bacteria, as well as reduction of the pH in the intestinal tract can be effective in reducing the cholesterol concentration[23]. Solvability of non-conjugate bile acids is lowered at a low pH and consequently, they are absorbed less from the intestine and are excreted more in the faces and these are applicable when prebiotic, probiotic and synbiotic supplementation in broilers during high environmental temperature and/or others which are support to the present study. It is concluded that supplementation of 0.2 gm synbiotic/litre drinking water of treatment groups caused significantly (p<0.01) increase in live body weight and hematological parameters. The biochemical parameters in uric acid was a significant (p<0.05) difference among groups and there was no significant (p>0.05) difference among groups in serum cholesterol after treating with under heat stress condition.

5 CONCLUSION

The research work was carried out to investigate the effect of synbiotic on growth performance, hematological (TEC, Hb, PCV, ESR) and biochemical (Cholesterol, Uric acid) parameters in broilers during high environmental temperature. A total of 30, at 7 days old (Cobb-500) broilers were randomly divided into 3 treatment groups (n=6). Heat stress broilers were held at 35 ± 2°C temperature and 70 ± 5% RH respectively where as normal temperatures was 25 ± 2°C and RH was 60 ± 5%. Normal control group NE-T fed the normal diet with normal environmental temperature. Heat stress groups considered as HS-A was control group fed the normal diet, HS-B as synbiotic group respectively. Supplementation of synbiotic produced a significantly (p<0.01) increased of the live body weight as compared to control group and highest weight gain was recorded in HS-B as synbiotics group. The hematological parameters (TEC, Hb, PCV, ESR) also significantly (p<0.01) differ compared to control. The biochemical parameters in uric acid was a significant (p<0.05) difference among groups and there was no significant (p>0.05) difference among groups in serum cholesterol after treating with synbiotic. From the findings it could be suggested that synbiotic is essential for the maintainnce of broilers performance under heat stress condition. To establish synbiotics as a growth promoter, further study needed to see any adverse effect in relation to histopathology and biochemistry before making any conclusion regarding the beneficial effect in broilers.

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La gestion des déchets d'activités de soins à risque infectieux en milieu diffus: laboratoires d'analyses médicales, dans la région de Gharb au Maroc

[The management of waste arising from care activities involving infectious risks in diffuse medium: medical analysis laboratories, of the Gharb region in Morocco]

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ABSTRACT: *Objective.* – This work aims to contribute to the improvement of the management of waste arising from care activities involving infectious risks, which is currently a real health and environmental concern, especially in diffuse medium.
Workers and methods. – This is a descriptive, exploratory and cross-sectional study was carried during 2011 in the Gharb region in Morocco. A census of medical analysis laboratories in the city of Kenitra with an anonymised questionnaire. Other methods have been used such as interviews with those responsible for the medical laboratories.
Results. – The participation rate in the survey was 83.33%. Almost 80% of the laboratories sorting the sharp waste and soft infectious waste, while only 50% use special containers for this waste. Only 25% meet the standard for disposal and collection time. Approximately 70% of the sharp waste discharged separately, while the soft infectious waste is mixed with household waste to 70% of laboratories. Almost 62.5% of medical laboratories eliminate the infectious waste by a single contribution to the recycling center which generates mismanagement disposal of infectious waste. While 37.5% eliminates this waste through a collection company and 66.7% of them have an agreement with a company to collect and only 33.3% were satisfied with the management of these companies.
Conclusion. – The management system of solid and liquid infectious and highly infectious waste is a major concern for health staff and people. This study supported the need reminders of information for health professionals on the management rules through continuing education, personal sensitization and the implementation of an adequate organizational plan based on the use of well-adapted approaches, regular assessment and coordination between those responsible.

KEYWORDS: sorting; containers; medical laboratories; Morocco; infectious waste.

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RESUME: Objectifs. – Ce travail a pour objectifs de contribuer à l'amélioration de la gestion des déchets d'activités de soins à risques infectieux, qui constituent un problème sanitaire et environnemental, surtout en milieu diffus.
Personnels et méthodes. – il s'agit d'une étude descriptive, exploratoire et transversale qui s'est déroulée durant l'année 2011 dans la région de Gharb au Maroc. Un recensement auprès des laboratoires d'analyses médicales dans la ville de Kénitra à l'aide d'un questionnaire anonymisé. D'autre méthodes ont été utilisées tel que les entretiens avec les responsables de ces laboratoires médicaux.
Résultats. – Le taux de participation à cette enquête a été de 83,33%. Presque 80% des laboratoires tri leur déchets piquants et déchets infectieux mous, tandis que 50% seulement utilisent des conteneurs spécifiques à ce type de déchets. Seulement 25% respectent la norme d'élimination et la durée de collecte. Environ 70% des laboratoires évacués séparément ces déchets piquants, alors que les déchets infectieux mous sont mélangés avec les déchets ménagère pour 70% des laboratoires. Presque 62,5% des laboratoires médicaux éliminent ces déchets infectieux par un apport individuelle à la déchèterie ce qui engendre une mauvaise gestion d'élimination des déchets infectieux. Alors que 37,5% élimine ces déchets par la voie d'une société de collecte et 66,7% parmi eux ont une convention avec une société de collecte et seulement 33,3% sont satisfaites de la gestion de ces sociétés
Conclusion. – Le système de gestion des déchets infectieux et hautement infectieux solide et liquide constitue une préoccupation majeure pour le personnel de santé et les populations, cette étude a appuyé le besoin de rappels d'information des professionnels de santé sur les règles de la gestion à travers de la formation continue, la sensibilisation des personnels et la mise en œuvre d'un plan organisationnel adéquat basé sur l'utilisation des approches bien adaptées, l'évaluation régulière et la coordination entre les différents responsables.

MOTS-CLEFS: tri ; conteneurs ; laboratoires médicaux ; Maroc ; Déchet infectieux.

1 INTRODUCTION

Les déchets (DASRI) qui présentent un risque infectieux du fait qu'ils contiennent des micro-organismes viables ou leurs toxines dont on sait ou on a de bonnes raisons de croire qu'en raison de leur nature, de leur quantité ou de leur métabolisme, ils causent la maladie chez l'homme ou chez d'autres organismes vivants. Ces déchets regroupent les déchets biologique et infectieux ainsi que les déchets piquants, coupants et tranchants (OPCT), c'est la catégorie 1 selon la législation marocaine [1]. Les déchets infectieux et anatomiques représentent le gros des déchets dangereux et jusqu'à 15% de la quantité totale de déchets liés aux soins de santé [2]. Les objets pointus et tranchants représentent environ 1% du total des déchets mais sont une source importante de transmission de maladies s'ils ne sont pas gérés correctement [2]. Toutefois, dans les pays à revenu faible, les déchets dangereux et non dangereux sont rarement séparés et, en réalité, la quantité de déchets dangereux est beaucoup plus élevée.

Au Maroc, l'extension de la couverture sanitaire la multiplication des cabinets médicaux, des cliniques privées et des laboratoires d'analyses médicales ainsi que l'utilisation de matériels à usage unique ont engendré une augmentation de la production des déchets en milieu diffus, ce qui rend sa gestion désormais une préoccupation de plus en plus pesante.

Cette situation est beaucoup plus préoccupante dans les pays en développement (PED) à cause notamment du retard considérable dans le domaine dû à leur manque de moyens et leur difficulté d'aborder la question avec une approche adaptée à leur contexte. Le manque d'un corps médicale spécialisé soutenu par des formation continue – qui est un préalable à toute stratégie de gestion – ainsi que la difficulté d'avoir un stock complet des matériels de tri ces déchets, souvent destinées aux contextes des pays du Nord, sont les principales contraintes pour la mise en place de politique efficace et pérenne de gestion des déchets dans les PED [3].

La mauvaise gestion de déchets infectieux entraine une détérioration de la qualité de l'air, de l'eau, et du sol. De même, il y a un risque avéré pour la santé humain ce qui mène à la mise en œuvre d'une politique globale et durable pour l'amélioration de cette gestion. Le but de la présente étude est de contribuer à l'amélioration de la gestion des déchets en milieu diffus particulièrement au niveau des laboratoires d'analyses.

2 CLASSIFICATION DES DASRI

Les DASRI peuvent être classés en 3 grandes sous-catégories en fonction de leur nature : les déchets infectieux, les déchets pathologiques et les déchets piquants et coupants [4].

2.1 LES DÉCHETS INFECTIEUX

C'est un matériau suspecté de contenir des agents pathogènes (bactéries, virus, parasites ou champignons) de la concentration ou de la quantité suffisante pour provoquer la maladie chez les hôtes sensibles. Cette sous-catégorie comprend :

- les déchets contaminés par du sang ou d'autres fluides corporels ;
- cultures et stocks d'agents infectieux de travaux de laboratoire ;
- les déchets provenant de patients infectés dans les quartiers d'isolement.

2.2 LES DÉCHETS PATHOLOGIQUES

Les déchets pathologiques précisément les déchets anatomiques non aisément identifiables constitués de tissus, d'organes, parties du corps, sang, liquides organiques et autres déchets de la chirurgie et des autopsies sur des patients atteints de maladies infectieuses, pourraient être considérés comme une sous-catégorie de déchets infectieux, mais il est souvent classé séparément -Particulièrement lorsque les méthodes particulières de manutention, traitement et élimination sont utilisés.

2.3 DÉCHETS PIQUANTS, COUPANTS, PERFORANTS

Ce sont des objets pointus et tranchants sont des éléments qui pourraient provoquer des coupures ou des plaies perforantes, y compris les aiguilles, les seringues, scalpels et autres lames, des couteaux, des sets de perfusion, des scies, des débris de verre, les pipettes, les Cathéters, les Rasoirs, les Petites ampoules coupantes, les Bistouris.... Qu'ils aient été ou non en contact avec un produit biologique, ces articles sont généralement considérés comme des déchets de soins médicaux très dangereux et doivent être traités comme s'ils étaient potentiellement infectés.

D'autre type de déchets Sont classés comme déchets assimilables aux DASRI particulièrement, les déchets issus des activités d'enseignement, de recherche et de production industrielle dans les domaines de la médecine humaine et vétérinaire ainsi que ceux issus de thanatopraxie».

2.4 D'AUTRES CLASSIFICATIONS [5]

Les DASRI peuvent être classés en 3 grandes sous-catégories en fonction de leur aspect physique : les déchets solides, les déchets semi-liquides et les déchets liquides.

2.4.1 DÉCHETS SOLIDES

Déchets mous :

- Tous déchets de soins à risques tels que : Sondes, tubulures, Seringues (sans aiguille), Compresses, pansements, Protections périodiques (sauf gynéco-obstétrique), Poches de perfusion avec tubulures, Non-tissé de bloc ;
- Tous déchets des malades en isolement infectieux (ne rentrant pas dans une autre catégorie ou sous-catégorie).

Déchets piquants, coupants, perforants : seringues, aiguilles, scalpels et lames de rasoir jetables, etc.

2.4.2 DÉCHETS SEMI-LIQUIDES

- Poches de liquides, tubes de prélèvement de sang, dispositif de drainage, drains, Flacons d'aspiration, redons, crachoirs... ;
- Tous produits sanguins et liquides biologiques (liquide pleural, péritonéal, péricardique, amniotique, synovial,…) et leurs contenants (poches de sang, transfuseurs…) ;
- Déchets anatomiques non identifiables, Prélèvements biologiques : flacons de cultures, boîtes de pétri.

2.4.3 DÉCHETS LIQUIDES

Effluents des automates d'analyse médicale et tout produit liquide en contact avec un liquide biologique ou un déchet ou une pièce anatomique et dont on a de bonne raison de croire, qu'il est susceptible de présenter un risque infectieux couplé ou non à un risque chimique et/ou toxique.

3 PRODUCTION DES DASRI EN MILIEU DIFFUS (LABORATOIRES D'ANALYSES MEDICALES)

Les laboratoires d'analyses médicales fait partit des producteurs des déchets médicaux diffus ils sont considérés comme un producteur intermédiaires à cause de la production de faibles quantités de déchets et de la dispersion géographiquement.

3.1 LES DECHETS DASRI PRODUITE PAR LES LABORATOIRES D'ANALYSES MEDICALES

Objets pointus et tranchants : Aiguilles, verre brisé, boîtes de Pétri, lamelles, pipettes cassés.

Déchets infectieux et pathologique : Le sang et les fluides corporels, les cultures et les stocks microbiologiques, des tissus, des carcasses d'animaux infectés, tubes et contenants contaminés par du sang ou des liquides corporels.

3.2 LES DIFFERENTES ETAPES DE LA GESTION DES DASRI [6]

- Le tri et conditionnement : opération effectue au lieu de génération des déchets et à travers laquelle chaque catégorie de déchets est mise dans un sac ou conteneur qui lui convient et orienté vers une filière précise ; Le conditionnement : destiné à contenir les déchets hospitaliers.il constitue une barrière physique contre les micro-organismes pathogènes qu'ile contiennent ;
- La collecte : c'est le trajet depuis le lieu de génération des déchets ou les zones de stockage intermédiaire des déchets jusqu'à la zone de stockage central.
- Le stockage : les locaux pour le stockage intermédiaire au sein de l'unité de soins et pour le stockage central doivent être désignés au sien de l'établissement ;
- Le transport : doit s'effectuer dans des conteneurs séparés portant une étiquette imperméable et à écriture indélébile indiquant la mention « déchets infectieux » et présente le symbole international du risque biologique ;
- Traitement et élimination : les DASRI sont traités, élimines selon des procédures appropries et reconnus en la matière (incinération désinfection par micro-ondes, thermique et chimique, enfouissement.) ;

4 POPULATION ET MÉTHODES

4.1 POPULATION

On entend par laboratoire d'analyses de biologie médicale tout établissement de santé privé où sont effectués les analyses de biologie médicale et les examens de laboratoire destinés à faciliter le diagnostic médical, le traitement ou la prophylaxie des maladies humaines à l'exception des actes d'anatomopathologie. Douze laboratoires d'analyses médicales privées dans la province de Kénitra de la région du Gharb ont été étudiés.

Dans les laboratoires d'analyses médicales privées ; les personnels participés dans cette étude sont les médecins chefs de ces laboratoires.

Cette étude est basée sur un recensement des laboratoires au niveau de la ville de Kénitra. En termes de pourcentage, le taux de participation est de 83,33 % de l'effectif total des laboratoires étudiés.

Dans le but d'apporter des réponses aux questions de recherche préconçues, l'étude est orientée vers la description et l'exploration. Il s'agit d'une étude descriptive exploratoire basée sur l'évaluation des connaissances, pratiques et attitudes concernant la gestion des déchets infectieux en milieu diffus dans une tentative de dégager les facteurs qui ont action sur l'amélioration du mode de gestion de ce type des déchets. On utilisera un devis descriptif qui est le plus adapté à ce genre de recherche.

4.2 MÉTHODES

4.2.1 SOURCES ET MÉTHODES DE COLLECTE DE DONNÉES

Afin d'accumuler différents points de vue pour investiguer les aspects convergents, l'étude a fait appel à une variété de sources de données :

- L'observation directe **;** elle nous a permis d'apprécier le processus et les résultats immédiats de la gestion des déchets à risque ; L'observation a été réalisée à l'aide d'une grille d'observation.

Les entretiens semi-directifs ; ont été réalisés avec les médecins chefs de ces laboratoires dans le respect de la confidentialité après information des intéressés sur l'objectif de notre étude.

- Un questionnaire destiné aux médecins chefs de ces laboratoires.

4.2.2 TRAITEMENT ET ANALYSE DES RESULTATS

Les questionnaires récupérés directement par nos soins sont analysés à l'aide de l'outil informatique (SPSS), et sont présentés sous forme de tableaux et de graphiques, suivis d'une discussion. Les résultats des entretiens sont aussi présentés et discutés, puis une synthèse générale des résultats de ces outils va essayer de dégager les facteurs influant la gestion des déchets à risques infectieux, en vue de contribuer davantage à l'amélioration du système de gestion au niveau des laboratoires d'analyses médicales.

5 RÉSULTATS

5.1 QUANTITÉ DE DÉCHETS GÉNÉRÉS

5.1.1 TAUX DE PRODUCTION DES DÉCHETS HOSPITALIERS

La quantité produite des DASRI diffus au sein des laboratoires médicales se situé dans l'intervalle de 5 kg / mois < D.A.S.R.I. < 100 kg / semaine [7]. Ce qui apparu normale puisque ces laboratoires sont considéré comme des producteurs intermédiaires contrairement aux hôpitaux publics qui représentent les producteurs majeurs des déchets infectieux.

5.1.2 LES LABORATOIRES D'ANALYSES MÉDICALES

Des entretient était lieu avec des médecins responsables des laboratoires d'analyses médicales à l'aide d'un questionnaire anonyme distribuer sur la totalité des responsables dans le cadre d'un recensement. Environ 40% des médecins enquêté sont de sexe féminine et 60% de sexe masculin (Tableau 1).

Tableau 1 : Caractéristiques de la population étudiée

	FREQUENCE	POURCENTAGE	POURCENTAGE CUMULEE
HOMME	06	60,0	60,0
FEMME	04	40,0	100,0
TOTAL	10	100,0	

Presque 40% des médecins travaillent en activité mixte, en partie libérale et en partie en établissement de soins (Tableau 2).

Tableau 2 : Caractéristiques de la population étudiée

	FREQUENCE	POURCENTAGE	POURCENTAGE CUMULEE
NON	6	60,0	60,0
OUI	4	40,0	100,0
TOTAL	10	100,0	

5.2 TRI ET CONDITIONNEMENT DANS LES LABORATOIRES D'ANALYSES MÉDICALES

Presque 80% des laboratoires tri leur déchets piquants et DASRI mous, tandis que 50% seulement utilisent des conteneurs spécifiques à ce type de déchets.

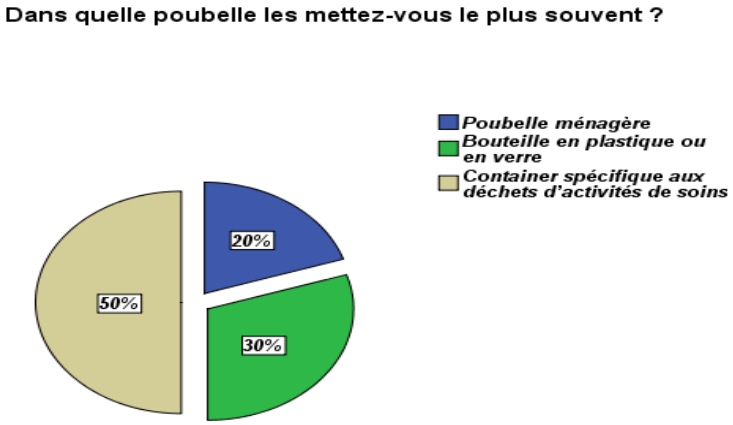

Figure 1 : Poubelle destinée à l'élimination des DASRI

5.3 LA COLLECTE DES DASRI DANS LES LABORATOIRES D'ANALYSES MEDICALES

Parmi les laboratoires privés qui apportent leurs déchets DASRI sur un lieu de stockage intermédiaire ou si une société de collecte les enlève sur les lieux d'exercice, seulement 25% respectent la norme d'élimination et la durée de collecte.

Tableau 3 : Fréquence d'évacuation des DASRI des laboratoires

	pourcentage	Pourcentage cumulée
À la demande	62,5	62,5
Plusieurs fois par semaine	25,0	87,5
1 fois par mois	12,5	100,0

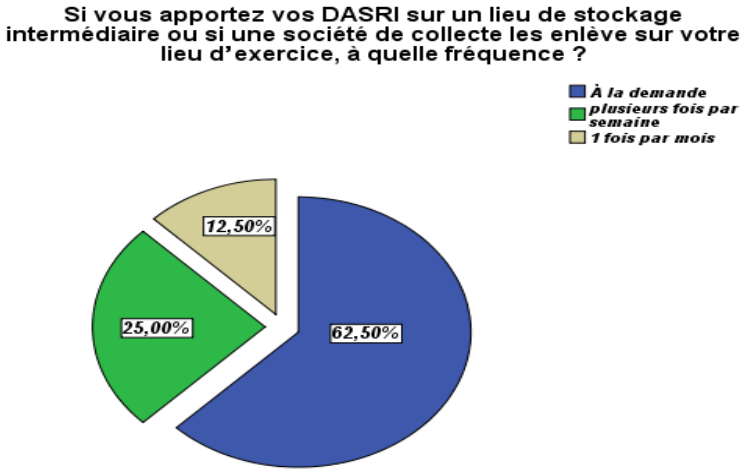

Figure 2: Fréquence d'évacuation des DASRI des laboratoires

5.4 LOCAL D'ENTREPOSAGE DANS LES LABORATOIRES D'ANALYSES MEDICALES

Environ 90% des laboratoires audité ont un locale d'entreposage intermédiaire malgré le manque de son conformité avec les normes.

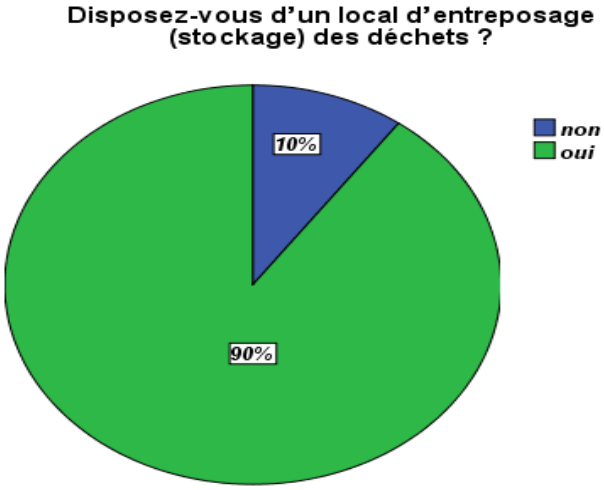

Figure 3 : local d'entreposage dans les laboratoires privés

5.5 ELIMINATION DES DASRI DANS LES LABORATOIRES D'ANALYSES MEDICALES

Environ 70% des laboratoires évacués séparément ces déchets piquants, alors que les DASRI mous sont mélangés avec les déchets ménagère pour 70% des laboratoires.

La moitié des laboratoires ne traitent pas ces DASRI liquide (évacuation dans les égouts sans traitement ou même une désinfection). Un système de désinfection installé dans 60% des locaux de ces laboratoires.

Presque 62,5% des laboratoires éliminent ces déchets infectieux par un apport individuelle à la déchèterie ce qui engendre une mauvaise gestion d'élimination des déchets infectieux. Alors que 37,5% élimine ces déchets par la voie d'une

société de collecte et 66,7% parmi eux ont une convention avec une société de collecte et seulement 33,3% sont satisfaites de la gestion de ces sociétés

La totalité des responsables des laboratoires d'analyse médicale acceptent l'intégration à une filière commune d'élimination de ces déchets et environ 80% des laboratoires refusent de signer une convention à titre individuel avec une société de collecte de ce genre des déchets

Les laboratoires d'analyses médicales n'utilisent pas une filière spécifique de la gestion des déchets à cause soit de :

- La méconnaissance de la réglementation 50%,
- La méconnaissance des sociétés de collecte 50%,
- Raison de l'absence de possibilité de regroupement proche de votre cabinet/lieu de travail 60%,
- raison du coût ? (D'un contrat avec une société de collecte) 80%.

Entre le moment où le déchet est produit et le moment où il est effectivement incinéré ou désinfecté, la durée maximale autorisée est différente selon la quantité de DASRI produite. Cette durée inclut donc l'entreposage, l'éventuel regroupement, le transport et l'incinération ou la désinfection. Il appartient à l'établissement d'obtenir contractuellement les engagements nécessaires lui permettant de respecter les délais suivants :

Tableau 4 : Délais d'élimination selon la quantité générée

Quantité produite	Délais
supérieure à 100 kg / semaine	72 heures
entre 5 kg / mois et 100 kg / semaine	7 jours

6 DISCUSSION

La gestion des déchets est effectuée au Maroc conformément avec la loi 28-00 sur l'élimination des déchets de 2006. Elle introduit la notion de déchet dangereux et la gestion de ce type de déchet en le soumettant à un système d'autorisation préalable à tous les stades de la gestion : collecte, transport, stockage et élimination. En plus de cette loi le gouvernement a publié Le Décret 2-09-139 du 18 juin 2009 relatif à la gestion des déchets médicaux et pharmaceutiques [8]. Ce texte définit différentes catégories de déchets médicaux et pharmaceutiques et définit les modalités de conditionnement, collecte, transport et élimination de ces derniers. La gestion des déchets dangereux est l'un des problèmes les plus importants dans les établissements médicaux.

Le taux de 83,33% de participation des responsables des laboratoires médicales dans notre enquête a témoignés de ses inquiétudes et de ses volontés de contribuer au développement du secteur de la santé et à l'amélioration des conditions de travail. La population étudiée était essentiellement de sexe masculin 60 %.

Les médecins responsables des laboratoires travaillent en activité mixte, en partie libérale et en partie en établissement de soins, ce qui donne à ces responsables une bonne expérience dans la gestion et un excellent savoir des contraintes relevées pour une meilleure gestion des déchets infectieux.

Le délai d'élimination n'est pas bien respecté dans les laboratoires médicaux, ainsi que pour les collecteurs des déchets piquants et dans tous les cas, le volume du collecteur doit être adapté à la quantité de déchets produits pour garantir une évacuation aussi fréquemment que l'imposent les contraintes d'hygiène. La durée d'utilisation de l'emballage (entre son ouverture et sa fermeture) doit faire l'objet d'une concertation interne associant les responsables des laboratoires, et les services opérationnelle d'hygiène. Pour les mini-collecteurs et les boîtes à aiguilles, les délais réglementaires d'élimination doivent être entendus entre la fermeture définitive de l'emballage et son incinération ou son prétraitement par désinfection. Toutefois les normes de la collecte sont moins appréciées et qui nécessite un effort organisationnel (manque de formation et de matériels) pour s'adapter aux normes de collecte et transport des DASRI [9].

Le manque d'organisation et des moyens humains et financiers rendent le défi de l'application de la politique nationale de la gestion des déchets infectieux particulièrement ardu pour l'hôpital et dans les laboratoires médicaux étudiés [10].

De ce fait, la mise en place de vrais locaux d'entreposage intermédiaire des DASRI, doit répondre aux normes d'hygiène et de sécurité, de jour comme de nuit, y compris les jours fériés : il est à noter que la continuité des activités dans les établissements de santé engendre une production permanente qui doit faire l'objet d'une prise en charge sécurisée,

particulièrement à l'intérieur des services ou au sien des laboratoires médicaux privées ; ceci représente, à notre sens, un des défis pour une gestion optimale des DASRI [11].

La majorité des laboratoires n'ont pas un plan bien définie de l'élimination des déchets infectieux cette situation est le résultat de l'absence de possibilité de regroupement proche de votre cabinet/lieu de travail 60% et pour le raison du coût (D'un contrat avec une société de collecte) 80%.

La problématique de traitement et l'élimination des déchets infectieux pour les laboratoires médicaux nécessitent une grande volonté pour la résoudre, l'application d'une approche participative et communautaire est obligatoire [12].

La gestion des déchets liquide reste toujours sont suite comme dans l'hôpital public, malgré les efforts des autorités compétente [13].

7 RECOMMANDATIONS

A la lumière de cette étude nous recommandons :

- Une formation continue et adaptée des professionnels de la santé pour assurer un changement durable des comportements à risque et l'instauration d'une culture de la prévention des risques professionnels.
- Une sensibilisation des responsables des laboratoires étudiés pour une application effective de la législation sur la gestion des déchets médicaux et pharmaceutiques.
- la mise en œuvre de programmes et plans de la gestion de ce type des déchets, basés sur l'augmentation du nombre de responsables, l'amélioration du système budgétaire et la motivation des personnels adaptés, réalisable et régulièrement évalués.
- Le regroupement des laboratoires d'analyses médicales dans des organisations ou des associations afin de pouvoir minimiser les coûts de traitement des déchets et d'assister à des formations dans le domaine de gestion des déchets et d'environnement.
- Renforcer les efforts pour traiter les déchets infectieux liquides qui s'évacués dans les égouts.

8 CONCLUSION

Le système de gestion des déchets DASRI solide et liquide constitue une préoccupation majeure pour le personnel de santé et les populations, la difficulté de ce système de gestion réside dans sa pérennité. En conclusion, cette étude a souligné le besoin de la mise en œuvre d'un plan organisationnel adéquat basé sur l'évaluation régulière et la coordination entre les différents responsables malgré les contrainte d'architecture et de rappels d'information des professionnels de santé sur les règles de la gestion a travers de la formation continue, la sensibilisation des personnels.

Le manque d'organisation et des moyens humains et financiers rendent le défi de l'application de la politique nationale de la gestion des déchets infectieux particulièrement difficile pour les laboratoires d'analyses médicales étudiés.

L'utilisation des approches bien adaptés à cette problématique peut considérer comme une démarche principales pour la résoudre, tel que l'approche participative [14], qui désigne une méthode de développement dans laquelle les populations dites ¨Bénéficiaires¨ ont un rôle déterminant dans le processus de conception et de mise en œuvre des actions de développement et l'approche communautaire qui est définie comme une pratique s'appliquant à la santé dans un système de solidarité et de dialogues [15]:

- horizontal, entre pairs ;
- vertical, entre couches professionnelles, couches sociales, génération d'âges ;
- durable, tenant compte des générations présentes et futures.

Cette pratique repose sur :

- une base collective communautaire, locale ;
- un repérage collectif des problèmes et des potentialités qui implique la population (diagnostic) et qui inclut les dynamiques sociales à l'œuvre dans la collectivité (ébauches de solutions, micro-réalisations, réseaux de solidarité) ;
- la participation de tous les acteurs concernés (décideurs, professionnels, usagers) ; participation autant sur le mode représentatif que direct.

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Corrélation entre abandon scolaire et stabilité de l'alphabétisme dans la ville de Bukavu en République Démocratique du Congo

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ABSTRACT: Within the context of the achievement of the goals of education for all (EFA), it was recommended that we proceed, in each region of the world and even in each country with its different administrative units, to the assessment of both the expansion and the quality of EFA. This last type of assessments is crucial inasmuch as it is better not to educate people than to offer them a low quality education. It is with the concern for the assessment of the quality of EFA, in its section regarding primary schooling, that this research was undertaken. The aim was to find out the level of study where the loss of acquired knowledge in reading and writing was more perceptible between Swahili and French for students who drop out of school prematurely.

KEYWORDS: reading, writing, Swahili, French, loss of knowledge, illiteracy, literacy.

RESUME: Dans le cadre de la réalisation des objectifs de l'éducation pour tous, il a été recommandé de procéder au niveau de chaque région du monde, voire au niveau de chaque pays et de ses différentes circonscriptions, à des évaluations à la fois de l'expansion et de la qualité de l'EPT. Ce dernier type d'évaluation s'impose d'autant plus qu'il vaut mieux ne pas éduquer les individus que de leur assurer une éducation de piètre qualité. C'est dans ce souci d'évaluation de la qualité de l'éducation pour tous, dans son volet de la scolarisation primaire, que cette recherche a été entreprise. Pour cela, comme objectif, il était question de déceler le niveau d'étude où la perte des connaissances acquises en lecture et en écriture est plus sensible entre la langue swahili et le français pour les sujets qui quittent prématurément le cursus de leur formation scolaire.

MOTS-CLEFS: Lecture, écriture, swahili, français, perte des connaissances, analphabétisme, alphabétisation.

1 INTRODUCTION

1.1 PROBLÉMATIQUE

La lutte contre l'analphabétisme est, surtout depuis la création de l'Unesco, une préoccupation fondamentale et toujours actuelle de la communauté internationale.

Cependant, «dans beaucoup de pays en voie de développement, la détermination politique pour l'éducation pour tous s'engage uniquement pour l'enseignement primaire universel et non pour l'alphabétisation » (Akihiro, 1996, 297). Tel est le cas de la République Démocratique du Congo (RDC).

La dégradation de la situation politique générale et des paramètres socio-économiques enregistrés par la RDC depuis le

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début de la dernière décennie du 20è siècle incite néanmoins à réfléchir sur la qualité de l'enseignement primaire ou son efficience dans la lutte contre l'analphabétisme. A ce sujet, dans une étude antérieure, Mokonzi et Vitamara (2000) ont remarqué que sur le plan quantitatif cet enseignement dessert de moins en moins d'enfants scolarisables et ne permet pas, sur le plan qualitatif, à ceux qui y accèdent de se doter, à temps voulu, des outils d'apprentissage fondamentaux que sont notamment la lecture et l'écriture.

Sachant que notre système éducatif s'affronte déjà à un si sérieux problème que dire de la situation de toute cette jeunesse qui décroche l'école avant de terminer le cursus normal d'apprentissage ? Selon Mokonzi (2009, p 13) le taux brut de scolarisation en RDC reste aujourd'hui très faible : 64% au primaire, 19% au secondaire. Sur 100 enfants qui entrent en première année primaire, 25 seulement atteignent la 5^{ième} année après quatre années scolaires. Au regard de cette observation de l'auteur, il se dégage un taux élevé de déperdition en terme de redoublement et d'abandon.

Pour l'Unesco (1990) en collaboration avec l'Agence intergouvernementale pour la Francophonie (AIF), si l'on veut disposer de conditions favorables pour une alphabétisation durable, d'une amélioration de la qualité des apprentissages et de leur maintien, il est indispensable de renforcer les environnements lettrés et l'édition nationale dans chaque pays, afin de créer une offre de publications adaptées à la demande sur le plan culturel et plus particulièrement linguistique.

A cet effet, s'intéressant à une autre étude antérieure réalisée par Gorman et Pollit (1997) effectuée au Guatemala ; ils définissent en premier lieu la classe de la troisième année primaire comme celle où la plupart des élèves sont alphabétisés et évalués en second lieu, la contribution réelle de l'école à l'alphabétisation. Ils se posent finalement la question de savoir si les compétences en lecture et en écriture acquises dans des conditions scolaires défavorisées ou limitées ne sont pas vraisemblablement désapprises par les enfants après leur départ de l'école.

Les résultats de cette étude indiquent l'alphabétisation comme fonction du niveau de connaissance. Pour ces auteurs, les sujets qui ont abandonné l'école subissent une régression du niveau d'alphabétisme de l'année d'études qu'ils ont atteint, en contrôlant le nombre d'années d'abandon scolaire et leur statut socio-économique. La corrélation entre l'âge de la passation du test et le nombre d'années d'abandons scolaire est de 0,84.

Le rapport de la C.N.S, cité par Mokonzi (2009, p 15), stipule, d'une part, que : « notre système éducatif révèle de nombreuses déficiences, notamment le manque d'une politique de l'éducation fondé sur les impératifs essentiels du développement intégral du pays, ce qui a comme conséquences une éducation fondamentale tronquée, une école secondaire anémiée, … » Et d'autre part, pour les Etats Généraux de l'Education (EGE), organisés en 1996, « l'école congolaise a cessée de créer le progrès pour engendrer la dégradation. »

C'est pourquoi, pour la même source, nombre d'observateurs estiment que si elle n'est pas morte, l'école congolaise est, au pire, dans le coma, au mieux très malade. Tout compte fait, personne ne considère qu'elle soit en bonne santé.

Eu égard à ce qui précède, la RDC étant un milieu qui ne favorise pas trop la lecture. Que deviennent les jeunes qui abandonnent les études dans cet environnement non lettré ? Ne retombent – ils pas dans l'analphabétisme après cet abandon de la scolarité ? Sachant que l'apprentissage au sein de nos écoles mène à la maîtrise du swahili, puis du français, laquelle de ces deux langues peut être la plus affectée par le retour à l'analphabétisme ?

1.2 HYPOTHÈSE DU TRAVAIL

- Les sujets qui abandonnent la scolarité pourraient perdre l'efficacité des aptitudes en lecture et en écriture qui varierait selon le niveau d'étude atteint ;
- Le niveau primaire, cycle minimum d'aptitude de base pour quitter l'analphabétisme, pourrait être le niveau où les sujets perdraient rapidement les connaissances acquises en lecture et en écriture ;
- par rapport aux langues, le français subirait un effet négatif avancé d'analphabétisme plus que le swahili.

Pour vérifier ces hypothèses, il a été administré occasionnellement deux épreuves de lecture et de l'écriture en swahili puis en français aux jeunes ayant abandonné leurs études dans la ville de Bukavu qui se sont disponibilisés à répondre à notre sollicitation.

Concernant l'analyse des données et l'interprétation des résultats, après dépouillement, nous effectuons l'étude du rendement et déterminons les sujets sur les échelles d'alphabétisation. Par la suite, nous procédons à l'étude corrélative de Bravais-Pearson de différents rendements au niveau global en les prenant deux à deux.

Cette étude est subdivisée en trois points, à savoir : les considérations théoriques, la méthodologie et la présentation des résultats. Elle se termine par une conclusion.

2 CONSIDÉRATIONS THÉORIQUES

Abandon scolaire

L'office de statistique de l'Unesco, cité par Naya-lena (1997, p 7) considère l'abandon ou la désertion scolaire comme le fait de quitter l'école avant la fin des études correspondant à un degré d'enseignement donné ou à un point intermédiaire ou un terminal d'un cycle d'enseignement.

Ainsi pour nous l'abandon scolaire est le fait de renoncer à un cycle d'enseignement, à la poursuite des études à l'école.

3 METHODOLOGIE

3.1 ECHANTILLON D'ÉTUDE

Dans la réalisation de notre étude, nous avons conçus et appliqué une échelle d'alphabétisation aux sujets qui ont abandonné les études dans les classes suivantes : 4ème, 5ème, 6ème années primaires, ainsi que ceux de la 1ère et 2ème secondaire dans la ville de Bukavu.

Cependant, l'investigation a été menée uniquement auprès d'un échantillon occasionnel de 250 sujets dont la répartition par niveaux d'études se présente comme suit :

Tableau 1. Echantillon réparti par niveau d'études

NPP : Niveau Post Primaire

	Années d'études				
	4ème année	5ème année	6ème année	NPP	Total
Effectif	52	80	66	52	250
Pourcentage	20.80	32.00	26.40	20.80	100%

Source : nos enquêtes

3.2 RÉCOLTE DES DONNÉES

En vue de recueillir les données nécessaires à la réalisation de cette étude, nous avons procédé à l'élaboration de deux échelles d'alphabétisation en français et en swahili comprenant cinq voyelles (en swahili) et 8 voyelles (en français), vingt syllabes simples, vingt syllabes complexes, vingt mots et 5 phrases. Ces échelles ont fait l'objet d'une dictée et d'une lecture individuelle respectivement auprès de 250 sujets de l'échantillon sélectionné occasionnellement.

Les échelles étant graduelles, l'application de la lecture et de l'écriture a également été faite de manière progressive suivant la séquence ci-après :

Lecture (ou écriture) des voyelles ;

Lecture (ou écriture) des syllabes simples ;

Lecture (ou écriture) des syllabes complexes ;

Lecture (ou écriture) des mots ;

Lecture (ou écriture) des phrases.

La cotation à été opérée sur un maximum de 70 points en swahili et 73 points en français, tout élément de la composante des échelles valant un point.

Les niveaux des échelles dans lesquels les sujets ont été classés sont les suivants :

Niveau 00 : constitué des sujets qui ne savent pas lire (ou écrire) au moins 3 voyelles sur 5;

Niveau 01 : composé des sujets qui savent lire (ou écrire) au moins 3 voyelles sur 5 ;

Niveau 1 : comprenant des sujets qui savent lire (ou écrire) au moins 10 syllabes simples sur 20 ;

Niveau 2 : formé des sujets qui savent lire (ou écrire) au moins 10 syllabes complexes sur 20;

Niveau 3 : renfermant des sujets qui savent lire (ou écrire) au moins 10 mots sur 20 ;

Niveau 4 : incluant des sujets qui savent lire (ou écrire) au moins 3 phrases sur 5.

Pour déterminer le niveau des sujets sur chaque échelle d'alphabétisation, nous avons procédé à la classification des sujets selon les différents niveaux de l'échelle. L'interprétation a été faite de la manière suivante :

- les sujets de niveau 00, 01, 1, et 2 ont été considérés comme étant retombés dans l'analphabétisme.
- Les sujets des niveaux 3 et 4 ont été classés dans les rangs de ceux qui maintiennent leur alphabétisme.

En vue d'analyser la fidélité de l'échelle, nous avons soumis les données récoltées à une étude de généralisabilité, laquelle a été basée sur le plan d'observation Sujets x Composantes (S x C). La représentation graphique de ce plan d'observation au moyen du diagramme de Cronbach est la suivante :

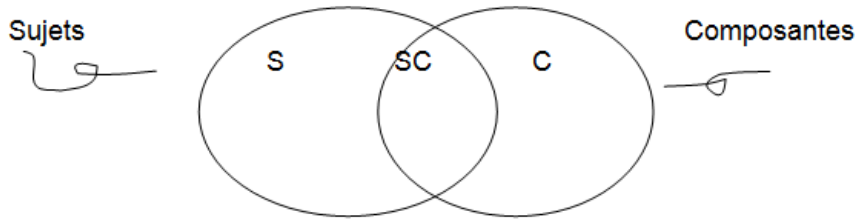

Figure 1: Représentation graphique du plan d'observation S x C

Ce plan d'observation comprend 3 sources de variation : deux effets principaux (S et C) et un effet d'interaction (SC). En appliquant aux données structurées selon ce plan d'observation le logiciel Gt mis au point par Ysewijn cité par Mokonzi et Issoy (2003), nous avons obtenu des coefficients de généralisabilité très élevés (supérieurs à 0.80)aussi bien pour la discrimination des sujets (soit $_{\partial}$ = 0.901 et $_{\Delta}$ = 0.882 pour la lecture, $_{\partial}$= 0.941 et $_{\Delta}$ = 0.932 pour l'écriture) que pour la différenciation des composantes de l'échelle (soit $_{\partial}$ = 0.997et $_{\Delta}$ = 0.991 pour la lecture, $_{\partial}$ = 0.821et $_{\Delta}$ = 0.814 pour l'écriture). Nous pouvons de ce fait classer avec précision les sujets dans les différents niveaux de l'échelle et comparer avec assurance les différents degrés de l'échelle d'alphabétisation et ce, quelle que soit la discipline retenue au cours de l'enquête.

3.3 ANALYSE DES DONNÉES

Eu égard aux résultats obtenus par chaque sujet, nous avons classé les données; par la suite nous les avons soumises à l'étude du rendement qualitatif et enfin, nous avons procédé à la détermination des niveaux de sujets sur l'échelle d'alphabétisation.

3.3.1 ETUDE DU RENDEMENT QUALITATIF

Pour une vue de l'efficacité de l'action d'alphabétisation au niveau global des enquêtés, au niveau de l'année d'abandon des études, le calcul du rendement a été effectué par la formule ci-après :

$$Rdt = \frac{X}{Max} \times 100$$

*Où : - **Rdt** : Rendement - **X** : Moyennes des cotes de sujets - **Max** : Maximum des points de l'épreuve.*

Pour apprécier le rendement réalisé, nous avons comparé ses résultats au critère de 2/3 (soit 66.67%) proposé par Wayenberghe cité par Bamwisho et Katako (1979, p.60)

Ce critère a permis de déterminer le degré de stabilité l'alphabétisme des sujets par rapport au nivéau de l'année d'abandon scolaire.

Ensuite le calcul de la corrélation de Bravais-Pearson permettra de comparer les moyennes obtenues par ces sujets dans les disciplines (lecture française, lecture swahili, écriture française, écriture swahili) prises deux à deux.

4 RÉSULTATS

Le rendement en lecture et en écriture est présenté en calculant certaines caractéristiques de la distribution des notes de sujets.

4.1 ETUDE DU RENDEMENT EN LECTURE SWAHILI ET FRANÇAISE

Pour les rendements globaux, une étude de corrélation de Bravais-Pearson des variables prises deux à deux a été effectuée.

4.1.1 ETUDE DE RENDEMENT GLOBAL EN LECTURE SWAHILI ET FRANÇAISE

Le rendement global obtenu est le suivant par discipline :

Tableau 2: rendement global en lecture swahili

Lecture	N	MAX	P	X	SD	D	Rdt
Swahili	250	70	70	43,57	19,98	2	62.24%
Français		73	73	44,55	15,16	9	61,03 %

*Légende : -**N** : nombre des sujets -**Max** : maximum des notes -**P** : note la plus élevée -**SD** : écart-type -**D** : note la moins élevée*

Le tableau 3 montre que sur un maximum de 70 points en swahili, les notes obtenues par 250 sujets varient de 70 à 2 avec une moyenne de 43,57 et un écart type de 19,98. Le rendement réalisé est alors de 62.24 %. En lecture française sur 73 points, les notes obtenues des sujets varient de 73 à 9 avec une moyenne de 44,55 et un écart type de 15,16. Le rendement réalisé est alors de 61.03%. Les rendements pour les deux disciplines sont inférieurs au rendement de 66,67 % considéré comme critère d'appréciation.

Ensuite, une étude corrélative de Bravais-Pearson entre les deux types de rendements présentés ci-haut a permis d'aboutir aux résultats ci-après :

Tableau 3: corrélation entre les rendements globaux en lecture swahili et en lecture française.

Variable	Nombre	Corrélation
Lecture swahili	250	0,027
lecture française		

Dans le tableau 5, les rendements en lecture swahili et celui de lecture française de 250 sujets ont une corrélation de 0,027. Cette dernière étant inférieure au seuil de 0,05, la corrélation calculée n'est pas significative.

Nous concluons donc que les rendements en swahili et en français étant faibles par rapport au critère d'appréciation, ceci dégage un retour à l'analphabétisme de la majorité de nos enquêtés. Pour la corrélation, les sujets se classent de manière similaire pour les deux disciplines, c'est-à-dire que les sujets qui sont fort en lecture swahili sont également forts en lecture française ; il en est de même pour les faibles et les moyens.

4.1.2 ETUDE DU RENDEMENT EN LECTURE PAR NIVEAU D'ETUDES

- **ETUDE DU RENDEMENT PAR NIVEAU D'ETUDE EN LECTURE SWAHILI ET FRANÇAISE**

Par niveau d'étude en swahili et en français, les rendements obtenus sont les suivants :

Tableau 4: rendement par niveau d'études en lecture swahili

Niveau d'études		N	MAX	P	X	SD	D	Rdt
Primaire	4è année	52	70	69	37.33	22.05	2	53,33%
	5è année	80	70	70	41,45	20,67	2	59,21%
	6è année	66	70	70	38,48	16,06	7	54,97%
Secondaire (NPP)		52	70	70	59,54	11,56	18	85,06%
TOTAL Swahili		250	70	70	43,6	19,9	2	62.3 %
Primaire	4è année	52	73	68	34,23	11,26	9	46,89 %
	5è année	80	73	67	42,10	14,86	16	57,67 %
	6è année	66	73	71	47,15	14,34	17	64,59 %
Secondaire (NPP)		52	73	73	55,35	12,09	24	75,82 %
TOTAL Français		250	73	73	44,55	15,16	9	61,03 %

Le tableau 4 montre qu'au niveau primaire, tous les rendements calculés en swahili sont inférieurs à 66.67 %. Ces rendements sont médiocres. Quant au niveau secondaire, les résultats sont excellents car, largement supérieur à 66.67 %. En français au niveau primaire, tous les rendements calculés sont médiocres, car inférieurs à 66.67% à l'exception de la sixième où le résultat est légèrement inférieur au score d'appréciation. Quant au niveau secondaire, les résultats sont excellents car, largement supérieur à 66.67%.

Ces résultats prouvent que les enquêtés du niveau primaire retombent dans l'analphabétisme après l'abandon des études par rapport à leurs homologues du niveau secondaire.

4.2 ETUDE DU RENDEMENT EN ÉCRITURE

Pour les résultats des rendements globaux, une étude corrélative de Bravais-Pearson des variables prises deux à deux à été effectuée.

4.2.1 ETUDE DE RENDEMENT GLOBAL EN ECRITURE SWAHILI ET FRANÇAISE

Les rendements globaux obtenus en écriture swahili et française sont présentés dans le tableau ci-après :

Tableau 5: rendement global en écriture swahili et française

Ecriture	N	MAX	P	X	SD	D	Rdt
Swahili	250	70	70	50,78	16,11	8	72,54 %
Française	250	73	73	43,12	17,77	5	59,07 %

En swahili, sur un maximum de 70 points, les notes obtenues par 250 sujets varient de 70 à 8, avec une moyenne de 50,78 et un écart-type de 16,11. Le rendement réalisé est alors de 72,54 %, c'est un rendement supérieur à 66,67 %. En français par contre, sur un maximum de 73 points, les notes obtenues par 250 sujets varient de 73 à 5, avec une moyenne de 43,12 et un écart-type de 17,77. Le rendement réalisé est de 59,07 %. C'est un rendement inférieur à 66,67%.(tableau 5)

Ceci dénote que les sujets écrivent mieux en swahili qu'en français.

Le calcul de la corrélation de Bravais-Pearson entre les rendements globaux en écriture swahili et en écriture française à permis de trouver les résultats ci-après :

Tableau 6: corrélation entre les rendements globaux en lecture swahili et en lecture française.

Variable	Nombre	Corrélation
Ecriture swahili Ecriture française	250	,137(*)

Le rendement global en écriture swahili et en écriture française de 250 sujets a une corrélation de ,137(*). Cette dernière étant supérieure au seuil de 0,05, la corrélation calculée est hautement significative.

Il s'avère donc que pour les résultats en swahili et en français dans cette épreuve d'écriture, les sujets se classent de manière similaire pour les deux disciplines, c'est-à-dire que les sujets qui sont fort en écriture swahili accusent une faiblaisse en écriture française ; il en est de même pour les faibles et les moyens.

4.2.2 ETUDE DU RENDEMENT EN ECRITURE PAR NIVEAU D'ETUDE

Le rendement en écriture par niveau d'étude a été calculé en écriture swahili et en écriture française.

a) ETUDE DU RENDEMENT EN ECRITURE SWAHILI PAR NIVEAU D'ETUDE

Les rendements réalisés sont présentés de la manière suivante :

Tableau 7: rendement par niveau d'études en écriture swahili

Niveau d'études		N	MAX	P	X	SD	D	Rdt
Primaire	4èannée	52	70	68	45,58	16,74	12	65,11
	5èannée	80	70	70	49,91	16,60	8	71,30
	6èannée	66	70	70	50,30	15,31	16	71,86
Secondaire(NPP)		52	70	70	57,92	13,43	12	82,74
TOTAL Swahili		250	70	70	50,78	16,11	8	72,54 %
Primaire	4èannée	52	73	68	34,62	18,15	6	47,42
	5èannée	80	73	70	40,50	17,45	5	55,48
	6èannée	66	73	73	46,21	16,28	7	63,30
Secondaire(NPP)		52	73	73	51,73	15,18	9	70,86
TOTAL Français		250	73	73	43,12	17,77	5	59,07 %

Pour le niveau primaire en swahili, la quatrième accuse une légère faiblesse par rapport aux autres niveaux dont les résultats sont excellents, car largement supérieur à 66,67% ; quant au niveau primaire en français, tous les rendements calculés sont inférieurs à 66.67 %. Au niveau secondaire, les résultats sont supérieurs à 66,67 %.Ce qui signifie que les sujets écrivent mieux le swahili plutôt que le français. Il n'y a qu'au secondaire où 70,86% écrivent mieux l'écriture française (tableau 7).

4.3 DETERMINATION DU SEUIL DES SUJETS

Dans l'échelle d'alphabétisation, le niveau de chaque sujet est déterminé en lecture, puis en écriture, et cela aussi bien en swahili qu'en français. Cette répartition s'effectue premièrement au niveau global et ensuite par niveau d'étude.

Afin de mieux distinguer les sujets qui se maintiennent dans l'alphabétisme de ceux qui retombent dans l'analphabétisme, il y a deux regroupement, les niveaux 00, 01, 1, et 2 considérés comme niveaux au sein desquels les sujets ont fait une rechute dans l'analphabétisme, et d'autre part, les niveaux 3 et 4 considérés comme niveau des personnes qui se maintiennent dans l'alphabétisme.

4.3.1 REPARTITION DES SUJETS SUR L'ECHELLE DE LECTURE

En appliquant l'échelle de lecture sur les 250 sujets de l'échantillon, la répartition suivante a été obtenue :

a) REPARTITION GLOBALE DES SUJETS SUR L'ECHELLE DE LECTURE SWAHILI ET FRANÇAISE

Les sujets se répartissent globalement sur les niveaux de l'échelle de lecture swahili et française de la manière suivante :

Tableau 8: répartition globale des sujets en lecture swahili et française

Lecture	Niveau	00	01	1	2	3	4	TOTAL
Swahili	Effectif	7	23	27	36	107	50	250
	%	2,8	9.2	10,8	14.4	42,8	20	100
Française	Effectif	5	24	30	33	101	57	250
	%	2	9,6	12	13,2	40,4	22,8	100

Sur les 250 sujets ayant passé l'épreuve de lecture swahili et française, le niveau 3 regorge les pourcentages les plus élevés dans les deux disciplines (soit 42,8% & 40,4%) par rapport aux autres niveaux.

En vue de distinguer clairement les sujets alphabètes et analphabètes en lecture swahili et en français, le tableau 9 a été dressé:

Tableau 9: répartition des sujets alphabètes et analphabètes en lecture swahili et française

Lecture	TOTAL		Analphabètes		Alphabètes	
	Effectif	%	Effectif	%	Effectif	%
Swahili	250	100	93	37,2	157	62,8
Française			92	36,8	158	63,2

Au regard de cette répartition globale, le taux des alphabètes est supérieur dans les deux disciplines (soit 62,8% & 63,2%) par rapport aux analphabètes (soit 37,2% & 36,8%). Il s'observe donc que la majorité des sujets se sont maintenus dans l'alphabétisme après l'abandon des études.

b) REPARTITION DES SUJETS SUR L'ECHELLE DE LECTURE PAR NIVEAU D'ETUDES.

Cette répartition est présentée en lecture swahili et en français.

- **REPARTITION DES SUJETS SUR L'ECHELLE DE LECTURE SWAHILI ET FRANÇAISE PAR NIVEAU D'ETUDES**

Les sujets se distribuent de la manière suivante sur cette échelle :

Tableau 10: Répartition des sujets sur l'échelle de lecture swahili par niveau d'étude.

		Niveaux de l'échelle						
	Classe	00	01	1	2	3	4	Effectif
Primaire	4e	4	10	6	2	21	9	52
	5e	1	7	14	14	28	16	80
	6e	0	6	10	17	27	6	66
Secondaire(NPP)		0	1	0	0	25	26	52
TOTAL Swahili		5	24	30	33	101	58	250
Primaire	4e	0	3	3	31	15	0	52
	5e	0	3	5	25	42	5	80
	6e	0	0	4	14	42	6	66
Secondaire(NPP)		0	0	0	2	36	14	52
TOTAL Français		0	6	12	72	135	25	250

Source : nos enquêtes

Du tableau 10, les proportions des enquêtés sont plus concentrées au niveau 3 de l'échelle pour les deux disciplines.

Pour mieux cerner la maintenance des sujets dans l'alphabétisme et la rechute dans l'analphabétisme, le tableau 11 en dégage l'illustration :

Tableau 11 : Répartition des sujets sur l'échelle de lecture swahili par niveau d'étude.

		Analphabètes		Alphabètes		
	Classe	Effectif	%	Effectif	%	Total
Primaire	4e	22	42,31	30	57,69	52
	5e	36	45	44	55	80
	6e	33	50	33	50	66
Secondaire(NPP)		1	1,92	51	98,08	52
TOTAL/Swahili		92	36,8	158	63,2	250
Primaire	4e	37	71,15	15	28,85	52
	5e	33	41,25	47	58,75	80
	6e	18	27,27	48	72,73	66
Secondaire(NPP)		2	3,85	50	96,15	52
TOTAL/Français		90	36	160	64	250

Dans ce tableau, en swahili, c'est au niveau post-primaire que le taux des alphabètes est supérieur à 66,7% (soit 98,08%). Quant au français, le taux des alphabètes est supérieur à 66,7% en 6ième primaire et au niveau post-primaire (soit 72,73% et 96,15%).

Au regard de ces données, au niveau primaire les enquêtés lisent déjà difficilement le swahili après leur abandon à partir de l'école primaire et en lecture française, l'on connait aussi des difficultés de lecture dans les classes inférieures à la sixième primaire.

4.3.2 REPARTITION DES SUJETS SUR L'ECHELLE D'ECRITURE SWAHILI

De manière similaire qu'en lecture, l'échelle d'écriture a été appliquée aux 250 sujets de l'échantillon, ainsi la répartition suivante a été obtenue:

a) REPARTITION GLOBALE DES SUJETS SUR L'ECHELLE D'ECRITURE SWAHILI ET FRANÇAISE

Les sujets se répartissent globalement sur les six niveaux de l'échelle d'écriture swahili et française de la manière suivante :

Tableau 12: répartition globale des sujets en écriture swahili et française.

Lecture	Niveau	00	01	1	2	3	4	TOTAL
Swahili	Effectif	0	8	15	32	116	79	250
	%	0	3,2	6	12,8	46,4	31,6	100
Française	Effectif	0	20	12	71	115	32	250
	%	0	8	4,8	28,4	46	12,8	100

Le présent tableau indique que sur les 250 sujets ayant passé l'épreuve d'écriture swahili, les niveaux 4 et 3 ont le pourcentage les plus élevés (soit 46,4% et 31,6%) par rapport aux autres niveaux. En suite pour l'écriture française, le niveau 3 a le pourcentage le plus élevé (soit 46 %) par rapport aux autres niveaux.

Pour cerner clairement les sujets alphabètes et analphabètes sur cette échelle, nous avons dressé le tableau ci-après :

Tableau 13: répartition des sujets alphabètes et analphabètes en écriture swahili

Lecture	TOTAL		Analphabètes		Alphabètes	
	Effectif	%	Effectif	%	Effectif	%
Swahili	250	100	55	22	195	78
Française			103	41,2	147	58,8

En swahili, le taux d'alphabètes est élevé (soit 78 %). Donc, la majorité des sujets se sont maintenus dans l'alphabétisme après l'abandon des études. Tandis qu'en français, 103 sujets sont analphabètes (soit 41,2%) et les 147 autres sujets (soit 58,8%) sont alphabètes.

Pour cette répartition, les enquêtés écrivent facilement en swahili qu'ils ne le font en français.

b) REPARTITION DES SUJETS SUR L'ECHELLE D'ECRITURE PAR NIVEAU D'ETUDES

Nous avons réalisé cette répartition sur l'échelle d'écriture en swahili, puis en français.

- **REPARTITION DES SUJETS SUR L'ECHELLE D'ECRITURE SWAHILI PAR NIVEAU D'ETUDES**

La répartition des sujets sur cette échelle s'effectue de la manière suivante :

Tableau 14: Répartition des sujets sur l'échelle d'écriture swahili par niveau d'études.

		Niveaux de l'échelle						
	Classe	00	01	1	2	3	4	Effectif
Primaire	4e	0	2	5	7	25	13	52
	5e	0	4	8	6	38	24	80
	6e	0	1	2	16	29	18	66
Secondaire(NPP)		0	1	0	3	24	24	52
TOTAL Swahili		0	8	15	32	116	79	250
Primaire	4e	0	7	5	21	15	4	52
	5e	0	10	3	22	37	8	80
	6e	0	2	4	16	36	8	66
Secondaire(NPP)		0	1	0	12	27	12	52
TOTAL Français		0	20	12	71	115	32	250

Du présent tableau, les sujets sont répartis sur l'échelle d'écriture swahili selon les différentes classes du cycle primaire et du niveau post-primaire.

Afin d'examiner le maintien des sujets dans l'alphabétisme et la rechute dans l'analphabétisme, le tableau ci-après a été dressé:

Tableau 15: Répartition des sujets sur l'échelle d'écriture swahili et d'écriture française par niveau d'étude.

		Analphabètes		Alphabètes		
	Classe	Effectif	%	Effectif	%	Total
Primaire	4e	14	26,92	38	73,08	52
	5e	18	22,5	62	77,5	80
	6e	19	28,79	47	71,21	66
Secondaire(NPP)		4	7,69	48	92,31	52
TOTAL/Swahili		55	22	195	78	250
Primaire	4e	33	63,46	19	36,54	52
	5e	35	43,75	45	56,25	80
	6e	22	33,33	44	66,67	66
Secondaire(NPP)		13	25	39	75	52
TOTAL/Français		103	41,2	147	58,8	250

Eu égard à ce qui précède, les enquêtés de l'ensemble des niveaux en étude écrivent sans beaucoup de difficultés en swahili et donc se sont maintenu dans l'alphabétisme dans cette discipline étant donné que les pourcentages sont supérieurs à 66,67%. En français, la situation ne va pas dans le même sens ; nos enquêtés n'écrivent mieux qu'en sixième et au niveau post-primaire avec les pourcentages (66,7% & 75%) ≥ à 66,7%. Ces résultats dénotent qu'en français, l'alphabétisme est affecté par l'abandon scolaire.

5 DISCUSSION DES RESULTATS

Les résultats mis en évidence par cette étude confirment que l'abandon scolaire pose un problème à l'alphabétisme acquis par les élèves lors de leur cursus de scolarité. Considérant les disciplines évaluées dans cette recherche ; en lecture, tous les rendements calculés en swahili sont inférieurs à 66.67 %. Ces rendements sont médiocres. Quant au niveau secondaire, les résultats sont excellents car, supérieur à 66.67 %. En français au niveau primaire, tous les rendements calculés sont médiocres, car inférieurs à 66.67% et au niveau secondaire, les résultats sont excellents étant supérieur à 66.67%.

Ces résultats prouvent que les enquêtés du niveau primaire retombent dans l'analphabétisme en lecture après l'abandon des études par rapport à leurs homologues du niveau post-primaire.

Quant à l'écriture, au niveau primaire en swahili, la quatrième accuse une faiblesse par rapport aux autres niveaux dont les résultats sont supérieurs à 66,67% et en français au niveau primaire, tous les rendements calculés sont inférieurs à 66.67 %. Au niveau secondaire, les résultats sont supérieurs à 66,67 %.Ce qui signifie que les sujets écrivent mieux le swahili plutôt que le français.

Les enquêtés ayant abandonné au niveau primaire pour les deux disciplines retombent dans l'analphabétisme par rapport à leurs homologues du niveau post-primaire.

Ceci démontre que les connaissances acquises par les apprenants au sein des nos institutions scolaires subissent une dégradation par le fait que nos milieux sont moins lettrés. Dans la rue où se trouve la plus part des enquêtés, la préoccupation fondamentale étant la recherche des moyens de survie eu égard au degré de pauvreté des populations en RD Congo, se cultiver n'est pas une priorité.

En poussant plus loin la réflexion, il y a de quoi se poser la question de savoir si la qualité de notre système éducatif permet aux apprenants qui abandonnent de se maintenir dans l'alphabétisme. les conclusions de la plupart des recherches qui portent sur l'évaluation des performances des écoliers de la République Démocratique du Congo et particulièrement de la ville de Kisangani dans les disciplines outils que sont la lecture, l'écriture et le calcul (cf Bakendire :1985, Mokonzi : 1985, Atongboa : 1997…).Très dramatiques, ces résultats traduisent le niveau fort avancé de la décadence de notre système d'enseignement et singulièrement de l'enseignement primaire.

En ce qui concerne la contribution de l'enseignement primaire à l'alphabétisme, les résultats de cette étude divergent grandement avec ceux de la recherche menée au Guatemala par Kathleen et Pollitt (1997, pp.283-298). Pour le système d'enseignement de ce pays d'Amérique du nord, déjà en 3ème année primaire plus de 90% d'écoliers savent lire et écrire.

Ces résultats montrent par ailleurs que l'enseignement primaire en République Démocratique du Congo est loin d'atteindre les objectifs d'une « éducation de qualité pour tous » fixés par la conférence de Jomtien en 1990 et réaffirmés par

le forum mondial de l'éducation tenu à Dakar du 26 au 28 avril 2000, à savoir « améliorer sous tous ses aspects la qualité de l'éducation dans un souci d'excellence, de façon à obtenir pour tous des résultats d'apprentissage reconnus et quantifiables, notamment en ce qui concerne la lecture, l'écriture et le calcul et les compétences dans la vie courante » (Unesco, 2000, p.17).

6 CONCLUSION

Dans le cadre de la réalisation des objectifs de l'éducation pour tous, il a été recommandé de procéder au niveau de chaque région du monde, voire au niveau de chaque pays et de ses différentes circonscriptions, à des évaluations à la fois de l'expansion et de la qualité de l'EPT. Ce dernier type d'évaluation s'impose d'autant plus qu'il vaut mieux ne pas éduquer les individus que de leur assurer une éducation de piètre qualité. C'est dans ce souci d'évaluation de la qualité de l'éducation pour tous, dans son volet de la scolarisation primaire, que cette recherche a été entreprise. Pour cela, comme objectif, il était question de déceler le niveau d'étude où la perte des connaissances acquises en lecture et en écriture est plus sensible entre la langue swahili et le français pour les sujets qui quittent prématurément le cursus de formation scolaire.

Après avoir appliqué une échelle d'alphabétisation (en lecture et en écriture) composée de cinq composantes graduelles respectivement à 250 apprenants ayant abandonnés l'école de 4ème, 5ème, 6ème années primaires et ceux du niveau post primaire, la description des performances des sujets enquêtés a été effectuée, mais également chaque apprenant a été situé sur l'un des niveaux de l'échelle. Cette dernière analyse a permis de constater que :

- Au niveau global en lecture swahili, les 250 sujets ont réalisé un rendement de 62.24 %. C'est un rendement faible car, inférieur à la moyenne de 66,67 % considéré comme critère d'appréciation. Donc les sujets subissent une régression dans l'alphabétisme en lecture swahili.
- En lecture française, le rendement réalisé au niveau global par les 250 sujets est de 61.03%. Ce rendement est inférieur comparativement au rendement moyen de 66,67 %. Les sujets subissent donc, dans cette discipline, une rechute dans l'analphabétisme.
- Quant à ce qui concerne le rendement des sujets par niveau d'abandon des études en lecture swahili et en lecture française, les rendements des sujets au niveau du cycle primaire sont médiocres par rapport à ceux des sujets du niveau secondaire à l'exception du moins de la classe de sixième primaire.

Concernant le rendement des sujets en écriture :

- Au niveau global en écriture swahili, les 250 sujets impliqués dans l'enquête ont réalisé un rendement de 72,54 %. C'est un rendement supérieur à 66,67 % ; cela montre en fait que les sujets se maintiennent dans l'alphabétisme pour cette discipline.
- En écriture française, le rendement global réalisé par les 250 sujets est de 59,07 %. Ce rendement est médiocre comparativement au rendement moyen de 66,67 % ; à ce effet, les sujets retombent dans l'analphabétisme.
- Quant à ce qui concerne le rendement des sujets par niveau d'abandon des études, en écriture swahili, les rendements des sujets au niveau primaire sont très bons. Les sujets du secondaire se comportent aussi très bien. En écriture française par contre, au niveau primaire, les rendements sont médiocres ; tandis qu'au niveau secondaire le rendement des sujets est satisfaisant. Pour l'écriture française donc, il y a une forte proportion des sujets qui subissent le retour à l'analphabétisme au niveau de l'école primaire.

Fort est de constater à cet effet que l'analphabétisme affecte plus l'écriture française que l'écriture swahili.

Ces résultats suscitent un sérieux doute sur la contribution de notre système d'enseignement primaire dans la lutte contre l'analphabétisme. Et pourtant, ainsi que nous l'avons mentionné plus haut, l'enseignement primaire constitue en République Démocratique du Congo, comme dans la plupart de pays en voie de développement, l'axe privilégié de la promotion de l'alphabétisation. Le doute se justifie également par le fait que, selon le bilan établi par le forum mondial de l'éducation, « en Asie du Sud et en Afrique subsaharienne, moins de trois enfants sur quatre atteignent la 5ème année de l'enseignement primaire ».

Aussi, pour pouvoir améliorer l'efficacité de l'enseignement primaire dans la lutte contre l'analphabétisme qui se renforce suite aux abandons scolaires, faut-il au préalable procéder à un véritable assainissement de l'environnement politique dans lequel évolue cet enseignement, à une amélioration sensible de l'environnement social, voire culturel, des élèves et des

enseignants ainsi qu'à une réforme fondamentale du système notamment au niveau des programmes des cours et de la didactique. Ces mesures sont plus qu'un impératif.

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Socio-Cultural Factors Influencing the Practice of Female Genital Cut among the Maasai Community of Kajiado Central Sub-County, Kenya

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ABSTRACT: The Female Genital Cut (FGC) is a widespread practice in a significant number of communities in Kenya such as Somali (97%), Kisii (96%), Kuria (96%) and the Maasai (93%), but relatively low among the Kikuyu, Kamba and Turkana. The practice is associated with short-term and long-term health effects including pain, bleeding, infections, and in extreme cases, death of the initiates. This study focused on socio-cultural factors influencing the practice of FGC among the Maasai community and adopted a cross-sectional research design, which employed a mixed method approach to generate both quantitative and qualitative data. Quantitative data was obtained from a randomly selected sample of 200 respondents, while quantitative data was generated from Focus Group Discussions (FGDs) as well as key informants (KI) interviews. The study found out that the Maasai (71% of the respondents) considered FGC as a cultural right whose main value is a rite of passage from girlhood to womanhood, enhancing marriage-ability, and acted as a rite of passage to adulthood. FGC was also considered as a traditional demand, enhanced easy childbirth, and reduced promiscuity among girls and women in the Maasai community. The authors conclude that FGC continues to persist in the Maasai community despite various effort put to eradicate it by different stakeholders. This is because of socio-cultural issues associated with it, which by far outweighs other risks associated with the 'cut'. For intervention programmes to succeed, the authors recommend that efforts should focus on targeting custodians of culture among the Maasai community who are largely the elderly women. This will create an opportunity for change agents to device appropriate strategies to curb the practice in the Maasai community. The devised strategies will inform various Anti-FGC interventions not only in the Maasai community, but also among other practicing communities in Kenya.

KEYWORDS: Female Genital Cut, Socio-cultural, Circumcision, Excision, Kenya.

1 INTRODUCTION

Sexual health is both an integral component of basic human health and development, as well as one of the inalienable and universal human rights (WHO, 1992). Female Genital Cut (FGC) is one of the most complicated and urgent sexual health problem of our time that requires global attention in addressing it due to it devastating impact both to the initiates and the community health at large (Giuliani, 2006). Globally, an estimated 100–140 million girls and women currently live with the consequences of FGC, most of whom live in 28 African countries (Oloo et al. 2011). Since the 1990s, national and sub-

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national data collection on FGM has taken place in more than 20 countries through the Demographic and Health Surveys (Toubia, 1994). The first historical reference to FGC is found in the writing of Herodotus, who reported its existence in ancient Egypt in the 5th century B.C. He was of the opinion that the custom had originated in Ethiopia or Egypt as it was being performed by Ethiopians as well as Phoenicians and Hittites. A Greek papyrus in the British Museum dated 163 B.C. also mentioned circumcisions performed on girls at the age when their parents received their dowries. Female circumcision was practiced as well by early Romans and Arabs (Lightfoot-Klein, 1991). As recently as the 1950s, physicians in the United Kingdom and the United States also performed FGC to "treat" hysteria, lesbianism, masturbation, and other so called "female deviations" (Rahman & Toubia, 2000).

The practice of FGC is derived from varied and complex belief systems and rituals surrounding women's fertility and control of their sexuality in traditional patriarchal societies. The reasons given by communities that practices FGC varies widely but a common reason given for the practice is that it reduces the sexual desire among girls and women, promotes virginity and chastity, maintains fidelity among married women, as well as for hygienic and aesthetic reasons (UNICEF, 2013). One of the notable trends in global FGC today is the progressive lowering of the age at which girls undergo the practice. Among communities that practice FGC, the procedure is a highly valued ritual, whose purpose is to mark the transition from childhood to womanhood (Gwako, 1992). In these societies, FGC represents part of the rites of passage or initiation ceremonies intended to impart the skills and information a woman will need to fulfill her duties as a wife and mother.

In the practicing communities in Africa, there are great incentives for families to continue the practice. In communities where it is a tradition, girls and women who do not undergo FGC are stigmatized and discriminated against for non-compliance with traditional norms (Hernlund, 2000). Stigma and discrimination may take the form of not being marriageable, as FGC is considered a prerequisite for marriage in some societies that practice it (WHO, 1992). The 'bride price' (paid either in cash or in kind) is part of the marriage transaction in African societies and is generally paid by the groom's family to the family of the bride. This may not be paid if the bride has not undergone FGC. Moreover, family 'honour' is considered besmirched in such societies if the bride has not undergone FGC (Hosken, 1993).

In communities that believe in ancestral worship, women are instilled with a fear of the unknown through curses and the evocation of ancestral wrath. Uncircumcised women are considered physically dirty and may be barred from such daily activities as cooking and community decision making roles [UNICEF, 2013]. They are considered religiously 'impure' and may not be allowed to undertake certain religious functions. In some communities, unexcised women are viewed as children-even though adult-and are banned from key social functions and deprived access to resources (Hicks, 1993). Another reason why FGC is sustained is because it provides economic incentives for the practitioners who perform the 'cut', both in the traditional and modern sectors. In some FGC-practicing communities, traditional practitioners are given an elevated status, wield considerable power and may resist FGC being stopped (Giuliani, 2006). Girls who undergo FGC are also provided with rewards, including public recognition and celebrations, gifts, the potential for marriage, respect and the ability to participate in social functions as adult women. The rewards may motivate some girls to look forward to undergoing FGC (UN, 2012).

In Kenya, different intervention approaches have been used to persuade practicing communities to abandon FGC (Giuliani, 2006). These include interventions using a health risk approach and addressing health complications of FGC; approaches addressing FGC as a harmful traditional practice; educating traditional circumcisers and offering alternative source of income; approach using alternative rite of passage; Interventions addressing FGC and religion; legal and human rights approach; the intergenerational dialogue approach, promotion of girl's education and empowerment to oppose FGC, and supporting girls escaping from early marriage and FGC (Humprey et al. 2007). According to the Kenya Demographic and Health Surveys (2008/9), the overall prevalence of FGC has been decreasing over the last decade. Twenty seven percent of women had undergone FGC, a decline from 32% in 2003 and 38% in 1998 (GoK, 1998). Older women are more likely to have undergone FGC than younger women, further indicating the prevalence is decreasing. However, the prevalence has remained highest among the Somali (97%), Kisii (96%), Kuria (96%) and the Maasai (93%), relatively low among the Kikuyu, Kamba and Turkana, and rarely practiced among the Luo and Luhya (less than 1%) (PATH, 1999).

In Kenya, the Maasai are a semi-nomadic community located in several districts of central Kenya. They largely dominate Kajiado county comprising of Kajiado Central, Kajiado South and Kajiado North constituencies, where they move around in search of pasture and water for their animals (IRIN. 2005). Traditionally, the Maasai diet consists mainly of cow's milk, maize meal and meat. All of these foods are grown or reared by the Maasai, reducing their need to rely on other communities, which has in turn reduced their exposure to and influence from other cultures (IRIN. 2005). With such an ingrained sense of culture and tradition, it can be very difficult to persuade Maasai people to let go of traditional practices like FGC (Dorkenoo, 1994).

Even educated Maasai men and women, who are aware of the risks FGC poses, practice it for fear of rejection by wider Maasai society (IRIN. 2005). Regardless of how educated she may be or her high social status, an 'uncircumcised' Maasai

woman is considered a girl child and risks isolation from the community, as well as zero-to-nil prospects of finding a spouse within the community (IRIN. 2005). The Maasai FGC ceremony is a large an annual community celebration for all girls who have reached adolescence during the year. During the course of the celebration, groups of girls mostly between the ages of 12 and 14 undergo FGC on the same day by traditional 'circumcisers' (usually experienced elderly women). Until recently, all girls undergo FGC procedure with the same sharp instrument (often a sharpened knife known as an "*ormurunya*"), after which a paste made from cow dung and milk fat is applied to stop bleeding (Ahmadu, 2000).

The type of FGC commonly practiced amongst the Maasai is clitoridectomy, which involves the removal of all or part of the clitoris. After undergoing FGC, the girls go into seclusion during which they are taught community secrets of marriage and their rights and duties as women in Maasai community. They return to society, where they are considered fully grown women, capable of being married (IRIN, 2005). FGC is as such tied into the community's sense of honour (Hicks, 1993). Despite the socio-cultural importance of FGC among the Maasai, several health complications have often been identified. The extent of the complication often depend on the type of operation, the location of the operation whether in rural community or in hospital, the eyesight of the circumcisers and the struggle by the initiate during the operation of the initiate (IRIN. 2005).

The most immediate complications include pain from lack of anaesthesia, hemorrhage of major blood vessels, and shock from blood loss and even bleeding to death. Weak urinary retention is often witnessed with initiates due to pain and fear during and after the cut (WHO, 1992). The lower urinary infection can extend upwards to the bladder and kidneys causing devastating effects including renal collapse, septicaemia and even death (Hosken, 1993). In addition, female genital mutilation may cause phobia (fear) of sexual intercourse. For instance, failure or incomplete healing of wounds on the Vagina makes penetration by the sexual partner painful for the female. Additional injury may be sustained on the sex organs during sexual intercourse, especially, if the male partner is aggressive in his approach [WHO, 1992]. This paper examines the socio-cultural factors influencing the practice of FGC in Kajiado Central Sub-County.

2 RESEARCH METHODOLOGY

This paper is an output of a study that was conducted in Kajiado Central Sub-County in the year 2012. The entire Kajiado County has a population of 687,312 inhabitants and an area size of 21, 292.7 km^2. Kajiado County as a whole is largely occupied by the Maasai community. Kajiado Central Sub-County consists of fourteen wards and a population size of 48,800 inhabitants. It is one of the three sub-counties of Kajiado County that share common borders with Nairobi County, Machakos County and Kiambu County. The Maasai community is known both locally and internationally because of its conservative lifestyle including their ingrained tradition and culture (Arhem, 2003). The focus on Kajiado Central Sub-County was based on the fact that it is largely dominated by the Maasai community (up to 95 %) and the Sub-County has experience violent protest by pro-FGC campaigners against government officers and the local populace who oppose the practice. The pro-FGC advocates have been women drawn from various wards in the Sub-County. The research on which this paper was drawn adopted across sectional research design that employs qualitative and quantitative methods of research. Four out of fourteen wards were sampled for the study and a sample size of 200 respondents used to solicit data needed in the study. The respondents comprised of traditional circumcisers, *manyatta* elders, traditional religious leaders, public health officers, administrative officers from the sampled wards and sampled men and women with at least five children in the study area and have underwent through the 'cut'. Data was collected by means of semi-structured interviews and focus group discussions with the respondents. The paper significantly revolves around the socio-cultural factors influencing the practice of FGC in Kajiado Central Sub-County in Kenya. This is vital in understanding how best such factors can be addressed in order to eradicate the 'cut' and its consequences to both, to the mothers as well as the young girls who are often subjected to it against their will.

3 FINDINGS AND DISCUSSIONS

3.1 SOCIO-CULTURAL FACTORS REINFORCING THE PRACTICE OF FGC AMONG THE MAASAI COMMUNITY

The researcher sought to find out the socio-cultural factors influencing the practice of FGC among girls and women among the Maasai community in Kajiado Central Sub-County. The findings were as reflected in Table 1.0.

Table 1: Socio-Cultural Reasons for Practicing Female Genital Cut (S=200)

Reason		Disagree	Agree	Total
		Percentage	Percentage	Percentage
a)	Enhances marriage ability	28	72	100
b)	A rite of passage to adulthood	40	60	100
c)	Traditional demand	19	81	100
d)	Enhances easy child birth	40	60	100
e)	Reduces promiscuity	29	71	100

It is apparent from the findings that the socio-cultural factors reinforcing the practice of FGC largely relates to traditional demand, rite of passage to adulthood, enhancing marriage-ability among girls, reducing promiscuity and enhancing easy child birth among women. The findings indicated that 81 percent of all respondents agreed that FGC must be practiced because it was adopted from the ancestors, while 71% of the respondents agreed that it reduces promiscuity among girls and women. In addition, 60 percent of the respondents stated that the practice is a rite of passage to adulthood and must be done while 72% agreed that it enhances marriage ability among girls who undergo the cut. Finally, 60% of all the respondents agreed that FGC is paramount as it enhances easy child birth among women.

3.1.1 TRADITIONAL REQUIREMENT/DEMAND

The study found that the majority (81%) of the respondents said that the practice of FGC is reinforced by the traditional demand of the Maasai community. The findings showed that FGC serves as a solemn mark of identity and unity among the Maasai community. As argued by the respondents, the community identify themselves as belonging to a group whose approval as a member is confirmed through FGC (for women) and male circumcision as well. Consequently, they maintained that the practice must always be maintained. One of the female respondents during focused group discussions narrated that:

> Female circumcision is our culture. Why should we be forced to abandon it when we were born into it? Abandoning our culture would be annoying our ancestors. It would bring a curse to the entire community.

It was thus evident that the practice is considered a treasure handed down from one generation to the other and confirms identity in the society. Among the Maasai community, those who resist the practice are often considered rebels and traitors whose lives are often cursed. The community held that various occurrences such as disabilities, deaths at birth, skin diseases, lightning strikes, death during cattle raids and barrenness are consequences of abandoning of societal culture and traditions. For instance, deaths at birth can occur if a woman is not circumcised since the ancestors and guardian spirit (as held by the community) is angry at the mother. As another study confirms, FGC is a hallmark of social-cultural identity that solidifies one's sense of belonging to the Maasai society (Gwako, 1992). Besides, a study conducted by Hernlund (2000) confirmed that in Gambia, respect for what was found from the grandparents was the most strongly and commonly stated reason for performing FGC and thus, must be upheld and respected by all people in the society (Rahman & Toubia, 2000).

3.1.2 CURBING PROMISCUITY AMONG WOMEN AND GIRLS

The study established that 71 percent of the respondents practiced FGC as it helps to control female sexual urge. Most of the respondents who were intending to circumcise their girls at the time the research was being done argued that controlling their sexual desire was paramount if promiscuity in the community was to be curbed. Both men and women argued that uncircumcised girls and women are always promiscuous and stand a great risk of contracting sexually transmitted infections. One of the male respondents said that:

> It is now a common knowledge in our country that communities who don't circumcise including our immediate neighbors have lost their loved ones to HIV/AIDS. Their girls are on sex spree like vehicles without breaks! We can only control such a behavior by cutting our girls at early teens.

Dignity and honor in Maasai community largely depends on the moral standards of both men and women. Uncircumcised women are greatly despised, disrespected and considered very dirty. The Maasai men argued that removal of clitoris manages women sexual excitability and thus become 'controllable' in marriage. This was a view largely held by women as well. For instance, one female respondent argued that:

> That thing (clitoris) contains bad blood that constantly disturbs women and makes them sexually uncontrollable. Cutting it off is the only way to get rid of the bad blood and manage their sexual desire. HIV/AIDS can never be heard of if women and girls were all circumcised.

It is evident from such sentiments that according to the Maasai community, women who are not circumcised are always sexually loose and are very vulnerable to sexually transmitted diseases. In addition, their dignity and honor in their homes and in the community is enhanced if they are circumcised as promiscuity is argued to be very minimal. This finding was in tandem with Michelle's (2000) finding in Guinea Bissau, where from her research, she found out that FGC was considered beneficial as it calm women and makes them more faithful to their husbands (Rahman & Toubia, 2000).

3.1.3 FEMALE GENITAL CUT AS A RITE OF PASSAGE TO ADULTHOOD

The findings of the research revealed that the community considered FGC as a rite of passage to adulthood, as agreed to by 60 percent of all the respondents in the study. The findings further revealed that the Maasai community has a cultural belief that uncircumcised women are ever young girls who can never 'grow up'. When the researcher probed one of the female respondents, she quipped:

> The Maasai celebrates FGC since community secrets regarding the institution of marriage are passed on to the circumcised girls. Good behavior and responsibility in marriage are passed on and thus reduces failures of responsibilities among women. Which 'moran' among our community would like to marry an uncircumcised girl who knows nothing regarding such community secrets and roles in marriage?

Among the Maasai community, initiation is an avenue through which community acceptable societal norms and values are taught to the initiates. Initiation thus moves a girl to a new social world considered by the community as a mature and responsible adult. Grown up girls who have not undergone the 'cut' are thus considered as 'children' who cannot be entrusted with any social responsibility such as decision making, cooking for the elderly, sitting with elderly mothers and advising other siblings.

Owing to the fact that girls of the same age often undergo the 'cut' and falls to the same age-set and naming among the Maasai, it is often enough reason for most girls to get circumcised even without the knowledge of the parents. Such often happens whenever a girl is 'left behind' by her age-mates. Overgrown girls who have not been circumcised among the Maasai never find a marriage mate since they are always considered as children regardless of their age.

During the Focused Group Discussion, one of the key informants argued that during the pre-initiation, the initiates are progressively introduced by their instructor to the kind of life and tasks expected of them as adult, mature and responsible Maasai women. During the healing time after the cut, the initiates are often taught how to properly behave in the community. This include; being diligent, attentive to the husband, helpful to the in-laws, and how to control their sexual life. Moreover, the initiates are taught how to dress-up and sit well as a dignified Maasai woman. It was apparent that those girls who have never undergone through the 'cut' are ever regarded as children in the community regardless of their great academic achievements in the community.

3.1.4 PROMOTION OF MARRIAGEABILITY TO THE INITIATES

The findings indicated that 72 percent of all the respondents agreed that FGC enhances marriage-ability of the initiate as they are considered mature enough to be wives. The Maasai community often considered a circumcised girl as an adult qualified by the rite of FGC to find a marriage partner. The uncircumcised girls therefore, never find husbands, and their fathers can never get the bride price unless they are married to another community. In relation to marriage-ability, one of the female respondents narrated that:

> ….Good behavior and responsibility in marriage are passed on and thus reduces failure of responsibilities among women. Which 'moran' among our community would like to marry an uncircumcised girl who knows nothing regarding such community secrets……?

It was apparent that Maasai *morans* would only go for a circumcised girl since it is a taboo to marry a 'child'. Female Genital Cut is thus an approval of time when a girl is considered prepared to start their own families among the Maasai. Marriage-ability among the Maasai is achieved once a girl has been circumcised and thus, be able to bring the bride price to the girl's parents. It approves the start of a family by young Maasai man (*moran*) and the circumcised girl, failure to which it shall be considered as sexual impurity, punishable by curse from the elders as it is a taboo.

3.1.5 CHILD BIRTH ENHANCED EASY CHILD BIRTH

It was evident from the research findings that 60 percent of all the respondents believed that FGC enhances easy child birth among the Maasai. The study established that various occurrences such as disabilities, deaths at birth, skin diseases, lightning strikes, death during cattle raids and barrenness are believed to result from abandonment of societal culture and traditions. For instance, deaths at birth can occur if a woman is not circumcised since the guardian spirit is angry at the mother. Circumcised women are believed to easily give birth because, through circumcision, they not only appease the ancestors and the guardian spirit through the blood they shed, but also have their birth canal prepared for birth. One traditional religious leaders (*Loonkidongi)* during the interviews narrated that:

> 'Blessed be Enkai …… Enkai value true Maasai who abide by our customs and tradition. He however, curses the rebels and traitors by bringing death to the community. He can send the red cock (lightning), to strike individuals who rebel, or death among the morans during cattle raids or death of the mother or child if she refuses the cut…..'

From the above evidence, the process of child birth among the Maasai is largely linked to community belief that easy child birth is brought about by the extent at which the community is loyal to their culture including FGC and the preparedness of the mother's birth canal at birth (whether circumcised or uncircumcised).

4 CONCLUSION AND RECOMMENDATIONS

From the foregoing discussions, it is evident that even though practicing FGC is considered outdated and criminalized in Kenya, the practice is still prevalent in Kajiado Central Sub-County. The study found out that the practice of Female Genital Cut among the Maasai community in Kenya is greatly influenced by socio-cultural factors upheld by the community. The research revealed that the view that FGC enhanced marriageability; it is a rite of passage to adulthood; it is a traditional demand; enhances easy child birth; and reduces promiscuity among girls and women in the society, influences the practice to continue. Based on the findings of the study, this paper recommends that efforts to eliminate FGC should focus on the custodians of culture among the Maasai community. This will create an opportunity for change agents to device appropriate strategies to curb the practice in the Maasai community. The devised strategies will inform various Anti-FGC interventions not only in the Maasai community, but also among other practicing communities in Kenya at large.

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Disjoint Path Algorithm for Load Balancing in MPLS network

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ABSTRACT: In this paper a new path computing algorithm named as Disjoint Path Algorithm (DPA) to ensure the efficient load balancing in MPLS networks to minimize the congestion and prominent use of network resources to support the traffic engineering feature of MPLS (MPLS-TE). This algorithm finds the alternate path called as Disjoint Path (DP), for selected flow sharing no common path to other flow paths. Then routing of flow via Disjoint Path is done by using the explicit path routing technology of MPLS network. Network Simulator (NS2) is used as simulator tool for analysis of the performance of algorithm. Simulation results shows that DPA effectively balances the load between the links in the network to improve the real time traffic service quality by lowering end to end delay, packet arrival time and packet drop rate and increasing throughput while reducing the congestion and improving the network utilization.

KEYWORDS: Disjoint Path Algorithm (DPA), Multiple Protocol Label Switching (MPLS), Traffic Engineering (TE), load balancing, Shortest Path First (SPF).

INTRODUCTION

Tremendous increase in rate of internet usage has led to the increasing importance of internet traffic control function and network management. Existing network infrastructure and its capacity does not satisfy all the needs of internet traffic. Thus adding bandwidth is not the solution to solve the problem of congestion as it will deliver poor returns on the investment because of unpredictable behaviour of today's telecommunication market. Congestion occurs when the resources are insufficient to carry all the traffic and when resource are routed inefficiently via available resource so that the part of network is over-utilized while another part is under-utilize. Thus this unbalanced distribution of network traffic is the primary cause for network congestion. Thus for improvement in performance, both at traffic level and resource level, minimization of congestion is crucial [1].

TRAFFIC ENGINEERING

To support resource oriented performance objective such as efficient resource utilization and resource management, Traffic Engineering (TE) came into existence. TE aims to optimize the network performance and its utilization by efficiently routing the traffic over the network. Typical feature of TE is load balancing which is to distribute the load more evenly over the network so as to ensure some links are not heavily loaded while others are lightly loaded. Thus the traffic stream from congested network is routed over alternate path available in the network to avoid the congestion.

Routing by conventional IP routing algorithm such as Open Shortest Path First (OSPF), Routing Information Protocol (RIP) and Intermediate System- Intermediate System (IS-IS) does not provide sufficient capabilities to serve different traffic properly and congestion avoidance in the network. Routing decision made by these protocols via shortest path is based on destination address only, without taking the traffic characteristics and bandwidth constraint into consideration. Thus the best path calculated by these protocols can become congested at peak times leaving other segments over alternate paths under-utilized. So TE came into existence to address this problem [2].

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MPLS TRAFFIC ENGINEERING

Many current strategies incorporating TE such as constraint based routing [4], IP-over-ATM [3] and many more are in practise but Multi-Protocol Label Switching –Traffic Engineering (MPLS-TE) is a flexible technology enables effective routing and overrides other technologies. Thus due to its strong technical support for implementation of QoS, MPLS is prominently used for TE. Explicit routing technology of MPLS is extensively used as it enables much greater control over the traffic to be routed in the network which in turn used to balance the load much effectively.

Concept of load balancing is important asset of MPLS-TE as it focuses on minimises the maximum link utilization by mapping the traffic on multiple parallel or alternate path rather than shortest path to reduce the localisation of load on it potentially causing congestion. Many load balancing algorithms have been proposed to support MPLS-TE [6]. In his paper we proposed Disjoint Path Algorithm (DPA) for load balancing in MPLS-TE and compared its performance efficiency over Shortest Path Algorithm (SPF).

DISJOINT PATH ALGORITHM

Adaptive adjustment is necessary to address the highly unpredictable nature of internet traffic. DPA provides network traffic adjustment according to traffic flow requests. Thus enabling congestion control mechanism over the resources.

CONCEPT OF DPA

Assume that there are many flows for Label Switch Path (LSP) in a network, two flows are selected from the congested LSP. Find shortest path for respective flow. Find the common path between these shortest paths. It may include single or consecutive links. Single node among the path id not consider as an common path. If such path exists find alternate path called as Disjoint Path (DP) to route the traffic through this disjoint path using explicit routing technology of MPLS or else route by Shortest Path Algorithm (SPF). If no common path exists between he two traffic flow no algorithm is applied in such case. Congestion is monitored for LSP, if paths are still congested then above procedure is followed again, else stopped. Figure 1 shows the Flow char t of DPA.

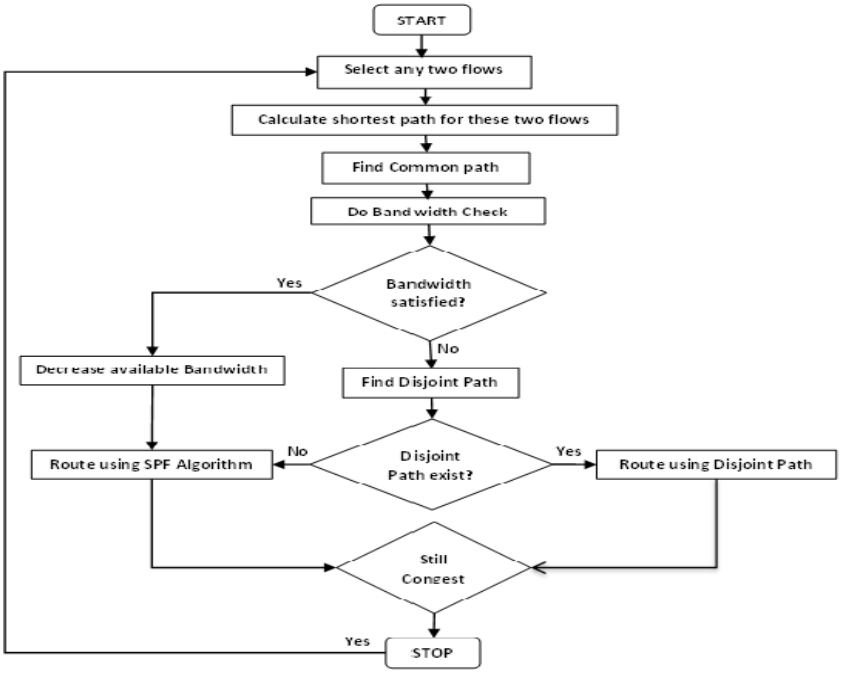

Figure 1: Flow chart for DPA

EXPLANATION WITH EXAMPLE

Consider the IP topology as shown in figure 2, where the circular shape represents IP nodes and all links is having bandwidth of 2Mbps and delay of 10ms. There are two request- request 1 and request 2 from IP(1) to IP(3) and IP(2) to IP(4) each having bandwidth of 1.5Mbps respectively.

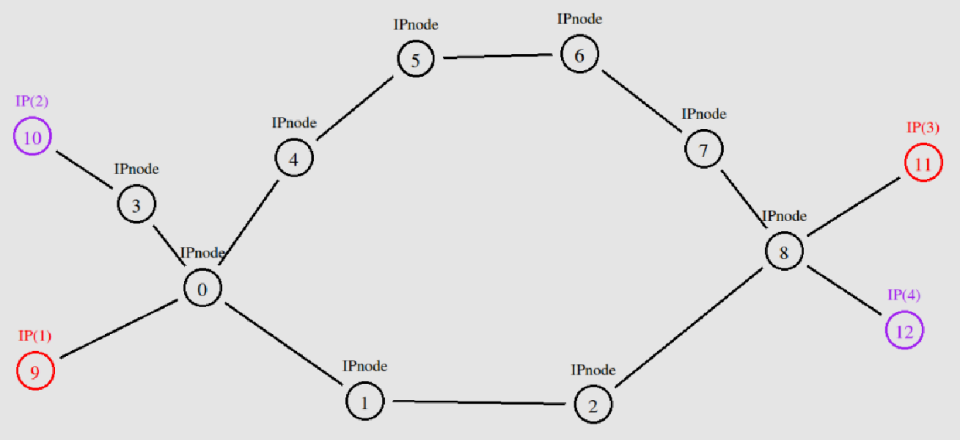

Figure 1: IP Network Topology

In conventional IP routing, flow 1 corresponding to request 1- will follow the route 9-0-1-2-8-11 and flow 2 corresponding to request 2- will follow the route 10-3-0-1-2-8-12, by Shortest Path Algorithm leading to congestion in common path 0-1-2-8 as the capacity requirement of two flows is 3Mbps while the links are of bandwidth 2Mbps each(0-1, 1-2, 2-8). As a result buffer at node 0 will overflow dropping the packets from tail at node 0 as shown in figure 4.

Now consider MPLS network where backbone domain is MPLS to which IP network is connected, as shown in figure 3. Here to distinguish from traditional IP network MPLS nodes ate represented in Square shape. Each MPLS node is deployed Label Switched Router (LSR) having all other consideration same as IP network.

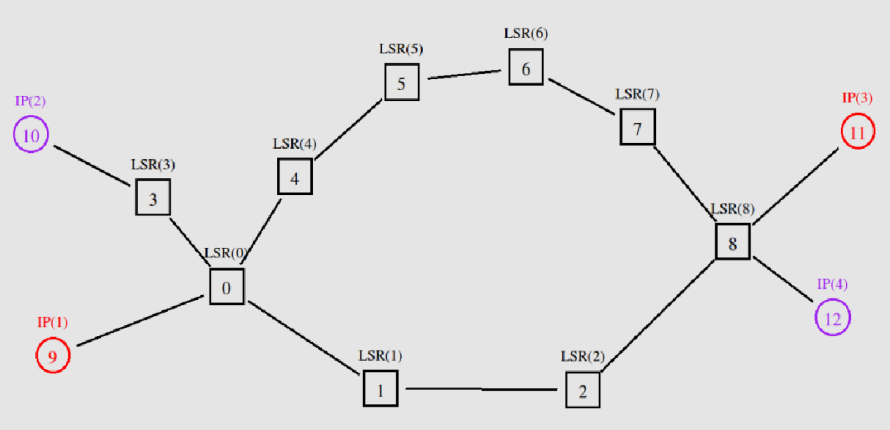

Figure 3: MPLS Network Topology

Now we apply DPA, which makes use of explicit routing technology of MPLS network to avoid congestion. DPA is applies only in MPLS domain. In DPA first we will calculate the shortest path for two requests i.e. for request 1 it is 9-0-1-2-8-11 and for request 2 it is 10-3-0-1-2-3-8-12. Considering node as distance metric, it is clear from the path that shortest path for flow 1 is shorter than that of shortest path for flow 2.Thus calculating Disjoint Path for request 2 will be more advantageous than for request 1.hecne DPA will find disjoint pat for request 2 which is - 10-3-0-4-5-6-7-8-12. Though this path is somewhat longer than the shortest path for request 2, it is more reliable than shortest path avoiding congestion as shown in figure 5.

thus by using explicit routing of MPLS network flow 2 is routed along the path 10-3-0-4-5-6-7-8-12 avoiding congestion and increasing overall performance of network.

SIMULATION RESULT

An open source network simulator (NS-2.34) is used for simulation. Figure 2 and figure 3 shows the network topologies for simulation. Graphs are drawn showing the effectiveness of DPA over SPF from the trace file generated using simulator. Characteristics of flow 1 by shortest path are compared with characteristics of flow 1 by DPA. Results for flow 2 can also be compared but results of flow 1 are sufficient to provide the efficiency and feasibility of DPA over SPF.

Figure 4 shows the Packet dropping in SPF routing when traditional IP network is used. At node 0, demand of capacity for forwarding link sharing common path will be 3Mbps (Flow1 -1.5Mps + Flow2-1.5Mbps). But as bandwidth of each link is 2Mbps only, the buffer at node 0 will overflow dropping the packets.

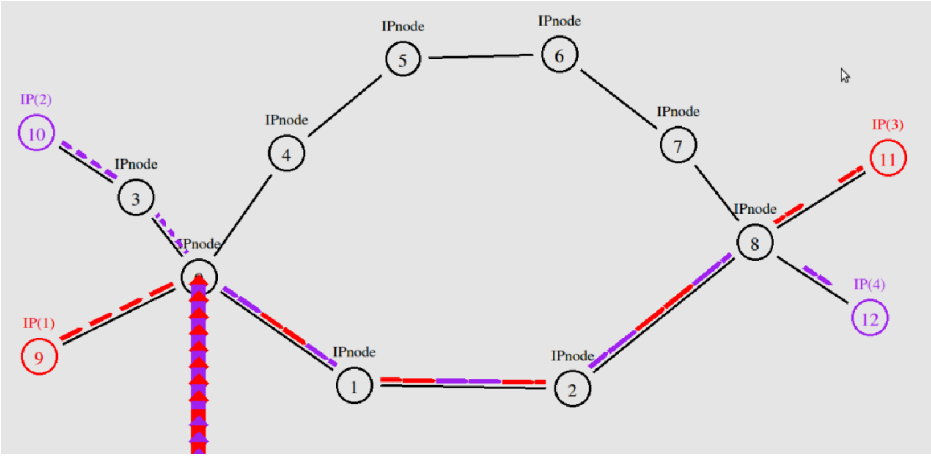

Figure 4: Dropping of Packet in SPF Routing

Figure 5 shows the avoidance of congestion by using DPA in MPLS based network, leading to no packet drop in the network. Figure 6 shows the graph for packet drop rate for DPA and SPF, it is clear from graph that there is no packet drop since we apply DPA.

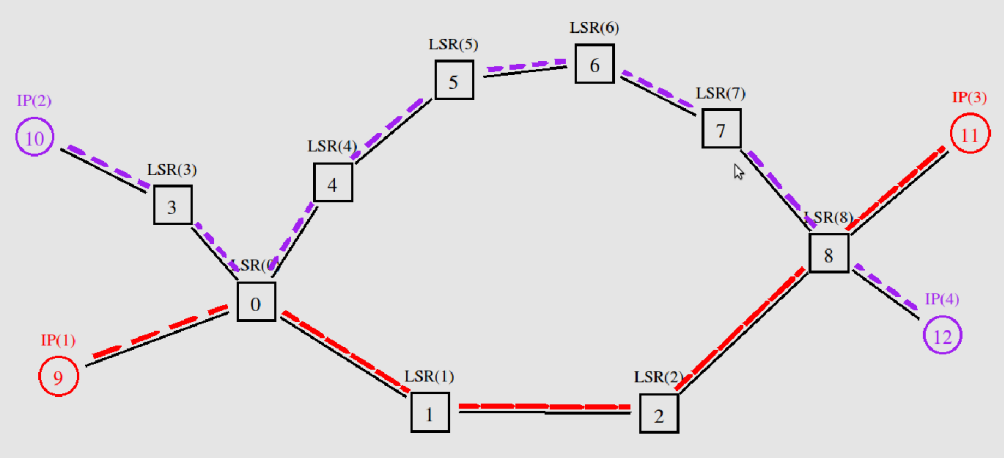

Figure 5: Zero packet drop after application of DPA

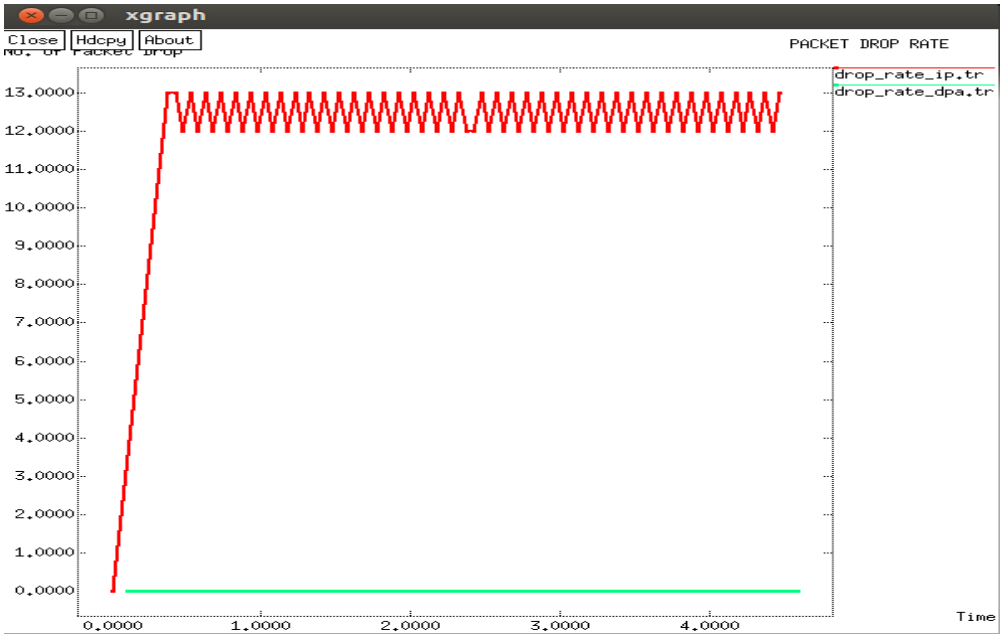

Figure 6: Graph for Packet drop rate

Figure 7 shows the throughput comparison of traditional IP routing using SPF and explicit routing in MPLS using DPA. Throughput is calculated at node 11 i.e. IP (3). Graph shows that there is considerable increase in throughput after applying DPA. SPF throughput is less than DPA as packets are dropped due to congestion.

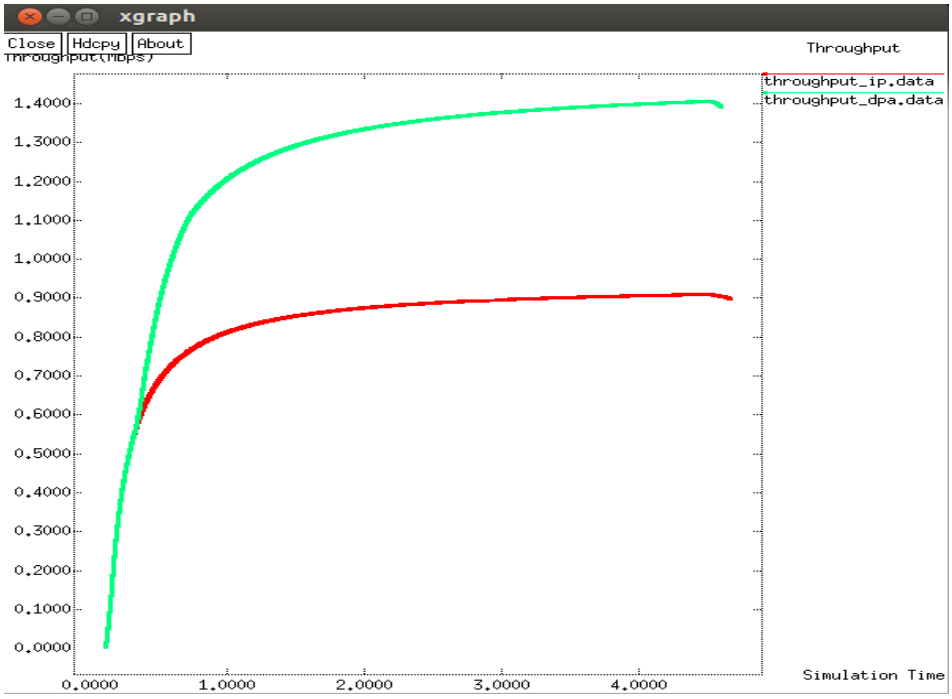

Figure 7: Graph for Throughput

Figure 8 shows end to end packet delay for flow 1.It is clear from the graph that packet delay increases first and after applying DPA it stabilises around 60ms. There is a steady flow as packet arrival time variation is zero leading to constant end to end delay. Thus DPA leads to reduction in end to end delay and data transmission avoiding congestion.

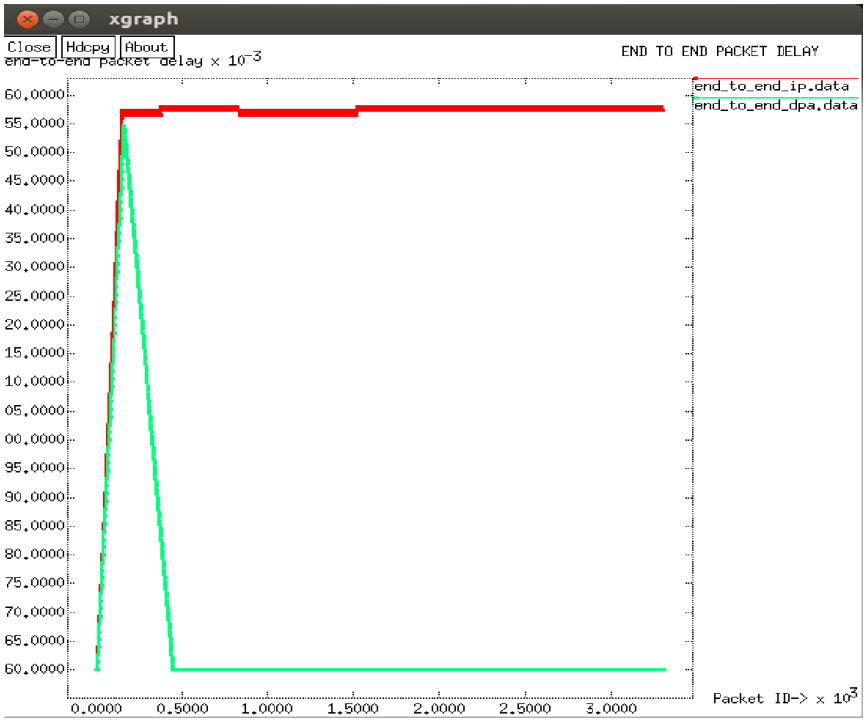

Figure 8: Graph for End-to-End Packet Delay

Table 1 shows the statistical comparison of both the algorithm, which in turn state the delay reduction efficiency and throughput efficiency of DPA is 62% and 33% respectively over SPF. Thus DPA considerably improves network performance and quality of service by reducing end to end delay, packet drop rate and improves throughput

Table 1: Statistical comparison of both Algorithm

Routing Algorithm → / Parameter ↓	Disjoint Path Algorithm	Shortest Path First	Efficiency of DPA (%)
Number of Packet Dropped	0	1048	-
Average End-to-End packet Delay (in ms)	60	157	62
Average Throughput (in Kbps)	1400	910	33

CONCLUSION

In this paper we discuss bottleneck in conventional IP routing algorithms and discuss the importance of traffic engineering. How MPLS effectively support TE. Then we presented the concept of DPA and implemented it in NS2 for simulation of path computational algorithm in MPLS network. From Simulation and results it is clear that he proposed algorithm addresses the shortcoming of currently used SPF algorithm and seeks to balance the load on the network avoiding congestion and better resource utilization improving network performance.

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Croyances des Enseignants sur le Nouveau Programme de Langues Etrangères en Algérie: Une Etude Qualitative

[Teachers' Beliefs about the New Foreign Language Curriculum in Algeria: A Qualitative Study]

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ABSTRACT: Recent political and economic developments in Algeria led to educational reforms. This article reports on a qualitative study that explored the beliefs of French and English teachers on a new curriculum that was introduced in Algeria. The results indicate that there is a mismatch between the teachers' beliefs and the innovation. The study explored the factors that underpinned this incompatibility from a socio-political perspective. As a conclusion, it is argued that the beliefs of the participants had not in fact been challenged before the implementation of the new curriculum. It is suggested that training which encourages reflective practice must be given priority. It is also recommended that policy makers and teachers should strive to promote dialogue in order to improve the education situation in Algeria.

KEYWORDS: Teachers' beliefs, foreign languages, Curriculum innovation, Algeria.

RESUME: Les récents développements politiques et économiques en Algérie ont abouti aux réformes du système éducatif. Cet article nous rend compte d'une étude qualitative qui a exploré les croyances des enseignants de Français et d'Anglais sur l'innovation des programmes en Algérie. Les résultats indiquent qu'il y existe une incompatibilité entre les croyances des enseignants et l'innovation. L'étude met en évidence les facteurs qui favorisent cette incompatibilité d'un point de vue sociopolitique. En conclusion, il est soutenu que les croyances des participants n'avaient pas en fait été contestées avant la mise en œuvre du nouveau programme. Il est suggéré que la formation qui favorise la pratique réflexive doit être traitée en priorité. Il est également recommandé que les responsables politiques ainsi que les enseignants doivent s'efforcer à encourager un dialogue réciproque en vue d'améliorer le système éducatif en Algérie.

MOTS-CLEFS: Croyances de professeurs, Langues étrangères, Innovation pédagogique, Algérie.

1 INTRODUCTION

Après une période d'instabilité politique dans les années 90, un processus de paix et de réconciliation a été lancé au début de l'année 2000 dans l'espoir de rétablir la stabilité dans le pays. Une série de réformes politiques et économiques ont donc été lancé pour répondre aux objectifs qui sous-tendent le processus de réconciliation. Ces réformes comprenaient le secteur de l'éducation, que le gouvernement Algérien considérait comme un élément important dans toute prospérité politique et économique (Toualbi-Thaalibi 2006, Tawil, 2006, Ministère de l'Éducation, 2006). Cette initiative s'est accompagnée d'une série de réunions entre l'Algérie et l'UNESCO, ce qui a conduit à un accord signé le 2 Octobre 2003, dans laquelle l'UNESCO a accepté de financer ces réformes de l'éducation (Tawil, 2006, Ministère de l'Éducation, 2006). Le projet, appelé le Programme d'Appui à la Réforme du Système Educatif Algérien (PARE), a été suivi par une série de réunions et de

conférences entre les responsables Algériens et l'UNESCO pour la période de 2003 et 2006, afin d'évaluer l'avancement de ces réformes et de formuler d'éventuelles orientations futures (Tawil, 2006).

Le gouvernement Algérien a nommé une Commission Nationale pour la Réforme de l'Education (CNRE) en 2000, dont la mission était d'évaluer la situation du système éducatif et de fournir des recommandations sur les réformes nécessaires (Ministère de l'Education, 2006). Le CNRE ont donné leur rapport en 2001. Le rapport a confirmé la nécessité de réformer le système éducatif pour relever les défis du 21e siècle (Tawil, 2006). Le principal problème mis en évidence par le CNRE est une détérioration du système éducatif reflété principalement dans: a) une diminution du nombre d'élèves qui réussissent leurs examens nationaux, b) une augmentation de la proportion d'élèves qui doubles leurs classes, et c) une proportion considérable d'élèves qui abandonnent l'école avant l'âge de 16 (Tawil, 2006). En outre, la commission a soulevé des préoccupations quant à la qualité professionnelle des enseignants (Tawil, 2006). Ainsi, les réformes des programmes scolaires proposées étaient centrées autour de trois plates-formes:

- Plate-forme 1: Réforme de la structure scolaire par: a) l'introduction d'un niveau préscolaire pour les élèves, b) la restructuration de la durée de l'école primaire de 6 à 5 ans, et de l'école moyenne de 3 à 4 ans, et c) la restructuration de l'enseignement post-obligatoire à l'école secondaire (lycée) en trois volets: général, technique et professionnel.
- Plate-forme 2: La réforme de la formation des enseignants par: a) l'amélioration des connaissances et des compétences des enseignants et des inspecteurs, et b) coordonner et évaluer la formation des enseignants et leurs développement.
- Plate-forme 3: La réforme des programmes d'enseignement et des manuels scolaires par: a) l'introduction de nouveaux programmes d'enseignement pour tous les niveaux scolaires, b) fournir de nouvelles ressources pédagogiques, c) l'introduction de nouvelles méthodes pédagogiques pour répondre aux objectifs des programmes, et d) la mise en place de systèmes d'informatique dans les écoles.

À la suite de cela, il y avait une redéfinition des buts et des objectifs du programme d'études au sein d'une philosophie socioconstructiviste de l'éducation. Dans l'enseignement des langues étrangères, par exemple, le socioconstructivisme se reflète dans deux programmes élaborés en 2005 par le Ministère de l'Éducation, respectivement, pour l'enseignement de l'Anglais (Ministère de l'Éducation, 2005a) et du Français (Ministère de l'Éducation, 2005b), qui stipulent que l'enseignement des langues étrangères en Algérie est un moyen de parvenir à la construction des connaissances des sciences et technologies, ainsi que vers la communication interculturelle (Ministère de l'Éducation, 2005a/b). En outre, de nouveaux manuels et de matériels didactiques ont été conçus pour répondre aux objectifs des réformes, ainsi que des programmes de formation des enseignants qui ont été lancés pour permettre aux enseignants de s'adapter au nouveau programme (Toualbi-Thaalibi 2006, Tawil, 2006).

Le gouvernement semblait être optimiste envers ces réformes, même si une première évaluation du projet a révélé que les enseignants, les parents et les élèves n'étaient pas aussi enthousiastes à l'égard de ces réformes (Toualbi-Thaalibi, 2006, Ministère de l'Éducation, 2006). Toutefois, ces études n'ont pas mis en évidence les raisons et les facteurs qui entourent ce manque d'enthousiasme. La présente étude visait à trouver des réponses à ce phénomène éducatif du point de vue des enseignants. Elle a tenté d'explorer les croyances d'un échantillon d'enseignants de Français et d'Anglais concernant les nouveaux programmes. En particulier, l'étude visait à apporter des réponses aux questions suivantes:

a) Quels sont les croyances de l'échantillon des enseignants en ce qui concerne l'innovation des programmes?
b) Quelles conclusions pouvons-nous tirer de cette étude?

2 CADRE THÉORIQUE

Cette étude se fonde dans le domaine de la recherche qui suggère qu'une meilleure compréhension des pratiques des enseignants peut être réalisé par une compréhension des croyances qui sous-tendent ces pratiques (Pajares, 1992; Ballone et Czerniak, 2001; Schmidt et Kennedy, 1990). L'hypothèse sous-jacente est que les décisions des enseignants en classe ne se produisent pas au hasard, mais sont guidés par des systèmes de croyances qui auraient des répercussions importantes sur leurs décisions pédagogiques dans la classe (Farrell et Lim, 2005). Il ya un consensus général que les croyances des enseignants proviennent en partie de leurs expériences personnelles et professionnelles (Richards et Lockhart, 1994), et aussi de leur expériences scolaires en tant qu'apprenants (Farrell et Lim, 2005; Schmidt et Kennedy, 1990). À cet égard, la recherche indique que les croyances des enseignants se répartissent généralement en trois grandes catégories: a) les croyances personnelles, qui sont les croyances des enseignants sur eux-mêmes et sur la façon dont ils devraient être, et qui proviennent de leurs expériences personnelles en tant qu'apprenant (Richards et Lockhart, 1994), b) les croyances sur l'enseignement, l'apprentissage et le programme, qui proviennent de différentes sources, principalement des expériences

personnelle des enseignants en tant qu' apprenants et de leur expériences professionnelles en tant qu'enseignants (Richards et Lockhart, 1994; Calderhead, 1996), et c) les croyances épistémologiques, qui sont étroitement liés aux croyances sur l'apprentissage et l'enseignement (Fives et Buehl, 2005) et qui représentent les croyances sur la nature des connaissances et de la façon dont les connaissances sont acquises (Flores, 2001; Filisetti et Fives, 2003).

En outre, la recherche soutient généralement que les innovations pédagogiques ne réussiraient pas si les objectifs de ces innovations sont incompatibles avec les croyances de ses utilisateurs (Anderson et al, 1991). Matese et al. (2002: 3) postulent que les enseignants voient «l'innovation à travers le prisme de leurs connaissances et croyances». Schmidt et Kennedy (1990) postulent que l'introduction des innovations pédagogiques n'est pas susceptible de modifier sensiblement les pratiques pédagogiques si les enseignants ne comprennent pas ou ne sont pas d'accord avec les objectifs les nouveaux programmes. Par conséquent, Richards et al. (2001) suggèrent que toute modification de programme devrait être mise en parallèle avec une tentative de changer les croyances des enseignants. Ils avertissent que les innovations pédagogiques échouent habituellement quand il ya une incompatibilité entre les idéologies qui sous-tendent l'innovation et les croyances des enseignants. À cet égard, les programmes de préparation et de développement professionnels peuvent jouer un rôle important pour remodeler les convictions des enseignants en fonction des objectifs de l'innovation (Pajares, 1992).

3 MÉTHODE DE RECHERCHE

Cette étude a tenté d'explorer les croyances des enseignants de langues étrangères au sujet des réformes pédagogiques en Algérie. L'étude a été positionné dans le cadre qualitatif, défini comme celui qui «produit des résultats qui ne sont pas fondes sur des procédures statistiques ou autres moyens de quantification ... [et] peuvent se référer à des recherches sur la vie des personnes, des expériences vécues, des comportements, des émotions et des sentiments, ainsi que sur le fonctionnement des organisations, les mouvements sociaux, les phénomènes culturels, et les interactions entre les nations» (Strauss et Corbin, 1998: 10-11). La recherche vise à étudier les enseignants d'un point de vue «émique» (Schwandt, 1998; Ellis, 2006; Mori, 2000), «qui prévoit la compréhension du monde complexe de l'expérience vécue du point de vue de ceux qui la vivent» (Schwandt, 1998: 221) ; en revanche à un point de vue «étique», qui voit la réalité et les individus recherches dans une position objectiviste (Schwandt, 1998). Plus précisément, l'étude a adopté un «paradigme constructiviste» (Guba et Lincoln, 1998; Schwandt, 1998), qui peut être brièvement défini comme «le paradigme où la réalité vécue est généralement construite par les acteurs sociaux» (Schwandt, 1998: 221). Ce paradigme a été utilisé dans des études sur les croyances des enseignants comme dans Gahin et Myhill (2001) et Valdiviezo (2006).

L'échantillon des participants comprenait vingt enseignants qui enseignaient le Français ou l'Anglais comme langues étrangères à différents niveaux scolaires en Algérie. Des entrevues semi-structurées individuelles ont été menées avec huit enseignants et des entrevues de groupe ont eu lieu avec quatre groupes d'enseignants. Les entretiens individuels ont été utilisés dans des recherches sur les croyances des enseignants, comme dans les études de Gahin et Myhill (2001), et Matese et al. (2002). Les entrevues de groupe ont également été utilisés dans des recherches sur les convictions des enseignants dans les études par Standen (2002) et Murphy (2000). Toutes les entrevues ont été réalisées aux domiciles des participants ou dans leurs lieux de travail, et ils étaient tous enregistrées sur bande audio. Dans ce processus, les participants ont tous été attribué un pseudonyme pour des raisons de confidentialité. Le Tableau 1 ci-dessous donne un aperçu des profils des participants et les méthodes de collection de données.

L'étude a utilisé «grounded theory» comme une procédure d'analyse des données et a suivi la procédure comme indiqué dans Strauss et Corbin (1998), et Boulton et Hammersley (1996). La procédure généralement comporte trois étapes consécutives: a) le codage ouvert, ou les données ont été traduits en plusieurs catégories (Boulton et Hammersley, 1996), b) codage théorique (ou axial), qui comprenait le processus de comparaison des catégories émergeant du codage ouvert vers un nouveau niveau d'abstraction ou d'autre catégories principales émerge (Strauss et Corbin, 1998), et c) codage sélectif, qui impliquait une analyse plus approfondie et une analyse abstraite des données vers des catégories d'ordre supérieur (Boulton et Hammersley, 1996).

Enfin, les questions d'éthique et de fiabilité ont été abordées tout au long de l'étude afin d'établir la confiance et la cohérence des résultats (Lincoln et Guba, 1985). En particulier, l'étude mentionnée a largement referee aux «Principes d'Ethique pour la Recherche en Education» (British Educational Research Association - BERA, 2004), mais a également elle a utilisé les stratégies discutées dans Lincoln et Guba (1985), et Boulton et Hammersley (1996).

Tableau 1: Profils des participants et les méthodes de collection des données

Méthode de collection de données	*Participant (pseudonyme)*	*Age*	*Sexe*	*Matière*	*Niveau*	*Années d'expérience*
Entrevue individuel	Jamila	41	Femelle	Français	Primaire	20
	Mohamed	46	Male	Français	Primaire	26
	Salima	47	Femelle	Français	Moyen	22
	Karim	37	Male	Français	Moyen	15
	Zohra	35	Femelle	Anglais	Moyen	12
	Nabila	33	Femelle	Anglais	Moyen	13
	Omar	49	Male	Anglais	Secondaire	26
	Hakim	47	Male	Inspecteur d'Anglais	Moyen	22
Entrevue de groupe	Bassim	38	Male	Anglais	Moyen	16
	Salim	42	Male			20
	Dalila	46	Femelle	Français	Moyen	20
	Wassila	48	Femelle			30
	Latifa	53	Femelle			34
	Ahlam	36	Femelle	Français	Secondaire	14
	Tariq	44	Male			16
	Amin	48	Male			22
	Malika	37	Femelle	Anglais	Secondaire	17
	Samia	33	Femelle			14
	Nabil	45	Male			21
	Rafik	39	Male			16

4 RÉSULTATS

4.1 LE NOUVEAU PROGRAMME

Les participants ont généralement estimé que le nouveau programme était lourd et difficile pour les élèves Algériens, car il ne tient pas compte de leur origine sociale. Ils pensent que le contenu de ce programme ne peut être accessible car il n'est pas approprié pour le niveau social des apprenants. En outre, les participants ont affirmé que le nouveau programme a été parachuté par le ministère sans moindre préavis. Ils ont cru que cela était en ligne avec une politique d'autoritarisme dans le système éducatif. Ils ont affirmé que le nouveau programme n'a pas été préparé en Algérie, mais que les rumeurs disent qu'il à été fait au Canada ou en France. Ils ont également estimé qu'il y avait un manque de directives claire des objectifs du nouveau programme, et qu'ils n'ont pas eu de soutien de la part de leur ministère.

4.2 LA SITUATION ACTUELLE D'ENSEIGNEMENT

Les participants ont estimé que l'enseignement en Algérie s'était détériorée en raison du nouveau programme, d'un manque sévère des ressources pédagogiques et des manuels scolaires, des classes surchargées, des élèves non motivés, et des enseignants qui ont des problèmes personnels et socioprofessionnel. En particulier, ils croyaient que l'enseignement n'était pas aussi agréable que par le passé. Ils croyaient que la profession d'enseignant est devenue difficile en Algérie et que les enseignants avaient développé un manque de motivation à son égard. Cela est dû, selon eux, à une culture autoritaire dans le système éducatif Algérien. Ils croyaient qu'un système autoritaire ne conduirait jamais aux progrès.

4.3 L'APPRENTISSAGE DES ÉTUDIANTS

Les participants ont cru que le niveau des apprenants a détérioré. Ceci est principalement dû à un nouveau programme qui est très chargé. Ils pensaient que ce dernier ne répondait pas aux besoins des élèves, ce qui, selon eux, a conduit à la perte de motivation dans le sens où les élèves étaient devenus passifs.

4.4 L'ÉCOLE

Dans l'ensemble, les participants ont décrit l'école algérienne comme étant comme dans la rue. Nabila, par exemple, a estimé que le rôle effectif de l'école en Algérie était de faire dormir les enfants comme si ils donnent des somnifères, alors qu'elle a estimé que le rôle réel de l'école devrait idéalement être d'ouvrir les yeux des élèves vers le monde. Un autre participant, Omar, a estimé que l'école algérienne, en réalité, avait été influencé par un système politique corrompu, et qu'elle est devenue un moyen d'endoctrinement, plutôt que de l'émancipation et de la liberté intellectuelle.

4.5 LES RESSOURCES PÉDAGOGIQUES

Tous les participants ont estimé qu'il y avait un manque draconien des ressources pédagogiques, ce qui, selon eux, a contribué à la détérioration de l'enseignement des langues étrangères en Algérie. Ils croyaient aussi que le nouveau programme ne convient pas à la situation actuelle, spécialement avec des classes de 40 élèves.

4.6 LES PARENTS

Tous les participants ont estimé que les parents doivent être impliqués dans le processus éducatif de leurs enfants. Ils croyaient que l'éducation ne se limite pas à la salle de classe, mais aussi qu'elle s'étendu aux domiciles des élèves. Ils croyaient que le suivi des parents est très important pour le progrès de leurs enfants. Cependant, ils croyaient que dans la réalité il n'y avait que quelques parents qui étaient intéressée par les progrès de leurs enfants, mais que la plupart d'entre eux s'en foutaient éperdument, et que le plus important pour eux était que leurs enfants vont à l'école.

4.7 L'ADMINISTRATION

Tous les participants ont affirmé qu'il y avait un conflit en Algérie entre, d'une part, une administration autocratique et bureaucratique, et d'autre part, les enseignants. Ils croyaient qu'ils travaillaient dans une culture d'oppression, ce qui avait conduit à l'injustice. Ils ont noté que les enseignants vivaient dans une peur constante de l'administration. Ils croyaient que cet état de choses était la principale cause de la détérioration de l'enseignement en Algérie. Ils ont noté que certains enseignants avaient renoncé à l'enseignement, tandis que d'autres ont choisi de recourir à la grève pour exprimer leurs préoccupations. Les participants ont également expliqué que le ministère ne les a jamais consultés avant que des innovations ont été décidées ou mises en œuvre.

4.8 LE RÔLE DE L'ENSEIGNANT

Les participants ont estimé que le rôle de l'enseignant en premier lieu est de transmettre les connaissances. Ils croyaient aussi que le rôle de l'enseignant était d'éduquer et d'élever leurs enfants afin qu'ils deviennent de bons citoyens. Les participants ont également estimé que les enseignants devraient s'efforcer d'améliorer leurs connaissances en permanence. Ils croyaient que l'apprentissage n'a pas de limites. À cet égard, ils ont cru que les séminaires aideraient à améliorer leur enseignement, mais ils affirment que les séminaires en Algérie sont tous du bla bla, et que généralement les enseignants n'apprennent rien d'important.

5 ANALYSE

Les résultats indiquent généralement qu'il y avait une incompatibilité des croyances des enseignants avec les principes qui sous-tendent l'innovation. Il a été indiqué ci-dessus que les innovations pédagogiques contestaient généralement les convictions des enseignants (Schmidt et Kennedy, 1990; Ballone et Czerniak, 2001), et il a été soutenu que ces innovations ne seraient généralement pas réussies si les objectifs de ces innovations étaient incompatibles avec les croyances des enseignants (Ballone et Czerniak, 2001). Des études comme celles d'Al-Mekhlafi (2004), Karavas-Doukas (1996) et Gahin et Myhill (2001) ont documenté la question de l'incompatibilité des croyances des enseignants avec les innovations pédagogiques et ils ont tous conclu que ce décalage s'est produit parce que les décideurs n'on pas prit en compte les croyances des enseignants lorsqu'ils mettaient en œuvre les innovations. D'autre part, les participants croyaient que la source du problème est relie exclusivement à des facteurs sociopolitiques et institutionnels, qui, selon eux, représentent des obstacles à la bonne mise en œuvre du nouveau programme. Pajares (1993) explique que les enseignants croient souvent que les sources des problèmes qu'ils rencontrent sont externes parce que les enseignants croient généralement qu'ils ont les qualités requises d'un bon enseignant, et que les sources de dégradation de l'éducation sont dues a des facteurs externes, tels que les parents, les élèves, mais surtout leur autorité. Les thèmes suivants ont été identifiés comme des facteurs qui

sous-tendent le phénomène de l'incompatibilité des croyances des enseignants avec le nouveau programme de langues étrangères en Algérie.

5.1 LES PRINCIPES DU NOUVEAU PROGRAMME NE SONT PAS CLAIRS

L'incompatibilité des croyances des participants avec le nouveau programme peut être vue dans l'orientation qu'ils avaient sur l'apprentissage et l'enseignement, qui à son tour peut avoir influencé leur perception du programme d'études. La littérature suggère qu'un décalage se produit généralement si les croyances des enseignants sur les contenus du nouveau programme sont incompatibles avec les principes qui sous-tendent l'innovation (Richards et al, 2001). Les résultats de cette étude indiquent que les croyances des participants étaient incompatibles avec le nouveau programme d'études parce que leurs croyances projetaient une philosophie transmissioniste, alors que l'idéologie qui sous-tend le nouveau programme a été conçue comme socioconstructiviste. La recherche sur les convictions des enseignants indique que les enseignants détiennent généralement des idéologies différentes sur les programmes d'enseignement. Calderhead (1996), par exemple, argumentent que les croyances des enseignants sur les programmes peuvent être mis sous deux catégories: a) un enseignement pour la transmission du savoir, où l'enseignant est le détenteur absolu des connaissances et que son rôle est de transmettre ces connaissances aux apprenants, où le rôle des apprenants est de recevoir les connaissances transmises par l'enseignant, et où le programme est prescrit selon des ensembles de règles prédéterminés, et b) un enseignement socioconstructiviste, où l'enseignant guide les élèves vers l'élaboration d'un savoir socialement construit, où les apprenants négocient leur processus d'apprentissage, et où le programme est basé sur le renforcement du développement des relations sociales guidés par les principes de la négociation de l'apprentissage. Des conclusions similaires avec cette étude ont été signalées dans Richards et al. (2001) sur les croyances des enseignants sur l'apprentissage et l'enseignement de l'Anglais comme langue étrangère, qui ont constaté que bon nombre de leurs répondants avaient des croyances transmissionistes alors que leur programme suivait l'approche communicative. Richards et al ont conclus que les croyances de leurs répondants étaient incompatibles avec les principes de l'enseignement communicatif des langues.

5.2 L'ÉCOLE EST POLITIQUEMENT DOMINÉE ET SOCIALEMENT MARGINALISÉE

Un autre facteur identifié à partir des données était les croyances des participants au sujet de l'école. Les participants ont critiqué l'école Algérienne d'être un lieu d'endoctrinement politique plutôt que d'émancipation. Ils ont également expliqué qu'il y avait un manque flagrant de ressources pédagogiques et que les classes sont surchargées. Brint (1998) explique que les écoles dans la plupart des pays en voie de développement ont généralement hérité un système traditionnel de leurs anciennes puissances coloniales, ce qui, par conséquent, a conduit à leur déclin et a leur inefficacité à répondre aux besoins et exigences de leurs sociétés.

Une autre cause qui semble ajouter au déclin de l'école Algérienne, selon les participants, est l'absence de communication entre l'école et les parents. Les participants semblaient croire que l'innovation pédagogique en Algérie ne peut pas réussir sans une participation active des parents d'élèves. En effet, la recherche suggère que l'implication des parents dans l'éducation de leurs enfants est essentielle et que cela augmente la performance et la réussite des enfants dans toutes les étapes de leur cheminement scolaire (Tableman, 2004). Du point de vue politique, il a été note que l'implication des parents dans les écoles peut aussi donner aux parents la possibilité de participer à la prise de décision (Pennell et West, 2007). En l'absence de ces facteurs, les participants estiment que le nouveau programme ne convenait pas au contexte actuel.

5.3 LES INTENTIONS DU NOUVEAU PROGRAMME SONT MAL DÉFINIES

Un autre thème que les résultats indiquent est qu'une partie des croyances des participants sur le nouveau programme était négatives parce qu'ils estimaient qu'il n'a pas été conçu en Algérie et qu'il n'était pas approprié au contexte socioculturel de leurs élèves. Ils ont également affirmé qu'ils n'avaient pas pris part à la prise de décision et à la conception du nouveau programme. Ces croyances semblent refléter une conscience implicite anti-hégémonique qu'un programme importé pourrait représenter une violation de l'identité nationale de leurs élèves. Des résultats similaires ont été documentés par Albirini (2006), qui a étudié l'effet de la technologie comme une innovation sur les convictions des enseignants en Syrie. Il a constaté que l'importation de l'innovation pédagogique dans les pays arabes sans tenir compte de la culture de ses utilisateurs se traduit par une incompatibilité entre l'innovation et les croyances de ses utilisateurs, et aboutit généralement à la résistance et même au conflit.

5.4 LES ENSEIGNANTS SONT SOUS-EVALUES ET MARGINALISES

Les participants ont estimé qu'ils n'étaient pas reconnus comme des professionnels. Une des raisons de cet état de choses est, selon eux, la nature autocratique de leur tutelle. En fait, les experts politiques et éducatifs soutiennent que le système éducatif Algérien est généralement caractérisé par une culture bureaucratique hérité de la période coloniale (Bouakba, 2006). Cet état de choses semble avoir miné le travail des enseignants et a créé en eux un sentiment d'être sous-évalué et impuissant. Kelly (1999) met en garde contre toute pratique de l'éducation ou les pratiques étaient fondées sur l'obéissance et l'autorité car cela engendre des conséquences néfastes pour le travail des professeurs et de l'éducation.

6 CONCLUSIONS

Les conclusions que nous pouvons tirer de l'étude est que les croyances des enseignants n'ont pas été fortement contesté avant la mise en œuvre des reformes pédagogiques en Algérie. À cet égard, les conséquences que nous pouvons tirer peuvent être résumée dans la priorité d'organiser des stages de formation et de développement où les enseignants, ainsi que les décideurs politiques, peuvent participer afin qu'ils puissent évaluer leurs systèmes de croyances. On considère généralement que la pratique réflexive peut jouer un rôle dans le remodelage croyances des enseignants (Schmidt et Kennedy, 1990; Richards et al, 2001; Ballone et Czerniak, 2001). Certaines stratégies qui favorisent la réflexion pourrait inclure des discussions, où les opinions et les expériences sont partagées, les problèmes sont discutés et les décisions sont négociées (Ballone et Czerniak, 2001). Cela pourrait conduire à la création éventuelle d'une «culture de collaboration» dans le système éducatif en Algérie.

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POLITICAL VIOLENCE IN NIGERIA ASSEMBLIES: A CASE STUDY OF CRISIS IN THE NATIONAL ASSEMBLY

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ABSTRACT: This research work is aimed at determining the nature, scope and reasons for increase in the frequency and the scale of political violence in Nigeria. It will adopt the use of past records of political violence in Nigeria using journals, newspapers, textbooks on political science and some internet materials on the case study. The research work therefore identifies poverty, a culture of impunity, weak penalties, a lack of effective governance, and small arms proliferation, amongst others as reasons for political thuggery in Nigeria. Furthermore, the influence of godfatherism in Nigeria politics further entrenched the culture of violence within the political space. Also, political violence is an expression of systemic and leadership failure in Nigeria, it shows weakness of the apparatus of the state particularly the police, state security service and national intelligence system. The research work also looks at the effects of instability and violence in Nigeria society, it's recommended and proffers a number of solutions ranging from sustainable development, security sector and electoral reforms, and anti – corruption measures.

KEYWORDS: violence, war, godfatherism, thuggery, assemblies, crisis, elections, sustainable development.

BACKGROUND TO THE STUDY

Violence is a common means used by people and governments around the world to achieve political goals. Many groups and individuals believe that their political systems will never respond to their political demands without applying violence. As a result they believe that violence is not only justified but also necessary in order to achieve their political objectives. By the same token, many governments around the world believe they need to use violence in order to intimidate their populace into acquiescence. At other times, governments use force in order to defend their country from outside invasion or other threats of force. Political violence is used by citizens, groups, or governments in different contexts:

- Animal right violence and domestic terrorism – by the Americans for medical progress, who oppose the destructive actions of some animal rights activists.
- No compromise animal liberation front and more exhort animal rights activists to use any means possible to achieve their political goals.

Another context of political violence occurs when the military or some other organized group seize control of the government in their country. Coups d'etat happen frequently in some countries, and they may involve much bloodshed but sometimes occur without serious injuries or loss of life. Political violence is a common phenomenon in Nigeria. It is a deliberate use of force to achieve specific political objectives. Obviously, political violence is encouraged by internal and external contradictions in the nation's political system. A range of political crisis is triggered off by political differences of the ruling elite.

The fact that politics deal with power acquisition and allocation of resources, the instinct and urge for political violence become inescapable reality in social engineering; although, violence in Nigerian politics sometimes seem to possess liberating and redemptive value; corruption, poverty, and high rate of illiteracy promote the culture of political violence in Nigeria.

The influence of godfatherism in Nigerian politics further entrenched the culture of violence within the political space. Of course, political violence is an expression of systemic and leadership failure in Nigeria. It shows weaknesses of the apparatus of the state particularly the police, state security service and the national intelligence system. The persistence of political crisis symphonizes ugly trends in the political development of the nation. Consequently, political violence could arise from wide spread frustration in the polity. In some instances, violence erupts in politics as a manifestation of high joblessness of people particularly the youths. Also, money politics has corrosive effects on the political system. Sadly, electoral violence is a major threat to the democratic ethos in Nigeria. Indeed, poor democratic ethos of those seeking public offices for self enrichment encourages electoral violence.

The use of weapons, arms and ammunition are increasingly associated with electoral violence. At every stage of the electoral process, politicians employ the services of touts to intimidate the opponents and the opposing parties. The quality of their weapons changes with time and sooner than later these thugs become the politicians' special squad or private army. The experience reveals that political violence could be perpetrated to disrupt the selection of candidate for an election. And, violence could be committed in the course of campaign, political rallies and during elections. Physical assault, molestation of opponents and other forms of harassments are common features of the electoral violence in Nigeria.

The scale, trend and patterns of violence vary across societies and periods. The prevalence of political violence both locally and internationally has manifested a lot of devastation in human civilization. The acts of violence have in no small measure debilitated advancement in developing countries. Even in the most advanced countries, the phenomenon of violence has continued to be a reoccurring saga and thus possesses a need for collaborative efforts in combating its dangers. Political violence has consequently affected the behavioural patterns of various political groups and social adherents. The consequences of violence therefore have continually drawn the attention of various governments, voluntary agencies, religious organizations and the academia towards controlling the spectre of its persistence.

REVIEW OF RELATED LITERATURE

The literature review for this study will be done under the following subheading: (a) overview of the concept of violence in Nigeria, (b) nature and sources of violence in human beings, (c) Features of wars and violence in Nigeria, (d) morality and scales of violence in Nigeria.

OVERVIEW OF THE CONCEPT OF VIOLENCE IN NIGERIA

Politics and violence are like Siamese twins in Nigeria. Political activity has always featured a notable degree of violence, in both the colonial and post colonial phases of the country's chequered existence. According to [2] comment on the place of violence in the colonial social order is apt: the colonial strategy was despotic. Inevitably, Nigeria was administered with the most unspeakable cruelties, and with unbounded forces of annihilation which rendered mass murder an administrative technique of the colonial regime. The obvious outcome was that pre-colonial societies were smashed into pieces through raw violence defined in colonial literature as 'punitive expedition', 'patrols' or 'pacification'.

The seeming kinship between political activity and violence has not changed significantly since independence. A retrospective survey of the First Republic (1960 - 1966), for example would show how the social fabric gradually unraveled until the fateful military intervention of 15th January 1966. Again, the threat of possible collapse into complete anarchy triggered the putsch of 31st December 1983, which affectively interred the second republic. Contemporary political violence in Nigeria is different in two ways from what happened in the past and this deserves close scrutiny. The bomb explosions, all apparently directed at military targets, add a new and worrying dimension. This study is of the view that the current wave of political violence springs from political disaffection occasioned by the sudden termination of the democratic transition process, when it was virtually at the point crystallization.

Political violence has taken place throughout the whole country. In the south –western states for example, the coalition received reports of politically motivated attacks, killings, destruction of property, violent clashes between rival political parties, and threats and intimidation of political candidates and supporters. There are several reports of violence perpetrated by gangs hired by different politicians. There have been numerous studies dealing with violence of various dimensions in Nigeria, before and after independence. But nine of these studies had an in – depth study of ethnics in the area of violence. This study is therefore intended to do a more analysis of violence in Nigeria. But as we know, every human action takes place

in a socio – historical context and so we cannot completely avoid the social and historical aspects of violence. However, even when this is done, it is only to provide necessary background for the study of ethnicity aspect of violence in Nigeria. So we will definitely look at the other dimensions, which previous scholars have examined, but our main emphasis will be on the ethical violence in Nigeria.

To further achieve the objectives of our literature review, we shall examine contributions made by scholars on the problem of violence in human societies. We shall pay particular attention to the kind of violence identified in Nigeria and how other writers have assessed the various acts of violence perpetrated in Nigeria morally. This will help us identify the existing gaps in the study of violence and be able to focus adequately on the efforts of filling such gaps.

NATURE AND SOURCES OF VIOLENCE IN HUMAN BEINGS

There are two schools of thought to the concept of the nature and sources of violence in human beings; they are the innate and the external sources. According to Field as quoted by [2] who sees innate violence in human beings in a psychological points of view and stresses that " while violence is most obvious in the form of direct aggression, it can also be manifested through verbal aggression of psychological intimidation reinforced by the threat of more direct action. Again, he opined that aggression is as behaviour intended to hurt someone. This is in line with Sieber's in [21] view that a lot of theorist associated in explaining the sources of violent actions. Cox also expressed his view on violence and summated that aggression is an in born drive similar to sex or hunger which is unavoidable since it is innate. In supporting the action of violence by individual, frustration – aggression hypothesis theorist, Cox further said that aggression as always a consequence of frustration [20].

In consonance to Cox ideas, Stuabs in [21] has also stated that a variety of motives result from threat, attack, the perception of danger and interference with the fulfillment of goals. Self protective personal goals can become so intense that they develop imperative, forceful quality of needs. Aggression is a likely response.

Another school of thought was the psychoanalytic theorists who were of the opinion that violence is a necessity. The key idea to the necessity of violence is repression. Also, Sigmund Freud opined that repression is the pillar on which the whole edifice of psychoanalysis rests. He further enthused that psychoanalytic theory deals with the conflict resulting from the clash between the "pleasure principle" and the "reality principle" meaning that, either by nature or by social organization, man is a neurotic animal. He also stated that no adult is force from conflict and repression. Because of this clash, violence is inextricable rooted into man's nature.

FEATURES OF WARS AND VIOLENCE IN NIGERIA

There are different kinds of violence perpetrated in Nigeria, but we shall consider a few among them which will include politically bred violence religious violence ethno- religious violence, ethnic violence and socio-economic violence.

POLITICAL VIOLENCE IN NIGERIA FROM 1960 – 1979

Nigeria got its independence in 1960. At the peak of this independence, was the regional and tribal bigotry that has characterized the already emergent volatile political terrain. These were politically bred violent activities among Nigerians, which we shall consider. At the time of Nigeria's independence, the country was first composed of three regions; northern region, eastern region and western region. The fourth, which was the mid-west, was created in 1963. In each of the regions, one party was dominant. The northern people congress (NPC) controlled the government of the north, the National council of Nigeria and Cameroons (NCNC) controlled the government of eastern region and subsequently with the mid west after its creation. In the western region the Action Group (AG) was in control. These parties founded their support and influence on regional basis [2].

In 1962, a crisis within the ruling Action Group in Western Nigeria split the party. The leader of the party, Chief Obafemi Awolowo, had vacated his position as regional premier before the Federal elections preceding independence and opted to contest for a seat in the Federal House of Representative. His deputy, Chief Samuel I. Akintola, succeeded him as the premier of western region. The crisis within the party affected the position of the government he controlled in western Nigeria, as the governor there appointed a new premier, Alhaji D.S Adegbenro, who appeared to him to enjoy the confidence of the majority of the members of the House of Assembly.

Akintola who then lost his position as premier, did not accept his removal, and at the ensuing meeting of the House of Assembly, there was confusion and members fought freely among themselves, to the extent that the police were forced to

use teargas to disperse them. The Federal government upon the event in the assembly declared a state of emergency in the whole region and appointed Dr. Moses Majekodunmi as the administrator of the region with full powers. Subsequently, Chief Obafemi Awolowo and some of his top party aides were arrested detained and charge with plotting to overthrow the federal government. They were sentence to imprisonment on charges of treasonable felony [2].

In 1962, Nigeria had conducted a new census. The results were controversial. The eastern region refused to accept them, and was later cancelled. The following year, a new census was organized and the results were unacceptable to the east. The census issue and the crisis, which had rent the Action Group apparently, brought about a realignment of parties. The failure of the census had embittered many, and as the first federal elections since independence were to take place in 1964, the alliance geared themselves to win elections by whatever means. There was an air of despondency and disillusionment, regionalism, tribalism and parochialism of the political leaders, which had made the achievement of true unity questionable. While this was going on, the Tiv in the middle belt revolted against the oppressive government of the Northern People's Congress (NPC) which ruled them as part of Northern Nigeria. They took up arms and refused pay their taxes. Before the independence, the Tiv, Idoma, and their neighbours had demanded a separate state to be known as middle belt state. In the same year, the army was used to quell them and the rebellion dragged on for some time [2]. However, the federal election of 1965 was engulfed in many corrupt practices. The elections were shamelessly rigged and the aftermath was a breakdown of law and order. Members from opposing parties and opinions embarked on a plan of arson, murder, and general defiance of law. The state of lawlessness continued up to 1966.

On the 15th of January 1966, a group of young army officers overthrew the first republic. It seemed clear that it was intended as a radical and nationalist protest against tribalism and corruption of the politician. Their speeches stated thus: our enemies are the political profiteers, swindlers, the men in high and low places that seek bribes and demand 10%, those that seek to keep the country permanently divided so that they can remain in office as ministers and VIP's of waste, the tribalists, the nepotists. In the course of the coup, the plotters kidnapped and killed Tafawa Balewa, the prime minister, and the premiers of northern and western regions. In ensuring the breakdown of governmental authority, the commanding officer of Nigeria Army, General Aguiyi Ironsi, assumed power. One of the main consequences of the January 1966 coup was an inflammation of Nigeria's deep – seated tribalism. The country is divided into three powerful competing groups; the Hausa and Fulani of Northern Nigeria, who are principally Muslims and comprise the largest segment of Nigeria, the Igbo who controlled Eastern Nigeria; and the Yoruba of the western region. The Northerners who believe that Igbo officers were responsible for the January coup in which the prime minister, Abubakar Tafawa Balewa, a northerner was killed, triggered a revolt against the national military government in July 1966. In that uprising, Genaral Ironsi was killed and the government of Nigeria put into the hands of Col. Yakubu Gowon, a northern Christian in September 1966. Northern resentment against the Igbo's flared sharply resulting in the deaths of many Igbo's and their exodus to eastern region. Peaceful demonstration of students concerned about their future and civil servants, escalated into urban mob violence as Igbo's were attacked in Sokoto, Kano, Katsina, Bauchi, and Zaria.

The east, where important petroleum production had begun, grouped itself behind Lt. Col. C.O Ojukwu and sought to withdraw from the federation and establish him a separate country known as Biafra. This marked the beginning of the Nigerian Civil war, which nearly shattered the prospect of a central government in Nigeria. Obasanjo clearly described the situation where he said: The war itself was the culmination of an uneasy peace and stability that had plagued Nigeria from independence. That uneasy peace and stability had their genesis in the geography, history and demography of Nigeria. But the immediate cause of the civil war itself may be identified as the coup and counter- coup of 1966, which altered the political equation and destroyed the fragile trust existing among the major ethnic groups. On the 10th of January, 1970 Ojukwu the Biafra rebel leader announced that he was about to leave Biafra, in order to arranged a negotiated peace. He said that he would be away for a short time, but it was only after twelve years in the exile in Ivory Coast that he was allowed to return to Nigeria. By 12th January, 1970, Col. Philip Effiong, to whom Ojukwu had handed over the care of remaining bits of rebel territory, ordered his men to lay down their arms. At the same time, he broadcast his unconditional surrender to General Yakubu Gowon and appealed to him to halt the federal advance in the name of humanity. So by 15th January, 1970 General Gowon gave a victory message to the nation which finally ended the secession [12pp 134-136]. By this, General Yakubu Gowon consolidated his regime by embarking on reconciliation, rehabilitation, and reconstruction. In 1975, when Gowon was attending a meeting of the organization of African Unity (OAU), he was overthrown in a peaceful coup by General Murtala Ramat Muhammed, who was subsequently assassinated by Col. B.S Dimka in a foiled coup on 13th Feb, 1976. General Olusegun Obasanjo succeeded General Murtala Muhammed and then led the country into civilian rule in 1979. The subsequent years that followed also saw the emergence of politically – bred violence, especially with the beginning of the civilian regime from 1979 – 1983 and the years that followed. We may not go into the details of those violent activities because they were not as serious as was witnessed in the years that preceded the civil war.

RELIGIOUS VIOLENCE IN NIGERIA

[10] has stress that the most classic example of conflict between the followers of prophet Muhammad (PBUH), and of Jesus Christ is in Nigeria. Violent clashes connected ostensibly or actually with religion are not unknown in Nigeria. A series of violent demonstrations, riots, and civil uprising have forcefully made many Nigerians and the governments come face to face with the harsh reality that religion is being systematically manipulated by some forces, for specific purposes which are clearly opposed to the unity of the people of this country [5] from 1980, especially in northern Nigeria, most incidents of collective violence assumed a religious character. This could be seen in the intra and inter – religious violence.

The first intra religious violence was the Maitatsine uprising in Kano city from 18th – 29th December, 1980 which led, according to official figures, to the killing of four thousand on hundred and seventy – seven civilians. Even if the actual; figures of those killed were not higher, this amounts to a massive slaughter of human beings by whatever standards. This was subsequently followed by the Bulunkutu uprising in Maiduguri from 26th -30th October, 1982 which has led to the killing of over four hundred persons, according to newspaper reports. Another riot by Maitatsine adherents is that of Rigasa in Kaduna state on Friday 29th -31st October, 1982, which led to the killing of over forty persons, according to official reports (Nigerian Standard 11th-12th Nov, 1982 pp 13). The Maitatsine disturbance also erupted at Gombe, though it was alleged that it was the Muslim youths under the guise of Maitatsine. Over one hundred lives, including policemen, were killed. This took place from 23rd April to 28th April 1985. Though it cannot be ascertained what actually was the cause of these disturbances, but it was certain that the Maitatsine adherents in Kano condemned some of the main teachings of Islam as lay down by the Quran and Sunnah. The Maitatsine disturbances also occurred in Jimeta – Yola on 15th Feb. – 2nd March 1984.

Other form of violence in Nigeria are intra – religious violence, inter – religious violence, ethno – religious violence, ethnic violence in Nigeria, intra ethnic violence, socio – economic violence and judicial violence etc.

MORALITY AND VIOLENCE IN NIGERIA

The concept of morality deals with prescriptions of what is good or bad. It talks about rules guiding good and bad behaviour.

[12], further opined that morality considers the moral nature of obligations and analyses or the value and good conscience of the individual within the society. Ethnic on the other hand is a branch of philosophy which studies moral principles, and thus it is seen as a discipline like any other subject (geography, economics, and psychology). If ethnics are therefore seen as a branch of philosophy, it must therefore use philosophical inquiry to determine the morality of an action by asking questions and using reflective evaluation. Ethnics further deals with arguing, reasoning, evaluating and seeking position for the justification of any action in a particular environment. It presents fact by finding their meanings order to determine the rightness and goodness of an action.

Ethnics therefore raises questions in order to bring ground for philosophical interpretation of issues, phenomena and action that can be adjudged good or bad, right or wrong. Hastings has further stressed that ethnics gives a training which can enable us to see effects in our actions and other people's conduct, so that we can set things in their right conduct and make profitable suggestions for future occurrence. Is should be noted at this juncture that, ethnics goes beyond the level of religious convictions asking questions and providing reasons for evaluation. When we speak of "ethics of violence in Nigeria ", what do we actually mean? Nigeria is a pluralistic society in religious, ethnic and socio – economic contexts. So the people that make up these pluralities have their thought – patterns, beliefs, convictions, and orientation in Nigeria towards violence. So ethics of violence in Nigeria consider the reasons and arguments of the people that make up this plurality use in justifying and defending the course of their violent actions in Nigeria. Added to above is the justification of violent actions by the state apparatus; the police, army and the security agents in the name maintaining law and order.

Generally, the scale and preponderance of violence in Nigeria ranges from the state – sponsored violence to civil disobedience or riots. Worst of it all is the intra – and inter – religious as well as ethnic clashes that have claimed the lives of innocent citizens of Nigeria. For the intra-religious crisis, especially the Maitatsine, their upsurge was said to be for moral purification and cleansing of the religious of Islam.

THEORETICAL FRAMEWORK

A lot of theories have been advanced by some scholars as the sources of violence which can be seen from external or environmental factors. But we shall consider a few among these theories.

The cultural theorists, propagated by [11] see violence as a symptom of an individual or society under extreme stress. So whether it is a slum boy cornered against a wall or a nation threatened economically, both lash out in violence. In the political theory, Rousseau is of the opinion that "man was born free, but is everywhere in chains". The noble savage was the primitive man unrepressed by culture, education or social conditioning. When this freedom is replaced by repression or restriction, violence has a liberating value. This theory has been developed to justify violence not only as a pragmatically effective weapon, but also as morally valuable. In supporting the above assertion, Sorrel states that

"Violence destruction of decadent society was not just politically revolutionary, but as an expression of the life – force, morally purifying. It is to violence that socialism owes its moral values through which it brings salvation to the modern world".

Fanon, in analyzing settler – native relationship described violence as catharsis – relief of strong suppressed emotions through drama or any artistic device as a way of providing relief from anger, suffering, frustration, depression and so on. He sees colonialism as inextricably bound up with violence that takes shape in three stages.

The first stage is oppression, when foreign invasions, military or economic enter and oppress the people in any country. The second stage is repression, with the colonists too powerful to be overthrown; the natives are forced to turn their natural aggression against themselves. There results a period of chronic tribulation, magic and fratricidal murders and fighting. The natives are unable to fight back against the colonist who takes their aggression to themselves. The third stage is revolution. In this stage of revolution, violence is not only indispensable as a pragmatic tool to overthrow the colonial government, but such violence is cathartic and re- humanizing. The colonized man finds freedom in and through violence. In this regards, violence is seen as a cleansing force. It frees the native from his inferiority complex and from his despair and inactions. It makes him fearless and restores his self – respect. Fanon dreams of the worthless, the prostitutes, and the hopeless dregs of humanity being re – awakened to rediscover them through violence, taking their place to march proudly in a great procession of liberated nations and men.

Source of violence in evolutionary theory according to Morris is based on Charles Darwin's concept of natural selection which appears to justify the value of survival by means of violence, for life was viewed as a continuous free fight. Morris further interpreted human violence in the light of its animal origins, observing that whereas animals only want defeat or domination, man goes on to murder. He gave example on the development of armed conflict with unarmed conflict, where there was no danger of violence, but aggression was conventionalized, channeled into contests, and sports such as judo, athletics, wrestling and boxing. But armed conflict has created the horror of violence which is seen in the extension of hands where clubs, spears, guns, bombs and missiles were used each with greater potentials of destructive force.

The social learning theorists are of the opinion that aggression as a source of violence is learned response and not an inbuilt instinct. Though they acknowledge the presence of psychological mechanisms for violence and rage, they totally dismiss the instinct notion of aggression. They felt that people behave aggressively because they have learned to do so and not because of biological instinct or frustration. They argued that many studies have shown that people's behaviour change after watching displays of acts of aggression and hostility.

Jensen and others have corroborated the Social learning views and opined that learned experience is an important determinant of aggressive behaviour. Children learn that aggression can enable them to control resources such as toys and parental attention. Children also get into aggression by observing others behave aggressively. The violent behaviour of some teenage gangs provides its younger members with aggressive role models. Children whose parents discipline with physical force tend to use physical aggression when interacting with others. The influence of the mass media, especially television, on promoting aggressive behaviour is not yet well understood but a growing body of research evidence indicates that watching violent entertainment is linked to subsequent aggression. The above shows that there are different views concerning the origins and sources of violence in human beings. Despite the fact that there are other sources of violence that are inherent as a result of many factors within one's environment, some of the innate sources as discussed above, are contributory to the individual's violent actions in the society.

DISCUSSION

VIOLENCE IN THE NATIONAL ASSEMBLY SERVICE COMMISSION

The National Assembly is Nigeria's bicameral legislature and the highest elective law – making body of the country. It consists of the 109-member senate and the 360 – member House of Representatives. The term of the National Assembly is 4-years from the date of its first sitting after the general elections. The current 7th National Assembly was inaugurated in 6th June 2011.

The National Assembly Service Commission established year 2000 has continued to consolidate and strengthen the institutional framework and operational standards for the National Assembly Service. In its pursuit for excellence, the commission believes that all efforts to boost staff moral and professional competence should be supported and rewarded. This objective would be achieved with the combined efforts of the commission and the entire staff of the National Assembly Commission.

The commission is the highest policy making body and its decisions are implemented by the management. The chairman and members of the commission are on full time basis. As a result, the commission holds statutory meetings weekly. In addition to this, the commission operates the committee system. There are six committees namely: establishment committee, senior staff committee, junior staff committee, documentation, research and records committee, tender board, and finance and general purpose committee. Each committee is chaired by one of the commissioners while a director serves as the secretary with the exception of finance and general purpose committee where the chairman to the commission presides and the secretary to the commission serves as the secretary.

ADMINISTRATION AND MANAGEMENT

The National Assembly Service Commission has various Departments through which it carries out its obligations namely: Department of appointments, promotions, Discipline and Appeals, Departments of Administration and Supplies, department of finance and accounts, department of planning, research and statistics.

The pervasive role of violence in Nigeria politics has a devastating human rights impact on ordinary Nigerians. As discussed above, thousands of Nigerians have been deprived of their very right to life or have been subjected to physical assaults because of the violent nature of political competition in Nigeria. But casualty estimates, considered alone, actually understate the scale of the human rights impact of political violence in Nigeria. Violence also discourages and prevents political participation and plays a central role in denying ordinary Nigerians a say in choosing their “elected “leaders.

CONCLUSION

The preceding discussions have shown that violence is an ill wind of social phenomenon, which does no one any good. In its aftermaths both its perpetrators and victims are loser. Also, that violence is not native to man but rather a consequence of his fallen nature, his frequent transgressions against the grains of his nature. It is his handiwork, for this reason, solution to that self inflicted problem must come from him. God’s grace shall continue to shelter him but he (man) must work out his own salvation as regards violence.

The antidote to violence in any society is justice. Nigerians should allow justice to rule. In the rule of justice with its assistants – law, fairness, equity, and equality, no one lives in fear of another, no one bears ill – will against another, everyone acts as his brother’s keeper, everyone thinks good of another and everyone’s joys or pains become the joys or pains of all. In such a situation development moves in a light speed and Nigeria will be a place to live for Nigerians to develop their individual and collective endowments to the fullest extent possible and thus attain both self and collective fulfillment. This may look like a dream. But, if it is a dream, it is one bound to come true if selfishness is replaced with altruism, ignorance with knowledge, greed with contentment, injustice with justice, a do – or – die politics with law governed politics, poverty with wealth and every bad thought with good thought and bad action with good action.

An attempt to suggest the way out of Nigeria’s myriad of problem is a Herculean task. It is an attempt undertaken solely in obedience to Sir Winston Churchill’s diction: “The difficulty can be overcome immediately; the impossible takes a little longer”, [19 pp 32] so are Nigerian problems, they are difficult but resolvable; if Nigerians especially their leaders face the task with sincerity of purpose and dedication they call for. First, efforts should start from the source of all that is ugly, immoral, despicable, repressible, soul-sapping, wrong, bad, revolting, wicked, unjust, dehumanizing, depressing, regrettable, etc, in Nigeria which is ignorance. Ignorance is the evil of all evils – the mother and sustainer of all wrongs. Problem of ignorance is hard to solve because the problem solver doubles as the problem creator and hence the problem to be solved. And it is known as a fact that man is hardly a good judge in a matter of his interest is involved. But in this case he has no other choice than to learn to be a good judge on which ever matter that comes his way whether his personal interest is involved or not. Experience has shown that ignorance is darkness and the only thing that can disperse darkness is light, which is also called knowledge. Knowledge is a confirmed antidote to ignorance, for that, should be pursued with religious zeal. The means through which knowledge is acquired is education. Education is a process of training of training the young as well as the old members of society to acquire knowledge and skills. Knowledge of the world they live in, knowledge of themselves, their role in the world, the real meaning, purpose and essence of life. Skills with which to translate what they know into practice for the good of all. No wonder the great philosopher Plato says: “those who are rightly educated generally become

good men" [18 pp 30] and good women too. In another forum Plato hammers that: "No man should bring children into the world, which is unwilling to persevere to the end in their nurture and education [18 pp 6].

So, the purpose of education is to make good men and women out of members of the society; hence moral instructions are necessity. Morally, educated people are assets to the society, propellers of development. This is because they know that the resources of the world are gifts to be share by all, for that reason they remain sensitive to their needs, to others' needs and to the world's needs and work for the realization of all. Only morally educated person is sensitive in these ways. That is why [17 pp 67] says: "An educated person is one who is morally good and properly adapted to his society and who contributes meaningfully to the growth and development of the society". Politics should be ridden of a do –or die syndrome. And lastly morality should be enthroned in all facets of Nigeria's life and strictly observed by leaders and the led, the old and the young and the high and the low in the society.

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Numerical Modelling Means for the Fight against Eutrophication of Lakes: Artificial Destratification and Selective Racking

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ABSTRACT: The object of this work is to test two applications: Artificial destratification and Selective Racking to fight the eutrophication of lake. For this we consider a jet described by the equations of Navier stocks whose resolution is based on the finite difference method. For the first treatment (artificial Destratification), the idea is to consider a rectangular area filled with water, and start the jet from the bottom to the surface. For the second treatment (selective Racking), it considers another rectangular field full of water, but the jet will now be on the left lateral border into the hole located in the right side border.

KEYWORDS: Equations of Nervier stocks, artificial destratification, selective racking, Method of Finished Differences.

1 INTRODUCTION

Eutrophication of lakes is a natural and a very slow process by which water bodies receive a large amount of nutrients (particularly phosphorus and nitrogen), which stimulates the growth of algae and aquatic plants. This process, takes place normally over a period going of several thousands to some dozens of thousand years. However, human activities have accelerated in many lakes by increasing the amount of nutrients that reach them, causing changes in the balance of these aquatic ecosystems [1]. Lakes being more than 3 metres deep possess, in summer a vertical thermic stratification that was provoked by the difference of density between the surface layers heated, whereas the water layers remained cold. The stability of water, blocking the vertical exchange within the water column, causes a depletion of the stock of hypolimnetic oxygen (lower half of the water) [2].In this work, we are going to apply both methods of rehabilitation of the eutrophes plans (aeration and selective racking), on the model described by the Equations of Nervier stocks, whose resolution is based on finite difference method [3].

2 PRESENTATION OF METHODS

Among the methods of rehabilitation of the eutrophes plans, we can use: the aeration and the racking:

2.1 AERATION BY DESTRATIFICATION

Aeration is now one of the proven processes. It is either limited to the deep layers (hypolimnetic aeration) or diffused over the entire (aeration by destratification) water column, this technique also disrupts the growth of algae and prevents the formation of undesirable compounds such as ammonia, methane or hydrogen sulphide.

The impact of this technique is evaluated on stratification by experimental work (Baines, WD and Leitch, AM1992 [4] Geoffrey Schladow 1993 [5]).

The aeration by desertification consists in creating one or several curtains of ascending bubbles that generates an effect of area topspin on several hundred meters. This mass movement causes a flow of water from the bottom to the lake surface. It causes their aeration through contact with the surface of the stretch of water and, thus, has consequence for oxidizing, the preservation of condition within all the column of water.

2.2 SELECTIVE RACKING

Concerning the racking, we count in the literature several experimental works. Monismith, S. 1988 [6]) examined the Generation of the internal waves by unsteady effect of racking of the water of a laminated reservoir. Sharp, J.J (1993) [7] Studied the racking by using circular structures partially submerged.

Hocking, C.G 1988 [8] proposed an algorithm of the selective racking for the case of the laminated reservoirs.

3 APPLICATIONS

We tried to solve the equations of Navier-Stokes and the equation of the transport of the mass of a jet at the bottom of a canal. In terms of vortex function ω, function of current $\boldsymbol{\psi}$, and concentration C, by applying both methods aeration by desertification and the selective racking with the corresponding initial and limit (borderline) conditions, These equations are:

$$\frac{\partial \omega}{\partial t} + (\vec{U}.\vec{\nabla})\omega = \frac{1}{\mathcal{R}e}\Delta\omega + \frac{1}{\mathcal{F}r^2}\left[\vec{\nabla}C \wedge \frac{\vec{g}}{\|\vec{g}\|}\right].\vec{k} \quad (1)$$

$$\Delta\psi = -\omega \quad (2)$$

$$\vec{U} = \vec{\nabla} \wedge (-\psi\vec{k}) \quad (3)$$

$$\frac{\partial C}{\partial t} + (\vec{U}.\vec{\nabla})C = \frac{1}{\mathcal{R}eSc}\Delta C \quad (4)$$

With the following notations:

- $\vec{\nabla}$ and Δ are respectively the gradient operator and the Laplacian operator.
- t is the time variable.
- $\vec{k}$ is the directly perpendicular vector in the plan of the flow.
- $\vec{U}$ Is the velocity Victor.
- ψ is the function of current
- ω is the vortex function , such a $\vec{\omega} = \omega\vec{k} = \vec{\nabla} \wedge \vec{U}$
- C is the concentration of the pollutant.
- $\vec{g}$ Acceleration of gravity.
- Re, Sc, Fr Represent respectively the numbers of: Reynolds, Schmidt and Froude.

3.1 APPLICATION 1: AERATION BY DESTRATIFICATION

To test this approach, we consider a rectangular domain D1, filled with water, with a width of 4 m and length 6m. We introduce in the middle of the bottom a jet of the pollutant of the concentration C (fig 1).

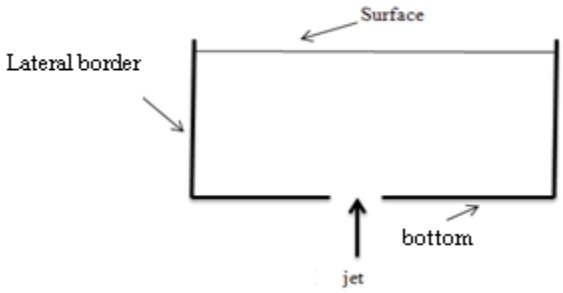
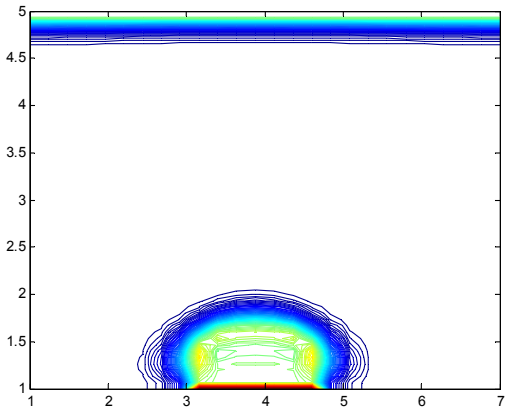


Fig. 1: the domain D1

3.1.1 RESULTS

In Figures (2.3), the results are presented as iso-values of the concentration C at different time. We see that the jet traces hypolimnetic bottom water to the surface.



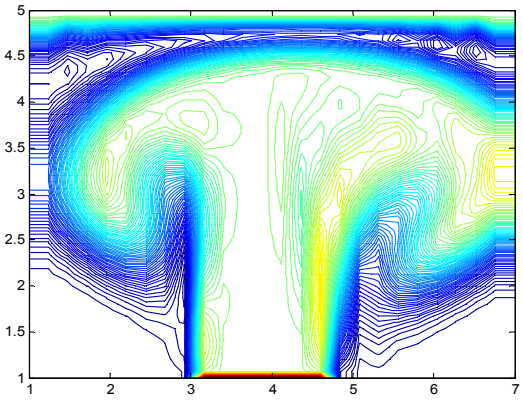


Fig. 2: iso-concentrations at time t = 1 s Fig. 3: iso-concentrations at time t = 10 s

The Figures (4, 5) represent the velocity fields in different time.

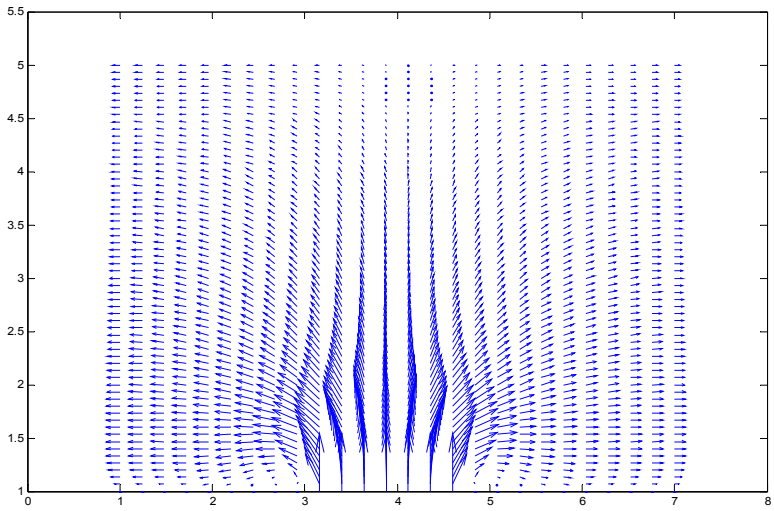


Fig 4: The velocity field at time t = 1s.

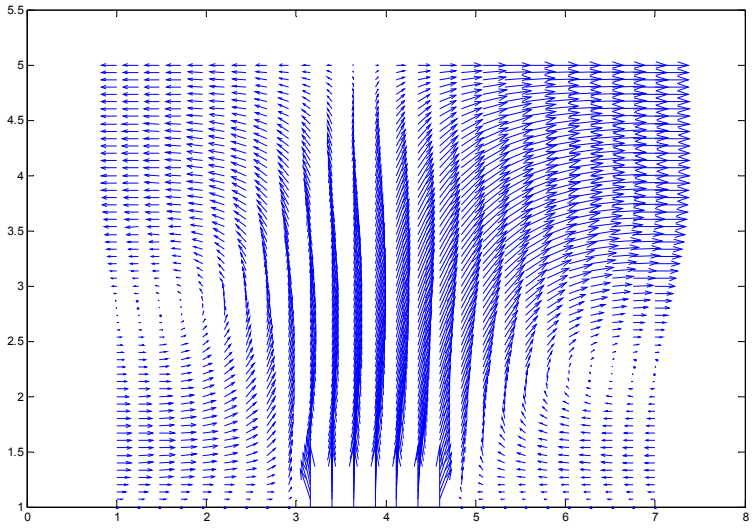


Fig 5: The velocity field at time t = 10 s

3.1.2 CONCLUSION

According to the obtained result (figures 2,3) by the application of the Aeration by Destratification on our mode , We see that the jet goes to the surface and by consequence hypolimniques waters are going to go back up of the bottom, what is confirmed by the results representing the field speed (figures 4,5) .

In the latter figs we see two cells of symmetric circulations being situated from part is of other one of the axis of the centred jet

3.2 APPLICATION 2: SELECTIVE RACKING

To test the treatment of the racking on our model, we take a rectangular domain D2, filled with water, with a width of 4m And a length of 6m with the initial conditions and in the limits correspondents.

But this time, we put on the wall approval an opening (fig 6).

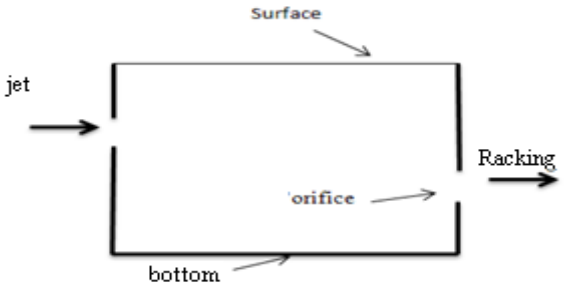
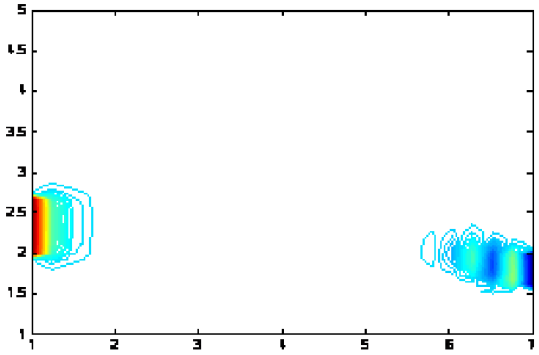


Fig 6 : the domain D2.

3.2.1 RESULTS

Figures (7,8,9) give the movement of the jet orifice to form iso concentration values according to different times



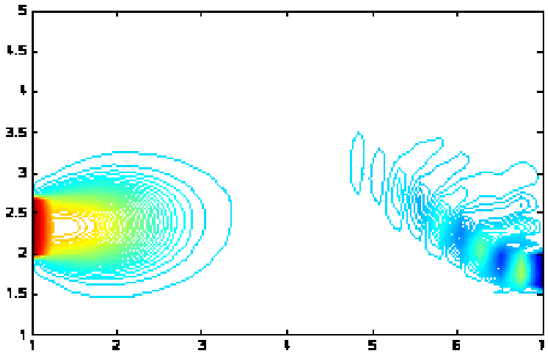


Fig 7: Racking at time t = 1 s. Fig 8: Racking at time t = 6 s.

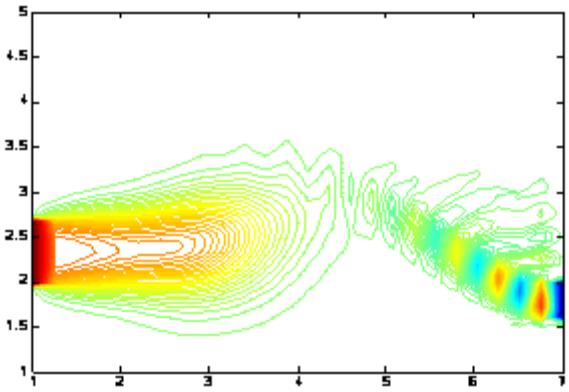


Fig 9: Racking at time t = 10 s.

On figures (10,11,12), we see the results obtained from the field of speed led by the racking in positions different from The opening.

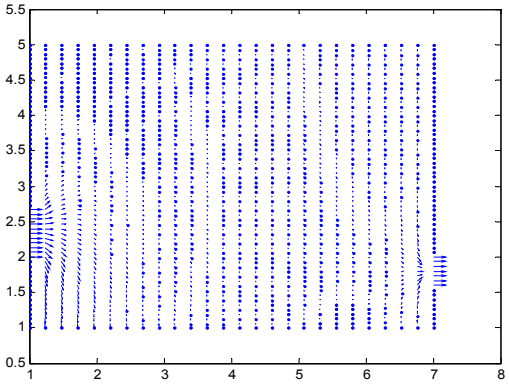


Fig 10: Field of speed leads by the racking in 10s of simulation. The opening is close To the bottom

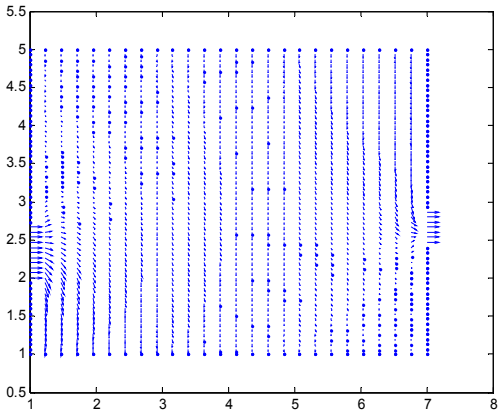


Fig 11: Field of speed leads by the racking in 10s of simulation. The opening is in the middle.

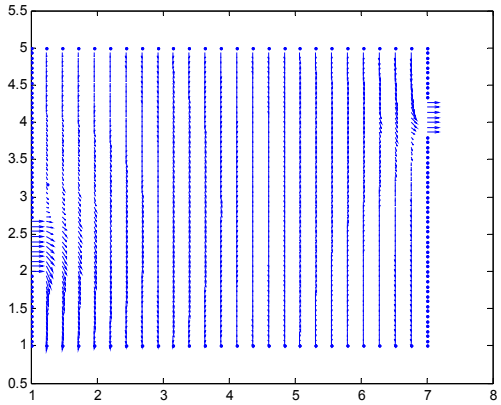


Fig 12: Field of speed leads by the racking in 10s of simulation. The opening is close To the surface.

The Figures (13,14,15) present the distribution of the horizontal speed in time t=10s, in positions different from the opening

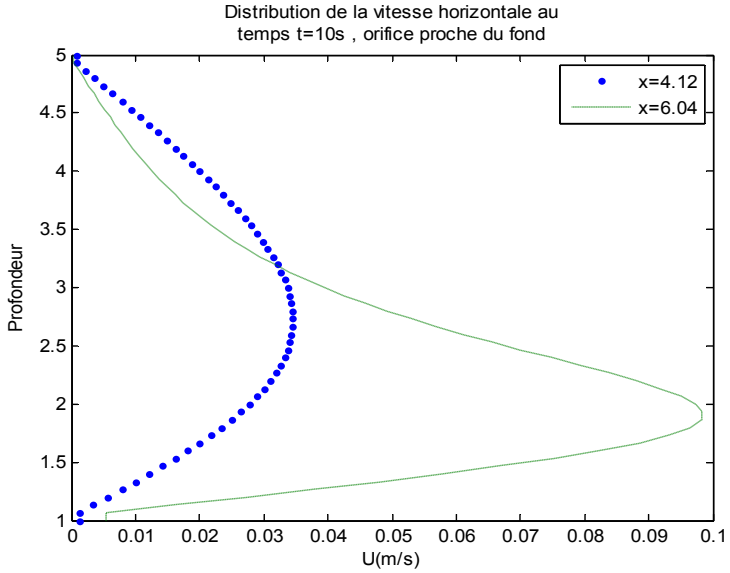


Fig 13: vertical Distribution of the horizontal speed in two points of the canal, in t=10 of simulation. The opening close to the bottom.

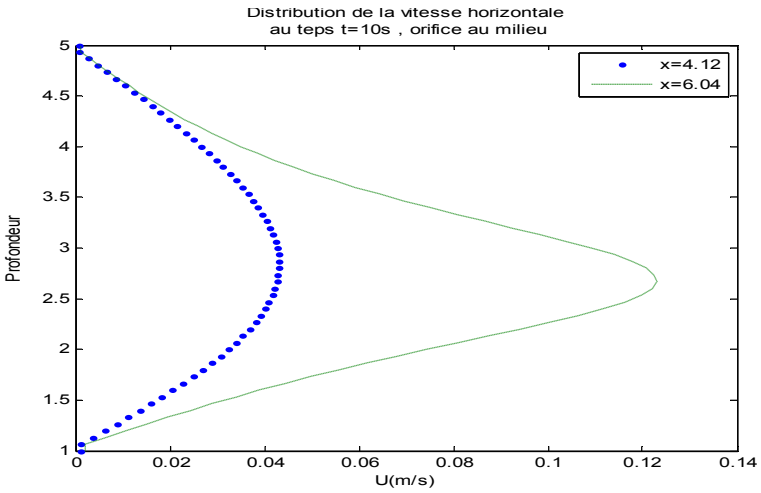


Fig 14: vertical Distribution of the horizontal speed in two points of the canal, in t=10 of simulation. The opening in the middle

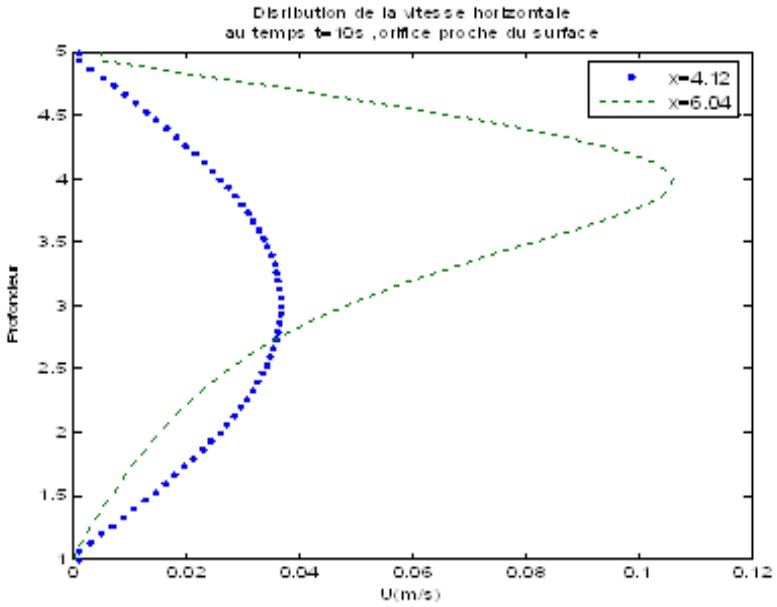


Fig 15: vertical Distribution of the horizontal speed in two points of the canal in t=10 of simulation. The close Opening of surface.

Figures (16,17,18), we present The distribution(casting) of the concentration in positions different from the opening.

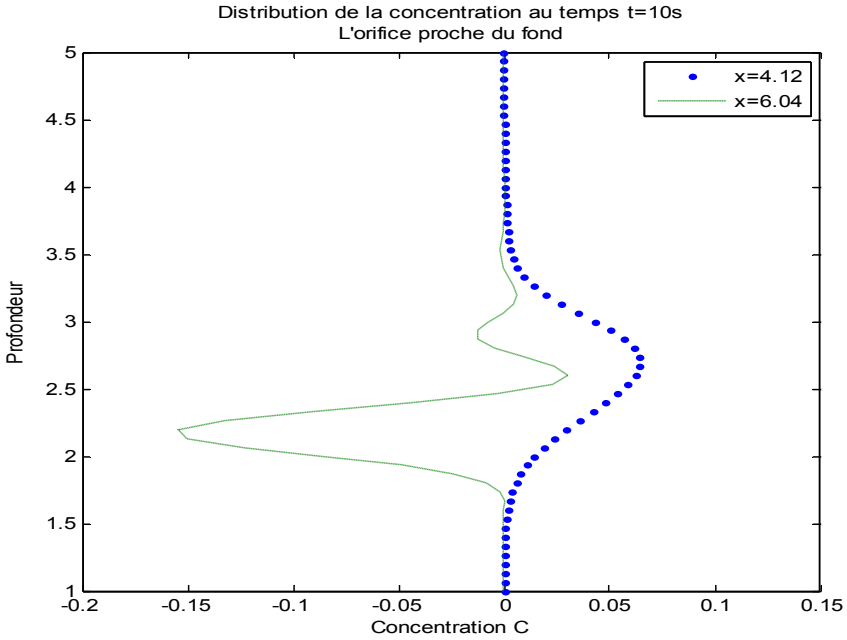


Fig 16: vertical Distribution of the concentration in two points of the canal, in t=10 of simulation. The opening close to The bottom.

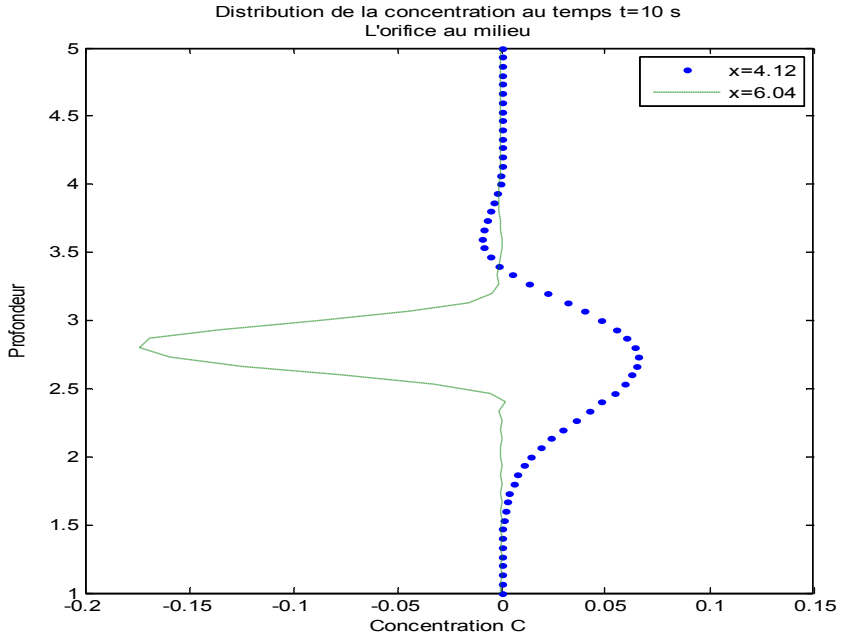


Fig 17: vertical Distribution of the concentration in two points of the canal, in t=10 of simulation. The opening close to the Middle.

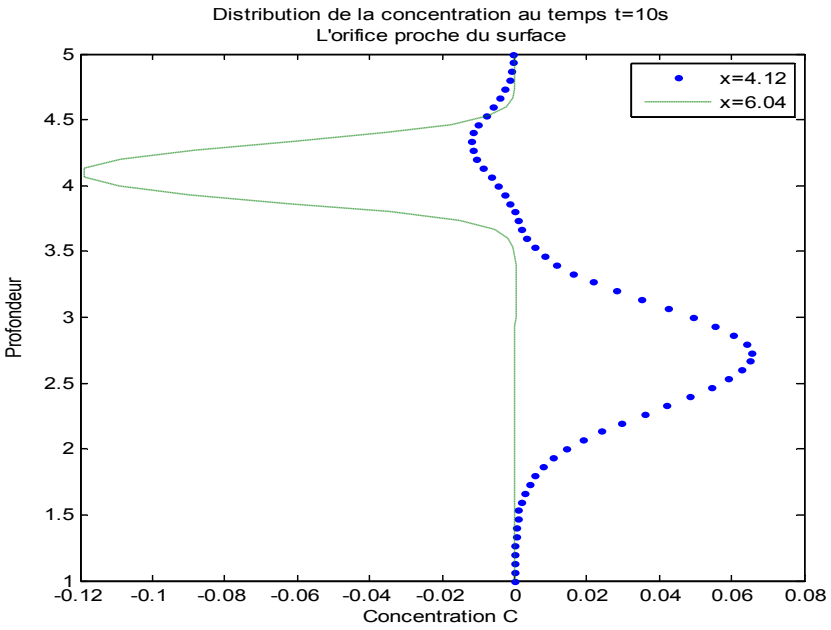


Fig 18: vertical Distribution of the concentration in two points of the canal, in t=10 of simulation. The opening close of surface.

3.2.2 CONCLUSION

According to the reached results (figures 7…. 15), we notice that there is a movement of the jet towards the opening and That it becomes established as a horizontal zone of retreat at the level of the release whatever is the position of the Opening. We notice according to the profiles of the concentration (figures 16,17, 18) that the distribution of the Concentration is better when the opening is close to the bottom. Indeed the simulation based on the principle of the Racking has shown that it forms a fine layer of retreat and it emphasized the impact of the position of the opening during The racking.

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Extraction par télédétection et analyse statistique du réseau de fractures, en milieu de socle, dans le département de Sinfra (Centre-Ouest de la Côte d'Ivoire)

[Extraction by remote sensing and statistical analysis of fracture network, in substratum area, in the department of Sinfra (center-west of Ivory Coast)]

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ABSTRACT: The goal in this work is to map the fracture network in the department of Sinfra (center-west of Ivory Coast), located in substratum area. The methodology used in this study also provides a method to validate the obtained map of fracture network. To achieve this objective, Landsat TM and ETM+ images (197-55) respectively from 1986 and 2003 are processed in order to extract the fracture network. This network is the characterized by statistical analysis methods in order to reveal the main directions followed by regional fractures and those followed by fractures in general. The second parameter to be analyzed in the context of this analysis is the statistical correlation between the number and cumulative length of fractures. The processing of satellite images has produced a dense network of fractures 8877. The distribution of number of fractures orientation in the overall fracturing field gives two main direction namely N0-10 and N90-100 in respective proportions of 16% and 12%. The distribution of orientation of the cumulative length of fractures has also two main directions, the same as before: N0-10 and N90-100 with 14% and 13% respectively in proportion. Five secondary directions were also identified: N10-20, N20-30, N70-80, N100-110 and N110-120. Thus, in the department of Sinfra, mega fractures follow both directions previously identified: EW and NS. This study also showed that the number and cumulative length of fractures are two parameters that are linked with à linear correlation coefficient R = 0.68.

KEYWORDS: Remote sensing, fractures network, statistical analysis, Landsat, Ivory Coast

RESUME: L'objectif visé dans ce travail est de cartographier le réseau de fractures dans le département de Sinfra (Centre-Ouest de la Côte d'Ivoire), région située en zone de socle. L'approche méthodologique adoptée dans cette étude, propose également une méthode de validation de la carte du réseau de fracturation élaborée. Pour atteindre l'objectif recherché, des images Landsat TM et ETM+ de la scène 197-55 datant respectivement 1986 et 2003 sont traitées pour en extraire le réseau de fractures. Ce réseau est ensuite caractérisé par les méthodes d'analyse statistique en vue de révéler les directions principales empruntées par les fractures régionales et celles empruntées par les fractures dans leur ensemble. Le second paramètre à analyser dans le cadre de cette analyse statistique est la corrélation entre les longueurs cumulées et le nombre de fractures. Le traitement des images satellitaires a produit un réseau dense de 8877 fractures. La distribution des orientations en nombre de fractures du champ global de fracturation donne deux directions principales à savoir N0-10 et N90-100 dans des proportions respectives de 16% d et 12%. La distribution des orientations des longueurs cumulées de

fractures présente également deux directions principales, les mêmes que précédemment à savoir N0-10 et N90-100 avec respectivement 14% et 13% en proportion. Cinq directions secondaires ont également été identifiées : N10-20, N20-30, N70-80, N100-110 et N110-120. Ainsi, dans le département de Sinfra, les megafractures suivent les deux directions relevées précédemment : E-W et N-S. Cette étude a également montré que le nombre et la longueur cumulée de fractures sont des paramètres qui sont liés avec un coefficient de corrélation linéaire de R=0,68.

MOTS-CLEFS: Télédétection, Réseau de fractures, Analyse statistique, Landsat, Côte d 'Ivoire.

1 INTRODUCTION

En Côte d'Ivoire, l'essentiel des ressources en eau se trouve dans les aquifères fracturés [2], [13], [9]. De plus, les formations géologiques sont constituées à plus de 97% de socle. La connaissance du comportement des réseaux de fractures revêt une importance en hydrogéologie, donc fondamentale étant donné que les réseaux de fractures représentent les voies privilégiées de circulation des eaux souterraines [2], [5], [6], [8], [13], [14].

Les méthodes permettant d'extraire le réseau de fracturation peuvent être regroupées en deux grandes catégories : les méthodes automatiques et les méthodes manuelles. Les méthodes manuelles ont l'avantage de faire intervenir les connaissances du terrain que possède l'operateur. Au nombre de ces méthodes figure la télédétection qui renferme de nombreuses techniques de prétraitements et de traitements qui rehaussent la perception visuelle des images pour une meilleure cartographie des discontinuités images [18].

La télédétection, grâce à sa vision synoptique permet d'étudier de vastes champs géographiques et constitue un puissant outil pour l'étude de la fracturation, faisant d'elle un outil incontournable pour l'évaluation des ressources naturelles et la cartographie des états de surface [16]. Cette raison justifie son utilisation dans le cadre de cette étude pour la cartographie des accidents majeurs dans le département de Sinfra.

- **Localisation de la zone d'étude**

Le département de Sinfra, est une localité située au Centre-Ouest de la Côte d'Ivoire et est situé entre les longitudes 5,38°W et 6,15°W et les latitudes 6,48°N et 6,82°N comme le présente la figure 1.

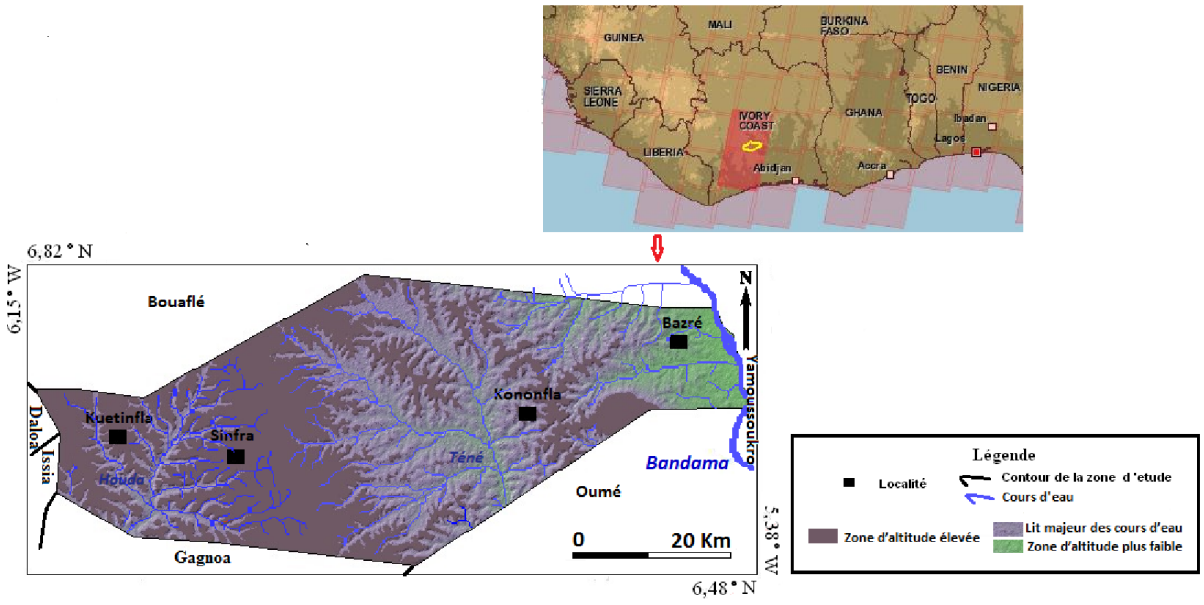

Fig. 1. Localisation de la zone d'étude

Les formations géologiques de la zone d'étude sont essentiellement issues du cycle Eburnéen avec des faciès molassiques Eburnéens, des granites Eburnéens, des faciès géosynclinaux Eburnéens et des faciès épicontinentaux Eburnéens. Elles sont

principalement constituées de granites. Ainsi, la géologie du département de Sinfra est essentiellement constituée de socle granitique. La figure 2 retrace les grands traits géologiques du département de Sinfra.

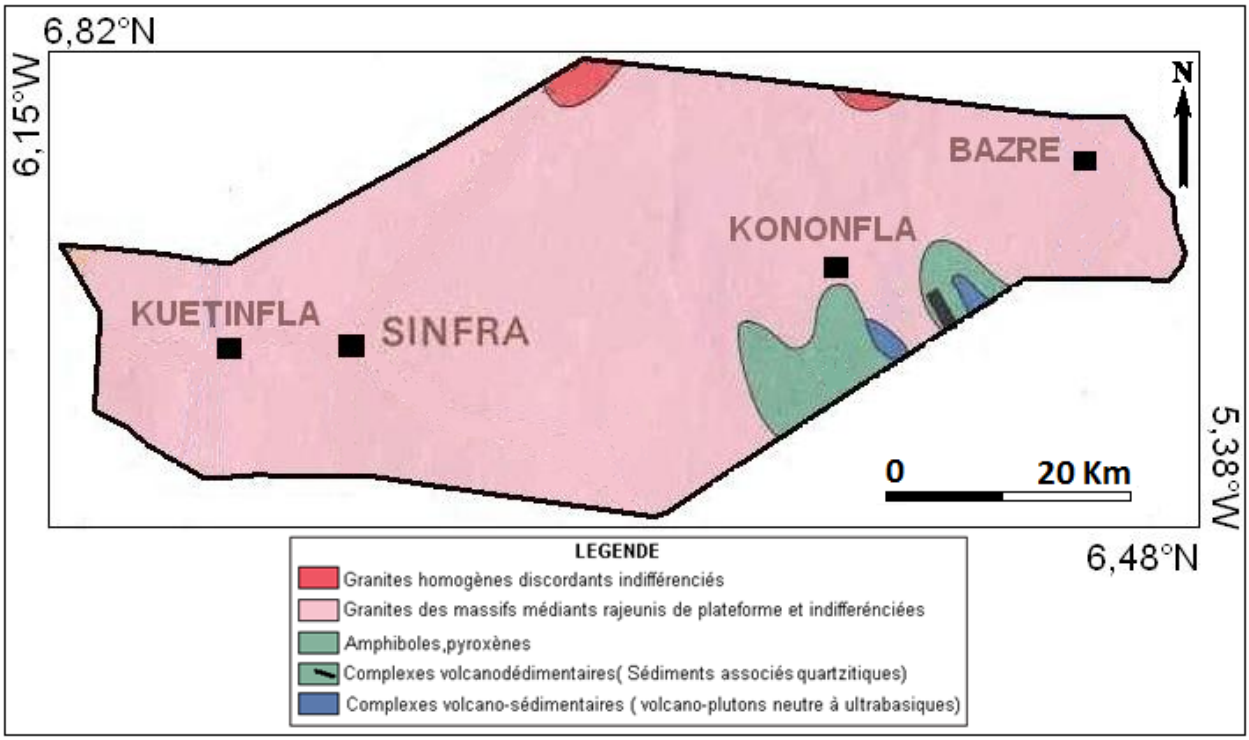

Fig. 2. Carte géologique du département de Sinfra [1]

2 MATÉRIEL ET MÉTHODE

2.1 MATERIEL

Les données utilisées dans cette étude sont de plusieurs types.

- **Données satellitaires**

Les données satellitaires sont constituées d'images satellitaires Landsat TM (Thematic Mapper) et ETM+ (Enhanced Thematic Mapper) de la scène 197-055, datant respectivement du 16 Janvier 1986 et du 20 Janvier 2003. Un modèle numérique d'Altitude (MNA) a également été nécessaire. Ces images ont été acquises à partir du site officiel de Landsat : http://glcfapp.glcf.umd.edu:8080/esdi/index.jsp

- **Données géologiques**

Les données géologiques sont fournies par la carte géologique de la zone d'étude, extraite de la carte géologique de la Côte d'Ivoire de [1].

- **Données topographiques**

Deux cartes topographiques au 1/200 000 ont été nécessaires pour réaliser cette étude. Il s'agit des cartes topographiques des degrés carrés de Daloa et de Gagnoa, produites par le Centre de Cartographie et de Télédétection (CCT). Plusieurs logiciels ont également été utilisés vu le caractère varié des traitements requis. Envi 4.8 et Idrisi Andes ont servi pour le traitement des images satellitaires. Linwin a permis de réaliser l'analyse statistique du réseau de fractures et Mapinfo 7.5 pour l'extraction des données issues des cartes topographiques.

2.2 METHODE

2.2.1 METHODOLOGIE DE TRAITEMENT DES IMAGES SATELLITAIRES

- **Prétraitements**

Les opérations de prétraitement ont consisté en des corrections radiométriques et géométriques. La correction géométrique réalisée selon la méthode polynomiale permet de corriger les différentes distorsions causées par l'environnement (courbure de la terre, variation d'altitude du sol, etc.), provenant du mouvement de la plate-forme, et dues aux erreurs des systèmes de mesures. La correction radiométrique permet de corriger les erreurs de l'image causées généralement par les perturbations atmosphériques.

- **Amélioration du contraste ou rehaussement**

Les images ainsi corrigées ont été traitées dans le but d'augmenter la perception visuelle de l'image, en améliorant sa qualité et en la rendant plus expressive. Ces différentes tâches sont accomplies dans l'optique d'une meilleure visualisation ou observation des discontinuités. Parmi les nombreuses techniques d'amélioration d'images, les techniques suivantes ont été appliquées : la transformée de Hotelling (ACP), les combinaisons d'images, les compositions colorées et le filtrage spatial.

- **Transformée de Hotelling (ACP)**

Les bandes brutes TM et ETM+ sont fortement corrélées comme le montrent les tableaux ci-dessous :

Tableau 1. Matrice de corrélation des bandes brutes Landsat TM de 1986

	TM1	TM2	TM3	TM4	TM5	TM7
TM1	1,000000	0,738546	0,750301	-0, 115390	0,410121	0,601834
TM2	0,738546	1,000000	0,864996	0,141244	0,661449	0,742594
TM3	0,750301	0,864996	1,000000	0,002150	0,704165	0,852901
TM4	-0, 115390	0,141244	0,002150	1,000000	0,591936	0,173067
TM5	0,410121	0,661449	0,704165	0,591936	1,000000	0,836265
TM7	0,601834	0,742594	0,852901	0,173067	0,836265	1,000000

Tableau 2. Matrice de corrélation des bandes brutes Landsat ETM+ de 2003

	ETM1	ETM2	ETM3	ETM4	ETM5	ETM7
ETM1	1,000000	0,738563	0,733769	0,005681	0,484322	0,639578
ETM2	0,738563	1,000000	0,839243	0,304762	0,724692	0,757614
ETM3	0,733769	0,839243	1,000000	0,072603	0.758965	0,890240
ETM4	0,005681	0,304762	0,072603	1,000000	0,549949	0,168209
ETM5	0,484322	0,724692	0,758965	0,549949	1,000000	0,874637
ETM7	0,639578	0,757614	0,890240	0,168209	0,874637	1,000000

Ces matrices de corrélation témoignent de la forte redondance de l'information contenue dans les images brutes Landsat TM et ETM+. Il s'avère alors nécessaire de décorréler ces bandes, ce qui consistera à comprimer les informations sur un nombre inférieur de bandes. Cette application conduit à l'analyse en composante principale (ACP). Les six canaux TM 1, 2, 3, 4, 5, et 7 sont tous à une résolution de 30 m excepté le canal TM 6 qui a une résolution de 120 m. Les six canaux ETM+ 1, 2, 3, 4,5 et 7 sont aussi toutes à une résolution de 30 m exceptés les canaux ETM+6(1) ,6(2) qui ont une résolution de 60 m et la bande panchromatique qui a une résolution de 15 m. Pour l'ACP, seuls les canaux qui ont une même résolution sont retenus. Les canaux TM1, 2, 3, 4,5 et 7 et ETM + 1, 2, 3, 4, 5 et 7 considérés pour l'ACP sont tous à une résolution de 30 m. Le rééchantillonnage n'a donc pas été nécessaire. Les images transformées ainsi obtenues et regroupant le maximum d'informations contenues dans les sept bandes brutes ont ensuite été combinées à travers une composition colorée.

- **Compositions colorées**

Il s'agit de transformer les images en niveau de gris en images couleur à partir de trois bandes ayant chacune une couleur de base : rouge (R), verte (V), et bleu (B). Pour mettre en évidence la structure du sol et les contours géologiques dans le département de Sinfra, la composition colorée utilisée est celle des canaux TM 4, 7, 3 [14]. Pour chaque type d'images, les 3 premières composantes totalisant le maximum de variance sont retenues pour une composition colorée. Ainsi les composantes principales cp1, 2 et 3 pour les images Landsat TM servent à réaliser une composition colorée qui totalisera alors le maximum d'information contenues sur l'ensemble des images utilisées. Il en sera de même pour les 3 premières composantes principales cp1, 2 et 3 des images Landat ETM+ [11]. Cette application a pour avantage de regrouper à l'intérieur d'une seule image, l'ensemble des informations contenues dans les images transformées précédemment retenues.

- **Combinaison d'images**

Le rapport de bandes : TM7-TM4/TM7+TM4 permet de visualiser les linéaments rattachés au réseau hydrographique mettant en évidence les zones d'écoulement d'où leur importance en Hydrogéologie [8], [14]. Un autre rapport de bandes : TM6-TM7/TM6+TM7 permet de mettre en évidence les linéaments régionaux et structures particulières [8]. La combinaison additive des canaux thermiques TM6 et infra-rouge lointain TM7 (TM6-TM7) a été utilisée pour mettre en évidence les linéaments régionaux, les structures circulaires et les grandes zones de fractures du substratum qui drainent les eaux souterraines à grande échelle [14]. Ces fractures sont soit des zones faillées ou cisaillantes. Elles présentent un intérêt en Hydrogéologie.

- **Filtrage spatial**

Les filtres utilisés ici sont les filtres directionnels qui sont appliqués dans quatre (4) principales directions : N-S, E-W, NE-SW, SE-NW. Le tableau 3 donne un exemple de matrices pour les filtres directionnels de Sobel.

Tableau 3. Filtre directionnel (7x7) de Sobel [8]

Direction N-S

1	2	1	2	1	1	1
1	1	2	3	2	1	1
1	1	3	4	3	2	1
0	0	0	0	0	0	0
-1	-2	-3	-4	-3	-2	-1
-1	-2	-2	-3	-2	-1	-1
-1	-1	-1	-1	-1	-1	-1

Direction E-W

-1	-1	-1	0	1	1	1
-1	-1	-2	0	2	1	1
-1	-2	-3	0	3	2	1
-2	-3	-4	0	4	3	2
-1	-2	-3	0	3	2	1
-1	-1	-2	0	2	1	1
-1	-1	-1	0	1	1	1

Direction NE-SW

0	1	1	1	1	1	2
-1	0	2	2	2	3	1
-1	-2	0	3	4	2	1
-1	-2	-3	0	3	2	1
-1	-2	-4	-3	0	2	1
-1	-3	-2	-2	-2	0	1
-2	-1	-1	-1	-1	-1	0

Direction NE-SE

2	1	1	1	1	1	0
1	3	2	2	2	0	-1
1	2	4	3	0	-2	-1
1	2	3	0	-3	-2	-1
1	2	0	-3	-4	-2	-1
1	0	-2	-2	-2	-3	-1
0	-1	-1	-1	-1	-1	-2

Après le filtrage des images suivant les directions ci-dessus mentionnées, la prochaine étape est l'extraction manuelle des linéaments.

2.2.2 EXTRACTION DU RESEAU DE LINEAMENTS

L'extraction manuelle des linéaments est utilisée dans le cadre de cette étude, car plus aisée compte tenu des données en présence [8], [14] et de la connaissance du terrain. En effet, les linéaments sont les structures linéaires observées sur les images satellitaires exceptés les linéarités anthropologiques (piste, routes, fils de haute tension…). L'extraction manuelle consiste à numériser toute structure linéaire observée sur l'image en ignorant les linéarités anthropiques (pistes, routes, fils de haute tension) par superposition des couches vectorielles aux images. Il s'agit donc ici d'extraire manuellement les

linéaments contenus dans l'image satellitaire, pour constituer le réseau de linéaments. Ils sont plus ou moins visibles sur les images par conséquent il faut traiter au préalable les images satellitaires. Les linéaments sont extraits des images transformées (ACP), rehaussées et filtrées. La carte du réseau de fractures est obtenue après la validation de réseau des linéaments.

2.2.3 VALIDATION DU RESEAU DE LINEAMENTS

La validation de la carte des linéaments consiste à accomplir les tâches suivantes :

- superposition des cartes et analyse des concordances suivies d'une confrontation des différents accidents [2];
- comparaison des rosaces directionnelles ;
- utilisation des données de terrain.

Les étapes de la démarche qui a abouti à la détermination du réseau de fractures sont données par la figure 3.

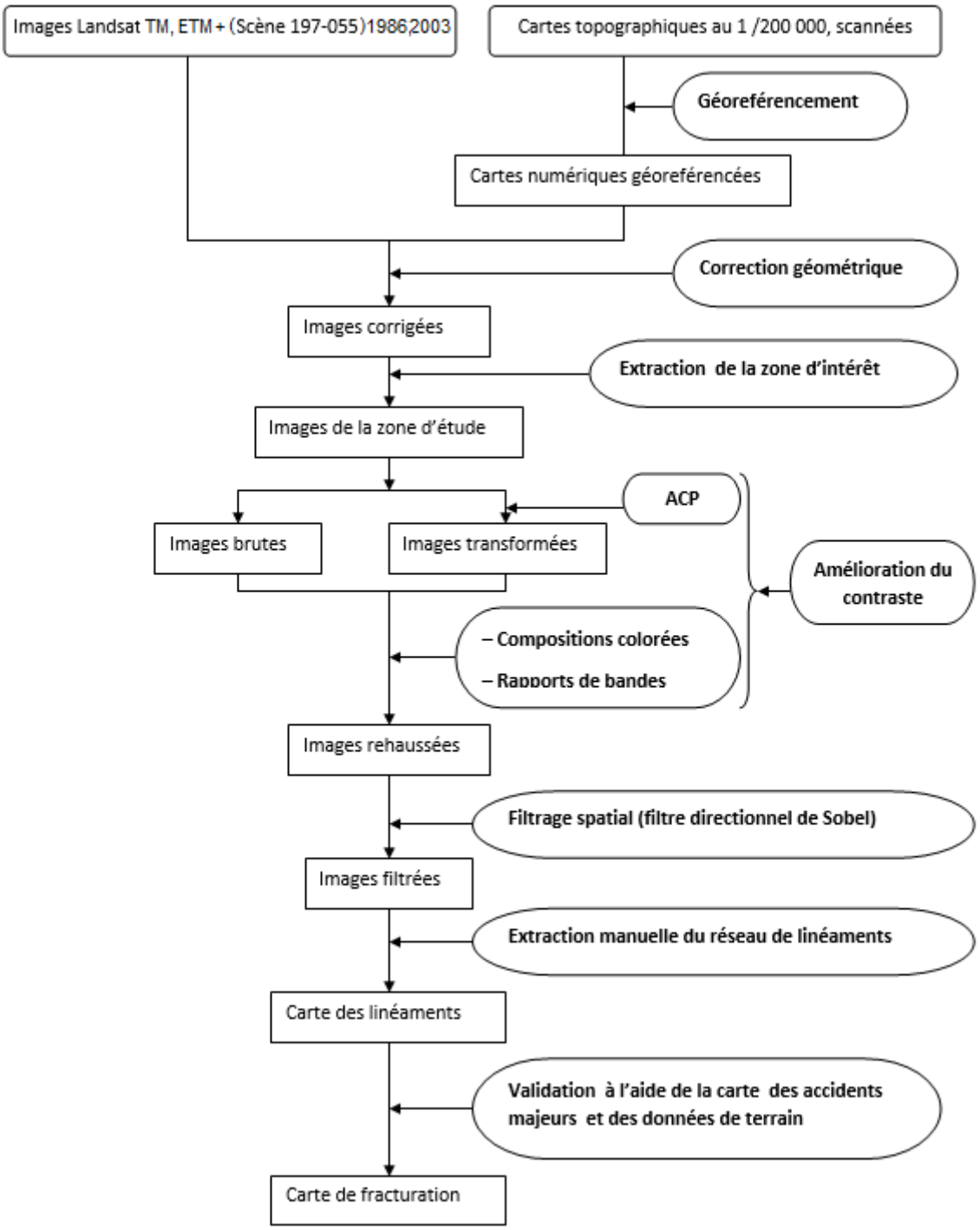

Fig. 3. Organigramme d'élaboration de la carte du réseau de fracturation

2.2.4 CARACTERISATION DU RESEAU DE FRACTURES PAR ANALYSE STATISTIQUE

Une étude quantitative du réseau de fractures prenant en compte la direction, la longueur et la densité des fractures permettra de construire les diagrammes et les rosaces directionnelles des fractures issues des images satellitaires. Cette analyse consiste à comparer les longueurs des accidents et leur direction d'une part et le nombre des accidents et leur direction d'autre part en vue de déterminer les directions principales des fractures régionales et celles de l'ensemble des fractures [2], [8], [12], [14].

La méthodologie de traitement des images satellitaires a permis d'obtenir plusieurs résultats qui feront l'objet du point suivant.

3 RÉSULTATS

3.1 CARTOGRAPHIE STRUCTURALE

Après transformation, rehaussement et filtrage des images, les linéaments ont étés extraits. Ensuite, en superposant la carte des linéaments et les cartes topographiques, les routes, les pistes et les fils de haute tension ont été isolés. La plupart des linéaments ont été extraits à partir des images filtrées.

Les figures 4 et 5 présentent les résultats du filtrage de direction E-W et NW-SE.

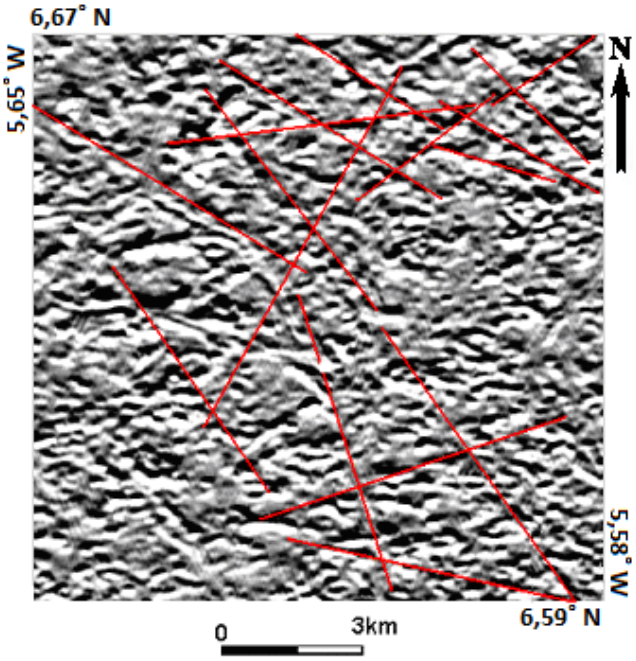

Fig.4. Filtre de direction NE-SW rehaussant les accidents accidents de direction NW-SE

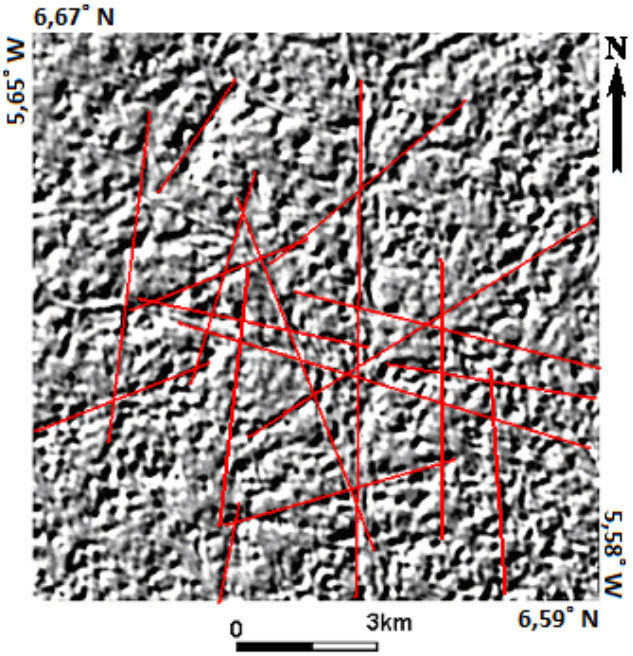

Fig.5. Filtre de direction E-W rehaussant les accidents de direction N-S

Le réseau linéamentaire obtenu est dense et comprend 8877 linéaments de taille variable. La Figure 6 présente la carte des linéaments majeurs du département de Sinfra.

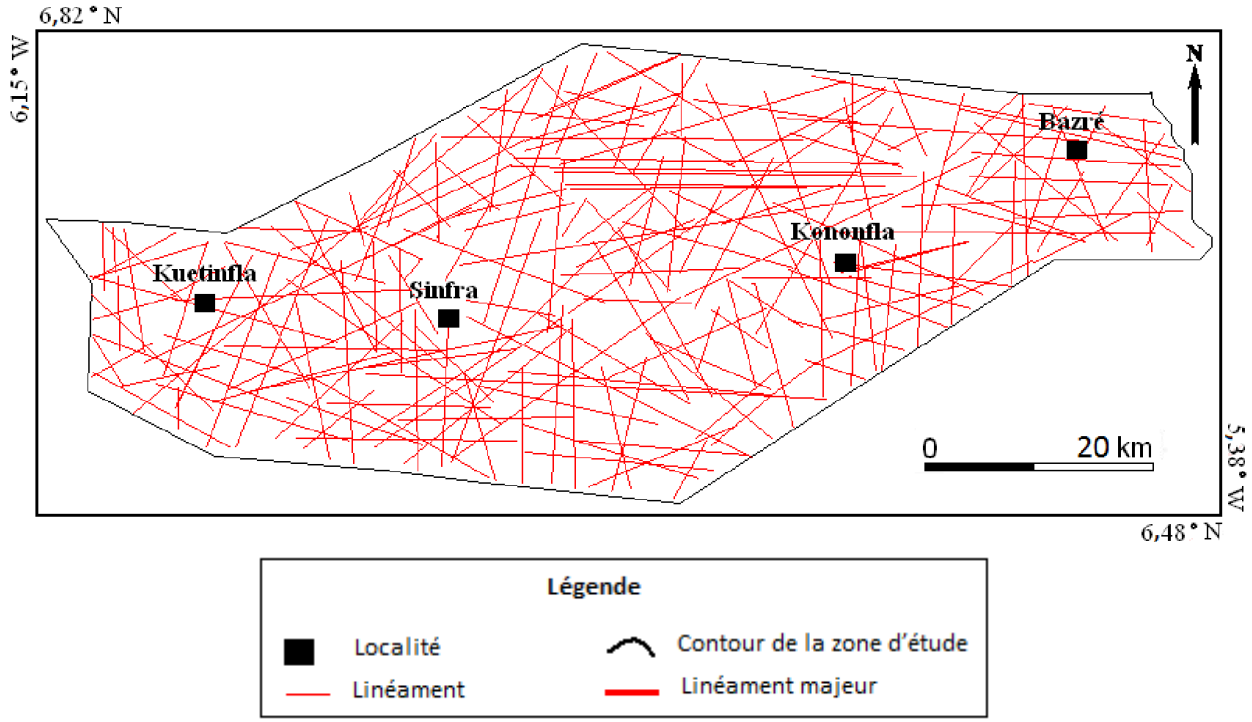

Fig. 6. Carte du réseau de linéaments dans le département de Sinfra

La validation de ce reseau de linéaments permet d'obtenir la carte du réseau de fractures.

3.2 Resultats De La Validation De La Carte Du Reseau De Fractures

La carte des accidents majeurs du département de Sinfra obtenue est superposée à la carte extraite de la carte des accidents majeurs de la Côte d'Ivoire réalisée par la SODEMI et reproduite par [2] (figure 7).

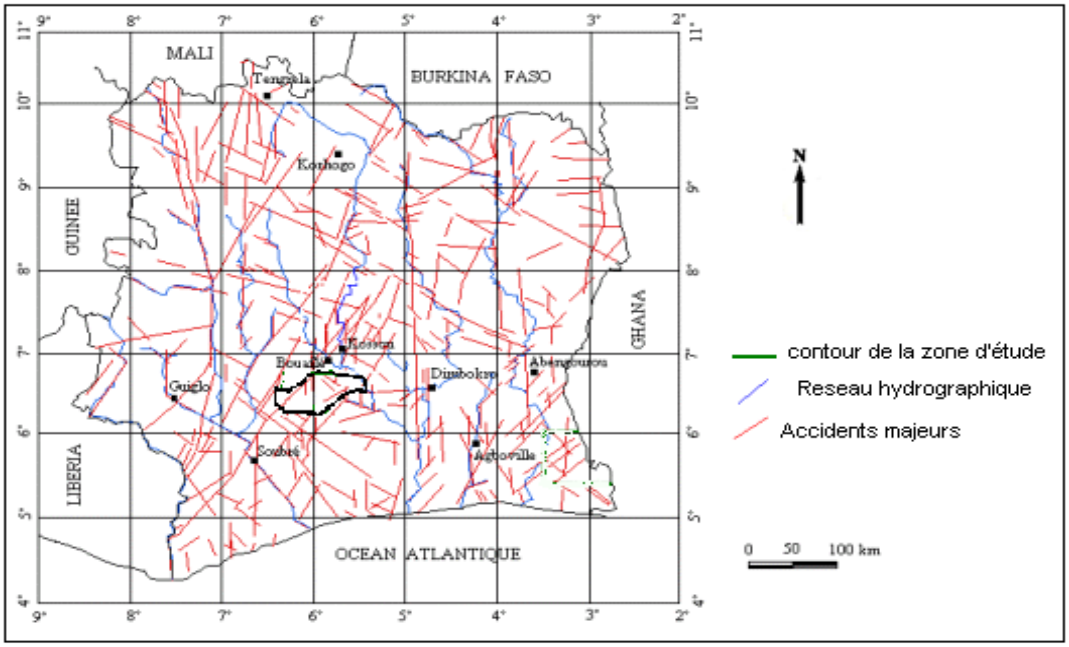

Fig. 7. Corrélation entre le réseau hydrographique et les accidents majeurs de la côte d'ivoire [2].

La carte des accidents majeurs qui sert de référence est extraite de la carte des accidents majeurs de la SODEMI [2]. Elle est représentée par la figure 8.

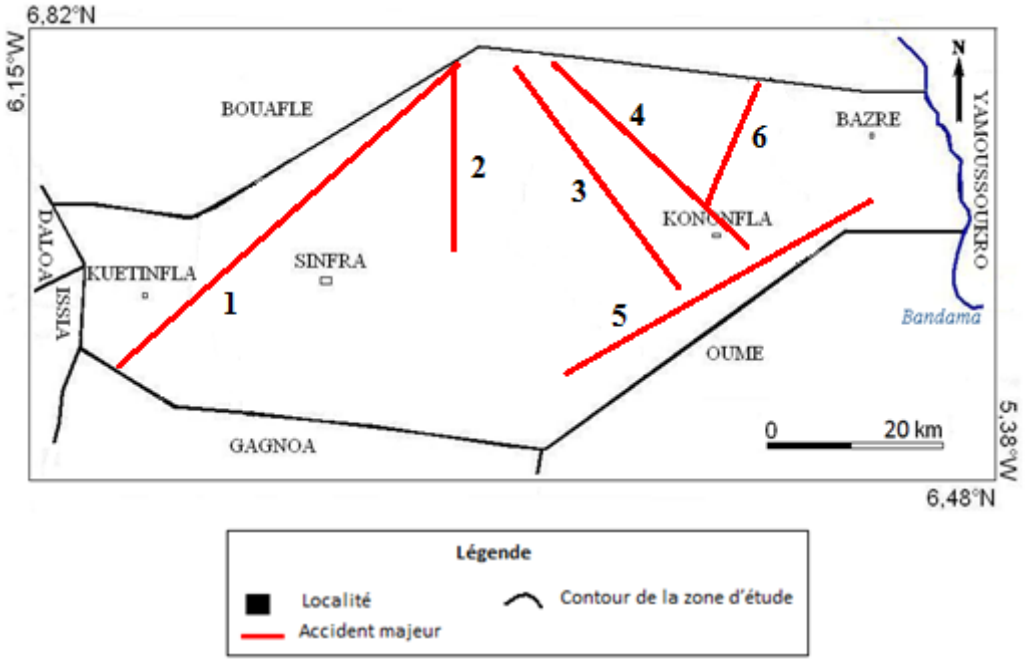

Fig. 8. Carte des accidents majeurs du département de Sinfra [2]

La comparaison des deux cartes montre une grande similarité. Quatre accidents ont été reconnus sur les six que comporte la carte des accidents majeurs du département. Sur les six accidents que comporte la carte structurale extraite de celle de la SODEMI [2], quatre ont été reconnus (figure 9).

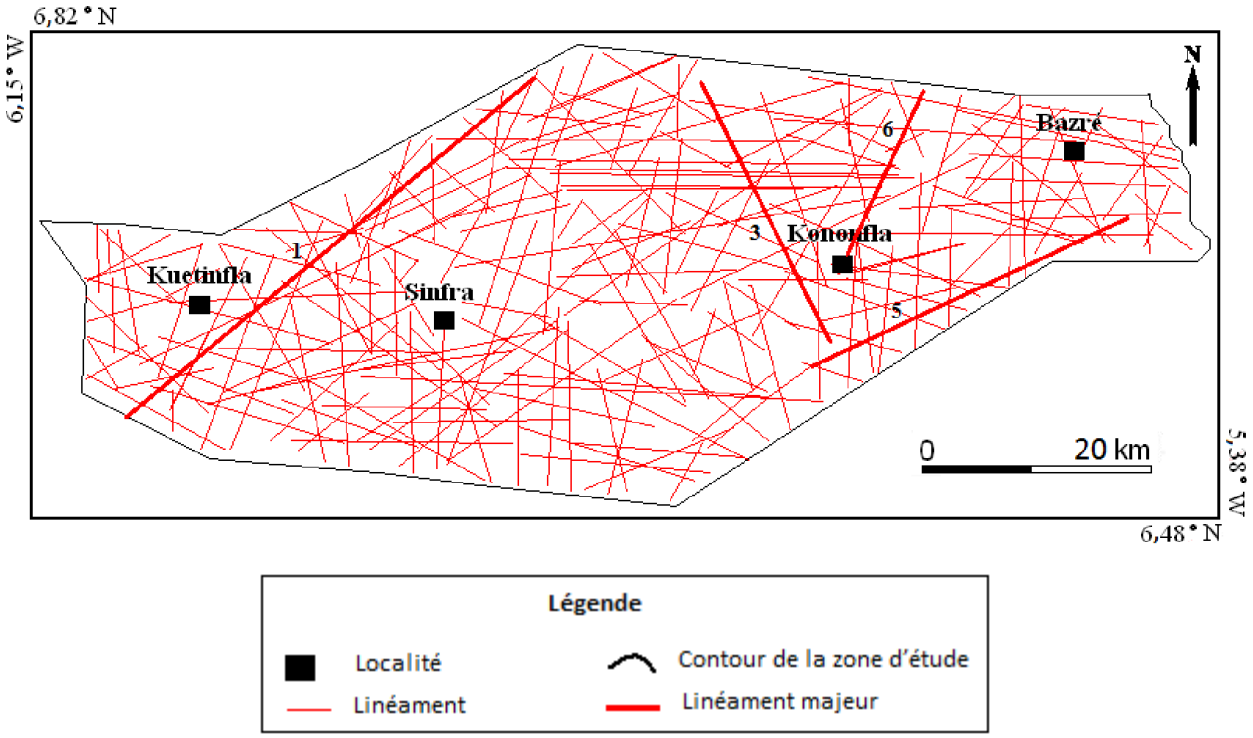

Fig. 9. Carte des accidents majeurs extraits de la carte des linéaments détaillés du département de Sinfra

L'analyse statistique du réseau de fractures s'avère necessaire afin de déterminer des paramètres qui contribueront à mieux le caracteriser la zone d'étude sur le plan hydrogeologique.

3.3 RESULTATS DE L 'ETUDE STATISTIQUE DU RESEAU DE FRACTURES

3.3.1 DISTRIBUTION DES ORIENTATIONS DES FRACTURES

La distribution des orientations en nombre de fractures donne une proportion 16% de linéaments dans la direction N0-10 et 12% dans la direction N90-100. La distribution des orientations des longueurs cumulées de fractures présente également deux directions principales, les mêmes que précédemment à savoir N0-10 et N90-100 avec respectivement 14% et 13% en proportion. les megafractures suivent donc les deux directions relevées précédemment : E-W et N-S (figure 10). Les autres directions sont présentes avec des proportions comprises entre 2 et 5%. Plusieurs de ces directions ont été identifiées lors de la visite de terrain qui s'est deroulée dans le mois d'Avril 2013.

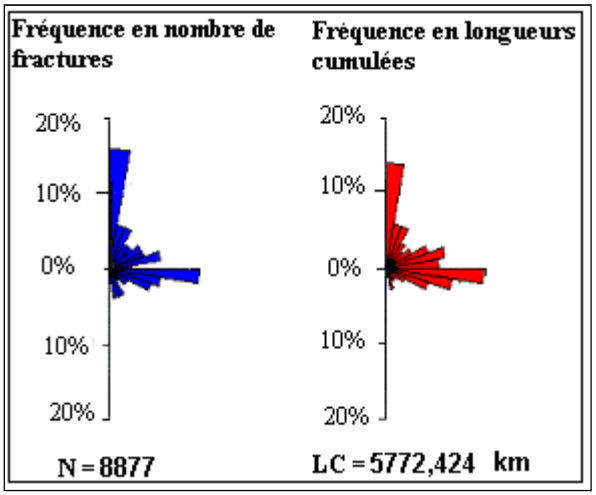

Fig. 10. Rosaces directionnelles du champ de fracturation globale

La direction N90-100 a été identifiée à Goulè Kouakoukro dans la localité de Kononfla. La direction N0-10 a été identifiée dans la localité de Zemenafla . L'analyse du champ global de fracturation donne deux directions principales à savoir N0-10 et N90-100 et cinq directions secondaires dans des proportions inferieures à 10% à savoir N10-20 identifiée à à Kononfla precisement dans la localité de Goule Kouakoukro et N10-20 , N20-30, N70-80, N100-110 N110-120.

3.3.2 CORRELATION ENTRE LES LONGUEURS CUMULEES ET LE NOMBRE DE FRACTURES

l'indique la figure 11, la longueur cumulée des fractures et le nombre de fractures sont des paramètres qui sont liés, l'un implique l'autre. Le coefficient de corrélation linéaire le montre bien, R=0,68 .

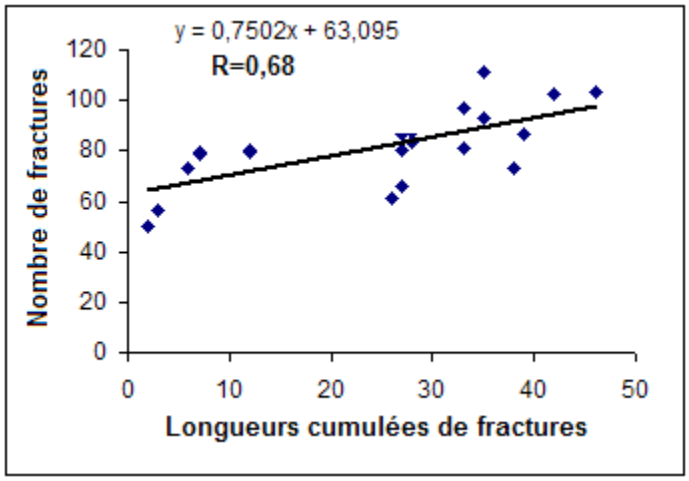

Fig. 11. Relation entre les longueurs de fractures et le nombre de fractures

4 DISCUSSION

Plusieurs travaux ont été entrepris au niveau du territoire ivoirien , notamment dans les régions ouest [8],[9],[12], nord et nord-est [5],[18], en vue de caractériser les réseaux de fractures et de modéliser les écoulements dans les réseaux souterrains. L'analyse du champ global de fracturation dans le département de Sinfra a permis d'identifier deux directions principales :N0-10 et N90-100. Plusieurs travaux realisés dans d'autres localités de la Côte d'Ivoire dont N'go et al.(2010) à Dimbokro, [16] et [17] à Soubré ont également identifié ces directions. Les travaux de [3] dans le domaine interne rifain au Maroc et de [4] en Tunisie ont relevé ces mêmes directions. Plusieurs directions secondaires ont également été identifiées dans le cadre de la présente étude : N10-20, N20-30, N70-80, N100-110 et N110-120. La direction N20-30 a été identifiée, comme direction secondaire par [7] et [8] dans la région de Man-Danané.

L'analyse du réseau de fractures a également révélé l'existence d'une corrélation entre les longueurs cumulées et le nombre de fractures, avec un coefficient de corrélation R=0,67. Cette valeur de corrélation obtenue, signifie que le nombre de fractures et la longueur des fractures sont deux variables dépendantes, elles sont donc liées. Elles peuvent être considérées indifféremment, l'une implique l'autre. L'analyse statistique du réseau de fractures fait donc état de la présence dans la région de Sinfra des fractures régionales qui influencent considérablement la perméabilité de la région. Ces fractures régionales, donc font office de réservoirs de l'eau souterraine. Il faut, cependant, souligner qu'en surmontant certaines contraintes liées à la cartographie linéamentaire les résultats obtenus peuvent être améliorés.

L'une des contraintes est le positionnement exact du linéament qui est parfois soumis à une incertitude de quelques dizaines de mètres selon [15]. Le problème d'échelle, ne s'est pas posé dans cette étude car l'échelle utilisée à savoir 1/200 000 correspond à la valeur conseillée pour l'identification d'un maximum de linéaments [12]. La méthode des pseudo-images réduirait considérablement la subjectivité selon [12], car elle est basée sur un traitement du Modèle Numérique de Terrain (MNT). Cette méthode a été utilisée par [12] à l'Ouest de la Côte d'Ivoire, dans une région montagneuse, très contrastée, avec une altitude moyenne comprise entre 200 et 600. Elle n'est donc pas très adaptée au département de Sinfra car il est très peu contrasté avec une altitude moyenne comprise entre 200 et 300 m.

Les linéaments obtenus ne sont pas exhaustifs malgré leur grand nombre. En effet la complexité de la fissuration en milieu de socle et le mode d'acquisition des informations ne permettent pas de déceler toutes les fractures.

La validation des fractures de petite taille reste cependant difficile compte tenu du fait que la carte structurale utilisée ne contient que les mégafractures. Toutefois, une étude de terrain est nécessaire afin d'effectuer des mesures sur les affleurements pour remédier à cette situation et renforcer les résultats acquis.

5 CONCLUSION

Les images transformées et filtrées ont servi de support pour l'extraction du réseau de linéaments. Ce réseau a été par la suite validé avec la carte des accidents majeurs de la SODEMI, pour donner le réseau de fractures. Les directions suivantes: N0-10 (N-S) et N90-100 (E-W), ont été identifiées comme directions majeures et principales des fractures. Les longueurs

cumulées et le nombre de fractures présentent une corrélation, de l'ordre de 0,67. Ainsi, l'essentiel de l'eau souterraine dans le département de Sinfra circule dans les fractures régionales qui en constituent les voies privilégié

Ce travail est une contribution à une meilleure connaissance du réseau de fractures. Il permettra d'envisager, d'une part, la simulation des écoulements souterrains qui conduira à la détermination des grands axes d'écoulement et, d'autre part, à l'évaluation des ressources en eau souterraine disponibles en vue d'une meilleure gestion de celles-ci**.** D'autres techniques pourraient être utilisées à savoir les techniques géophysiques ou les relevés de terrain pour valider le réseau de linéaments.

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Intelligent Home security using GSM communication module

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ABSTRACT: Home security is essential for part for a safe home. This paper aims in developing a low-cost and intelligent security system using thermal heat, passive IR and proximity sensors. Arduino Uno board which act as a microcontroller unit receives continuous data from all these sensors and processes them. The arduino will trigger an alarm and alert messages will be sent to user's mobile via GSM in case of untoward situations. Sensor LM35 (temperature sensor) is used to prevent fire damage to human life by detecting temperature change beyond a certain limit. Proximity sensor uses Hall Effect principle to detect any intrusion through doors and windows whereas the low-power Passive Infrared (PIR) detectors take advantage of pyro-electricity to detect a human body that is a constant source of infrared radiation. Use of artificial intelligence to generate patterns of intrusion based on map of the house and entrance will help in configuring the device individually thereby further increasing the safety of the house. Hence the device serves the purpose of safety and security.

KEYWORDS: Hall-effect proximity sensor, LM35, PIR sensor, Arduino Uno, GSM, Artificial Intelligence.

1 INTRODUCTION

These days with increasing risk of fire accidents and new ways of burglary safety and security of any living or working place is one of the most primary concerns. These forces the security system manufacturers to use modern technology have enhanced safety as well as security.

One of the most primary concerns Safety and security of any living or working place.

CCTV surveillance which is major part of security systems are very costly and many of these systems do not trigger any alarm if intrusion or fire is detected. Thus a cost-effective and fast-reactive security system is needed.

Hence the design explained in this paper is a prototype of such system which consists of a microcontroller unit- Arduino Uno board and a SIM300 GSM module; three sensors- LM35 temperature sensor, PIR sensor and Hall-effect proximity sensor. Arduino Uno is used in processing and controlling the system which receives and processes the data from every sensor. The GSM unit act as an interface between arduino and user's mobile and is responsible for communication between them thereby enabling mobile phone user to control it from anywhere in the world if the GSM network is available to switch on/off the system and to receive the alert messages. The thermal sensors will be placed at fire-prone areas like kitchen and around geysers. They will continuously send the temperature values to processing board. If the temperature value violates the limit value then arduino will trigger an alarm and send an alert message to the mobile station. PIR sensors will be installed in the drawing room and those rooms security is essentially important. They detect the presence of human in the home and generate pulses which are captured by the arduino. According to the pulse received by microcontroller, an alarm is triggered and a call is established to mobile station through a GSM modem thus warning the presence of a burglar in the home to owner-occupier. The proximity sensors can be attached to doors, windows or any possible access points too. The sensor will detect if there is an unwanted intrusion through any of these points, it will generate pulses to be read by arduino and then the procedure similar to that of PIR sensor is followed, establishing the connection to mobile station through a GSM modem and thus warning the owner.

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2 BLOCK DIAGRAM

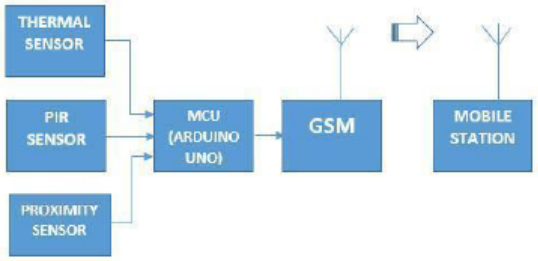

Fig.1: Block diagram of prototype

The block diagram of the working system is shown in figure 1. As mentioned above, the system comprises two units. The microcontroller unit and three sensors. The data from the sensors is continually processed by the microcontroller and an alert is sent to the mobile station via GSM module if something values reach its respective extremes as eg. temperature limit in case of a temperature sensor.

3 WORKING CIRCUIT

The system will remain in off (silent) mode initially. It can be activated by simply sending a particular SMS from the phone to GSM. By taking into account the time taken for complete evacuation, system may take a while to activate all the sensors once the message to turn on is received. After the activation the system will work as follows.

3.1 PROXIMITY SENSORS

These sensors are attached to the windows and doors will get activated once a burglar tries to intrude or gain excess through any open any door, window or any of the weak spots in the house. The alarm will be set on and alert message will be sent to user's phone.

3.2 PIR SENSOR

Taking into conisation that the burglar is able to get into the house without being detected due to malfunctioning of proximity sensor and enters into the coverage region of the PIR sensor, then output pulses are generated this enhances the security system are doubly layered system are notoriously tough to break. These pulses are then taken as input by arduino unit. To avoid false triggering the unit then waits for a pre-defined time of maximum 30 seconds and checks for that signal again. This is done to avoid false triggering. If signal still exists, then the same protocol as that of proximity sensor is followed.

3.3 TEMPERATURE SENSOR

The temperature sensor LM35 will constantly send the room temperature values to arduino. If temperature value crosses marked level of extremity, say 45°C, arduino unit will triggers an alarm and will sends a warning message to mobile station through GSM.

3.4 USE OF ARTIFICIAL INTELLIGENCE FOR EXPANSION OF THE LEVEL OF SECURITY

Pre-defined data (map of house, pictures of objects inside the rooms) will be captured and sent to the manufacture. Through an appropriate algorithm intrusion points (weak points) will be detected and marked before installing the device. This will help in configuring the device appropriately as per the requirement. For instance if CCTV is installed inside the house it specify its rotation time. Further in case of circuit damage it will send the data to the cloud server and process the last taken data for the chances being that it might be a hit from burglar.

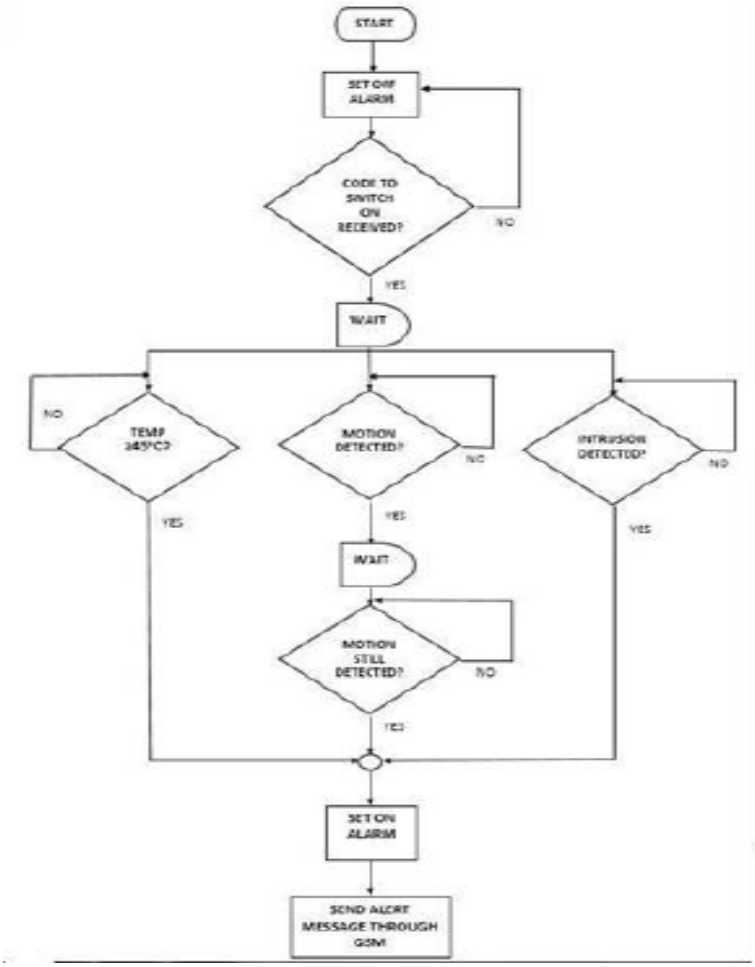

Fig. 2: Working Algorithm

Figure 2 shows the algorithm of system's working. The use can deactivate system as per his/her will by just sending a particular deactivation message through his phone.

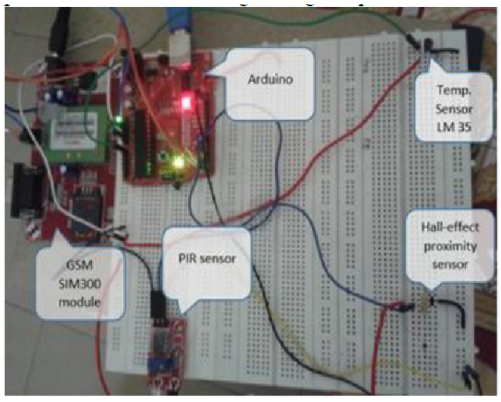

Fig. 3 Snapshot of the circuit

4 CONCLUSION

In this paper using easily available programmable sensors like the PIR and Hall Effect proximity sensor the importance of home security measures are elaborated. Further the work on advanced security measures including the face detection

technique with the help of CANNY's edge detection is under development. Use of artificial intelligence to detect the patterns and generate weak points inside the house will enhance the security system. Also to eliminate any occurring ambiguities in the current system this system can be improvised with the inclusion of Voice Pattern Analysis using IC APR9600 (voice recording IC) with advanced Digital Signal Processors and finger print reading which can be added to the current installation of security system. Also the work for developing a smart GUI using an Android application and an efficient alogoritm to dectect patterns is under the purview with Ethernet servers using an HTTPS internet website, so as to communicate with the standalone system from anywhere. This will also help in the versatility and bring down the operation cost

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URBAN DEVELOPMENT PLANNING IN NIGERIA: PROSPECTS AND CHALLENGES

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ABSTRACT: In recent periods urban development has been vigorous and unsustainable in Nigeria. By using a combination of analytical and evaluative techniques this study investigated the reason for this phenomenon and made suggestions on ways of making Nigerian cities more livable. The study discovered that despite several policies and programmes of the successive governments in Nigeria on urban development such as the promulgation of planning laws like the Town and Country Planning ordinance of 1946, Land Use Act to control issuance of permits for housing construction, The Urban and Regional Planning Act to streamline the responsibilities of each level of government on physical planning and preparation of Physical Development plans such as Master plans, Layout plans and Land Use plans, Urban Renewal plans, Zoning of land use, and other Development control principles, which can be classified as policy issues, urban degeneration has continued to increase. The study attributes this to massive population increase in the urban areas, For example the residents of urban centers in Nigeria in 1950 were less that 15% of the population and by 1975, and this proportion rose to 23.4% and in year 2000 was 43.3%. Nigerian urban population growth rate of 4.8% annually was markedly higher than growth rate of 1.2% in Developed countries. This has created several problems some of which are expansion of squatter settlements, increased poverty and a widening gap between the rich and poor, growing insecurity and rising crime rates, inadequate and deteriorating building stock, services and infrastructure. The study therefore recommends that Rural-urban drift will continue to increase in Nigeria, in the absence of any clear cut policy on rural - urban migration. Moreover there should be appropriate implementation and monitoring of master plans for major towns where they exist and the preparation and implementation of new ones where they are non-existent or out of date.

KEYWORDS: Urban Development, Planning, Nigeria.

INTRODUCTION

Urbanisation is not a recent phenomenon in Nigeria. Indeed many ancient cities such as Ile Ife, Kano, Ibadan, Benin and Sokoto have had a rich history of urbanization. Urbanisation however increased significantly during the colonial administrations. It is apparent that the rate of urbanization in recent period has been vigorous, alarming and unsustainable. Urbanization is defined as the agglomeration of people in relatively large number at a particular spot of the earth surface (Onyemelukwe, 1977; Agbola, 2004; Olotuah and Adesiji, 2005). Urbanisation is regarded as a process, whereby an increasing proportion of the world, nations or region's population lives in developed areas (Falade, 2003).

According to Mabogunje (2002), residents of urban centers in Nigeria in 1950 were less that 15% of the population. By 1975, this proportion had risen to 23.4% and by 2000 was 43.3%. According to him, urban population growth rate is 4.8% annually; markedly higher than growth rate of 1.2% in Developed countries (HDR, 2004). Conversely, another school of thought believes that urbanization is not about the population size, but must satisfy certain conditions like modernization, physical and economic development, as well as the heterogeneity in occupation (Wirth, 1938 and Harvey, 2000 and Oyeleye 2013) Urbanisation is not a bad phenomenon as many people wrongly assume Urban areas (and urbanized regions) facilitate agglomeration economies, which are a vital part of firms becoming internationally competitive, with costs reduced through the learning, matching, and sharing (of knowledge, labour, infrastructure) that happens between firms. Urbanization has also

been linked to poverty reduction and innovation. Almost universally, access to basic urban services such as health, education, water, sanitation and electricity are higher in urban areas than in rural areas and are higher in larger urban areas than in smaller urban areas.

With the increasing population explosions and massive rural-urban migration accompanying the urbanization process in the developing countries, global economic integration, increased international trade, capital flows, telecommunication, new waves of technologies, and shifts in the comparative advantage of production continue to play a central role in integrating major urban centers and shaping the spatial organization of the cities (Jiboye, 2005).

Oyesiku (1997) opined that the pressure created by population growth from natural increase and migration on little investment in infrastructure and services in Nigerian urban areas is indeed so great that declines in quality and quantity of these are inevitable. This emigrational factor often results to over urbanization, which constitutes a "strike back" effect on the environment. (Awosusi1 and Jegede 2013**)**

In Nigeria the phenomenal rise in population from 82 million in 1991 to an estimated population of about 170 million in 2013 (National Population, Commission, 2010) and massive economic growth at over 7% per annum over the last decade (Awojori, 2011) which makes the country the continents dominant economy brought much pressure on the already depressed urban infrastructures to the extent that current estimates put the number of homeless people in Lagos in 2010 at over 250000. Yet Lagos was ranked as one of the most unlivable cities in the world in 2009. Nigeria's cities, as elsewhere in Sub-Saharan Africa, lack adequate infrastructure for housing, sanitation, water, and open space. Much of this is due to the absence of effective, proactive and goal getting local administrations that encompass the evolving functions and responsibilities in the face of massive population growth and continued urbanization. Therefore it is clear that to a large extent, urbanization may not be a problem since it is inevitable to urbanize. However problem lies with the process of managing this phenomenon in order to minimize the negative consequences to the level where it constitutes less of a problem

URBAN DEVELOPMENT STRATEGIES IN NIGERIA

There is no shortage of urban development strategies and policies in Nigeria right from the colonial period. Urban development interventions ranged from statutory enactments such as the 1863 Town Improvement Ordinance, 1904 Cantonment Proclamation, Township ordinance of 1917,and the Town and Country Planning ordinance of 1946 to guide physical planning, to preparation of Physical plans such as master plans, layout plans and Land Use plans and Urban renewal plans, Land Use Act to control issuance of permits for housing construction, The Urban and Regional Planning Act to streamline the responsibilities of each level of government on physical planning, Zoning of land use, and other Development control principles, which can be classified as policy issues.

While most of these enactments were mainly public health laws, the Town and Country Planning Ordinance was a watershed in the history of colonial planning legislations in Nigeria as it made provisions on a wide range of Town planning issues such as compensation and betterment, process of acquisition of land by the government for development and most especially, establishment of planning authorities to coordinate planning in each local government areas and preparation of planning schemes as a strategy of Urban development. These enactments especially defined the powers and responsibilities of planning authorities as the government's executive arm in planning administration.

The post colonial period also witnessed renewed efforts at decentralization of administration by creating new administrative headquarters at the states and local government levels and the establishment of new Federal capital city in Abuja. The successive military administrations in Nigeria created 36 states to replace the erstwhile regional structure of north, west, east and mid- west. The new state capitals had to be developed as centres of administration. A good chunk of resources meant for the states were channeled to the enhancement of facilities, in these towns leading to what Okowa (1987) refers to as urban bias. In response to this bias, rural dwellers had been migrating to these cities to benefit from the niceties of city life which included modern sector employment, decent housing, among others

In response to this the Federal and states administrations created separate Ministries Agencies and Boards on Urban affairs to develop government policies and responses to urban problems which had become noticeable in the 1980s.One of such was the defunct Capital and Urban Development Agency(CUDA) with a mandate of securing physical development of Akure.

In the area of urban morphology many states and the Federal authority adopted the use of Master planning approach. Thus many states were encouraged to produce master plans of their major towns to guide development and redevelopment Essagha,(1997) defined master plan in Nigerian context as an official long term document by the appropriate Federal, State

or Local authority as may be desirable clearly stating the direction of future physical development plan of a place. He described the master plan as a public document made up of maps, drawings, sketches and explanatory written reports. The maps/plans could be to direct the physical development of the area or region. The master plan should be able to guide and direct the physical development up to next 20 to 30 years in the planned area or city. Master plans have been used extensively in planning Nigerian cities and towns.

DATA ANALYSIS

The paper draws on document analysis and qualitative research. In addition other relevant materials and data were sourced from published sources including government departments, publications, journal articles and textbooks among others.

THE STATE OF NIGERIAS URBAN AREAS TODAY

The state of the Nigerian urban areas today reveals an environment rich in policies, programmes and laws but deficient in implementation

Lawanson (2006) opines that the most serious problems confronting cities, towns and their inhabitants as identified in Agenda 21(1996) include the following:

Inadequate financial resources, lack of employment opportunities, spreading homelessness and expansion of squatter settlements, increased poverty and a widening gap between the rich and poor, growing insecurity and rising crime rates, inadequate and deteriorating building stock, services and infrastructure. Other problems include lack of health and educational facilities, improper land use, insecure land tenure, rising traffic congestion, increasing pollution, lack of green spaces, inadequate water supply and sanitation, uncoordinated urban development and an increasing vulnerability to disaster. All these have seriously challenged the capacity of government at all levels to realize socio- economic development and environmental protection, which are all components of sustainable urban development.

This situation has been aggravated by the continued rural to urban migration with its attendant stress on infrastructures such as housing leading to homelessness slums pressure on roads light and water supply. In the same vein Adebayo and Jegede who studied urban situation in Ado Ekiti described the appalling state of Nigeria's urban areas below

The Nigerian urban areas today present a grim litany of woes. Many Nigerian cities are vulnerable to flooding, erosion and storm .Invariably, natural disasters in cities kill or injure members of low-income groups disproportionately because the poor often live in unsafe housing on vulnerable lands. The loss of homes, possessions and often livelihood because of a natural disaster often leads to further impoverishment. Motor vehicles and motorcycles also pose a significant environmental threat to urban residents. Reported road traffic accidents in Nigeria between 1990 and 1995 were 121,451 of these figures, 15.66% totaling 19,049 cases occurred in Lagos, Nigeria's metropolitan city.

The list of urban litany of woes seems inexhaustible. Other scholars have also recognized urban sprawl, incompatibility of uses, unplanned poor layouts, poor waste disposal and poor urban governance. All these have reduced the livability of Nigerian cities

Aina (1990) gave a more concise overview of problems in Urban Nigeria as follows

Urban areas of Nigeria are deprived settlements characterized by excessive residential densities, largely uninhabitable housing and the absence of sanitation, basic infrastructure and social services. They harbor migrants from the rural areas who are unable to fit into the economy of the city and so tend to find solace in informal activities and crime The proliferation of these shantytowns results in the unwieldy expansion of the urban centers which poses a major planning problem as provision and management of roads, drainage and sewage systems among other infrastructure proves very difficult.

HOUSING AS A MAJOR FAILED COMPONENT OF URBAN DEVELOPMENT

Housing is by far the most important component of urbanization as collectively it accounts for about 50% of urban land uses. Housing is one of the most investigated sectors in Nigeria (see Aribigbola 2008, Olayiwola 2005), yet the least accessible, least affordable and least equitable in the Nigerian urban areas despite the fact that these have been the major targets of many housing policies and programmes in Nigeria. Fatusin and Aribigbola (2013) in their study of urban housing market in Ondo state wrote

"there is an appalling housing market where policies are at best only partially implemented and where informal housing production still predominate, which confirms the need for more houses to cater for a population of 170 million people which grows at 2.5% per annum. The housing market of the state is dominated by informal sector where housing development programmes on loan and regulations in term of quality do not trickle down to the developers thereby creating chaotic housing market".

The operation of the free market structure has improved housing market in terms of housing stock growth, housing material production, housing economics, and housing infrastructure only marginally, the central focus which are stated above have not been realized.

In term of housing quality,Fatusin and Aribigbola in their study of housing quality in Akure, Ikare and Okitipupa the urban centres in Ondo state conducted a survey which revealed that 35% of houses in these cities can be classified as poor using yardsticks such as presence/absence of structural defects, materials used in construction, roofing, privacy, availability of courtyards/court gardens etc. while over 11% are in dilapidated forms. Yet out of these 46% (poor & dilapidated),majority of them (58%) were built after the launch of National Housing Policy in 1991.The structure also reveals that 46.6% were made from Crude earth/clay materials,42.8% of houses do not have toilet facilities,16.2% do not have access to electricity,10.5% and 7.2% are still dependent on rainwater and rivers and streams for domestic water needs,23.9% are still dependent on bush/field for sanitation,42.8% cook in the open while an average of 56.3% still travel over 15minutes to get domestic water.

There is a consensus among Nigerian housing experts that the magnitude of housing problems in the country is high. According to FRN (1991), the urban housing shortage as at 1990 was projected at 5million housing units while the rural housing shortage stood at just 3.2 million. It was further projected that some 700,000 housing units had to be produced annually to tackle this shortage. It will be recalled that Nigeria's population according to National population commission in1991was only about 83million now 165million. More recently, the United Nations study put the overall housing deficit at 17million which the Nigerian National Bureau of Statistics had earlier estimated at between 12 and 14 million in 2007.it was in a bid to solve this problem that the Federal government of Nigeria formulated the National Housing Programme NHP in 1991, reviewed it in 2002 and a made new one in 2012.

Prior to this time there had been many programmes on housing development right from the colonial period. This period marked the establishment of European Reservation Areas which later metamorphosed into Government Reservation Area, to provide decent housing for the British colonialists. The post-colonial period marked the advent of Housing Corporations in Nigeria which were established to intervene directly in Housing provision. However this was not far reaching enough and the problem remained insurmountable. The first and the second national development plans made scanty provision on housing. However the housing component of the third national rolling plan made a lot of provisions concerning housing. In the Fourth National Development Plan, government accepted housing as a social responsibility and pledged to ensure that the average urban worker do not pay more than 20% of his salary as monthly rent, The period also marked the establishment of the Federal Mortgage Bank to provide loans to people. it is informative to note that provisions were not made for low income people.

REASONS FOR THE FAILURES OF THE MAJOR URBAN DEVELOPMENT PROGRAMMES

There is no doubt that there has been lackluster approach to solving urban problems in Nigeria. Indeed there has been apparent disconnect between these policies programmes and approaches to urban development and the situation on the ground. The appalling state was recognized at the international conference on slums organized by ONU-HABITAT held in Rabat in 2012, where slums were reported to be increasing in many urban areas in Nigeria. For example Lagos was recorgnised as a mega city of 18 million dwellers. (UDR, 2013), yet the rate of provision of infrastructures and maintenance and new housing provision could not keep pace with population growth from natural increase and mainly from in-migration. Government must live up to expectation in this regard.

According to Oyeleye (2013) Rural-urban migration in Nigeria has been increasing over the past 25 years. Between 1985 and 1990, over 3 million Nigerians migrated from rural areas to urban centres, while over 5 million Nigerians migrated between 2001 and 2005. This shows over 75% increase in the rural-urban migration in Nigeria, for every period of 5-years. This is quite unsustainable and it will therefore put a lot of pressures on existing infrastructures and weak urban managers.

There is no doubt that there is weak urban governance in Nigeria. This is because there is lack of appreciation of planning issues by participants in the political sphere at Federal States and Local levels.The political leaders have shown little or no interest in urban planning issues. By virtue of section 4 of the Nigerian Urban and Regional Planning Act the local Government is responsible for formulation and implementation of Town plans. Yet the local government as presently constituted is pro inertia as far as urban management is concerned. This is so because the local governments not only lack

the resources financial and human, they seem less concerned about planning issues generally. Yet planning is supposed to be a local government responsibility.

According to Taylor (2000) the reason for the poor state of Nigerian urban areas can be summarized into five points:

the national government stresses economic planning and downplays physical planning generally; local planning authorities are subject to excessive political interference in matters relating to development control; funding is inadequate to implement local planning schemes; there is a lack of a well-trained planning workforce at all governmental levels - federal, state and local; and that there is little coordination between planning levels: there is usually competition between the local political authority and the local planning authorities.

In a nutshell, there is lack of coordination in urban development planning. Ajaegbu (1976) discovered in a study of planning and Development in Jos, Nigeria, that five principal government agencies influenced urban development in that city, but lacked overall coordination and integration in result. In fact, all of the following influenced urban development in Jos: the Local Authority, the Water Board. the Town Council. and the State Ministry of Works. The situation in Lagos is worse with proliferation of agencies and boards which are essentially into urban planning in Lagos. The proliferation of agencies responsible for urban development produce independence of action, unresolved responsibilities, and a woeful result.

CONCLUSION AND RECOMMENDATION

There is no doubt the magnitude of Nigeria's urban problems have continued to increase in recent period. Yet very little efforts are being made especially at implementation level to provide sustainable solution to them. Studies have shown that while there is no shortage of policies and programmes, the government does not have the will, commitment and the resources to combat the problem

Rural-urban drift will continue to increase in Nigeria, in the absence of any clear cut policy on rural - urban migration. Therefore Nigeria may continue to experience failures in its urban development in the absence of population and migration policies that seek to reduce the population of those who have no business being in the urban areas.

It is also important to ensure appropriate implementation and monitoring of master plans for major towns where they exist and the preparation and implementation of new ones where they are non-existent or out of date. Moreover old master plans have to be reviewed to ensure they are responsive to the present realities.

The problem of weak institutions especially institutions that are connected with urban development like the ministries of urban development should be strengthened to be able to hold their ground in the face of political interventions from highly placed individuals who are bent on circumventing the system for their personal benefits. The Local governments need to be strengthened to be able to perform efficiently their roles in urban development as defined by the URP Act of 1992.

There is the need to encourage more indigenous housing designs which utilize local building materials, mesh with cultural traditions, and adhere to the environmental restraints of a tropical climate;

Urban renewal must be encouraged to restructure, re-plan and rehabilitate the blighted parts of the Nigerian urban areas. This may not be easy because it will involve as the case may be dislocation of people living in areas regarded as slums, which may be difficult socially and to a large extent economically.

Moreover there is the need for more budgetary provision on issues that border on providing urban infrastructures which at present is low across the three levels of government in Nigeria.

Lastly there is the need for government at all levels to form synergy in form of Public- private- Partnership with other stakeholders like the private sector in building urban infrastructures, since the resources available to government may not be enough to provide for infrastructural investment.

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Assessment of Radiogenic Heat Production in Soil Samples around Ife Steel Rolling Mill Site in Southwestern Nigeria

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ABSTRACT: In this study, the analysis of soil samples was carried out to determine the concentrations, distribution and the pattern of Radiogenic Heat Production of some heavy elements in soil samples inside a steel rolling mill in Ile-Ife, Osun State, Nigeria within latitudes 6033'N and 6046'N; and longitudes 4044'E and 4054'E. The distribution of K, U, and Th was particularly investigated in this site. Soil samples were collected from thirty (30) points along three traverses at a space interval of 20cm covering a survey area of 80cm by 60cm within the Rolling mill. The analysis of the soil samples using a cylindrical NaI(Tl) detector reveals that the contents of the radioactive elements in the soil fall below the WHO's critical values of contaminated soil. Field observations and soil properties show that the soils were derived from weathering of pre-existing sedimentary bedrocks which constitute the geology of the area. The results also show that the contribution and rate of heat production of ^{40}K, ^{238}U and ^{232}Th in the samples vary significantly with geological locations, with ^{40}K as the major element which predominates in heat production for the Upper profile of the study area, while ^{238}U and ^{232}Th are trace elements. The radiogenic heat production elements (RHPE) contribution shows that all the points on the sites have the same pattern of radiogenic heat production contribution of the elements to the radiogenic heat production (RHP).

KEYWORDS: Radiogenic heat, radionuclide, geothermal energy.

1 INTRODUCTION

Geothermal energy is a reliable source of power that can reduce the need for imported fuels for power generation. It is renewable because it is based on practically limitless resource and has significant environmental advantages because geothermal emissions contain no chemical pollutants or waste, they consist mostly of water, which is re- injected underground.

One of the sources of the Earth's internal heat is the heat produced by the decay of long- lived radioactive isotopes. This is the main source of the Earth's internal heat, which in turn, powers all geodynamic processes [21].

Geophysical methods play a key role in geothermal exploration. The geophysical surveys are directed at obtaining indirectly from shallow depth and physical parameters of the geothermal systems. The various geothermal techniques in use in exploration for geothermal energy include subsurface (Shallow) temperature measurement [13], [12], [14], [15], [23]; Geochemical thermometric methods [3], [1], [20], [30]; Magnetolluric methods [9], [31]; Gravity method [29]; Aeromagnetic surveys [24], [27]; Sesmic Method [11], [22] and Radioactive Method [19], [16]. These various techniques have its own advantages and disadvantages. Some lack the maturity under difficult conditions which others become less useful for deep exploration because of lack of sensitivity. Considering the limitations of the various methods, it is probably necessary to use an integrated geophysical approach employing a wide variety of techniques for accuracy.

Surveying for radiometric minerals has become important over the last few decades because of the demand for nuclear fuels [11], [6]. Radiometric surveying is employed in the search for deposits necessary for this application [12], [21].

Radiometric surveys are of use in geological mapping as different rock types can be recognized from their distinctive radioactive signature. The widespread occurrence of geothermal manifestations in Nigeria is significant because the wide applicability and relative area of exploitation of geothermal energy is of vital importance to an industrializing nation like Nigeria [2]. There are three known geothermal resource areas in Nigeria: the Ikogosi Warm Springs of Ekiti State, the Wikki Warm Springs of Bauchi State and the Rafin Rewa Warm Springs of Jos in Plateau State. A combination of measurement and analyzing radionuclides contributions to geothermal heat production would help in the accurate evaluation of suspect geothermal resource areas for future detailed investigations and possible exploitation.

In this work, the radioactive method was applied to measure the concentration of radioactive elements such as Potassium (40K), Uranium (238U) and Thorium (232Th), using Gamma- ray spectrometer. The heat produced by radioactive decay in soils and rocks is of fundamental importance in understanding the thermal history of the Earth and interpreting the continental heat flux data.

1.1 GEOLOGICAL SETTING

The Most of Southwestern part of Nigeria belongs to the schist belt. To be specified, Osun (which is the parent case study) and Oyo belong to crystalline basement region, Ogun State belongs to basement complex (undifferentiated) region. The major rocks in the southwestern Nigeria are igneous, sedimentary and metamorphic. The igneous rocks include the older granite, pegmatite, rhyolite and dolerite while the sedimentary rocks include the Shale, Coal measures, and Coastal plains and Alluvium. The metamorphic rocks include the undifferentiated basement complex.

1.2 RADIOGENIC ELEMENTS AND HEAT PRODUCTION

The heat generated by long- lived isotopes has been an important heat source during most of Earth's history. In order to be a significant source of heat radioactive isotopes must have a half- life comparable to the age of the Earth, the energy of its decay must be fully converted to heat and isotopes must be sufficiently abundant. The main isotopes that fulfill these conditions are 238U, 235U, 232Th and 40K. The isotope 235U has a shorter half- life than 238U and release more energy in its decay.

The heat, Q produced by radioactivity in a rock that has concentrations C_u , C_{th} and C_k respectively, of these elements is:

$$Q= 0.00348C_k+95.2C_u+ 25.6C_{th} \quad [28] \qquad (1)$$

However, conduction is the most significant process of heat transport in solid materials. It is an inefficient form of heat transport and when the molecules are free to move, as in fluid or gas, the process of convection becomes more important. Although the mantle is solid from the standpoint of the rapid passage of seismic waves, the temperature is high enough for mantle to act as a viscous fluid over long time intervals [21].

Consequently, convection is also the most important form of heat transport in the fluid core.

2 MATERIALS AND METHOD OF MEASUREMENT

The process of data acquisition involves both fieldwork and Laboratory measurements. The study area was divided into Upper, Middle and Lower profiles. The Upper profile consists of points 1-10, the Middle profile consists of points 11-20 while the Lower profile is from point 21-30. Soil samples were taken from thirty (30) points on all the profiles. The soil samples were collected from different lithologies and geological settings characterizing the areas around the site. The Fig. 1 is the cross section map showing the areas from which the soil samples were collected (the exact location is represented by each sample code) and the area where samples were collected from the steel rolling dump site. The summary of the soil types, sample location and code are presented in Table 1. The Surrounding sites are coded as follows: Upper profile (UP), Middle Profile (MP) and Lower Profile (LP) the code UP1 stands for the soil samples collected from a point in the upper profile.

The soil samples were compressed to fine grains to minimize self-absorption and to have geometry and matrix. Each sample was carefully packed in plastic container, sealed and weighed. They were then left for thirty days in order for gaseous members of Uranium and Thorium series reach secular equilibrium before counting.

Natural radionuclide of relevance for the radiogenic heat production are mainly 40K and gamma- ray emitting nuclei in decay series of 238U and 232Th Gamma radiation analysis allows various gamma emitter to be distinguished and the quantitative content of Potassium, Uranium and Thorium to be calculated.

Concentration of 40K, 238U and 232Th are determined in the laboratory through spectrometry of emitted gamma rays using a cylindrical NaI(Tl) detector (model No 802 series) by Canberra Inc. The gamma rays, which interact with the scintillator, are converted into pulses with height proportional to the energy of the gamma rays.

These pulses are amplified and fed to a multichannel analyzer (Canberra series 10 multichannel analyzer). All the samples were counted for 36000 sec, as this was considered adequate for measurement of the low activity of the samples. The efficiency and quantitative calibration of the apparatus was determined using a standard material prepared from Rocketdyne laboratories, Califonia, USA.

3 ANALYSES

The photopeak area values were converted into concentration in Bqkg-1 and then later to part per million (ppm). These concentrations in ppm were later used for determination of the radiogenic heat production using Rybach equation (Eq. 1) where C_u , C_{th} and C_k are concentrations in ppm of Uranium, Thorium and Potassium, respectively. Multiplying the radiogenic heat production values by the rock density gives the radiogenic heat generated in cubic meter of the rock (Wm^{-3}). The area under photopeak represents the counts due to each radioactive nucleus and was computed from the memory of the Multichannel Analyzer (M.C.A.).

These are presented in table 1. The area under the photopeak is a measure of the activity of the radionuclide producing the photopeak. The photopeak counts obtained for each rock sample after subtracting the background value was converted to concentration by using standard conversion factor *K*. Thereafter, the concentration of the radionuclide were converted from $Bqkg^{-1}$ to ppm (part per million).

The amount of heat generated per second by natural Uranium, Thorium and Potassium were obtained by using Rybach's equation, and then the total radiogenic heat production for each sample was obtained by summation of the three isotopes heat production.

4 RESULTS AND DISCUSSION

The photopeak counts obtained for each rock sample was converted to concentration in $Bqkg^{-1}$ by using standard conversion factor. Thereafter, the concentration of the radionuclides were converted from $Bqkg^{-1}$ to ppm (part per million) as presented in table 1. Radiogenic heat production was computed from the U, Th, K concentration using the formula (1) proposed by [25], and presented in table 2.

Considering the distribution of the radiogenic heat production elements (RHPE) contribution, it can be seen from the pattern of distribution shown in the table 3, that K is the major element which predominates in heat production while U and Th are trace elements.

The main objective of this study is to obtain the pattern of contribution of the elements to the radiogenic heat production in a steel rolling mill in Ile-Ife, Osun State, the Southwestern Nigeria. To determine this, the data obtained was transformed to relative importance index (RII) for each element to determine the rank of the elements. The relative index was evaluated using the following expression [18]:

$$RII = \frac{\sum w}{AxN} \qquad (0 \leq index \leq 1)$$

where

w = weighting given to each factor by the respondents, and ranges from 3 to 1.

A = highest weight (i.e. 3 in this case) and

N = total number of respondents.

The result of this analysis is shown in the table 4. Considering the range of RII (0.888-0.555), it shows that all the elements have contributed to radiogenic heat production (RHP). However, K-40 (RII = 0.888) is the major element with the highest contribution in the Southwestern Nigeria, while U-238 and Th-232 contribute equally and moderately. Early works on crustal rock samples of

Southeastern Nigeria shows that Th-232 is the highest contributor to the radiogenic heat production in that region [10] while K-40 is the highest for Southwestern Nigeria. The later corresponds to the present result. This might be as a result of

differences and similarities in the geological setting of these regions. In addition, convectional geochemistry considers K as a major element (those which predominate in any rock analysis) and U and Th as trace elements [7] which is corroborated with the present result.

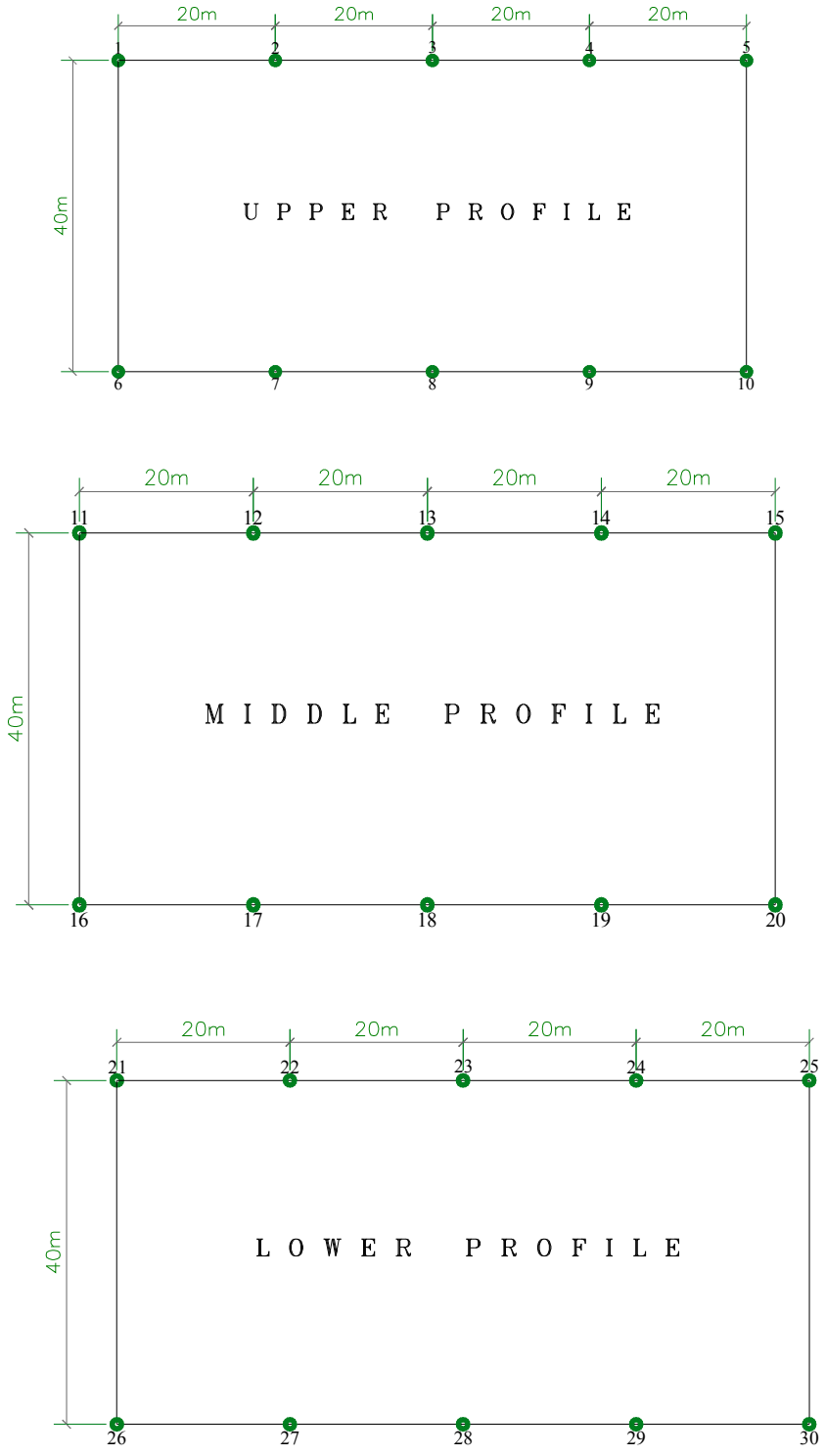

Figure 1: Survey area of Rolling Mill

Table 1: Concentration of K, U, and Th in ppm

		Concentration of Radionuclide in Ppm		
S/N	Profile Code	^{40}K	^{238}U	^{232}Th
1	UP1	24830.09	1.97	0.08
2	UP2	25506.19	1.49	0.43
3	UP3	14176.53	0.85	0.48
4	UP4	11042.8	0.85	0.50
5	UP5	54573.99	0.30	0.48
6	UP6	81577.14	0.10	0.57
7	UP7	35370.56	0.06	0.95
8	UP8	36993.16	0.02	0.46
9	UP9	941.99	0.06	0.68
10	UP10	926.57	0.19	0.80
11	MP11	3228.72	0.09	0.27
12	MP12	2373.29	0.05	0.30
13	MP13	3200.91	0.10	0.15
14	MP14	2883.80	0.17	0.21
15	MP15	2217.75	0.12	0.31
16	MP16	1663.86	0.34	0.14
17	MP17	562.07	0.32	0.08
18	MP18	1721.32	0.45	0.43
19	MP19	1803.66	0.13	0.48
20	MP20	1227.82	0.06	0.50
21	LP21	6405.29	0.81	0.48
22	LP22	919.09	0.16	0.57
23	LP23	811.55	0.36	0.95
24	LP24	8704.87	0.50	0.46
25	LP25	2235.04	0.04	0.68
26	LP26	38664.35	0.22	0.80
27	LP27	25674.86	0.15	0.27
28	LP28	17873.43	0.08	0.30
29	LP29	32629.7	0.38	0.10
30	LP30	60154.47	0.48	0.26

Table 2: Radiogenic Heat Production in pW/kg

		Heat Production in pW/kg			
S/N	Profile Code	^{40}K	^{238}U	^{232}Th	Total
1	UP1	3.29	80.90	6.23	90.42
2	UP2	3.22	28.93	1.09	33.24
3	UP3	11.93	9.76	3.16	24.85
4	UP4	8.61	5.74	18.10	32.45
5	UP5	10.79	74.81	22.29	107.89
6	UP6	121.38	6.09	22.47	38.94
7	UP7	6.99	18.45	20.93	46.37
8	UP8	5.44	8.15	28.85	42.44
9	UP9	1.61	4.71	19.82	26.14
10	UP10	6.69	9.66	16.19	32.54
11	MP11	6.28	15.96	7.71	29.95
12	MP12	3.93	11.82	26.23	41.98
13	MP13	18.11	32.57	6.92	227.6
14	MP14	2.50	30.22	9.88	42.6
15	MP15	2.13	42.51	1.73	46.37
16	MP16	28.60	12.16	1.51	42.27
17	MP17	6.01	5.87	0.21	12.09
18	MP18	22.12	77.03	6.02	205.17
19	MP19	87.12	15.42	21.09	123.63
20	MP20	79.07	33.91	1.62	114.6
21	LP21	111.72	47.85	3.80	171.37
22	LP22	90.34	4.10	13.30	236.74
23	LP23	68.33	21.30	2.65	92.28
24	LP24	100.16	13.83	12.65	152.64
25	LP25	6.21	7.85	14.98	29.04
26	LP26	4.53	28.4	1.30	34.23
27	LP27	85.12	19.31	1.21	105.64
28	LP28	88.85	35.99	82.84	207.68
29	LP29	96.92	26.24	25.65	148.81
30	LP30	76.49	8.40	22.87	107.76

Table 3: Average Radiogenic Heat Production

Profile	40K	238U	232Th
UP1-10	6.90	24.72	15.91
MP11-20	52.59	27.75	8.29
LP21-30	89.17	21.33	18.13
Average	49.55	24.60	14.11

Table 4: General Analysis of Results

Radionuclide Element	RII	Rank
40K	0.888	1
238U	0.555	2
232Th	0.555	3

5 CONCLUSIONS

It was observed from the result that radioactive minerals are present in all the soil samples and the heat production pattern of the middle and lower profiles are the same. The upper profile had a high radiogenic heat production due to the heaps of waste metal scraps dumped at the site. There is irregular contribution of these radionuclides (U, Th, and K) to the radiogenic heat production in the soil as a result of their geological location.

Hence the model of radiogenic heat production of Osun state of Nigeria has K as the major element, which predominate in heat production while U and Th are trace elements.

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The quality of groundwater in several sites of Tangier Tetuan Region (Morocco)

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ABSTRACT: The Region of Tangier-Tetuan (Northern of Morocco) experienced an important urban development in the last decade. For this reason, groundwater's quality is highly susceptible to deterioration by liquid and/or solid waste pollutants. Nevertheless, rural and some per urban residents are still pending on springs supplies for drinking water, irrigation and domestic activities without any treatment, so they are exposed to water diseases.

In order to evaluate the hygienic quality of these springs, a study was conducted during 2013. Fifteen springs were selected for the investigations on chemical and bacteriological parameters.

The physicochemical results showed that the majority of the studied springs are considered acceptable, except some springs that don't meet the standards recommended. Our study revealed also a serious contamination of groundwater by microbial agents, the concentrations of different microbial indicators differed, dependent on the spring's location with respect to the different sources of contamination.

Monitoring the chemical and bacteriological quality of drinking water is essential to prevent the population to health risk.

KEYWORDS: Tangier-Tetuan, drinking, springs, chemical, bacteriological, groundwater, health risk.

1 INTRODUCTION

Water is an essential element to human life, but it can be a carrier of multiple illnesses. In fact, the quality of drinking water is an important environmental determinant of health [1-2-3]. Besides, accessibility to safe water is crucial for sustainable development [4].

Urban development has a negative impact on groundwater quality [4-5]. Actually, human activities can change the ecosystem and the groundwater use become unsafe [6-7].

Morocco faces a major challenge in term of water quality over the near and medium terms [8-9-10]. Groundwater resources must be judiciously managed and protected [11].

Nowadays, groundwater quality is seriously vulnerable to domestic and industrial waste and/or phytosanitary products [12-13].

In Tetuan-Tangier Region, groundwater supplies are used by a large part of suburban and rural population as a source for their drinking, domestic activities, animal drinking and cultures irrigation.

Previous researches have showed a relationship between water quality and urban development [14-15]

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Safe drinking water must have an acceptable quality in terms of its physical, chemical and bacteriological parameters [16]. These parameters have been used to determine the general quality of drinking water worldwide [17].

Currently, the assessment of the groundwater quality is very important. This work focuses on the determination of the chemical and bacterial quality of some springs in the northen area of Morocco.

2 MATERIALS AND METHODS

2.1 FIELD SAMPLING

Groundwater samples were collected during 2013, twice a year (wet and dry seasons), from fifteen selected locations with different degrees of environmental quality at Tangier-Tetuan Region (Northen of Morocco).

The chosen sites (S1: Ain Sekkouh; S2: Ain Lahcen; S3: Ain Benkarich; S4: Ain Bouanane; S5: Ain Melloul ; S6: Ain Rass Louta ; S7: Ain Hawma Kahla ; S8: Ain Mae Labyad ; S9: Ain Khandeq Jamaa ; S10: Ain Diwana ; S11: Ain Dchar ; S12: Ain Mae Alah ; S13: Ain Roumane ; S14: Ain Tine ; S15: Ain Puente) are represented in Figure 1.

Samples were transported in cold boxes (at 4°C) to be subjected to some bacteriological and chemical parameters measurement within 24 hours in the laboratory. Standard methods were followed in collection, storage and analysis of the water samples.

2.2 LABORATORY ANALYSIS

2.2.1 MICROBIAL INDICATORS

The samples were collected in sterile glass bottles, kept at 4°C and analyzed within 24 hours in the laboratory. Faecal bacteria were enumerated by the membrane filter technique using specific media (Tergitol and Slanetz) and different incubation conditions (44 °C for faecal coliforms and 37 °C for both total coliforms and faecal streptococci).

After 24 hours, number of bacteria was calculated and expressed in Colony-Forming Units per 100 ml (CFU/100 ml).

2.2.2 PHYSICOCHEMICAL PARAMETERS

Water physicochemical analysis was conducted using methods described by Rodier [18]. Field analyses were made for the parameters pH, temperature and electrical conductivity which were all measured by adequate sensors. The other parameters were analyzed in the laboratory after completion of the sampling.

3 RESULTS

3.1 DETECTION OF FAECAL BACTERIA

The results of microbiological analysis of water samples from different springs of Tangier-Tetuan Region are presented in figures 2 and 3. Data fell into two clearly defined periods (wet and dry seasons).

Microbiological results indicated that faecal coliforms, total coliforms and faecal streptococci values were higher than the required values in all studied springs.

In wet season (fig. 3), total coliforms values varies between 5 and 254 CFU⁄100 ml, faecal coliforms values between 0 and 53 CFU⁄100 ml and faecal streptococci values between 0 and 240 CFU⁄100 ml.

In dry season (fig. 2), total coliforms values varies between 4 and 240 CFU⁄100 ml, faecal coliforms values between 0 and 75 CFU⁄100 ml and faecal streptococci values between 0 and 240 CFU⁄100 ml.

In rainy season, the ratio FC/FS is more than 4 in S8 and S13 (human pollution) and less than 1 in S1, S2, S4, S5, S7, S11, S12, S14 and S15 (animal pollution).

In dry season, the ratio FC/FS is more than 4 in S13 (human pollution) and less than 1 in S1, S2, S3, S4, S5, S10, S11, S12, S14 and S15 (animal pollution).

3.2 PHYSICOCHEMICAL ANALYSIS

The results of physicochemical analyses are presented in Tables 1 and 2 and compared with the reference values of the drinking water (NM 03.7.001) [19].

In the dry season (table 1), the pH value in S11 were lower than the reference limit (pH = 5,96). On the other hand, the dissolved oxygen values don't meet the standards recommended except the values in S8, S11 and S15 (respectively 5,89 mg/l, 5,68 mg/l and 5,14 mg/l). However the others chemical parameters did not exceed the reference values of the drinking water regulation.

In the wet season (table 2), the dissolved oxygen values don't meet the standards recommended except the values in S1, S8, S11 and S15 (respectively 5,6 mg/l, 6,02 mg/l, 6,04 mg/l and 5,55 mg/l). However the others chemical parameters did not exceed the reference values of the drinking water regulation.

4 DISCUSSION

Chemical and microbiological indicators were used to assess the groundwater quality in some springs of Tangier-Tetuan Region [19].

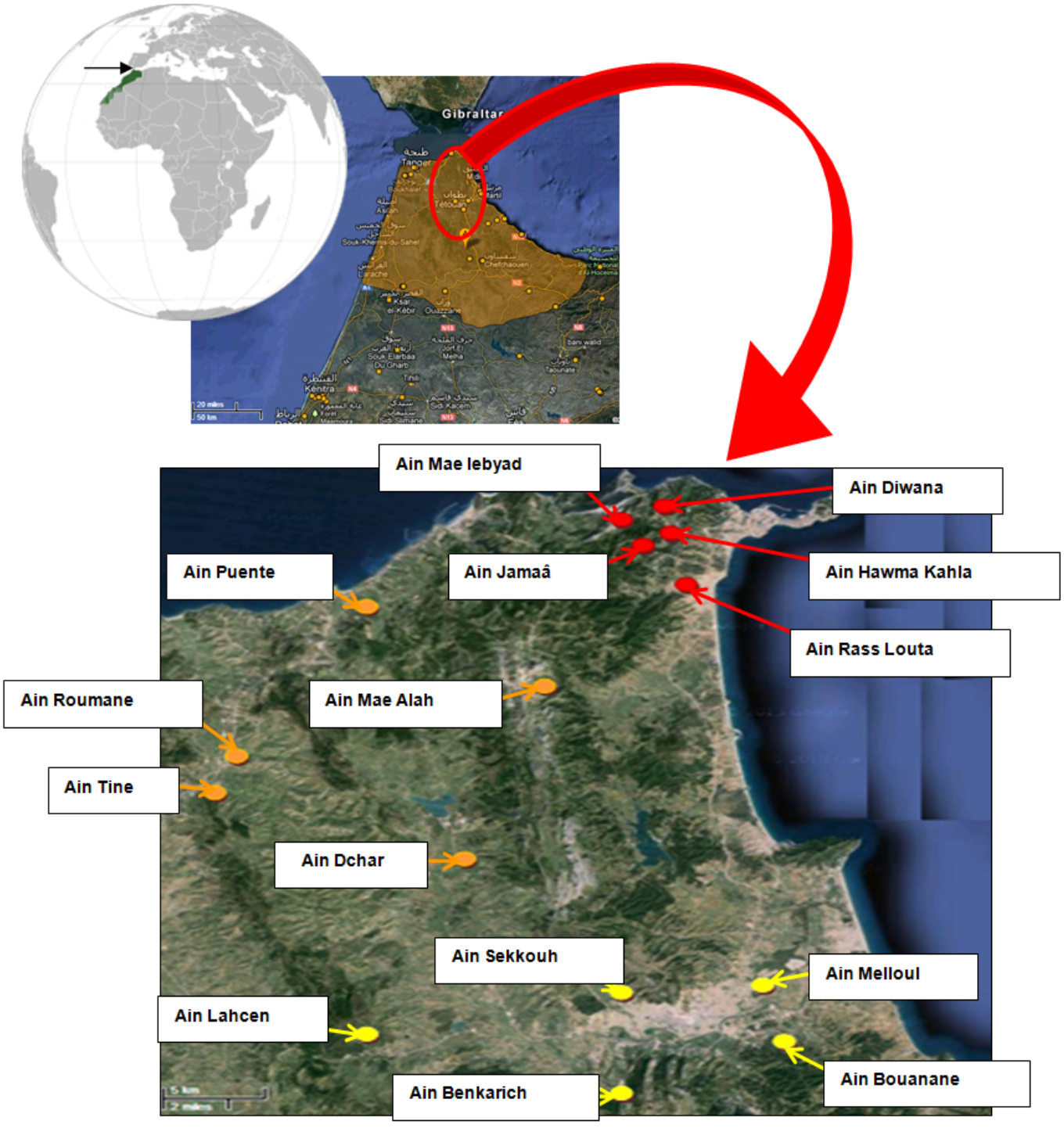
In the dry season, chemical analyses have shown that the pH of the water samples significantly varied from 5,96 to 8,5 and was lower than the reference limit (pH = 5,96) in sample S11. This may be due to impact of sewage water on groundwater. On the other hand, the dissolved oxygen values ranged from 2,99 (mg/l) to 5,89 (mg/l) and don't meet the standards recommended except some springs S8, S11 and S15 (respectively 5,89 mg/l; 5,68 mg/l and 5,14 mg/l).

In the wet season, chemical analyses have shown that the pH of the water samples significantly varied from 6,8 to 8,5. Moreover, the dissolved oxygen values ranged between 3,11 (mg/l) and 6,04 (mg/l) and don't meet the standards recommended except the values in S1, S8, S11 and S15 (respectively 5,6 mg/l; 6,02 mg/l; 6,04 mg/l and 5,55 mg/l).

The others chemical parameters did not exceed the reference values of the drinking water regulation.

Our results are in agreement with the investigations of Belghiti et al in Meknes Region [16] and Bricha's et al in M'nasra's groundwater [22].

Microbiological results show that there is a seasonal variation (dry and rainy season) in the bacteria concentration and exceeds the standard of drinking water in all studied springs, this is probably due to wastewater infiltrations, human and⁄or animal pollution. Similar results were found by many investigators such as Tazi et al in Casablanca [20], Arnade in Florida [21], Belghiti et al in Meknes Region [16] and Bricha's investigation in M'nasra's groundwater [22].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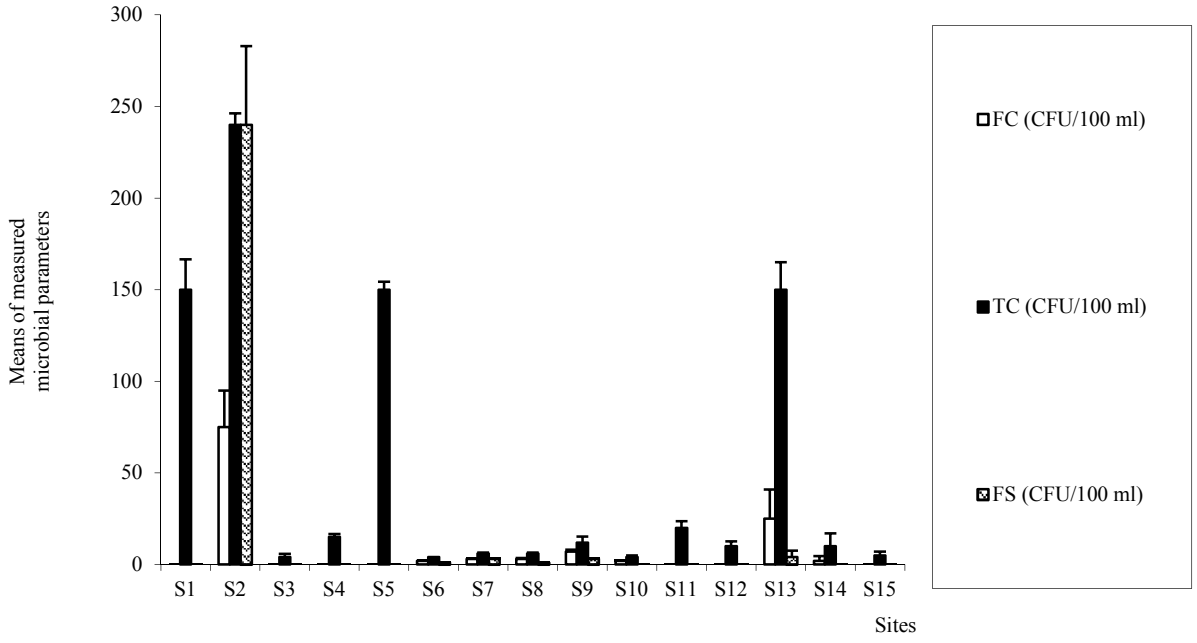
Ain Benkarich

Fig. 1.


300
250
200
150
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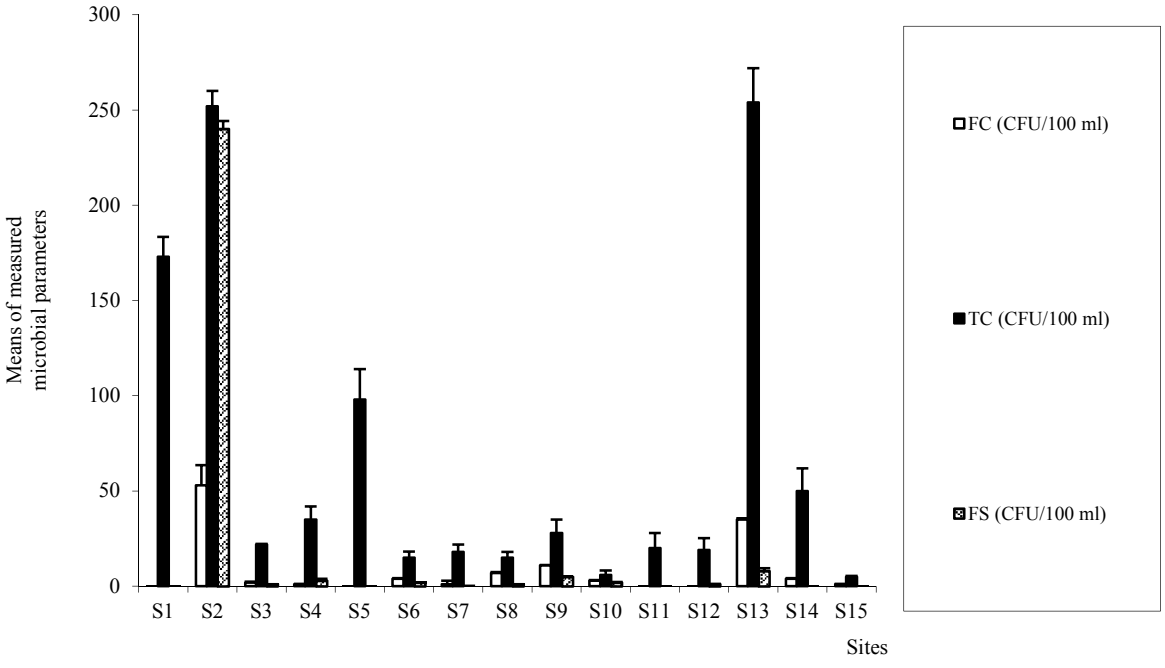
Means of measured microbial parameters
S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15
Sites
FC (CFU/100 ml)
TC (CFU/100 ml)
FS (CFU/100 ml)

Fig. 2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0
Means of measured microbial parameters
S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15
Sites
FC (CFU/100 ml)
TC (CFU/100 ml)
FS (CFU/100 ml)

Fig. 3

Table 1

Parameters	Sampling sites														
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15
Temperature (°C)	21	20	19,5	20,5	21	20	19	20	18,5	21	22,5	17	20,0	20	24,6
Turbidity (NTU)	0,66	4,31	0,15	0,74	0,77	0,28	0,3	0,16	0,20	0,28	3,9	3,5	3,6	1,8	2,9
pH	6,65	7,2	7,1	7,15	6,65	7,2	8,5	8	7,4	8	5,96	6,8	6,8	6,8	7
Electrical conductivity (µs/cm)	1264	251	651	633	1232	533	470	226	508	305	342	614	512	302	382
Mg^{2+} (mg/l)	2	0,24	2,72	2,4	1,24	1,5	2	0,51	2,5	1	2,10	1,88	1,2	2,7	0,98
Ca^{2+} (mg/l)	6,8	0,88	4,2	4,4	7,8	3,4	6,1	1,2	5	2,5	2,94	2,28	1,3	3,32	2,7
Cl^{-} (mg/l)	163,3	46,15	42,6	49,7	49,7	40	34	24	22	36	118	156	176	88	74
So_4^{2-} (mg/l)	63,3	15,12	16,25	20,4	120,2	21	14,7	15	17,2	14	42,5	47,7	65,6	78,2	23,8
No^{2-} (mg/l)	0	0,45	0	0	0	0	0	0	0,04	0	20,1	0,12	0,22	0,15	0,18
No^{3-}(mg/l)	1	2,8	0,9	2,6	0,1	1,7	0,5	0,5	1	0,3	10,3	2,8	5,42	8,26	2,2
NH^{4+} (mg/l)	0	0	0	0	0,12	0	0	0	0	0	0,2	0	0	0,1	0,12
Dissolved oxygen (mg/l)	3,3	3,55	3,7	3,45	2,99	3,5	3,22	5,89	3,65	3,1	5,68	3,97	3,5	4,65	5,14

Table 2

Parameters	Sampling sites														
	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
Temperature (°C)	20	16,3	16	16,4	20,4	18	17	18,5	17	19,5	19	17	20	20	21
Turbidity (NTU)	0,61	5	0,55	0,9	0,85	0,44	0,53	0,47	0,73	0,49	3,9	4,6	5	2,05	3
pH	7,6	8	7,2	7,5	7,8	7,2	8,5	7	7,4	8	6,8	7,1	6,9	7	6,8
Electrical conductivity (µs/cm)	1163	187	703	570	1077	533	454	212	488	300	321	602	505	300	403
Mg^{2+} (mg/l)	2	0,22	2,75	2,4	1,44	1,75	2	0,50	2,55	1,5	2,22	2	1,42	2,33	1,02
Ca^{2+} (mg/l)	5,56	1	4	5	7,8	3,5	6,1	2	5	2,5	2,94	2,28	1,8	3,72	2,7
Cl^{-} (mg/l)	152,1	45	42	47	42	37	29	23	20	34,5	108	153	160	68	54
So_4^{2-} (mg/l)	60	12	16	18,5	99,5	20	12,5	14	17	12	42	45	63	72	22
No^{2-} (mg/l)	0	0,41	0	0	0	0	0	0	0,04	0	0,09	0,12	0,22	0,16	0,2
No^{3-}(mg/l)	1,5	3	0,9	2,6	0,3	1,6	0,7	0,5	1,5	0,4	12	2,8	5,42	8,27	2,2
NH^{4+} (mg/l)	0	0	0	0	0,14	0	0	0	0	0	0,21	0	0	0,2	0,15
Dissolved oxygen (mg/l)	5,6	3,85	3,97	3,67	3,11	3,74	4,53	6,02	3,65	3,5	6,04	4,01	3,96	4,83	5,55

5 CONCLUSION

The results of bacteriological analysis show that the groundwater in Tetuan-Tangier Region present risks to human health. There is a need to improve the microbial quality of these waters.

The decrease of dissolved oxygen concentrations indicates inorganic (heavy metals) and⁄or organic (organic matter, hydrocarbons) contaminations. We suggest that additional research should be conducted. This work is now in progress.

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Dynamic Compositions of Multiple Aspects in Web Service Aspect Oriented Programming with Business Process Executable Language

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ABSTRACT: Now days, Web services plays a very important role in universal technology for distributed and heterogeneous application completed the internet. WS-BPEL is a general principle that executes basic deployment, and then it must perform the static analysis. An important use case for WS-BPEL is defining around the enterprise business connections in which the business processes of unique enterprise contact through the Web Service interfaces. Therefore, WS-BPEL facilitates the strongest ability to model the need of relationships between partner processes. Business Process Execution Language for Web Services (BPEL4WS) motivation on gathering existing web services into higher level web services. However, these type of standards demonstration some short comings about modularity and flexibility and reliability. In this paper, we support an aspect-oriented technique for web service composition and AO4BPEL, for present and future, an aspect-oriented extension to BPEL4WS. With aspects programming, we eliciting and analysis the web service composition in a modular approach and the composition becomes more easy and feasible for dynamic change.

KEYWORDS: Aspect Oriented Programming, Business Process Executable Language, WS-BPEL.

1 INTRODUCTION

The Web Services framework the paradigm of Service-Oriented Computing (SOC) scheme. In these application models offered different services that can be used to compose the WS-BPEL processes and also provides the better coordination in a loosely coupled manner. Web service BPEL composition does not involve the physical integration of all components: The basic components that involved in the composition still separated from the composite web service. The web services that is used to Enterprise Application Integration (EAI) [17] to specifying the composition of web services means that identify those operations that need to be involved and learn how to handle the exceptional situations. Many types of composition languages have been developed, in which the most important languages are those, WSCI, BPML and BPEL4WS. These languages are process-based and have their origins in Workflow Management Systems (WFMS). In this paper, we offer the solution of two major problems that occurred in Aspect Oriented Programming.

The aspect-oriented programming is a new methodology of programming that is used to increase the modularity by follow the rules of separation of cross-cutting concerns. In this paper, researcher described and explained the AOP-based performance evaluation framework for UML models. Basically, it divides the requirements of software in two portions functional requirements and non-functional requirements. But here it focuses on the non-functional requirements. It focuses on the performance to get better performance with the use of cross-cutting concerns. Evaluation Framework (APEF) work well and also provides the better performance. Software performance as a cross-cutting concern it does not target a number

of, it adjoin a multiple functional and non-functional elements. It using the Aspect Oriented Programming (AOP) for evaluating the better performance of software and also find the some limitations of the software. For the evaluation of performance, we are using the UML models. Then it ensures that AOP-based Performance then we improved the performance verification, time saving and development cost for the evaluation using the (APEF).

The internet has been emerged as a stable application platform. Those days has gone when internet was used to present static information only. Today World Wide Web has ability to provide highly interactive applications and services. Transformation of application development and deployment is growing from desktop to web. Over the internet, the applications are provided as Software as a Service (Saas). Due to SaaS over internet, the access has become independent of time and physical location.

We are using the Aspect-Oriented Programming (AOP) for the mutant criteria. The criteria include the test data or programs. It is used to finding the better testing. Aspect-Oriented Programming (AOP) provides the new code without changing the new code. It also provides the traversal concerns. AOP also provides the benefits of program based test and mutant test to guide the generation test data from OCL specification. OCL approach has the fundamental common faults can related to the test code.

Now days, modern business is rapidly increasingly to adopting the Service Oriented Architecture to become more cooperative to achieve latest changes in the market. Abject Oriented-Programming (AOP) and Model-Driven Architecture (MDA) have gained the considerable attention. In this paper researcher provides the quantitative approach to measure the uses of Model-Driven Architecture (MDA) [9] and Aspect-Oriented Programming [9] in service oriented environments [9]. It provides full grip to applying this usefulness techniques [9]. MDA plays a vital role in the environment of development processes. Applying the MDA techniques then we gained the better quality and efficient results with the use of automated techniques and also reusing the software's. The uses of both approaches we getting the simultaneously benefits. In this paper, researcher using the numerical approach to evaluate the implementation of the web services with use of both techniques. AOP and MDA techniques are much modular, encapsulated and also traceable.

In this paper, researcher tells that the usage of aspect in requirement engineering phase still is not suitable. In early stages, we have a tendency to explosion the Abject-Oriented Programming (AOP) to maps at the development stages. Unified Modeling Language (UML) is a standard modeling language. It expresses the overall processes of software development from requirement analysis to implementation and also testing. In this paper, researcher applies the demand engineering requirement for software development. Unified Modeling Language (UML) is used to purpose the way to detect to any type of aspect problem and resolve this problem among the mismatch aspects

In this paper, the BPEL approach is discussed at architecture and presentation level which will allow compositions of component's aspects. This could possibly aid other composition languages to determine composition with other interfaces. In this paper, proposed the solution of two shortcomings in Aspect Oriented Programming (A0P). First one is that lack of modality concern at runtime. Second, changing the compositions at runtime occurred in Aspect Oriented Programming.

2 LITERATURE REVIEW

Many researcher works to recognize the main benefit points of composition then get the better flexible and adaptive compositions in aspect oriented environment. Security is extremely popular topic in business, trade and academic surroundings. In this paper, researcher purpose the aspect oriented approach for dynamic enforcement of web services security. It is completely based on security between Abject-Oriented Programming (AOP) and modulation of web services. The major challenge of security occurred in legacy systems, it should be adapted to any type of network or web environments. In this era, web services and internet technologies give a successful business applications accessible through variety of network, the computer network may be a LAN, MAN, and WAN. Enforcement of web services security is one of the most important work in which the researcher's community has to performing the duties. Much type of standard languages has been used to enforce the web services. Many security features require in run-time verification of secure policies [13]. If any changes occur in the environment then it is able to remove or add web services, static and dynamic adaption. These type of processes are integrated (weaved) in Abject-Oriented Programming (AOP) process at run time. In web services, dividing the business and security issues and also developing them separately. It allows the modification of the web services, compilation at run-time to integrate and used to detect and modify the security concerns [1].

In this era, the OCL specification using to generate the test data and also overcome the limitations has obtained importance. Software testing is a fundamental idea for ensuring software quality. In this paper, researcher using the three techniques, first one is structural, second is functional, and third is fault-based. In which, each technique have the different test criteria, which facilitates the selection of test data and evaluate a test set. Each modified program is named a mutant

and provides a common fault. Test data are used to kill the each generated mutant and then it produce the result. We are using the Aspect-Oriented Programming (AOP) for the mutant criteria. The criteria include the test data or programs. It is used to finding the better testing. Aspect-Oriented Programming (AOP) provides the new code without changing the new code. It also provides the traversal concerns. AOP also provides the benefits of program based test and mutant test to guide the generation test data from OCL specification. OCL approach has the fundamental common faults can related to the test code [2].

Since last decade software industry plays a vital role but the quality of software is much important for quality package development. There are some techniques which are being studied to reduce the complexity of software for the purpose of complexity. Aspect-Oriented programming approach is a new paradigm that can help to reduce complexity by modularization of cross-cutting concerns [14]. Abject-Oriented programming is a so for goal approach but it does not guarantee to solves the problems completely. As a solution of this problem in this researcher purposes that technique of structural integration of that both object oriented and aspect oriented programs to overcome such concerns. After implementing this approach, during unit testing, the tester very much interested to attain the developed results. So the goal of integration testing is to test a unit by applying the unit interaction as possible as much [3].

The aspect-oriented programming is a new methodology of programming that provides the separation of issues between the applications code and non-functional mechanism. Especially, developers of aspect-oriented programming should only concern about their modules. The main hypothesis of aspect-oriented programming, in which entity (aspect) does not need to be inform the presence of other entities. In this paper, researcher purposes an approach to detect inferences in executable codes. Unluckily, unrequired inferences should be occurred when many entities are woven at the same join point of the base code. One entity can prevent the execution of another one entity or any type of base write variable and other one is read variable. Assertions are added in the entity chain to detect the many types of inferences. The all type of implementation is totally based on resolver construct. This type of technology is recently introduced in aspect-oriented programming. When the entities are developed independently, their actions on the other type of programs are mostly incompetent. Native hypothesis may be created regarding the behavior of one entity can be violated after the composition with other aspects. It provides an erroneous behavior. Aspect-oriented provides the two implementation applications, which one is prevention and second is detection. For using these approaches we easily debugging and detecting our aspects [4].

The aspect-oriented programming is a new methodology of programming that offer a native modularization unit that can effective to solve the code scattering and code tangling issues. These codes are caused by the by cross-cutting concerns. Aspect-Oriented Programming (AOP) provides a new techniques model the cross-cutting concerns that are very effectively and efficiently. Mostly work are computing in the implementation phase in Aspect-Oriented Programming (AOP) modeling. In which some works are described in early development and the current requirement engineering but it does not express the explicit cross-cutting concerns. In requirement engineering of software development, Aspect-Oriented Programming (AOP) is introduced to provide required model. In this paper, researcher tells that the usage of aspect in requirement engineering phase still is not sufficient. In early stages, we were using the Aspect-Oriented Programming (AOP) to maps at the development stages. Unified Modeling Language (UML) is a standard modeling language. It expresses the overall processes of software development from requirement analysis to implementation and also testing. In this paper, researcher applies the engineering requirement for software development. Unified Modeling Language (UML) is used to purpose the way to detect to any type of aspect problem and resolve this problem among the mismatch aspects [5].

In this paper, researcher purposes a security with the use of Aspect-Oriented Programming (AOP). Basically the Multi-level security (MLS) was developed by the US military in the 1970. It takes permission to the users to share the information between different classes of users. A secret military have planned to get different levels of secure information, in which if user wants to share information then it can be able to use this security level. It used the Bell-Lapdulla [6] security model to achieve the multi-level security in Aspect-Oriented Programming (AOP). Multi-level security (MLS) is a significant operation for military system, it provides the facility of many domains same like trusted operating systems. Multi-level security (MLS) permits the simultaneous access to the users to with different types of security concerns clearly defined, and also provides the prevention to users to how avoid to get unauthorized access. It avoids the user to do not get unsecure information using the business logic process. This type of aspect oriented approach provides the security at implementation level and also provides the facility of security at scattering code and tangling code. In this paper, researcher purposes the BPL (Business Process Logic) model to achieve the high level security in a multi-level security [6].

Aspect-Oriented Programming (AOP) is a favorite candidate to encapsulate the cross-cutting functionalities with the use of parallelization. It has been selected for run-time monitoring fault-tolerance and the fail over of the Aspect-Oriented Programming (AOP) architecture. Due to the duplication between Abject-Oriented Program and also the base program,

Aspect-Oriented Programming (AOP) technologies have been worked fast and trying to apply run-time monitoring in software development and also in fault-tolerance. In Aspect-Oriented Programming (AOP) parallelization, multi-core technologies are widely applied. It is very powerful and understandable work to expand the how much to take full advantage of the powerful multi-core platform for parallel computing to reduce the bundle of outcomes of weaving code. In this paper, researcher using the two types of parallel techniques to achieve the parallelization with very easily and efficiently. First technique is library-based and second is language based. These are used in Aspect-Oriented Programming (AOP) to get special type of structure for parallelization [7].

Aspect-Oriented Programming is a very important step of modeling aspects. This type of paradigm is already applied in aspect-oriented programming architecture and then it provides the better area of concurrency, replication, coordination and also distribution. Aspect-oriented programming is a featured that used in modeling to trying concerns issues to gained and modify with the use of cross-cutting, which all aspects include in aspect-oriented programming system. In the view of researcher, in aspect-oriented programming modeling few researchers' works on design and few works on constraints and some of them works on applications. In aspect-oriented analysis on an aspect oriented design achieved the better measurement modeling. If we find cross-cutting at first stage of software development then we use then modeling with them. It may be a good discovery of designers to resolve conflicts in first stage. It makes the more reusable components with the use of automatic code creating, if it much possible. It is too much important to measure the use of aspect oriented modeling in aspect oriented programming design and analysis phase. UML (Unified Modeling Language) technique supports the new type of methods. UML is an extensible modeling language to provide the facility of domain specific modeling. In this paper, researcher using the extensive techniques to improve the performances of aspect-oriented programming in software development phase [8].

3 INTRODUCTION TO BUSINESS PROCESS EXECUTABLE LANGUAGE

A Business Process Execution Language (BPEL) process is based on import and export functionality by using the interfaces solely. BPEL method relies on import and export particularly by strongest composition language that based on workflow. In BPEL, Business processes can be categorized in two different ways. In a business interaction, executable business process model provides the behavior of participants and abstract business process are little bit verifying the processes that are not need to be executed. Abstract business process plays a descriptive role with multiple use cases and including the observable behavior and template. In [11] Web Service Business Process Execution Language is using the both [12] Executable and Abstract processes. It specifying the interoperable integration model that simplified the growth of mechanized.

4 MAJOR TWO LIMITATIONS OF WS-BPEL

BPEL includes two major limitations:

- Lack of modeling concern at runtime.
- Changing the composition at runtime.

4.1 LACK OF MODELING CONCERN AT RUNTIME

This type of problem mentioned in introduction, web services compositions of ranked modularization according to the aggregation connection between connected business processes might not be more applicable modularization pattern for attributes of the composition that statement misgiving such as classes of services, business rules, authentication, exception handling, auditing, and access control.

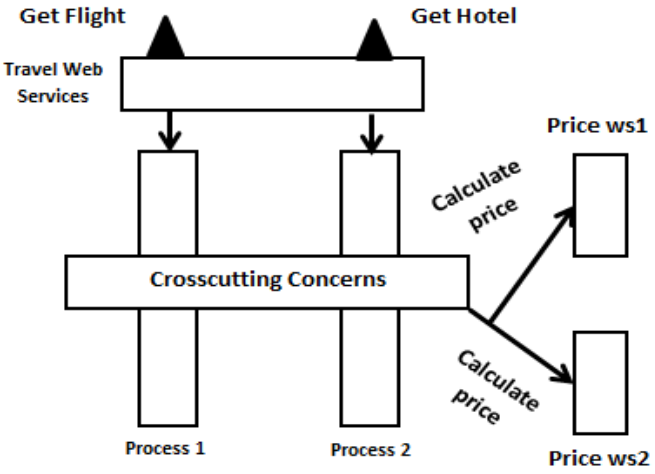

Figure 1: Web Service Composition service based

Let us take the example of simple travel service shown in Figure 1 describe that how the code containing of these concerns of cut around the margin and is not be modularized. Vertical bar is represented by the BPEL process in Figure 1. Our example web services of travel provide the facility of two operations GetFlight and GetHotel. Several market segments provide the composite operations in the production of web services.

4.2 CHANGING THE COMPOSITION AT RUNTIME

When a BPEL process is implemented, the BPEL files of all the services taking part in the composition should be known and only once a process has been implemented, there is no any technique to change it dynamically. The only tractability in BPEL is dynamic partner binding. It provides the static view of traditional workflow in management system, in which the processes and compositions are merged together.

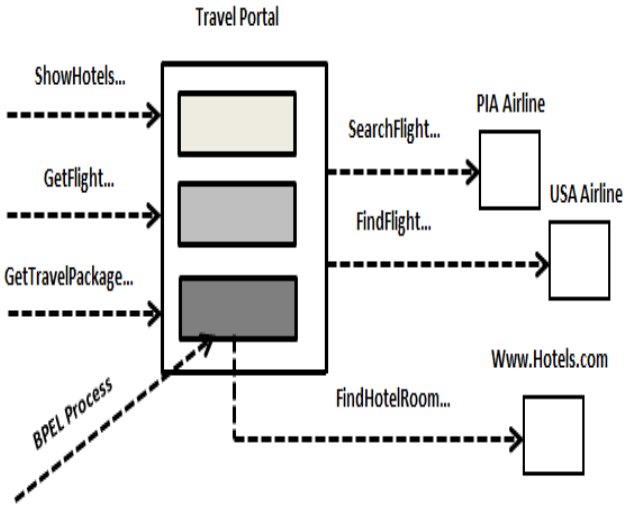

Figure 2: Changing the Composition at runtime

To define the misgivings, let us take an example of a travel agency portal in which aggregates or composed the information from partner web services like airline companies and hotel chains. The final result of travel portal is briefly described in Figure 2 with composite operations. Each relation describe the business process in BPEL and the functionality of GetTravelPackage composite two airline and hotel web services.

5 DRAWBACKS COMPOSITIONS

- If we stopping the working of web services may demand a loss of users.
- Exceptionally in Business to Business situations, one composition operation may possibly run very long and in which may avoids us from stopping it. If we stop the all running instructions then we should restore or give back all last function activities.
- Change of the composition representation on case by case starting point top to all types of exceptions.
- Ad-hoc root are required for advance business processes.

6 CONCLUSION

In this paper, we purpose the BPEL technique for web service compositions with base of modularity and dynamic adaptability. Work flow management systems are not able to provide the highly nature of web service compositions for overcome the problem of change compositions at runtime execution. We using the BPEL approach to improve the modularity and increase the availability, adaptability of web service compositions. Our main purpose to enhance the context of aspect oriented programming between BPEL aspects and base processes.

7 FUTURE WORK

We need to enable the dynamic composition or dynamic changes with the help of semi-automatic generation and web semantics ontologies.

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Variations among *Xanthomonas axonopodis* pv*. vignicola* isolates in Benue State, Nigeria

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ABSTRACT: *Xanthomonas axonopodis* pv. *vignicola* is the causative agent of bacterial blight, a destructive disease of cowpea in Africa. Laboratory studies were conducted with the objective of detecting variations among *X. axonopodis* pv. *vignicola* isolates which were collected from three different cowpea growing zones (Makurdi, Guma and Gboko Local Government Areas) in Benue state. The isolates were designated MKD388-1, GUM391 and GBK205-8 respectively. Isolates were cultured on Nutrient agar, tested for their Gram-staining reaction and their capability to utilize asparagine as a sole source of carbon and nitrogen. They were also subjected to biochemical tests. The genetic diversity of the isolates was assessed using Single Sequence Repeat (SSR) primers. Four primer combinations selected based on their reproducibility and amplification were used to differentiate the *X. axonopodis* pv. *vignicola* strains. Following these tests, the three isolates showed variations in color and growth character of colonies ranging from yellow to creamy colony color with mucoid growth. Variations to different biochemical tests were also observed among isolates. Primer assay showed genetic variation among the isolates as strains from Makurdi and Guma Local Governments showed high levels of molecular similarity while Gboko strain was distant. This study has lead to an understanding of the dynamics of pathogen variability that can be used to develop resistance gene pyramiding or gene deployment strategies. This will prevent selection for new virulence, which are effective against the currently available genetic sources of resistances genes.

KEYWORDS: *Xanthomonas axonopodis* pv,*vignicola*, isolates, strain, variation, primers

1 INTRODUCTION

One of the major biological constraints to increase cowpea production in the smallholder farming sector is attack by fungal, viral and bacterial diseases (7). Besides fungal and viral diseases, bacterial blight and pustles incited by *Xanthomonas axonopodis pv. vignicola* (19) formerly *Xanthomonas campestris pv . vignicola* (5) is the most important disease of cowpea. Cowpea bacterial blight (CoBB) is prevalent in all major cowpea growing areas of the world (6). The economic gains that can be made by partially or even completely alleviating these constraints are enormous. In the case of most of the fungal and bacterial diseases, the main reason for the all too common "breakdown" of once-effective resistances is the variability that exists in the pathogen population, which necessitates a continual replacement of cultivars due to disease susceptibility. New pathotypes evolve with the introduction of new varieties and hybrids of our crops. Rapid and accurate detection of new virulence will help formulate strategies of deploying resistant cultivars in particular regions and countries. If we develop means to quantify the variability in pathogen populations it will provide a basis of breeding cultivars with durable resistance or designing strategies for the long-term management of major diseases. For example, in the case of pearl millet downy mildew, the information on virulence pattern and sources of resistance will be highly crucial for both public and private sector breeding programs that will ultimately benefit the pearl millet farmers who will not have to suffer yield loss (16). The identification and characterization of *Xanthomonas axonopodis pv. vignicola* (*Xav*) which causes bacterial blight in cowpea crop has been carried out in West Africa. A number of sources of resistance among cowpea genotypes to the several strains of the bacteria causing this disease (CoBB) have been detected (4;17;9;16). Interestingly, limited work has been done to

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identify the most useful germplasm for breeding and bacterial blight continues to attack successfully susceptible cultivars, which makes it imperative to develop alternative ways of disease management to overcome the challenges of infection.

The conventional method of identifying the variability in the pathogen has been the use of sets of host differentials and disease rating scales to study the virulence reaction both in the field and greenhouse. Genetic characterization of the pathogen populations based on pathogenicity data will go a long way to develop high yielding cowpea varieties with other important agronomic traits and resistance to bacterial blight (BB). To assess the genetic diversity of *Xanthomonas axonopodis* pv. *vignicola* pathogens, SSR markers were used to study diversity among three *Xav* strains collected from three cowpea growing areas in Benue State.

2 MATERIALS AND METHODS

2.1 MICROSCOPIC EXAMINATION OF SPECIMENS

Diseased plant materials were cut from the boundary between diseased and healthy tissue and placed on a clean slide. A drop of ethylene blue was added and covered with a cover slip. This was examined under the microscope at a magnification of x40 using a light microscope.

2.2 ISOLATION AND PRESERVATION OF *X. AXONOPODIS PV. VIGNICOLA*

Diseased plant tissues were cut in bits and suspended in sterile water for two hours to allow sufficient quantity of bacterial cells to ooze out from the tissue. (Nutrient agar was prepared by dissolving 28g of the agar in 1 litre of distilled water and sterilized by autoclaving at 121^0C for 15 minutes). A loopful of the suspension was then streaked on the surface of nutrient agar plates in a zigzag fashion on a quadrant of the plate starting from the circumference (12). The plates were then inverted and incubated at 27^0C for 48-72 hours according to Vauterin *et al*. (19). Bacterial colonies from each plate were further sub-cultured repeatedly until pure colonies were obtained. A loopful of each pure culture was streaked on YPSA plates (Yeast extract 5g; Peptone 10g; Sucrose 20g; Agar 12g in 1 litre of distilled water at a pH of 7.4 and autoclaved at 121^0C for 15 minutes). The plates were incubated at 28^0C for 48 – 72hours. Pure cultures were transferred to YPSA slants incubated at 28^0 C for 48 – 72hours and preserved at 4^0C for further work. In both methods, only round, smooth, entire domed and yellowish bacterial colonies were selected as described by Ah-You *et al.* (1).

2.3 MORPHOLOGICAL AND BIOCHEMICAL TESTS

Gram reaction of the isolates was determined following the staining procedure in Vauterin *et al*. (19). First, thinly spread bacterial smear was prepared on a clean slide, air-dried and fixed by passing it over a Bunsen burner flame. The dried smear was flooded with crystal violet solution for one minute and washed in tap water for few seconds. It was then flooded with iodine solution for one minute and washed again in tap water. Thereafter it was decolourised with 95% ethanol by applying drop by drop until no more colour flows from the smear. Finally slides were counter stained for about 10s with safranin, washed in tap water and examined under microscope using oil immersion objective. Gram negative bacteria were selected for further tests.

2.4 GROWTH ON ASPARAGINE MEDIUM

All Gram-negative isolates were allowed to grow on Asparagine medium (Asparagine 0.5g; KH_2P0_4 0.1g; $MgSO_4.7H_2O$ 0.2g; KNO_3 0.5g; $CaCl_2$ 0.1g; NaCl 0.1g and agar 12 – 15g (for plates) in 1 litre distilled water with pH 7 and autoclaved at 121^0 C for 15 minutes) at 28^0C for 48 – 72 hours without any other carbon and nitrogen sources (3). This is used as a diagnostic test for *Xanthomonas* because they are not able to grow on it while others like yellow *Enterobactericeae* and many *Pseudomonads* can grow on it. The growth of the bacteria on Asparagine agar plates was recorded and those that were unable to grow on the medium were taken for further tests. In all cases uninoculated medium was taken as control.

2.5 GROWTH ON NUTRIENT AGAR WITH 5% GLUCOSE

Isolates were streaked on nutrient agar with 5% glucose (Nutrient agar 28g; 50g glucose in 1 litre distilled water with pH 7 and autoclaved at 121^0 C for 15 minutes) and incubated at 28^0C for 48 -72 hours. Mucoid and yellow colony growth on this medium is one of the characteristics that differentiate *Xanthomonas campestris* from other *Xanthomonas* species (3). Therefore the growth and colony colour were recorded.

2.6 PRESENCE OF XANTHOMONADIN PIGMENT

Following the procedure used by Bobosha (2), each isolate was streaked on nutrient agar and incubated at 28^{0}C for 48 hours. About 2-3 loopful of each bacterial isolate from nutrient agar was transferred to 3ml of methanol in test tubes and placed in boiling water bath until the pigment was removed. The suspension was then centrifuged at 13,000rpm for 15 minutes to remove cell debris. The supernatant was decanted and the methanol allowed to evaporate by keeping the methanol extract in 50-60^{0}C water bath until the optical density of the pigment extract reaches 0.4 at 443nm. Five nanolitre of each extract was spotted on a precoated silica gel plate and a total of 30nl was spotted. The solvent was allowed to move slowly approximately 10cm on the gel plate. A yellow spot was taken as positive for the presence of the pigment as described by Vauterin *et al.* (19).

2.7 CASEIN HYDROLYSIS

The ability of *Xanthomonas axonopodis* pv. *vignicola* to degrade the protein casein by producing proteolytic exo-enzymes was tested by growing the isolates on milk agar plates (Skim milk powder, 100g; Peptone, 5g; Agar, 15g in 1 litre distilled water with pH 7.2 autoclaved at 121^{0}C for 15 minutes). Clear zone around the growth of the isolates was recorded as positive for casein hydrolysis (2).

2.8 STARCH HYDROLYSIS

The isolates were streaked on starch agar medium (soluble starch, 2.0g; Nutrient agar, 28.0g, in 1 litre distilled water with pH 7 and autoclaved at 121 ^{o}C for 15 minutes) to evaluate their ability to hydrolyze starch (amylase production). The plates were incubated at 28 ^{o}C for 7 days; starch hydrolysis was observed by flooding the plates with Lugol's iodine solution for 30 seconds. The appearance of yellowish and reddish clear zones around the line of growth of each isolate indicated starch hydrolysis (2).

2.9 SALT TOLERANCE

To test for salt tolerance, isolates were inoculated onto nutrient broth with 0%, 1%, 2%, 3%, 4% and 5% NaCl concentration as described by (2). Inoculated salt free (0%) nutrient broth was used as control. The presence or absence of growth was recorded.

2.10 CATALASE TEST

Few drops (3) of hydrogen peroxide were added on the surface of 48hour old culture of each isolate on YPSA medium. Bubble formation was recorded as positive for catalase activity (8).

2.11 OXIDASE REACTION

One ml of distilled water was added to make 1% solution of 0.01g tetramethylphenylene diamine dihydrochloride. A few drops of the reagent were pipetted on to a filter paper. Using a wire loop, a loopful culture of the test organism was rubbed across the impregnated filter paper. The observation was recorded as positive with purple colour or negative with no purple colour after 60 seconds (8).

2.12 GENETIC CHARACTERIZATION OF THE ISOLATES USING REPETITIVE PCR

2.12.1 DNA EXTRACTION

The DNA extraction was done following the protocol in Vivantis GF-1 Bacterial DNA Extraction Kit for all isolates. In addition, bacterial isolate from soybean bacterial blight infection was included to see whether this causal agent has any similarity with CoBB causal agent. A loopful of each isolate was grown to saturation in 5ml of peptone water overnight. From each of the cultures, 2ml `was suspended in eppendorf tube and micro centrifuged at 6,000xg for 2min. The supernatant was decanted completely leaving only the pellet. Pellet was resuspended in 100µl buffer R1 and mixed by repeated pipetting.

The lysate was treated with 10µl lysozyme, mixed thoroughly and incubated at 37^{0}C for 20min after which it was centrifuged at 10,000xg for 3min to pelletize the digested cells and the supernatant decanted completely. Pellet was

resuspended in 180µl of Buffer R2 and 20µl of proteinase K was added, mixed thoroughly and incubated at 65^0C for 20min with occasional mixing every 5min. Twenty micro litre of RNAase A was added, mixed and incubated at 37^0C for 5min. Four hundred micro litre of Buffer BG was added and mixed thoroughly by inverting tube several times until a homogenous solution was obtained, then it was incubated at 65^0C for 10min.

Absolute ethanol of 200µl was added and mixed thoroughly to avoid uneven precipitation of nucleic acid due to high local ethanol concentrations. The sample was transferred to a column assembled in a clean tube and centrifuged at 10,000xg for 1min. The flow through was then discarded. The column was washed with 750µl of wash buffer and centrifuged at 10,000xg for 1min and again centrifuged at 10,000xg for 1min to remove residual ethanol. The column was then placed in a clean microcentrifuge tube and 50µl of pre-heated Elution Buffer was added directly onto column membrane and allowed to stand for 2min; centrifuged at 10,000xg for 1min to elute DNA. DNA was stored at 4^0C. The purity of the extracted DNA was evaluated by running on 1% agarose gel.

2.12.2 AGAROSE GEL ELECTROPHORESIS

The gel was prepared using electrophoresis buffer and electrophoresis-grade agarose by melting in a microwave oven, mixing, cooling to 55^0C, pouring into a sealed gel casting platform, and inserting the gel comb. After the gel has hardened, the seal was removed from the gel casting platform and the gel comb withdrawn. This was placed into an electrophoresis tank containing sufficient electrophoresis buffer to cover gel approximately 1mm. DNA samples with an appropriate amount of 10x loading dye were prepared and loaded into wells with a pipette and ran at 80volt and 37ampere for 45min and photographed using UV transilluminator

2.12.3 PCR ANALYSIS

The primers used for PCR amplification were SSR primers synthesized in Mike Timko's Laboratory, University of Virginia, USA. PCR analysis was done with 4 primer pairs EX-39, EX-40, EX-41 and EX-43. Accupower PCR premix tube (BIONEER) was used for the PCR reaction to which 1µl of DNA sample, 1µl of primer pair and 18µl of water (Molecular Biology Grade -Lonza) were added. Each PCR premix tube (20µl final volume) contained: 1U Taq DNA polymerase, 250µM dNTP mix, 10mM Tris-HCL (pH 9.0), 30Mm KCL, 1.5mM $Mgcl_2$ and stabilizer/tracking dye.

PCR reactions were performed in a heated lid thermal cycler (My Cycler) operated as follows:

1 cycle of initial denaturing at 94^0C for 30s,

35 cycles of denaturation at 94^0C for 30 sec, followed by annealing at 55^0C for 30s and extension at 72^0C for 2 min.

A final extension cycle of 10 min at 72^0C was added to ensure completion of the final amplification products.

2.12.4 ANALYSIS OF PCR PRODUCT

A 10µl of the final PCR product was electrophoresed on a 2% agarose gel with ethidium bromide staining. The gels were run for approximately 1 h 20 min at 170 voltage in 1 X Tris acetic acid (TAE) buffer (45 mmol L-1 glacial acetic acid, 0.5 mmol l-1 ethylenediaminetetra acetic acid (EDTA), (pH, 8.4). A 1 kb DNA molecular marker ladder was loaded in the first well for band size determination of PCR products. The ethidium bromide-stained gel was visualized on an UV transilluminator and photographed using a Polaroid camera.

2.12.5 DATA ANALYSIS

The bands in each lane were taken for analysis. In the regions where no bands were observed, 0 was used to indicate the absence. The analysis was done using the similarity index SAB = 2NAB /NA + NB (11).

Where SAB = sum of isolate A and B; NA = number of bands for isolate A; NB = number of bands for isolate B.

3 RESULTS

3.1 MORPHOLOGICAL AND BIOCHEMICAL CHARACTERISTICS

Bacterial cells were seen stained deep blue; while plant tissues appear paler greenish blue. The growth of isolates on nutrient agar with 5% glucose medium showed variation in colour and growth character of colonies. MKD388 -1 isolate

showed smooth, yellow colony colour with high mucoid type of growth. GUM391 appeared smooth, yellow to creamy colony colour with less mucoid growth. Similarly, GBK205 -8 was smooth, yellow tiny colony with high mucoid growth. Among the isolates tested for their Xanthomonadin pigment production, MKD388-1 and GBK205-8 isolates produced the pigment while GUM391 isolate did not. Gram reaction was negative for all the isolates while catalase reaction was conversely positive for all. In casein hydrolysis ability, MKD388 -1 and GUM391 isolates were able to hydrolyse casein up to 4cm clear zone while GBK205-8 hydrolysed casein up to 2cm. Yellowish clear zones were seen around GUM391 isolate and GBK205-8, while reddish clear zones were observed around the growth of MKD388 -1 isolate indicating that starch has been partially hydrolyzed to dextrins. (Table 3.1).

For salt tolerance test, all the isolates tolerated 1% sodium chloride (NaCl) concentration by growing profusely, MKD388-1 and GUM391 isolates also grew profusely on 2% NaCl while GBK205-8 isolate only showed abundant growth. For 3% and 4% NaCl concentrations, all isolates showed abundant and sparse growth respectively. It was only on 5% NaCl that none of the isolates was found tolerant. (Table 3.2).

TABLE 3.1. MORPHOLOGICAL AND BIOCHEMICAL CHARACTERISTICS of X. axonopodis pv. vignicola

Isolate	**MKD388-1**	**GUM391**	**GBK205-8**
Growth on NA with 5% glucose	Lightyellow colony and Mucoid growth	Creamy colony with less mucoid growth	Yellow tiny colony with high mucoid growth
Xanthomonadin production	+	_	+
Gram reaction	_	_	_
Catalase reaction	+	+	+
Oxidase reaction	_	_	+
Casein hydrolysis	+3	+3	+2
Starch hydrolysis	+1	+3	+3

NB: +3=3-4cm clear zone, +2=1-2cm clear zone, +1 =< 1cm clear zone, + = positive, - = negative

TABLE 3.2. SODIUM CHLORIDE (NaCl) TOLERANCE OF X. axonopodis pv. vignicola ISOLATES

	Isolate		
NaCl concentration(%)	MKD 388-1	GUM 391	GBK 205-8
1	+++	+++	+++
2	+++	+++	++
3	++	++	++
4	+	+	+
5	-	-	-

***+++** = profuse growth, **++** = abundant growth,**+** =sparse growth, - = no growth*

3.2 PCR PRODUCTS

Band pattern of the isolates

The DNA extraction procedure yielded high molecular weight of DNA measuring up to 20ng (Plate 1). Out of the 4 primers screened for amplification of *Xav* DNA, only 1 resulted in non-distinct amplification product, it was therefore discarded and the remaining 3 generated reproducible patterns. Analysis of 3 *Xav* and 1 *Xag* Isolates presented a total of 14 amplicons from the three primer combinations. The highest number of amplicons (9) was produced by primer EX-40 and the lowest number of amplicons (2) by primer EX-39

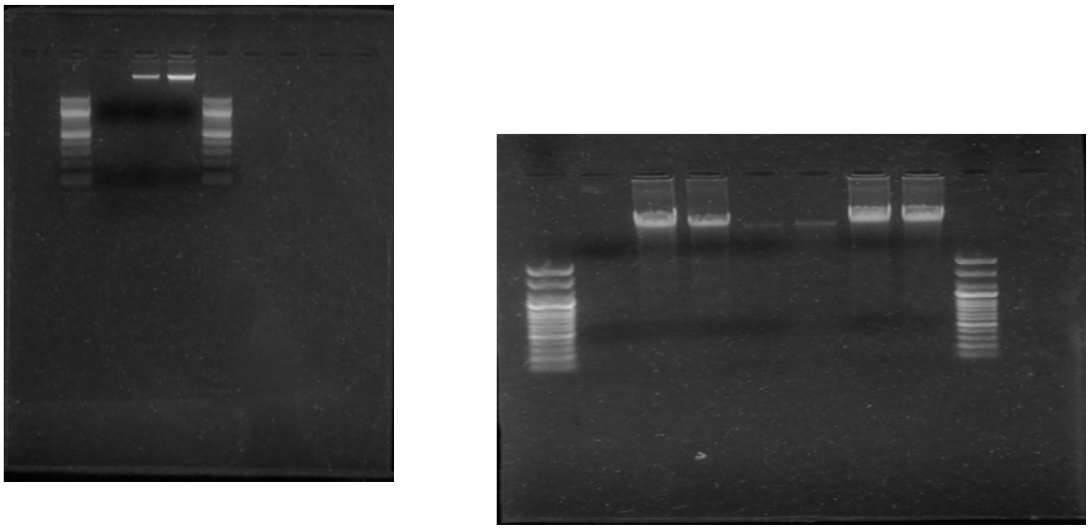
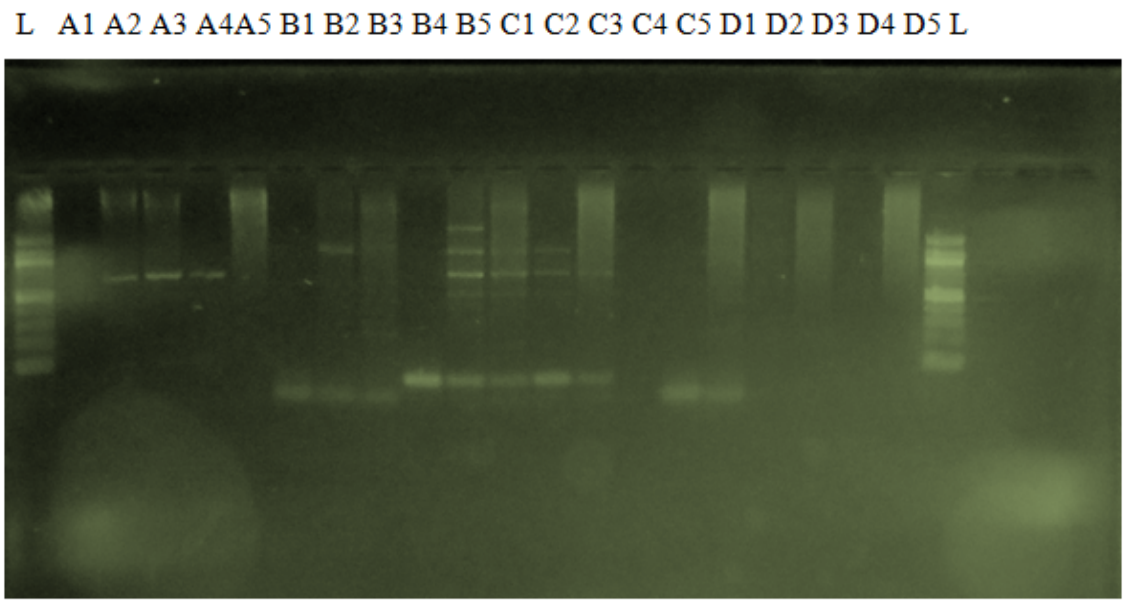


Plate 1: Extracted DNA on 1% agarose



N.B: L= Ladder, A=EX-39, B=EX-40, C=EX-41, D=EX-43, 1=Blank, 2=SB, 3=GUM391 4=MKD388-1, 5=GBK205-8

Plate 2: Different band patterns of the isolates stained with Ethidium Bromide

Table 3.3. shows similarity obtained for each pair of isolates. *Xanthomonas* isolate from soybean (SB) showed only 50% similarity to GUM391. There was a very high similarity index of 80% between MKD388-1/GUM391 and SB/MKD3888-1. However, no similarity was observed between GBK205-8/MKD388-1, GUM391/GBK205-8 and SB/GBK205-8

TABLE 3.3. SUMMARY OF GENTIC SIMILARITY AMONG ISOLATES (SAB=2NAB/NA=NB)

isolates	% similarity	Remark
SB/GUM391	50	SIMILAR
MKD388-1/GUM391	80	SIMILAR
GBK205-8/MKD388-1	-	NO SIMILARITY
SB/GBK205-8	38	NO SIMILARITY
SB/MKD388-1	80	SIMILAR
GUM391/GBK205-8	-	NO SIMILARITY

4 DISCUSSION AND CONCLUSION

The bacteriological properties of *Xanthomonas axonopodis* pv. *vignicola* observed in Makurdi, Guma and Gboko isolates of Benue State, Nigeria are within the range of variability exhibited by members of the genus *Xanthomonas* (9). In general, morphological and biochemical characteristics of the isolates showed different colours and growth patterns that were characteristics of members of this group of organisms. This confirmed that the isolates were actually *X. axonopodis* pv. *vignicola*. The variation in colour, pigmentation and biochemical characteristics of the isolate colonies could have stem from the different areas where the isolates were obtained and this observation agrees with the findings of (2).

The presence of xanthomonadin pigment is usually taken as a distinct character of the genus xanthomonas. However, Bradbury (3) observed that the absence of the pigment does not exclude the isolate from the genus. There could be possibility of losing the pigment during culturing, or on the other hand, the isolates might not carry that character like the white pathovars of *Xanthomonas campestris* as reported by Sugimori and Oliveira (18).

Salt tolerance ability by the isolates reflected what was reported by Khatri-Chhetri (9) and Bobosha (2) but not to the same extent, as 5% NaCl suppressed the growth of all *X. axonopodis* pv. *vignicola* isolates in our study. Bradbury (3) described the characteristics of *Xanthomonas axonopodis* like starch hydrolysis with neither positive nor negative reaction. This indicates the possibility of finding pathovars and strains as positive or negative for that specific test within the species and may account for variations among isolates of a given population. Genetic similarity among *X. axonopodis* pv. *vignicola* isolates have been previously demonstrated through random amplified polymorphic DNA (RAPD), restriction fragment length polymorphism (RFLP), and repetitive element-polymerase chain reaction by Ah-You *et al*. (1) and Mhedbi-Hajri *et al*. (13). There was also a relative predominance of a specific group of *X. axonopodis* isolates in East Africa (14) that was found in Spain (10) but not in Americas. In the present study, *X. axonopodis* pv. *vignicola* isolates from Makurdi and Guma Local Governments showed high levels of similarity. The low level of molecular variation may be that the isolates are evolutionary related. While the no similarity of Gboko isolate to any other isolate support the hypothesis that strains from different ecological zones form genetically and evolutionary separate groups; therefore resistance developed to a strain in a particular zone will not be effective on another strain in a different zone. Because of the low similarity observed in soybean isolate and cowpea isolates, the hypothesis that *Xanthomonas* strains from soybean are genetically separate from *Xanthomonas* strains of cowpea is supported. Further investigation of strain variation in bacterial blight strains may be required to develop SSR markers to be specifically used for bacterial blight. It has been demonstrated in this study that SSR markers designed for cowpea may be used in *X. axonopodis* pv. *vignicola* diversity studies and may also facilitate the identification of polymorphisms linked to virulence factors and contribute to the understanding of plant-bacteria interactions at the molecular level.

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Control of chaos in permanent magnet synchronous motor with parameter uncertainties: a Lyapunov approach

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ABSTRACT: The problem of controlling the chaotic permanent magnet synchronous motor (PMSM) is addressed. Based on the Lyapunov stability theory, a state feedback controller is designed to make the system states track desired references even when the system exhibits chaotic behavior. Both cases of certain and uncertain systems are considered. System performances are maintained in spite of parametric uncertainties. Numerical simulations are then presented to show the effectiveness of the proposed controller.

KEYWORDS: Permanent magnet synchronous motor, chaos, parameter uncertainties, stability, Lyapunov stability theory

1 INTRODUCTION

Permanent Magnet Synchronous Motors (PMSM) are very popular in various industrial applications due to their numerous advantages including mechanical robustness, high power density and low maintenance cost [1], [2]. Many control techniques are applied to PMSM such as PI control [3], [4], sliding mode control [5], [6], [7] H_∞ control [8], [9] adaptive control [10], [11], passivity control [2], [12], fuzzy control [13], [14], fractional order control [15], [16] and finite-time stability theory [17], [18].

Some of the above references ([2], [10], [12], [13], [14], [17] and [18]) are focused on a particular configuration of the PMSM in which the system exhibits a chaotic behavior. Chaos is, in fact, a phenomenon that affects many electrical systems such as PMSM and can lead to the instability of the motor and the collapse of the drive system [7]. Since 1980, Kuroe and Hayashi [19] studied chaos in motor drives with parameters fall into a certain domains. More details about chaos in electric drive systems can be found in [20].

Recently, chaos control and synchronization in electrical systems has emerged as a new area of research. In this paper, the problem of speed control of chaotic PMSM is addressed based on Lyapunov stability theory. The controller designed must guarantee a good reference tracking for the system states in spite of parameter uncertainties. The proposed controller is validated through numerical simulations.

The paper is organized as follows: in Section 2, the mathematical model of the permanent magnet synchronous motor is derived. In Section 3, controller design method is presented in case of certain and uncertain systems. Finally, numerical simulations are given in Section 4, followed by a conclusion.

2 PERMANENT MAGNET SYNCHRONOUS MOTOR MODEL

A permanent magnet synchronous motor with a smooth air gap can be described in the d-q frame as follows [21].

$$\begin{cases} \dot{i}_d = -i_d + i_q\omega + \tilde{u}_d \\ \dot{i}_q = -i_q - i_d\omega + \gamma\omega + \tilde{u}_q \\ \dot{\omega} = \sigma(i_q - \omega) + \tilde{T}_L \end{cases} \quad (1)$$

where i_d and i_q are the d-q axes currents, ω is the angular velocity of the motor. $\tilde{u}_d$ and $\tilde{u}_q$ are the d-q axes voltages and $\tilde{T}_L$ is the external load torque. γ and σ are system parameters.

After an operating period, the external inputs of the systems are supposed to be set to zero, such that $\tilde{u}_d = \tilde{u}_q = \tilde{T}_L$. The system becomes unforced.

$$\begin{cases} \dot{i}_d = -i_d + i_q\omega \\ \dot{i}_q = -i_q - i_d\omega + \gamma\omega \\ \dot{\omega} = \sigma(i_q - \omega) \end{cases} \quad (2)$$

The study of the system (2) indicates three equilibrium points and a chaotic behavior exhibited when its parameters fall into a specific area [21]. Fig. 1 illustrates the chaotic attractor of the PMSM for $(\gamma, \sigma) = (20, 5.45)$ and initial conditions $(i_{d0}, i_{q0}, \omega_0) = (0.5, -0.6, 0.5)$.

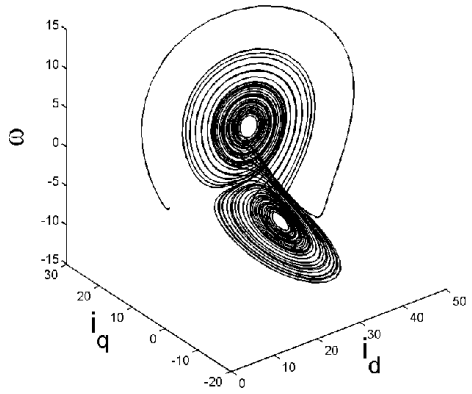

Fig. 1. The chaotic attractor of the PMSM system

The equilibrium point $(0,0,0)$ is locally stable whereas the two others, namely $(\gamma-1, \sqrt{\gamma-1}, \sqrt{\gamma-1})$ and $(\gamma-1, -\sqrt{\gamma-1}, -\sqrt{\gamma-1})$, are locally unstable [21].

Let (i_d^*, i_q^*, ω^*) denotes an equilibrium point. The aim of this paper is to design a controller that stabilizes the system (2) to the equilibrium point (i_d^*, i_q^*, ω^*) and guarantees chaos suppression.

For this purpose, a single controller u is added to the system.

$$\begin{cases} \dot{i}_d = -i_d + i_q\omega \\ \dot{i}_q = -i_q - i_d\omega + \gamma\omega + u \\ \dot{\omega} = \sigma(i_q - \omega) \end{cases} \quad (3)$$

For the tracking error vector e, $e = [e_1, e_2, e_3]^T$, defined such that

$$\begin{cases} e_1 = i_d - i_d^* \\ e_2 = i_q - i_d^* \\ e_3 = \omega - \omega^* \end{cases} \quad (4)$$

the dynamic error equations of the system can be expressed by

$$\begin{cases} \dot{e}_1 = \dot{i}_d = -e_1 - i_d^* + (e_3 + \omega^*)(e_2 + i_q^*) \\ \dot{e}_2 = \dot{i}_q = -e_2 - i_q^* - (e_3 + \omega^*)(e_1 + i_d^*) + \gamma(e_3 + \omega^*) + u \\ \dot{e}_3 = \dot{\omega} = \sigma(e_2 + i_q^*) - \sigma(e_3 + \omega^*) \end{cases} \quad (5)$$

For any equilibrium point (i_d^*, i_q^*, ω^*) of the system, it comes

$$\begin{cases} \dot{i}_d^* = -i_d^* + i_q^* \omega^* = 0 \\ \dot{i}_q^* = -i_q^* - i_d^* \omega^* + \gamma\omega^* = 0 \\ \dot{\omega}^* = \sigma(i_q^* - \omega^*) = 0 \end{cases} \quad (6)$$

then the reduced dynamic error equations

$$\begin{cases} \dot{e}_1 = -e_1 + \omega^* e_2 + (i_q^* + e_2)e_3 \\ \dot{e}_2 = -\omega^* e_1 - e_2 - (i_d^* + e_1 - \gamma)e_3 + u \\ \dot{e}_3 = \sigma(e_2 - e_3) \end{cases} \quad (7)$$

The convergence of the PMSM system states to the equilibrium point (i_d^*, i_q^*, ω^*) is then reached if the dynamic errors are stabilized at zero. The controller design allowing to stabilize the dynamic error system (7) to zero is discussed in the next section.

3 CONTROLLER DESIGN

In this section, controller design is performed for the chaotic PMSM system. Two cases are considered: when system parameters are fixed to their nominal values and when the model of the system is affected by parametric uncertainties.

3.1 CONTROL OF THE NOMINAL SYSTEM

When uncertainties are neglected, the dynamic error system (7) is globally asymptotically stable if the control law in the next theorem is applied. That means that system (3) can be stabilized at the equilibrium point (i_d^*, i_q^*, ω^*) considered as a tracking reference for the system states.

Theorem 1: The chaotic system (7) is globally asymptotically stable if the following nonlinear control law u_0 is applied

$$u_0 = -k_0 e_2 - (\sigma + 1)e_3 \quad (8)$$

where k_0 is a nonnegative number.

Proof: Let the quadratic Lyapunov function $V(e)$ defined by

$$V(t) = \frac{1}{2}(e_1^2 + e_2^2 + e_3^2) \quad (9)$$

The time derivative of this function along the trajectories of system (3) is

$$\begin{aligned} \dot{V}(e) &= e_1\dot{e}_1 + e_2\dot{e}_2 + e_3\dot{e}_3 \\ &= e_1(-e_1 + \omega^* e_2 + (i_q^* + e_2)e_3) + e_2(-\omega^* e_1 - e_2 - (i_d^* + e_1 - \gamma_0)e_3 + u_0) + \sigma_0 e_3(e_2 - e_3) \\ &= -(e_1^2 + e_2^2 + \sigma_0 e_3^2) + i_q^* e_1 e_3 + e_2((\sigma_0 + 1)e_3 + u_0) \end{aligned} \quad (10)$$

and can be simplified to

$$\dot{V}(e) = -(e_1 - \frac{1}{2} i_q^* e_3)^2 - {e_2}^2 - (\sigma_0 - \frac{1}{4} i_q^{*2}) {e_3}^2 + e_2((\sigma_0 + 1)e_3 + u_0) \tag{11}$$

By substituting the control law (8), it comes

$$\dot{V}(e) = -(e_1 - \frac{1}{2} i_q^* e_3)^2 - (1 + k_0){e_2}^2 - (\sigma_0 - \frac{1}{4} i_q^{*2}) {e_3}^2 \tag{12}$$

If $\sigma_0 - \frac{1}{4} i_q^{*2} \geq 0$, i.e. $\gamma_0 \leq 4\sigma_0 + 1$ and $k_0 \geq 0$ then

$$\dot{V}(e) \leq 0 \tag{13}$$

which implies that the studied system is stable.

3.2 CONTROL OF THE UNCERTAIN SYSTEM

To take account of the parametric uncertainties, the system parameters γ and σ are supposed to lie within intervals centered around nominal values γ_0 and σ_0:

$$\gamma \in [\underline{\gamma}, \overline{\gamma}] \text{ and } \gamma \in [\underline{\sigma}, \overline{\sigma}] \tag{14}$$

and can, therefore, be expressed as

$$\gamma = \gamma_0 + \delta_\gamma \gamma_1 \text{ and } \gamma = \gamma_0 + \delta_\gamma \gamma_1 \tag{15}$$

with $\gamma_0 = \frac{\underline{\gamma} + \overline{\gamma}}{2}$, $\gamma_1 = \frac{\overline{\gamma} - \underline{\gamma}}{2}$, $\sigma_0 = \frac{\underline{\sigma} + \overline{\sigma}}{2}$, $\sigma_1 = \frac{\overline{\sigma} - \underline{\sigma}}{2}$ and $\delta_\gamma, \delta_\sigma \in [-1, 1]$.

Using the above notations for the uncertain parameters, the dynamic error equations (5) become

$$\begin{cases} \dot{e}_1 = -e_1 + \omega^* e_2 + (iq^* + e_2)e_3 \\ \dot{e}_2 = -\omega^* e_1 - e_2 - (id^* + e_1 - \gamma_0 - \delta_\gamma \gamma_1)e_3 + \delta_\gamma \gamma_1 \omega^* + u \\ \dot{e}_3 = (\sigma_0 + \delta_\sigma \sigma_1)(e_2 - e_3) \end{cases} \tag{16}$$

In order to guarantee the convergence of the system states to their desired trajectories (i_d^*, i_q^*, ω^*), a controller is designed according to the following result.

Theorem 2: If the uncertain parameters are such that

$$\gamma_0 \leq 4(\sigma_0 - \sigma_1) + 1 \tag{17}$$

then the chaotic system (16) is globally asymptotically stable if the following nonlinear control law u is applied

$$u = -k_0 e_2 - (\sigma + 1)e_3 - k_1 sgn(e_2)((\gamma_1 + \sigma_1)|e_3| + \gamma_1 |\omega^*|) \tag{18}$$

where k_0 and k_1 are real numbers such that $k_0 \geq 0$ and $k_1 \geq 1$ and *sgn* is the function sign defined by

$$\text{sgn}(x) = \begin{cases} 1 & if\ x > 0 \\ -1 & if\ x < 0 \\ 0 & if\ x = 0 \end{cases} \tag{19}$$

Proof: Consider the same Lyapunov function $V(e)$ defined by (9).

The time derivative of $V(e)$ is:

$$\begin{aligned}\dot{V}(e) &= e_1\dot{e}_1 + e_2\dot{e}_2 + e_3\dot{e}_3 \\ &= e_1(-e_1 + \omega^* e_2 + (i_q^* + e_2)e_3) + e_2(-\omega^* e_1 - e_2 - (i_d^* + e_1 - \gamma_0 - \delta_\gamma\gamma_1)e_3 + \delta_\gamma\gamma_1\omega^* + u) + e_3(\sigma_0 + \delta_\sigma\sigma_1)(e_2 - e_3) \\ &= W_0(e) + W_1(e) + \delta_\sigma\sigma_1 e_3{}^2\end{aligned} \tag{20}$$

where $W_0(e)$ is the time derivative of the Lyapunov function of (11) and $W_1(e)$ is given by

$$W_1(e) = \delta_\gamma\gamma_1 e_2 e_3 + \delta_\gamma\gamma_1\omega^* e_2 + \delta_\sigma\sigma_1 e_3(e_2 - e_3) + u_1 e_2 \tag{21}$$

Note that here, the control law u in (20) is expressed as $u = u_0 + u_1$.

By substituting expressions of u_0 (theorem 1) and u_1 (theorem 2), one can obtain

$$\begin{aligned}W_0(e) + \delta_\sigma\sigma_1 e_3{}^2 &= -(e_1 - \frac{1}{2}i_q^* e_3)^2 - (1 + k_0)e_2{}^2 - (\sigma_0 + \delta_\sigma\sigma_1 - \frac{1}{4}i_q^{*2})e_3{}^2 \\ &\le -(e_1 - \frac{1}{2}i_q^* e_3)^2 - (1 + k_0)e_2{}^2 - (\sigma_0 - \sigma_1 - \frac{1}{4}i_q^{*2})e_3{}^2\end{aligned} \tag{22}$$

$$\le 0 \text{ if } \sigma_0 - \sigma_1 - \frac{1}{4}i_q^{*2} \ge 0 \text{, i.e. } \gamma_0 \le 4(\sigma_0 - \sigma_1) + 1 \tag{23}$$

and for $k_1 \ge 1$,

$$\begin{aligned}W_1(e) &= (\delta_\gamma\gamma_1 e_2 e_3 - k_1\gamma_1 |e_2||e_3|) + (\delta_\gamma\gamma_1\omega^* e_2 - k_1\gamma_1\omega^* |e_2|) + (\delta_\sigma\sigma_1 e_3 e_2 - k_1\sigma_1 |e_2||e_3|) \\ &\le 0\end{aligned} \tag{24}$$

Consequently, $\dot{V}(e) \le 0$ and system (16) is globally asymptotically stable for the considered control law.

4 SIMULATION RESULTS

In this section, numerical simulations are performed in order to verify the effectiveness of the proposed control laws. All simulations are curried out using the 4th order Runge-Kutta method with a step size of 0.01 second and considering the same initial conditions $(1, -2, 0.7)$. The considered reference is the equilibrium point $(i_d^*, i_q^*, \omega^*) = (\gamma - 1, \sqrt{\gamma - 1}, \sqrt{\gamma - 1})$. Control is activated at time equal to 5 seconds.

Fig. 2 shows the dynamic error system states considering nominal values $(\gamma, \sigma) = (\gamma_0, \sigma_0) = (20, 5.45)$ of PMSM. The used value for the constant gain is $k_0 = 10$.

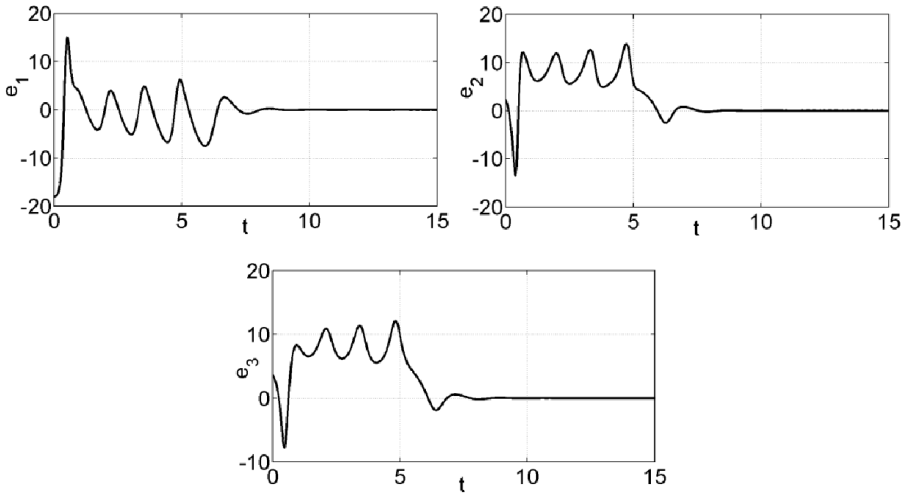

Fig. 2. Evolution of the dynamic errors for controlled PMSM system without considering uncertainties

Fig.3 shows the dynamic errors of the controlled PMSM system for different values of the uncertain parameters. Referring to the parametric uncertainty description detailed in (15), the used simulation parameters are $(\gamma_1, \sigma_1) = (10, 0.7)$ and $(\delta_\gamma, \delta_\sigma) = \{(-1,-1),(-1,1),(1,-1),(1,1),(0,1)\}$. The control gains are fixed to $(k_0, k_1) = (10, 5)$.

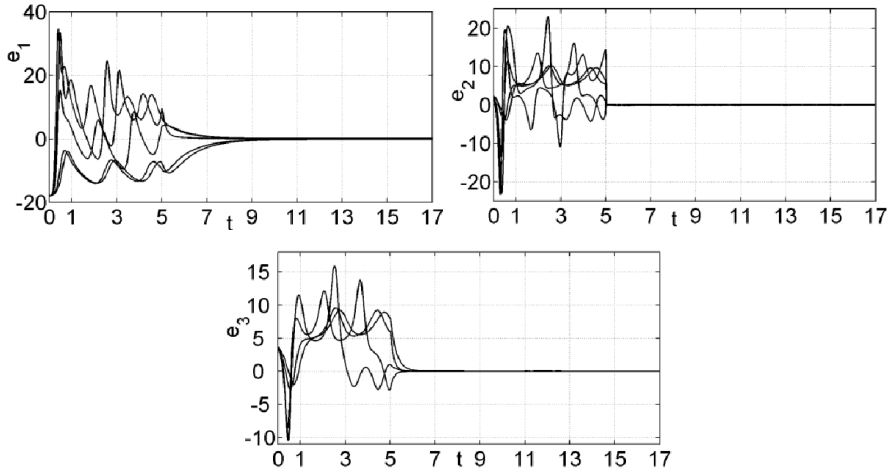

Fig. 3. Evolution of the dynamic errors for controlled PMSM system considering uncertain parameters

Both figures show that the proposed controllers are able to ensure chaos suppression. Moreover, system states can stabilize to the equilibrium point despite the presence of parameters uncertainties.

5 CONCLUSION

In this paper, control of chaos in a PMSM system is addressed. Based on the Lyapunov stability theory, controllers are designed and successfully applied to the chaotic PMSM system. The controllers are applied with or without considering uncertainties in system parameters. In both cases, system states are stabilized to the desired trajectories. Furthermore, the proposed structure is simple and easy to implement and can therefore be tested experimentally.

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Effect of greenhouse fixed ventilation opening on rose yield for Ethiopia highland

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ABSTRACT: In Ethiopia almost most greenhouses are equipped with fixed ventilation owing to the fact that its influence on CO_2 concentration, indoor temperature and RH% which affects plant growth is not clearly understood or due to lack of capacity. Particularly, relative humidity in the greenhouse not only affects plant growth but also major factor for pest-disease which should be maintained at the required range. In this study, the influences of fixed ventilation opening on indoor CO_2 concentration, temperature and relative humidity which consequently affect yield were investigated. To execute simulation and examine the influence of ventilation opening on indoor climate and yield a generic tool or a model set up in Matlab software was employed. For the existing ventilation configuration, simulation of indoor climate was conducted and the result illustrated that low CO_2 particularly during day time and high and low temperatures are major problems in the greenhouse. The observed indoor climate beyond the required range inhibits growth.

The result of the sensitivity analysis for summer period showed that one percent increase in ventilation opening increases the CO_2 concentration by 0.013%, decreases canopy temperature and vapor concentration by 0.065% and 0.114% respectively and increases yield by 0.328%. During winter period, a percent increase in ventilation area resulted in 0.036% and 0.075% reduction in canopy temperature and vapor concentration respectively, 0.012% increased indoor CO_2 concentration and 0.03% increment in dry matter harvest. A yearly base sensitivity analysis illustrated that, a percent increase in ventilation opening area increases the dry matter harvest and interior CO_2 by 0.231% and 0.012% respectively and decreases the canopy temperature and vapor concentration by 0.057% and 0.102% respectively.

Thus, production in Ethiopian highland can be improved by providing better ventilation so as to increase the CO_2 concentration and reducing extreme high temperature and vapor concentration in the greenhouse which influence the rate of photosynthesis. However, increased ventilation opening should be taken into consideration in relation to evapo-transpiration as a consequence of outdoor wind effect and the cost of insect screen to cover the larger ventilation opening.

KEYWORDS: ventilation, sensitivty analysis, simulation, dry matter harvest.

1 BACKGROUND

In Ethiopia greenhouse horticulture for flower production is assumed to be a young industry and started in 1999 in the highland part of the country near the capital Addis Ababa, and exporting started in 2000 [2],[10]

The capital Addis Ababa, place for some growers is found in the highland part of the country where its latitude 8.9^0N of equator, longitude 38.8^0E of Greenwich.

The measured data obtained from one of floriculture company, Lafto Rose farm PLC, depicted that undesirable indoor climate, specifically temperature and relative humidity are major problems.

Undesirable greenhouse indoor climate, pest-disease and environmental problems are major concern. Thus, reduction in yield could occur owing to the fact that pest-disease infestation and undesirable indoor climate. Danse et al., [6] pointed out

that downy mildew and botrytis are the major problems in Ethiopian greenhouse horticulture particularly during the rainy season and mainly induced by low temperature.

Growers in this part of the country are still profitable despite the aforementioned problems in the greenhouse. However, maintaining the indoor climate at the required range such as CO_2, temperature and RH% can result better production and even reduces cost and environmental load due to chemical application.

Maintaining the indoor climate as per plant requirement can be achieved through applying knowledge of climate control techniques, which includes the use of appropriate cladding material, best possible ventilation area, passive heating or cooling and ventilation control strategies.

One of the vital process which affects greenhouse micro-climate is ventilation. It strongly helps to heat and mass exchange between the outdoor and indoor environment. Thus, climate control and energy efficiency can be improved with best design of ventilation features. Specifically, ventilation can be considered as one factor for optimum control of temperature, humidity and CO_2 concentration. A greenhouse design which permits a large range of values for the ventilation flux supports well-managed passive air exchange with the environment. In this regard, it provides improved opportunity for boosting up crop production, improving product quality and minimizes use of chemical for plant protection [13].

Mistriotis et al., [13] also depicted that, when the provision of mechanical ventilation is not possible due to energy and maintenance, natural ventilation is the cheapest way to regulate greenhouse indoor microclimate.

In Ethiopia, currently most growers are making use of natural ventilation for air exchange and to maintain the indoor climate.

To scrutinize and improve the indoor climate of the greenhouses and increase the yield per unit area, a tool or model which takes into account the influence of all the important design parameters on crop yield will be crucial.

According to Abdel-Ghany and Kozai [1] predicting state variables such as temperatures of air, plant, cover and soil, relative humidity, transpiration and evaporation based on either conducting experiments or simulation models essentially can help greenhouse designers to improve the greenhouse design to obtain an environment suitable for plant growth. In contrast to conducting experiments, simulation methods provide a quick, less expensive and more flexible and repeatable way provided that the model is reliable. In the past there have been various simulation or mathematical models developed that depend on the energy balance analysis. Principally, these simulation models were used to predict the greenhouse indoor climate as function of outdoor climate and parameters of the greenhouse elements.

Frausto and Pieters [8], Ganguly and Ghosh [9] explained that, greenhouse climate simulation models with high degree of complexity and lots of parameters that should be determined by calibration have been built in the past ten years.

Specifically concerning ventilation, some theoretical models were built to describe the air exchange in greenhouse. According to Mistriotis et al., [13], Okada and Takakura (1973) were the first to derive equation for the air exchange in the greenhouses, where, the ventilation rate is the sum of two terms; a term proportional to the outdoor wind speed and a term proportional to the square root of the temperature difference. Mistriotis et al., [13] also depicted that another model or approach was presented by Kozai et al., (1973), where natural ventilation in multi-span greenhouses was estimated on the basis of flow rate and pressure difference due to buoyancy or wind effect for one opening.

According to Bot, 1983; de Jong 1990; Boulard et al., 1996 as cited by Coelho et al. [5], knowledge of the physical principles of natrual ventialtion is very essenstial for the control of ventilation. Baptista et al., (1999, 2001) as cited by Coelho et al. [5], there are two main forces which are responsibe for pressure difference in natural ventilation. The first is wind, which causes an alteration of the pressure field around the buidling or obstacle, resulting positive or negative pressure differences. The second is thermal bouyancy or stack effect owing to the variation in indoor and outdoor temperatures and the consequential density gradient. Thus, movemtnt of air by natural convection can occur when the abovementioned two process combined.

A generic tool or a model built as an integral approach in Matlab software designed by Wageningen University and Plant Research International (PRI) was used in this study. The tool encompasses heat and mass balance equations which would enable to analyze greenhouse design parameters (cover properties, passive heating and cooling, ventilation area, soil properties). The model helps to execute sensitivity analysis of design parameter and simulation of indoor climate and dry matter harvest.

OBJECTIVE

The purpose of this study is to determine the effect of ventilation area on indoor climate, consequently on yield for the existing greenhouse configuration in the highland part of Ethiopia.

2 MATERIALS AND METHOD

2.1 ROSE VARIETY

The response of major rose varieties grown in Ethiopian highland to indoor climate such as temperature, RH%, light and CO_2 was reviewed so as to make set point. Accordingly, PAR requirement 700-900µmol/m^2/s [15], temperature requirement 17-25^{0}C [16] and relative humidity requirement 60-80% [12] were taken as best possible range at which the rose performs better.

2.2 THE MODEL

The body of model consists of three major components; state variables that vary with time (greenhouse air temperature, canopy temperature, soil temperature, vapor concentration of greenhouse air, greenhouse CO_2 concentration and total biomass), control inputs (shade screen, white wash and ventilation opening control) and external inputs (solar radiation, wind speed, outdoor temperature, outdoor air vapor concentration and outdoor air CO_2 concentration). The model output, particularly the state variables are in hourly values and thus the external inputs were in hourly basis. Consequently, hourly sky global radiation value was calculated and other external inputs except CO_2 were collected from Ethiopian meteorological agency. Outdoor CO_2 concentration was assumed to be constant that is 340ppm.

Matlab ode(15) was used to compute the energy and mass balance equations discussed below.

(A) ENERGY BALANCE IN GENERIC TOOL

According to Bot, (1983) as cited by El Ghoumari et al., [7] the dynamic behavior of state variables (temperature, humidity and CO_2) inside the greenhouse is governed by the energy and mass balances. Specifically, the energy balance which influences greenhouse temperature is affected by the energy input of the heating system, the energy losses caused by the energy exchange between the cover and the outside environment as well as through the natural ventilation provided by the windows, and finally the energy which comes out of the solar radiation.

The heat fluxes among different components within the greenhouse (cover, soil, crop and air) were introduced in the generic tool indicated in the equations below. Radiative and convective heat exchanges which occur among the components were described in the energy balances of the states.

ENERGY BALANCE FOR THE GREENHOUSE AIR TEMPERATURE

Greenhouse air temperature at different time instant has been computed on the basis of various equations which contain different convective heat fluxes as shown in eq.1.

$$Cap_{Air}\frac{dT_{Air}}{dt} = H_{canair} - H_{AirOut} - H_{Airflr} - H_{air\,\mathrm{cov}} \ldots\ldots [Wm^{-2}] \quad (1)$$

ENERGY BALANCE FOR THE COVER TEMPERATURE

To compute the differential cover temperature at different time instant, near infrared and PAR components of the solar radiation, longwave radiation fluxes and convective heat fluxes among different bodies were listed out in the equation stated below (eq.2):

$$Cap_{\mathrm{cov}}\frac{dT_{\mathrm{cov}}}{dt} = R_{sun\,\mathrm{cov}} + H_{air\,\mathrm{cov}} + L_{air\,\mathrm{cov}} + R_TIR_{can\,\mathrm{cov}} + R_TIR_{flr\,\mathrm{cov}} - H_{\mathrm{cov}\,out} - R_TIR_{\mathrm{cov}\,Ssy} \ldots\ldots\ldots\ldots [Wm^{-2}] \quad (2)$$

ENERGY BALANCE FOR THE CANOPY TEMPERATURE

Similar to cover temperature computation, the differential equation of canopy temperature comprises near infrared and PAR portion of solar radiation, longwave heat fluxes and convective heat fluxes among various greenhouse components indicated in the equation below (eq.3).

$$Cap_{can}\frac{dT_{can}}{dt} = R_PAR_{suncan} + R_NIR_{suncan} - H_{canair} - L_{canair} - R_TIR_{can\,\mathrm{cov}} - R_TIR_{canflr} - R_TIR_{cansky} \ldots\ldots\ldots\ldots [Wm^{-2}] \quad (3)$$

ENERGY BALANCE FOR GREENHOUSE FLOOR TEMPERATURE

To calculate the greenhouse soil temperature at different time instant, in the same manner, near infrared and PAR portion of solar radiation, longwave heat fluxes and convective heat fluxes among greenhouse components were taken into account, described in the equation below (eq.4):

$$Cap_{flr}\frac{dT_{flr}}{dt} = R_PAR_{sunflr} + R_NIR_{sunflr} + H_{airflr} + R_TIR_{canflr} - R_TIR_{flr\,\mathrm{cov}} - H_{flrso1} - R_TIR_{flrsky} \ldots\ldots\ldots [Wm^{-2}] \quad (4)$$

(B) VENTILATION FLUX

As discussed earlier, pressure difference between the external and internal air as consequence of wind action and buoyancy or stack effect are the main cause of natural ventilation [3], [4].

VENTILATION FLUX FOR ROOF OR SIDE OPENING ONLY

If a greenhouse is equipped with either roof or side opening only, ventilation fluxes is calculated making use of a mathematical equation stated below [14].

$$f_{vent} = \frac{A}{2}C_d\sqrt{2g(h/4)\frac{(T_{air}-T_{out})}{T_m} + C_w * V_{speed}^{\,2}} \ldots\ldots\ldots [m^3 m^{-2} s^{-1}] \quad (5)$$

(C) VAPOR BALANCE AND TRANSPIRATION

Vapor balance in the greenhouse should take into account crop transpiration, vapor loss due to ventilation and condensation on the cover. The, equation stated below (eq.6) was used to compute the vapor pressure in the greenhouse at different instant of time.

$$con_VP_{air}\frac{dVP_{air}}{dt} = MV_{canair} - MV_{air\,\mathrm{cov}} - MV_{airout} \ldots\ldots\ldots [kg.m^{-3}.s^{-1}] \quad (6)$$

Transpiration from the canopy is calculated based on the vapour pressure difference between the canopy and greenhouse air as stated below (eq.7):

$$MV_{canair} = VEC_{canair}\left(VP_{can} - VP_{air}\right) \ldots\ldots\ldots [kg.s^{-1}.m^{-2}] \quad (7)$$

(D) CARBON DIOXIDE BALANCE

Regarding carbon dioxide balance within the greenhouse, plants respiration and air exchange due to window ventilation affect carbon dioxide equilibrium [7].

Consequently, the following relationship was used to compute the greenhouse carbon dioxide concentration. In the generic tool, the carbon dioxide balance depends on the crop assimilation rate, respiration rate and flux through ventilation opening as stated in eq.8 below.

$$Gh_h * \frac{dCO_{2air}}{dt} = MC_{crpair_m} + MC_{crpair_g} - MC_{aircrp} - MC_{airout} \ldots\ldots [kgm^{-2}s^{-2}] \quad (8)$$

(E) GROSS PHOTOSYNTHESIS RATE FOR ROSE OR GROWTH MODEL

Obtaining a growth model which can fit the generic tool was investigated.

GENERIC TOOL GROWTH RATE CALCULATION APPROACH

The approach in generic tool to compute photosynthesis was performed by introducing inhibition factors for light and carbon dioxide. Here, the inhibition factors are introduced based on parameters p1 and p2 respectively as illustrated below. For each factor, these parameters are crop specific which would enable to fit the response of photosynthesis calculated by this approach with respect to response of rose to these factors obtained from literature, particularly the result of Kim and Leith [11]. That means the trend of the inhibition factors should at least be similar to the trend of photosynthesis versus these factors.

$$MC_{aircrp} = h_R_{can} * h_CO_{2air} * MC_{aircrp_pot} \ldots\ldots [g(CO_2)m^{-2}hr^{-1}] \quad (9)$$

$$h_R_{can} = \frac{R_{can}}{p1 + R_{can}} \ldots\ldots [-] \quad (10)$$

$$h_CO_{2air} = \frac{CO_{2air}}{p2 + CO_{2air}} \ldots\ldots [-] \quad (11)$$

$$MC_{aircrp_h} = h_Tcan * h_Tcan24 * MC_{aircrp} \ldots\ldots [g(CO_2)m^{-2}hr^{-1}] \quad (12)$$

$$\frac{dYield}{dt} = HI * \beta_CO_2_CH_2O * \beta_CH_2O_DM * (MCaircrp - MCcrpair) \ldots\ldots [kg(DM)m^{-2}s^{-1}] \quad (13)$$

For temperature, a trapezoidal temperature filter was used for mean and instantaneous temperature of the canopy. The generic tool has these temperature inhibition factors based on the crop response to temperature, thus rose response to mean temperature and instantaneous temperature were considered as indicated in the figure 1**Erreur ! Source du renvoi introuvable.**. The inhibition factor ranges between one and zero, and when the temperature is in the optimal range, then the inhibition factor becomes one or there is no punishment. Otherwise there is a punishment when the temperature is out of the optimal range in both cases.

By taking into consideration MCaircrp_pot as canopy photosynthesis, it is possible to use this approach for this research work to compute net photosynthesis. And finally yield was calculated as harvested number of stems (eq.13).

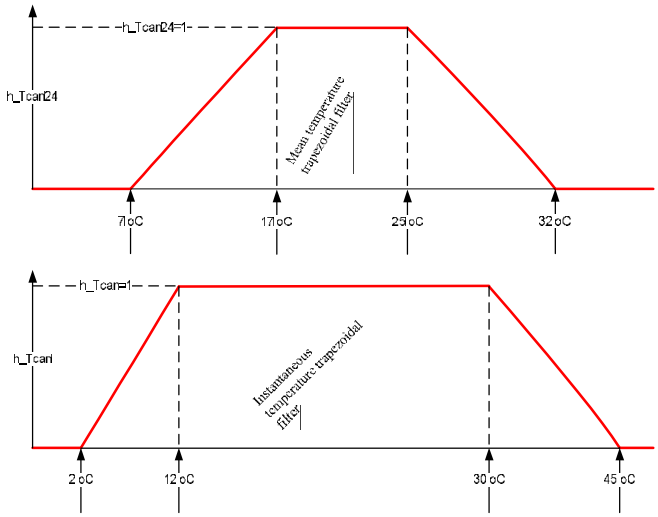

Fig. 1. Temperature growth inhibition factor computation method

(F) SENSITIVITY ANALYSIS FOR GREENHOUSE COVER PROPERTIES

In the sensitivity analysis, the extent of influence of ventilation area on rose yield was calculated. That is, small change in ventilation area and the resulting change in the state variables could be calculated.

In this analysis, the ventilation area of the existing Ethiopian greenhouse which is $60m^2$ per $960m^2$ was considered as nominal value, then the percent change in dry matter production when this design parameter increased by 1% was calculated.

According to van Henten (1994) as qouted by Vanthoor et al., [17], the relative sensitivity of dry yeil for a given design parameters is calculated as described below.

$$S_r(t) = \frac{Yield_{Pnom+\Delta p}(t) - Yield_{Pnom}(t)}{Yield_{Pnom}(t)} * \frac{P_{nom}}{\Delta P} \quad (14)$$

$$\Delta P = h * P_{nom} \quad (15)$$

Where, h is perturbation factor (0.01), $Yield_{Pnom}$ is the yield at nominal value of the design parameters, $Yield_{Pnom+\Delta P}$ is the increase in yield when the design parameter increased by 1 percent (h) and P_{nom} is the nominal value of the design parameters.

3 RESULT AND DISCUSSION

Before using the model for simulation and sensitivity analysis primarily validation was carried out. In the execution of model validation, as illustrated in figure 2, the difference between simulated and measured greenhouse air temperature is less significant.

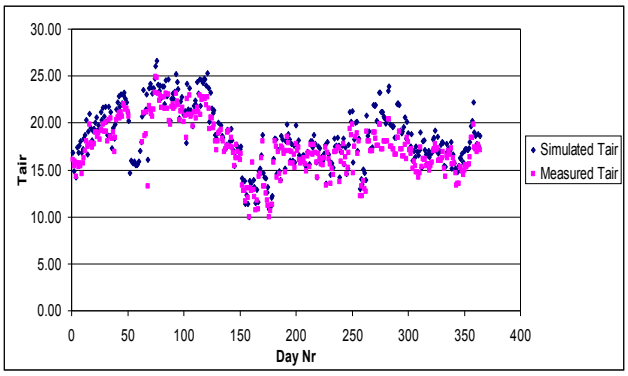

Fig. 2. Comparison of simulated and measured mean daily greenhouse temperature

3.1 SENSITIVITY ANALYSIS

According to the sensitivity analysis carried out, the influence of the parameter (ventilation area) on dry matter production during summer and winter is somehow different. As illustrated in the table 1 for summer season, a percent increment in ventilation area has negative influence or reduction on canopy (0.065%) and greenhouse air temperature (0.058%). However, greenhouse CO_2 concentration increased by 0.013% when the ventilation area increased by 1%. This due to the fact that since there is no external supply of CO_2, the greenhouse CO_2 concentration can be lowered as a result of photosynthesis during day time, even less than the outdoor CO_2 concentration, specifically for smaller ventilation opening area. As compared to the above climatic factors, ventilation opening area increment by 1% drastically reduces indoor vapor concentration by 0.114%. This could show that indoor vapor concentration is significantly higher than outdoor vapor concentration. Regarding yield, a percent increase in ventilation opening area resulted in 0.328% increment in dry matter harvest. This is owing to the fact that, higher ventilation opening area can alleviate higher temperature during day time and increases interior CO_2 concentration consequently the photosynthesis would become relatively better.

Similarly, sensitivity analysis for winter season showed that (table 2), increased ventilation opening by 1% reduces both canopy and indoor temperature and vapor concentration. On the contrary, indoor CO_2 concentration and dry matter harvest increased by 0.012% and 0.03% respectively.

Here, it is possible to see the significant difference between dry matter harvest increment during summer and winter. During summer season (dry season for almost 9-10 months), the increment in yield larger than winter season, this is due to the fact that high temperature problem during day time in summer season is noticeable and can be minimized by increased ventilation to enhance photosynthesis. Consider CO_2 increment and enhanced photosynthesis in both seasons is same, again concerning indoor temperature, since winter season (rainy season) is characterized by relatively lower outdoor temperature, increment in ventilation area can contribute to cooler indoor temperature which can inhibit photosynthesis, however, as seen in figure 3, 4 and 5, the influence of ventilation opening area on interior CO_2 concentration more considerable than on canopy and air temperature. Thus, it is justifiable to expect increment in dry matter harvest in winter which is mainly due to increased CO_2 concentration.

According to sensitivity analysis executed on yearly base or for one year (table 3), likewise winter and summer season, increased ventilation opening area by 1% resulted 0.057% and 0.054% lower in both canopy and indoor temperature respectively. However, dry matter harvest and indoor CO_2 concentration increased by 0.231% and 0.012% respectively for same reason as discussed above. Similarly, indoor vapor concentration significantly reduced by 0.102% as the opening area increased by 1% as compared to above interior climatic factors.

As discussed earlier, in the highland part of Ethiopia, botrytis is major problem in greenhouse cultivation due to high RH%, thus better ventilation can be an option to inhibit the reproduction of this disease.

3.2 SIMULATION OF STATE VARIABLES

Simulation of greenhouse indoor climate (Figure 3) showed that when the existing ventilation area three times higher, the influence on indoor temperature is somehow insignificant, nevertheless, extreme high temperature slightly can be reduced as consequence of the increased ventilation area. This is due to the fact that higher ventilation area allows better heat and

mass exchange as explained by Mistriotis et al., [13]. To contrary, higher ventilation opening area exacerbates low temperature during night time very slightly.

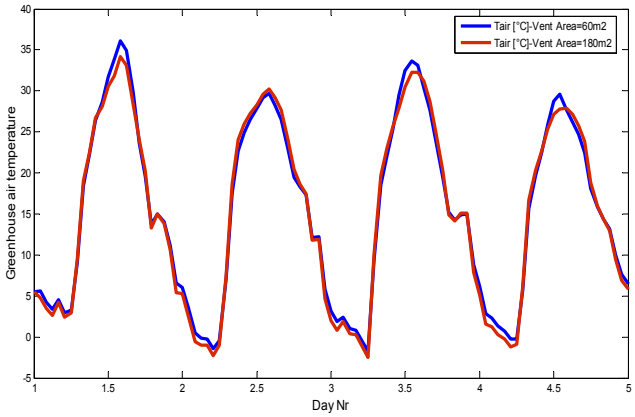

Fig. 3. The effect of ventilation area on greenhouse air temperature

Moreover, the simulation result for canopy temperature (Figure 4) showed that as compared to during night time extreme low temperature, day time high temperature can possibly be reduced when the ventilation area increase from the existing value 60m^{2}per span to 180m^2 per span.

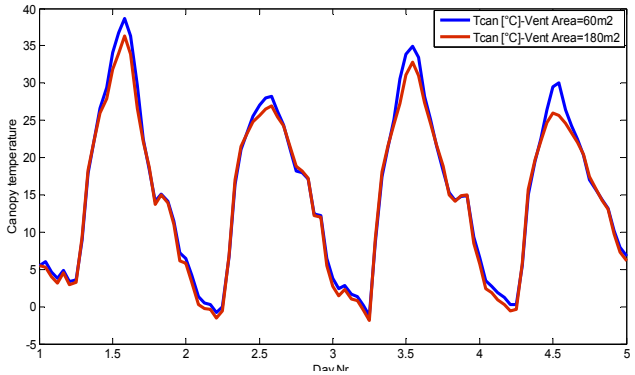

Fig. 4. The effect of ventilation area on canopy temperature

According to simulation output for indoor CO_2 concentration (Figure 5), when the ventilation area is tripled it has significant impact on the CO_2 greenhouse concentration particularly during day time. During day time, due to photosynthesis the indoor CO_2 gets very low as compared to the outdoor CO_2 concentration, thus, higher ventilation area would enable more CO_2 flux from outside to inside. To the contrary, during night time, owing to maintenance respiration, the CO_2 inside the greenhouse becomes higher provided that the ventilation opening is very small so that less possibility for the gas to escape to the environment. Hence as the graph illustrates, when the ventilation is relatively higher, night time indoor CO_2 concentration gets lower. It is possible to draw inference that for greenhouse with no external CO_2 supply or dependent on natural ventilation, it possible to maximize the production by closing the opening during night time to increase indoor CO_2 for photosynthesis for the subsequent day, however, care also should be taken to control RH% inside the greenhouse simultaneously.

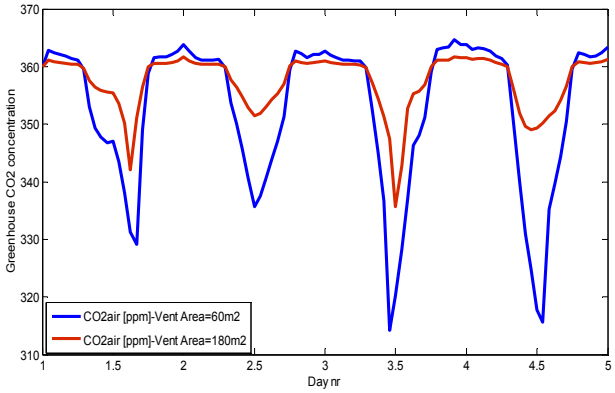

Fig. 5. The effect of ventilation area on greenhouse CO_2 concentration

Table 1. Integrated relative mean sensitivity analysis for summer season

States	Parameter
	Ventilation Area
Tcov	-0.034
Tair	-0.058
Tcan	-0.065
Tflr	-0.051
VPair	-0.114
CO_{2air}	0.013
DM_{harv}	0.328

Table 2. Integrated relative mean sensitivity analysis for winter season

States	Parameter
	Ventilation Area
Tcov	-0.021
Tair	-0.036
Tcan	-0.036
Tflr	-0.029
VPair	-0.075
CO2air	0.012
DM_{harv}	0.03

Table 3. Integrated relative mean sensitivity analysis for one year

States	Parameter
	Ventilation area
Tcov	-0.031
Tair	-0.054
Tcan	-0.057
Tflr	-0.045
VPair	-0.102
CO2air	0.012
DM_{harv}	0.231

4 CONCLUSION

The study revealed that increased ventilation opening area for Ethiopian highland greenhouse floriculture can contribute to the increased in yield due to the fact that significant improvement of indoor CO_2 concentration and minimizing higher day temperature particularly during the longer summer season.

However, increasing ventilation area should be associated with the rate of evapo-transpiration and cost of insect screen for larger openings.

Moreover, increase ventilation opening area can exacerbate low temperature during night time, specifically during winter season. Thus, rose growth model which takes into consideration night time temperature influence on yield is very crucial.

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SYMBOLS AND ACRONYMS

Abbreviation/ symbol	*Description*	*Value*	*Unit*
$\beta_CO_2_CH2O$	Conversion factor from CO_2 to CH_2O	30/44	-
$\beta_CH_2O_DM$	Conversion factor from CH_2O to Dry matter	0.8	-
MCaircrp_h	Photosynthesis rate	-	$kg(CO_2)\ m^{-2}\ s^{-1}$
MCcrpair_m	Maintenance respiration rate		$kg(CO_2)\ m^{-2}\ s^{-1}$
tau_NIR	Cover near infrared transmissivity	0.87	-
tau_PAR	Cover PAR transmissivity	0.83	-
epsilon-covup	Cover long-wave emission coefficient	0.67	
A	Roof ventilation opening area	60	m^2
Cap_{Air}	Heat capacity of the air	10^3	$J\ m^{-2}\ K^{-1}$
Cap_{can}	Heat capacity of the canopy	$1.2*10^3$	$J\ m^{-2}K^{-1}$
Cap_{cov}	Heat capacity of the cover	$2.5*10^3$	$J\ m^{-2}\ K^{-1}$
Cd	Discharge coefficient	0.705	-
con_VP_{air}	Vapor pressure constant	-	$kg.m^{-3}.J^{-1}$
Cw	Global wind coefficient		-
DM_{harv}	Percent dry matter harvest	-	%
fvent	Ventilation flux	-	$m^3m^{-2}s^{-1}$
g	Acceleration due to gravity	9.8	$m\ s^{-2}$
h_CO_2air	Inhibition factor for CO2	-	-
h_Rcan	Inhibition factor for radiation	-	-
h_Tcan	Inhibition factor for temperature	-	-
h	vertical height of ventilation opening	6.2	m
Haircov	Sensible heat greenhouse air to cover	-	$W\ m^{-2}$
Hairflr	Sensible heat greenhouse air to the floor	-	$W\ m^{-2}$
Hairout	Sensible heat greenhouse air to the surrounding due to ventilation	-	$W\ m^{-2}$
Hcanair	Sensible heat canopy to air	-	$W\ m^{-2}$
Hcovout	Sensible heat cover to the surrounding	-	$W\ m^{-2}$
HEC	Convective heat exchange	-	$Wm^{-2}K^{-1}$
HECaircov	Convective heat exchange air to cover	-	$Wm^{-2}K^{-1}$
HECairflr	Convective heat exchange air to floor	-	$Wm^{-2}K^{-1}$
HECcanair	Convective heat exchange canopy to air	-	$Wm^{-2}K^{-1}$
Hflrsol	Sensible heat floor to soil	-	$W\ m^{-2}$
HI	Harvest Index	65	%
Laircov	Latent heat greenhouse air to cover	-	$W\ m^{-2}$

Mcaircrp	Crop CO_2 assimilation rate	-	kg (CO_2) $m^{-2}s^{-1}$
MCcrpair	Maintenance respiration		kg (CO_2) m^{-2} s^{-1}
Mcaircrp_pot	Potential crop CO_2 assimilation rate	-	kg $m^{-2}s^{-1}$
MVcanair	Vapor flux from canopy to air	-	$kg.s^{-1}.m^{-2}$
MVaircov	Vapor flux air to cover	-	g m^{-2} s^{-1}
PAR	Photosynthetic active radiation	-	µmole $m^{-2}s^{-1}$
NIR	Near Infrared	-	µmole $m^{-2}s^{-1}$
P1	Crop parameter for radiation inhibition	-	-
P2	Crop parameter for CO_2 inhibition	-	-
R_PARsunflr	PAR radiation sun to floor	-	Wm^{-2}
R_PARsuncan	PAR radiation sun to canopy	-	Wm^{-2}
R_NIRsunflr	Near infrared radiation sun to floor	-	Wm^{-2}
R_NIRsuncan	Near infrared radiation sun to canopy	-	Wm^{-2}
R_TIRcancov	Longwave radiation canopy to cover	-	W m^{-2}
R_TIRcanflr	Longwave radiation canopy to the soli	-	W m^{-2}
R_TIRcansky	Longwave radiation canopy to sky	-	W m^{-2}
R_TIRcovsky	Longwave radiation cover to sky	-	W m^{-2}
R_TIRflrcov	Longwave radiation the soil to the cover	-	W m^{-2}
R_TIRflrsky	Longwave radiation floor to sky	-	W m^{-2}
Tair	Greenhouse air temperature	-	^oC
Tcan	Canopy temperature	-	^oC
Tcov	Greenhouse cover temperature	-	^oC
Tflr	Floor temperature	-	^oC
Tm	Mean temperature	293	^oK
Tout	Surrounding temperature	-	^oC
Vspeed	Wind speed	-	m s^{-1}
VP_{can}	Vapor pressure on canpy	-	Pa
VP_{air}	Vapor pressure of greenhouse air	-	Pa
VEC_{canair}	Vapor exchange coefficient	-	$kg.s^{-1}.Pa^{-1}.m^{-2}$

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APPRAISAL AND MAPPING OF SOIL SALINITY PROBLEM IN AMIBARA IRRIGATION FARMS, MIDDLE AWASH BASIN, ETHIOPIA

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ABSTRACT: One of the main reason for the loss of productive land in irrigated fields is the buildup of salinity in the soil. In Amibara irrigation Scheme, though no systematic appraisal and mapping has been made before, large tract of land has been abandoned because of salinity problem. Hence a study was conducted to appraise the salinity problem of the Amibara irrigation farms in Middle Awash Basin and to generate thematic maps using Arc GIS for further management recommendation. A total of 249 surface soil samples representing 15,256.22 ha Amibara Irrigation farms were collected and analyzed. Standard methods were followed to measure pH, electrical conductivity (EC) and soluble cations. Arc GIS 9.3 was used to map the overall salinity and sodicity problem of the area. Results showed that around 34 % (5239.79 ha) of the command area has been mapped as saline soil (ECe > 4 dS/m and SAR < 13). On the other hand, only 0.05% (9.13ha) scheme was classed as saline sodic (ECe > 4 dS/m, and SAR >13). From the thematic maps generated, it is concluded that proportion of the land taken up by salinity is rapidly increasing. More and more land is fully abandoned due to salinity problem. The water table control by rehabilitating the subsurface drainage system seems to be the only feasible way to improve sustainability of the scheme.

KEYWORDS: Soil Salinity/Sodicity, GIS.

1 INTRODUCTION

In Ethiopia, the Amibara Irrigation Scheme (AIS), which covers about 15,256 ha of irrigable land in the Awash River Basin, encounters problems of salinization and rising water tables to varying degrees. Irrigated agriculture at Amibara Irrigation Project, located in the Middle Awash region, was started towards late sixties [7]. The soils at the farm area were generally non-saline & groundwater table in the area was below 10 meter [8]. However, subsequent miss-management of irrigation water, in the absence of a complementary drainage system, gave rise in water logging, Salinization of fully productive areas and considerable losses in crop yields. This severe problem resulted in abandoned of substantial areas of Melka Sedi cotton producing areas.

Effective control of soil salinity necessitates a good knowledge of the cause, extent, distribution, and speciation of salt. Moreover, problem of salinity is never a static soil behavior. Therefore, spatial and temporal variability of this behavior are important issues to be considered in soil management [16]. Reliable and up-dated information on the spatial and temporal variability of soil salinity is required to effectively manage the limited natural resources and maintain a viable agricultural industry that is highly dependent on conjunctive use of surface and ground waters with varying salinity levels [2] and [6].

Reasonably a number of studies have been conducted in Amibara irrigation scheme, reviewing through the progress and the current status of salt affected area, irrigation and groundwater quality analysis of the study area [9], [10], [15], [5] and[3]. According to these studies, poor drainage and lack of appropriate irrigation water management were the main causes, which

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facilitated secondary salinization. Though different attempts have been made by different researchers, there has never been a comprehensive mapping of the salinity problem in the study area. Hence, the main goal of this study is to characterize the salinity problem in a command area and generate thematic maps using GIS to be used for further management decision.

2 MATERIALS AND METHODS

DESCRIPTION OF THE STUDY AREA

The Amibara irrigation scheme, found in Amibara Wereda (province), Gebiresu zone of Afar National Regional State, cover a long broad alluvial plain along the right bank of the Awash river, locally known as Melka Sedi and Melka Werer (Amibara Plain) with a gross command area of about 15,256 ha (Figure 1). The area is at an elevation of about 740 meters above sea level and it is located at $9^0$16'N latitude and $40^0$9'E longitude in the Middle Awash Valley. The average annual rainfall is around 560 mm, accumulated with the long and short rains. The mean maximum temperature is 35^0C and means minimum falls down to 19^0C. The mean annual free water evaporation as recorded by the class A pan is around 3000 mm (Werer Agricultural Research Centre, unpublished data). The area is classified as semi-arid. The principal soil types in the study area are recent alluvial and vertisols with its textural class as clay, clay loam, silty clay loam, silty loam and silty clay [7] and [3]. The major crop grown is cotton, with minor crops including maize, sesame, banana and vegetables in some areas of Werer research center.

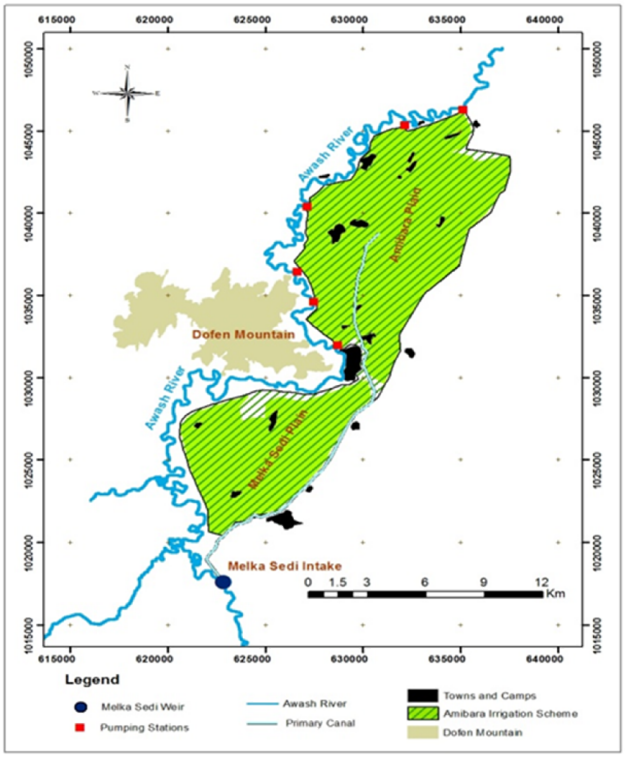

Fig. 1. Location map of Amibara Irrigation Scheme.

DATA COLLECTION

Soil samples were collected during the month of October and November 2011. A total of 249 representative auger samples were taken from Melka Sedi and Melka Werer farms at a soil depth of 0-30 cm. Considering extreme heterogeneity of soils of Melka Sedi area with respect to salinity and sodicity and occurrence of wide range of the problem; attempt was made to collect soil sample systematically from every farm units of Melka Sedi area. While for Melka Werer area, with lesser extent of salinity and sodicity problems, soil samples was collected randomly at 2 km interval. Collected samples were delivered to the laboratory of Werer Research Centre, air-dried, ground to pass through 2 mm sieve and prepared for selected chemical analysis. Each of the soil sampling points was spatially referenced using GPS (Figure 2).

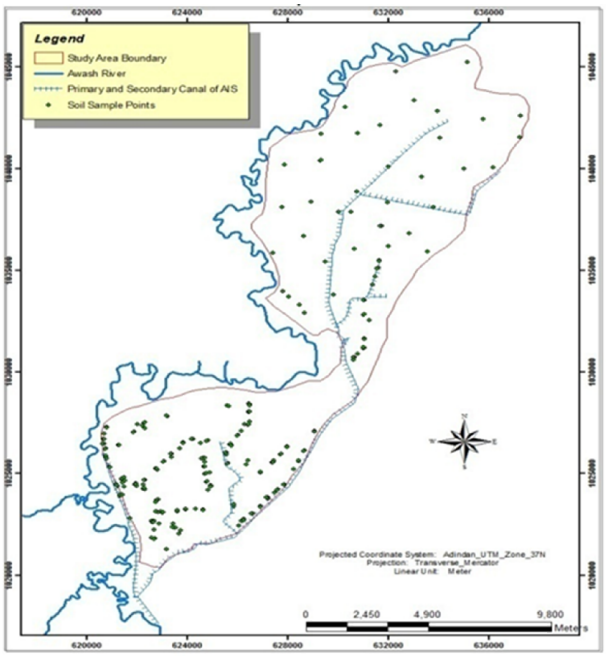

Fig. 2. Spatially Referenced Soil Samples

LABORATORY ANALYSES

Soil samples were air dried and ground to pass through 2 mm size sieve. The saturation paste extract were then prepared following the methods described in Rhoades *et al.* [13].Soil reaction (pH), electrical conductivity (EC), water soluble cations (Ca^{2+}, Mg^{2+} and Na^{+}) were determined from saturated paste extract. Soil pH was measured using a digital pH-meter and Electrical conductivity (EC) by digital conductivity meter according to the method outlined by the USSLS [14] and Rhoades *et al.* [13] respectively. Basic water soluble cations (Ca^{2+} + Mg^{2+} and Na) were determined by EDTA titration and flame photometer, and expressed as meq/l of extract [12]. Sodium adsorption ratio (SAR), of the soil solution was calculated from the concentrations of soluble Na, Ca and Mg. Finally, soils under investigation were classified to the different salt affected soil classes based on the criteria established by the USSLS (14) and Abrol *et al* [1].

SOIL SALINITY APPRAISAL

Soil salinity appraisal and mapping was conducted in Arc GIS environment. To carry out the soil salinity appraisal, field collected data were used (Figure 2). Taking the ECe value of a randomly collected soils samples, a soil salinity raster map was created using Arc GIS 9.3 with Inverse Distance Weight (IDW) interpolation techniques. IDW interpolation method was selected for soil salinity map of the study area based on the minimum errors resulted from the methods used when compared to each other. According to Abrol *et al* [1] classification standards, the generated raster layers were further reclassified using reclassify tool in spatial analyst extension as salinity classes using different ECe ranges. Finally, layouts were prepared for the developed raster layers using layout view.

SOIL SODICITY APPRAISAL

Exchangeable sodium percentage (ESP) is widely used to measure sodicity status of soils but experimental determination of exchangeable sodium percentage is tedious, time consuming and subject to errors (FAO, 1988). To overcome some of these difficulties several workers prefer to obtain an estimate of the exchangeable sodium percentage from an analysis of the saturated soil extract [3] and [11]. Sodium adsorption ratio of the saturation extract (SARe) is another parameter that has long been recognized as an index or indicator of sodicity hazard [14] and [1]. It is the proportion of water soluble sodium to calcium plus magnesium in the soil and is expressed in an equation form as:

$$SAR = \frac{\left(Na^{+}\right)}{\left(Ca^{2+} + Mg^{2+}\right)^{0.5}}$$

Where concentration of the cations are expressed in meq/l

The calculated SARe for a randomly selected surface soil samples (Figure 2) were interpolated using IDW interpolation technique to create a potential soil sodicity raster map. Using reclassify tool the generated raster layers were classified to show the soil sodicity hazard of the study area. A layout for soil sodicity raster layer was also developed.

Moreover, to develop salt affected soil raster layer, the developed soil salinity and sodicity raster layers were combined to generate a single rater layer using combine tool in local toolset of spatial analyst extension of the software. Further the combined raster layer was reclassified on the basis of USSLS [14] soil salinity/ sodicity standard analysis. Here also layouts were prepared for the developed raster layers using layout view in the Arc GIS environment.

DATA PROCESSING

In preparation for the overlaying and analyses, topographic map (1:50,000) of the study area was scanned and vectorized. The ECe and SAR value of a randomly selected soil samples were used for soil salinity and sodicity map preparation. Polygons having similar attributes were merged in every process. Analysis were made easy by applying expressions and conditional statements using spatial manipulation language (SML). These techniques are very efficient method of identifying and merging thousands of features that met the set of criteria to generate the final category [11]. Polygons will be given a unique identity and assign a corresponding name registered as attributes to determine the features projected in the map. Various digital and statistical data were combined to generate final output.

3 RESULT AND DISCUSSION

SOIL SALINITY AND SODICITY CHARACTERISTICS

Analytical results of electrical conductivity, pH, SAR, concentration of major cations of the soil solution used as an important parameter to explain salinity and sodicity characteristics of soils of the studied area, are presented in Appendix Table 1. Four classes of soils were defined based on their chemical properties, accounting for changes in pH, ECe and Sodium Adsorption Ratio (SAR): non-affected, saline, sodic, and saline-sodic soils, each of the last three with different degrees of salinity/sodicity. The threshold value for ECe was set at 4 dS/m according to the saline or non-saline boundary in USSLS soil salinity standard analysis; and for SAR, which is an indicator of sodic or non-sodic characteristics, was set at 13.

SOIL REACTION (PH)

Soil pH varied between 6.9 to 8.9 for Melka Sedi and 7.06 to 9.1 for Melka Werer farm areas (Appendix Table 1). The pH values appeared to be low in saline soils, where calcium and magnesium were dominant and on the other hand the pH is high in sodic and saline sodic soils where sodium seems dominant.The pH of the study site is in general greater than 7, indicating alkalinity reaction. Since the pH value or the soil reaction is influenced by the presence and concentration of cations, its ranges varies in salt affected soils. Early reports by Girma and Geremew [4] and recent study conducted by Gedion [3] also reveals that the pH of the study area has a value greater than 7. The probable reason for this high pH value could be attributed due to high concentration of bicarbonates [10]and [15].

SOIL SALINITY APPRAISAL

Soils of the area exhibited high range of variation with respect to ECe values (Appendix Table 1). ECe value varied from 0.33 dS/m to 82.1 dS/m and 0.4 dS/m to 37.5 dS/m, respectively for soil samples taken from Melka Sedi and Melka Werer farms. Regarding the magnitude of the problem, sever salinity problem was observed at Melka Sedi farms, especially on the former Banana farm areas. Even though the extent was less in terms of area affected, salinity problem in Melka Werer farm area was also observed. It was also observed that several hectares of cotton cultivated farms were at saline phase as witnessed from manifestation of frequent salinity patches elsewhere in the command area indicating the possibility of salinity expansion to take place in near future at faster rate than ever seen before.

According to the classification system of the USSLS [14] and Abrol *et al* [1], out of 249 soil samples, 48 % of the soil samples were mapped as non saline soils with ECe values less than 2 dS/m. 18 % of the soil ranges for slightly saline soils with

ECe values between 2 dS/m to 4 dS/m and the rest 34 % of the soil ranges between moderately saline to severe sainity with ECe values greater than 4 dS/m (Table 1).

Table 1. Area coverage per salinity levels for 0-30cm depth

Farm Unit	Percentage area per salinity level					
	Total Area (ha)	Non Saline	Slightly Saline	Moderately Saline	Strongly Saline	Severe Salinity
ECe (dS/m)		0-2	2-4	4-8	8-16	>16
Amibara Farms	15256.22	7294.65	2712.65	2089.68	2013.42	1145.82
% Area	100	47.8	17.8	13.7	13.2	7.5

Hence Cotton yields may start to decrease when ECe value is greater than 7 dS/m [1]. Even now relative decrease in cotton yield occurred in Melka sedi and former banana farms and it will be aggravated unless salinity levels are controlled using proper reclamation measures.

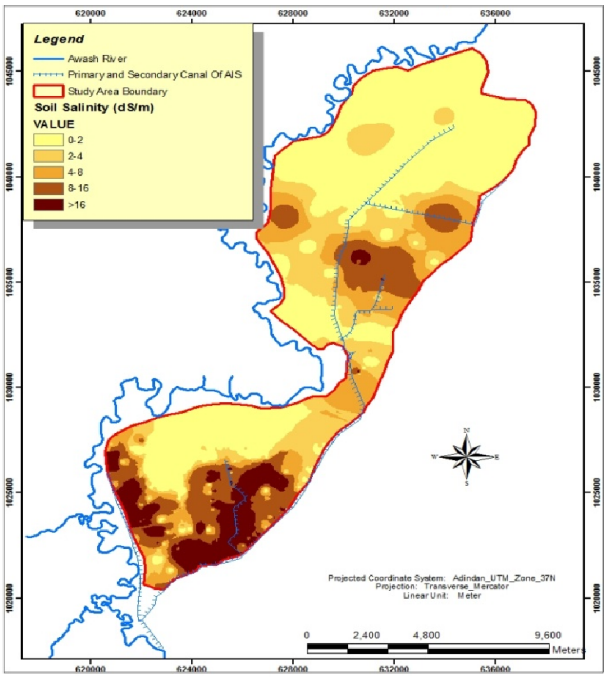

Fig. 3. Soil salinity map of AIS

SOIL SODICITY MAP

The sodium adsorption ratio ranges from 0.7 to 27.2 in Melka sedi and 0.6 to 9.4 in Melka Werer farm areas (Appendix Table 1). Soil sodicity problem were observed in Melka Sedi farm areas especially in some fields of former Banana farms, which had a very strongly sodic character. Soils of Melka Werer were not very much affected by sodicity problems so far.

The probable reason for high SAR value on the former Banana farms may be explained by the fact that this part of the farm had been waterlogged for many years compared to other farms. During this time, due to annual variation in dynamic nature of the water table, much of the calcium and magnesium might have precipitated having behind the sodium to accumulate.

According to Abrol *et al* [1] classification, taking the SARe values of the saturated extract at a soil depth of 0-30 cm, out of 249 soil samples 78 % the soil is mapped as non sodic with SARe values less than 3. About 21 % of the soil is very slightly sodic with SARe value ranges between 3 and 7. The rest 1 % is fall under classes of slightly sodic to very strongly sodic (Table 2).

Table 2. Area Coverage per Sodicity Levels for 0-30cm depth

Farm Unit	Percentage area per salinity level					
	Total Area (ha)	Non Sodic	Very slightly sodic	Slightly Sodic	Moderately Sodic	Strongly Sodic
SARe		0-3	3-7	7-13	13-21	21-37
Amibara Farms	15256.22	11863.49	3168.93	214.74	6.71	2.35
% Area	100	77.76	20.77	1.41	0.04	0.02

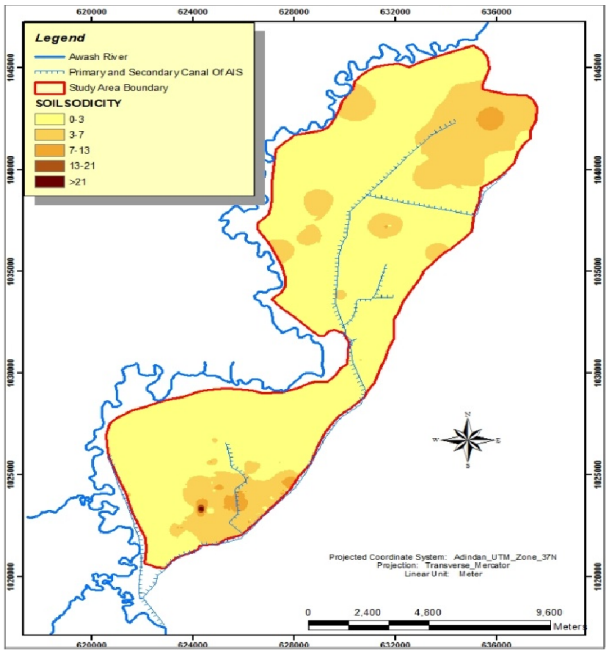

Fig. 4. Soil sodicity map of AIS

SALT AFFECTED SOILS IN AMIBARA IRRIGATION SCHEMES

The analytical result obtained (Appendix Table 1) indicates that the electrical conductivity of the saturated extract at soil depth of 0-30 cm varies from 0.33 to 3.93 dS/m for non saline, 23.00 to 45.90 dS/m for saline sodic soils and 4.02 to 82.10 dS/m for saline soils. Whereas the sodium adsorption ratio of the saturated extract varies from 0.6 to 4.05 for non saline, 12.75 to 27.19 for saline sodic and 0.79 to 11.80 for saline soils. Hence considering the distribution of salt affected soils in Amibara Irrigation Schemes, about 34 % of the soils are salt affected soils (Table 3).

According to U.S. Salinity Laboratory Staff [14] classification, significant part of Melka Sedi farm and former Banana farms are mapped as saline and saline sodic soils. Around 34 % of AIS soils are saline soils with ECe greater than 4 dS/m and SARe less than 13. About 0.05 % of the area is mapped as saline sodic soils with ECe and SARe values greater than 4 dS/m and 13. This saline sodic soils were found in Melka Sedi former Banana Farm (Appendix Table 1, Field Number 2A4). Sodic soils, with ECe less than 4 dS/m and SARe greater than 13, in the farm area were not identified (Table 3).

Table 3. Area Coverage of Salt Affected Soils in AIS

No.	Salt affected soils Class	ECe (dS/m)	SARe	Area (ha)	% Area
1	Non Saline –Non Sodic Soils	< 4	< 13	10007.30	65.60
2	Saline Soils	> 4	< 13	5239.79	34.34
3	Saline Sodic Soils	> 4	> 13	9.13	0.06
			Area	15256.22	100%

Because of the insufficient annual rainfall, evapotranspiration exceeding rainfall (evapotranspiration rate of 3000 mm/year, as compared with 500 mm annual precipitations) to leach down salts from the plant rooting zone and lack of

natural drainage, soils of Amibara irrigated command areas were developed into salt affected soils. Here also, due to poor irrigation practice and lack of appropriate drainage, the groundwater levels have come closer to the surface; the farm areas are prone to secondary salinization. Development of productive and sustainable irrigated agriculture in such areas must then be preceded by necessary precautionary measures and followed by proper management practices.

From the map it can be shown that about 66 % of the farm area is non saline and non sodic with ECe and SARe less than 4dS/m and 13. But soil salinity and sodicity problem is never a static soil behavior; there will always be change in the distribution of salt affected soils spatially. Unless salts are leached down and drainage is provided soon, more areas will be affected by salinity and sodicity.

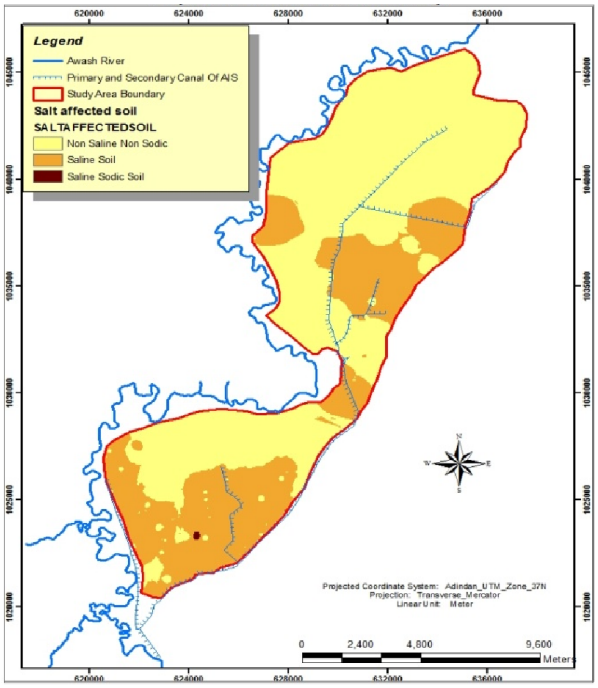

Fig. 5. Salt affected soils map of AIS

4 CONCLUSION AND RECOMMENDATION

CONCLUSION

Based on the findings reported in the previous section, soil salinity and sodicity assessment of the study area revealed that substantial parts of Amibara farm areas were consistently and continuously affected by salinity problem. Significant proportion of the irrigated land has been abandoned or soon will be abandoned mainly because of secondary salinization resulted from shallow saline groundwater table.

RECOMMENDATION

Given the conclusion stated and the field observation, the following recommendations are forwarded

1. The subsurface drainage system should be rehabilitated and operationalized with immediate effect.
2. There are areas of farm where sign of sodicity is showing up. The sodic soil should be treated at the earliest before the soil structure is fully destroyed.
3. More and more lands are being abandoned. Hence further research on other alternative management options should be done.
4. There is no clarity on what to do with already affected and abandoned soil. This has to be addressed immediately.

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APPENDIX

Top soil (0-30 cm) salinity and sodicity status of Amibara farms

lab.no.	Coordinate		Field no.	Ec (ds/m)	pH	Ca+Mg (meq/l)	Na (meq/l)	Sum Cation	SAR
	Easting	Northing							
1	622260	1027505	F1/3/37	0.74	7.9	3.40	2.94	6.34	2.3
2	620683	1026970	F1/3/29	2.15	8.0	15.20	3.67	18.87	1.3
3	627456	1024073	F1/1/0	2.39	8.4	6.30	6.08	12.38	3.4
4	624577	1025751	3B15	20.60	7.3	121.20	23.69	144.89	3.0
5	626228	1022760	F3/1/3	0.88	8.4	3.20	2.46	5.66	1.9
6	621242	1026421	F1/3/27	0.89	8.5	4.40	2.46	6.86	1.7
7	626280	1027425	F3/3/42	0.79	8.1	5.20	2.22	7.42	1.4
8	623201	1027838	F1/3/41	0.37	8.2	1.70	1.98	3.68	2.1
9	622254	1024257	F1/1/10	9.98	7.5	88.80	8.73	97.53	1.3
10	622305	1027527	F1/3/38	1.26	8.1	7.00	2.46	9.46	1.3
11	620757	1025826	F1/2C/25	10.60	7.7	94.00	11.87	105.87	1.7
12	624808	1026633	F1/20/66	0.47	8.2	0.60	2.22	2.82	4.1
13	625567	1028343	F1/2B/74	0.70	8.5	2.70	2.94	5.64	2.5
14	624754	1026605	F1/2D/65	0.40	8.4	1.20	1.74	2.94	2.2
15	624215	1026704	F1/2D/63	0.86	8.4	6.30	2.22	8.52	1.2
16	620766	1026249	F1/3/26	26.90	7.3	281.60	16.69	298.29	1.4
17	622307	1024224	F1/1/9	21.90	7.3	269.20	11.63	280.83	1.0
18	623936	1023232	2A2	0.50	8.9	2.70	1.98	4.68	1.7
19	620778	1027295	F1/3/31	4.70	8.4	26.40	8.49	34.89	2.3
20	625857	1023405	F3/1/5	70.90	7.3	496.60	131.81	628.41	8.4
21	622202	1027353	F1/2B/49	0.80	8.9	4.00	2.22	6.22	1.6
22	622739	1025238	F1/2A/9	0.87	8.8	5.40	2.94	8.34	1.8
23	622596	1022655	1A6	12.90	7.9	121.40	10.90	132.30	1.4
24	620782	1027268	F1/3/30	0.65	8.2	3.20	2.70	5.90	2.1
25	626446	1028440	F3/4/53	0.33	8.1	1.80	1.74	3.54	1.8
26	620711	1026204	F1/3/26	40.80	7.0	439.80	33.42	473.22	2.3
27	624824	1024178	3B11	3.19	8.3	16.60	5.84	22.44	2.0
28	622861	1022545	1B5	0.76	8.6	4.60	2.46	7.06	1.6
29	626437	1028025	F3/4/51	0.40	8.6	1.00	1.98	2.98	2.8
30	624700	1024990	3B/3	1.43	8.4	8.60	3.91	12.51	1.9

……(Continued)

lab.no.	Coordinate		Field no.	Ec (ds/m)	pH	Ca+Mg (meq/l)	Na (meq/l)	Sum Cation	SAR
	Easting	Northing							
31	632294	1044778	P9	0.55	8.2	2.20	2.64	4.84	2.5
32	632005	1040104	AIP46	0.62	8.8	3.80	2.46	6.26	1.8
33	626474	1028437	F3/4/56	0.99	8.6	6.60	2.70	9.30	1.5
34	624327	1023272	2A4	45.90	7.8	109.00	200.73	309.73	27.2
35	630768	1030889	F5/6B	0.66	8.4	4.00	3.18	7.18	2.3
36	626182	1022656	F3/1/2(aban.)	31.90	7.6	78.00	83.40	161.40	13.4
37	627797	1033981	P2	0.81	8.4	5.80	1.25	7.05	0.7
38	628422	1025599	F3/1/17	0.93	8.7	5.00	2.32	7.32	1.5
39	626586	1023046	F3/1/5	0.80	8.7	6.00	2.05	8.05	1.2
40	626895	1025044	F3/2/24	0.83	8.5	3.80	1.79	5.59	1.3
41	626008	1026893	F3/3/39	0.65	8.4	3.00	1.52	4.52	1.2
42	631387	1045097	AIP62	0.61	8.5	3.60	1.25	4.85	0.9
43	626917	1025077	F3/2/25	0.78	8.7	6.80	1.25	8.05	0.7
44	625559	1026032	F3/3/33	1.76	8.3	12.80	2.59	15.39	1.0
45	626142	1027102	F3/3/41	0.55	8.6	4.70	1.25	5.95	0.8
46	626526	1023033	F3/1/4	0.39	8.2	2.80	0.99	3.79	0.8
47	626921	1023381	F3/1/7	4.02	8.4	11.20	9.79	20.99	4.1
48	624756	1024592	3B12	0.50	8.3	3.40	0.99	4.39	0.8
49	627684	1025949	F3/2/28	0.82	8.6	3.00	1.52	4.52	1.2
50	631022	1031195	F5A/7B	0.51	8.2	2.50	2.33	4.83	2.1
51	627594	1024235	F3/1/11	10.67	8.0	73.20	18.93	92.13	3.1
52	627214	1023812	F3/1/9	11.51	7.7	76.60	15.40	92.00	2.5
53	626460	1027548	F3/4/50	0.81	8.4	4.60	1.52	6.12	1.0
54	629051	1027109	F4/1/5A	2.72	8.1	19.00	3.12	22.12	1.0
55	627726	1025982	F3/2/29	1.92	8.3	10.40	2.85	13.25	1.3
56	628647	1026124	F4/1/1B	2.50	8.2	14.60	2.85	17.45	1.1
57	621281	1026408	F1/3/26	2.46	8.2	15.00	2.85	17.85	1.0
58	625692	1026439	F3/3/33	0.60	8.2	4.20	0.99	5.19	0.7
59	627577	1024192	F3/1/11	28.80	7.5	66.80	42.89	109.69	7.4
60	626034	1022450	F3/1/1	0.79	8.4	3.00	1.79	4.79	1.5

…… (Continued)

lab.no.	Coordinate		Field no.	Ec (ds/m)	pH	Ca+Mg (meq/l)	Na (meq/l)	Sum Cation	SAR
	Easting	Northing							
61	628636	1026098	F4/1/1A	0.90	8.3	5.20	1.25	6.45	0.8
62	626444	1028059	F3/4/52	0.77	8.1	5.10	1.25	6.35	0.8
63	631369	1034293	F6/9	1.60	7.9	6.20	2.05	8.25	1.2
64	631040	1033535	F5B/12A	2.70	7.8	14.40	2.32	16.72	0.9
65	627186	1023774	F3/1/8	0.82	8.2	6.60	1.52	8.12	0.8
66	627421	1025610	F3/2/27	64.50	6.9	671.80	30.30	702.10	1.7
67	626153	1022653	F3/1/2	27.00	7.3	236.20	11.19	247.39	1.0
68	627437	1025631	F3/2/27	1.30	8.4	6.80	2.05	8.85	1.1
69	625604	1025506	F3/2/19	1.22	8.4	8.00	1.52	9.52	0.8
70	623462	1022323	1C6	2.77	8.1	17.30	3.72	21.02	1.3
71	622810	1025165	Banana farm	0.61	8.5	4.00	1.52	5.52	1.1
72	622931	1023118	1A8	2.08	8.5	10.60	2.85	13.45	1.2
73	627383	1025553	F3/2/26	0.99	8.4	5.40	1.79	7.19	1.1
74	623601	1023147	2B1	0.78	8.4	3.70	1.25	4.95	0.9
75	626900	1023352	F3/1/6	1.74	8.6	12.20	3.92	16.12	1.6
76	630999	1031166	F5A/7A	0.50	8.3	1.80	1.34	3.14	1.4
77	626601	1023026	F3/1/5(Aban.)	25.10	7.6	243.20	36.28	279.48	3.3
78	630636	1030726	F5A/6A	0.65	8.7	3.10	1.61	4.71	1.3
79	623351	1025810	AIP8	0.58	8.1	4.20	1.08	5.28	0.7
80	631009	1033540	F6/6B	5.99	7.7	43.00	5.32	48.32	1.1
81	627951	1026303	F3/2/31	0.45	8.2	4.00	1.08	5.08	0.8
82	632000	1036193	AIP42	15.19	7.2	145.20	9.04	154.24	1.1
83	626237	1022692	F3/1/3(aband.)	34.50	7.2	252.60	42.83	295.43	3.8
84	627849	1024463	F3/1/12	19.86	8.3	36.00	80.22	116.22	18.9
85	626130	1027086	F3/3/40	3.02	8.0	22.80	3.73	26.53	1.1
86	625535	1025953	F3/2/22	0.76	8.4	3.90	1.34	5.24	1.0
87	620893	1025346	F1/2C/23	0.82	8.4	5.80	1.34	7.14	0.8
88	621993	1024389	F1/1/10	0.63	8.4	3.60	1.08	4.68	0.8
89	621309	1023901	F1/1/9	1.12	8.5	6.20	2.14	8.34	1.2
90	622704	1021805	1B3	0.42	8.1	2.60	1.08	3.68	0.9

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lab.no.	Coordinate		Field no.	Ec (ds/m)	pH	Ca+Mg (meq/l)	Na (meq/l)	Sum Cation	SAR
	Easting	Northing							
91	624790	1024634	4A7	21.90	7.4	127.10	34.08	161.18	6.2
92	622310	1024690		0.52	8.4	3.20	1.08	4.28	0.9
93	622683	1022670	A6	10.88	7.4	92.20	7.45	99.65	1.1
94	626544	1023044	F3/1/4 (aband)	35.20	7.5	192.20	83.96	276.16	8.5
95	624909	1024429	4A6	16.25	7.3	114.00	18.07	132.07	2.4
96	624635	1025774	4A10	7.70	7.7	64.20	7.98	72.18	1.4
97	623585	1023182	2B2	0.27	8.4	2.10	0.81	2.91	0.8
98	624741	1025004	4A8	3.16	8.0	25.50	3.20	28.70	0.9
99	627212	1023784	F3/1/9	30.50	7.9	93.00	80.50	173.50	11.8
100	624681	1025775	4A10(aband.)	32.70	7.3	287.20	35.89	323.09	3.0
101	632834	1036830	AIP66	1.63	8.1	9.40	2.93	12.33	1.4
102	631595	1035129	F6/16	6.54	8.0	41.30	6.39	47.69	1.4
103	636163	1040072	AIP52	0.91	8.5	5.60	2.14	7.74	1.3
104	630752	1038862	AIP44	1.44	8.2	7.90	3.10	11.00	1.6
105	626059	1022436	F3/1/1	15.60	8.1	44.20	34.78	78.98	7.4
106	631049	1031664	F5B/6B	6.60	8.0	35.90	10.10	46.00	2.4
107	630592	1030720	F5A/5	25.30	7.4	254.40	12.31	266.71	1.1
108	630023	1037868	AIP40	1.54	8.9	8.40	3.73	12.13	1.8
109	624155	1026709	F1/2D/62	0.53	8.5	2.60	1.61	4.21	1.4
110	628650	1032917	AIP32	0.49	8.3	3.70	0.81	4.51	0.6
111	631959	1038345	AIP43	0.77	8.4	4.20	1.61	5.81	1.1
112	626407	1025645	F3/2/25(aband.)	32.30	7.2	308.00	18.33	326.33	1.5
113	624632	1023216	2A5	0.42	8.5	3.40	0.81	4.21	0.6
114	621870	1027076	F1/2B/48	0.50	8.7	3.20	1.34	4.54	1.1
115	626421	1027389	F3/2/32	0.48	8.3	3.20	1.34	4.54	1.1
116	626486	1028366	F3/4/55	0.49	8.2	2.60	0.49	3.09	0.4
117	627399	1025553	F3/2/26	42.60	7.2	282.70	54.31	337.01	4.6
118	626431	1027414	F3/2/31	0.78	8.6	3.60	2.79	6.39	2.1
119	627483	1024058	F3/1/10	15.00	8.3	47.40	47.16	94.56	9.7
120	624948	1024379	4A6(cold store)	24.30	7.8	65.00	72.67	137.67	13.8

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lab.no.	Coordinate		Field no.	Ec (ds/m)	pH	Ca+Mg (meq/l)	Na (meq/l)	Sum Cation	SAR
	Easting	Northing							
121	627958	1026330	F3/2/32	7.36	7.8	51.90	7.85	59.75	1.5
122	626480	1028060	F3/3/45	0.68	8.7	1.90	1.56	3.46	1.6
123	629482	1035419	AIP63	0.50	8.2	2.60	2.28	4.88	2.0
124	621926	1024463	F1/1/14	2.19	7.8	18.00	2.99	20.99	1.0
125	623527	1022336	1C6	21.30	7.5	135.60	68.14	203.74	8.3
126	622758	1025250	F/2A/20	0.58	8.4	4.00	2.10	6.10	1.5
127	630636	1036047	AIP42	1.56	8.0	9.00	3.71	12.71	1.7
128	621941	1024521	F1/115	6.82	7.5	63.00	4.42	67.42	0.8
129	629043	1027064	F1/4/1B	0.65	8.8	2.00	2.99	4.99	3.0
130	624905	1024339	4A6	24.60	7.9	138.60	75.78	214.38	9.1
131	631548	1035113	F6/16	20.40	7.3	183.60	19.60	203.20	2.0
132	622588	1022659	1A6	1.07	8.4	4.20	2.63	6.83	1.8
133	621146	1024499	F1/1/11	4.72	8.0	40.00	4.24	44.24	0.9
134	623057	1025625	F1/2B/55	0.97	8.5	4.80	2.10	6.90	1.4
135	624520	1026517	4A11	0.66	8.3	5.20	1.74	6.94	1.1
136	637207	1041551	AIP54	1.18	8.6	4.50	2.99	7.49	2.0
137	625994	1026860	F3/3/38	0.67	8.8	5.20	2.28	7.48	1.4
138	624549	1025744	3B15	5.29	7.9	39.60	5.85	45.45	1.3
139	621391	1024722	F1/1/12	47.90	7.0	352.80	23.27	376.07	1.8
140	620677	1026479	F1/3/27	26.60	7.3	218.00	31.69	249.69	3.0
141	622614	1022602	1A5	22.80	7.1	260.00	18.68	278.68	1.6
142	624652	1025336	3B13	1.77	7.9	13.00	3.17	16.17	1.2
143	627347	1033551	WRC130	24.30	7.2	281.60	18.42	300.02	1.6
144	624877	1025048	4A8	20.40	7.4	155.20	31.35	186.55	3.6
145	630516	1037890	AIP64	0.78	8.1	4.20	3.10	7.30	2.1
146	622827	1023719	2B4	0.43	7.9	3.43	1.02	4.45	0.8
147	633795	1038110	AIP47	15.33	7.3	156.20	9.43	165.63	1.1
148	625758	1026413	F3/2/23	0.60	8.3	4.67	1.38	6.05	0.9
149	630618	1030617	F5A/1	0.47	8.1	3.90	4.78	8.68	3.4
150	626979	1036360	AIP60	14.48	7.4	153.40	9.43	162.83	1.1

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lab.no.	Coordinate		Field no.	Ec (ds/m)	pH	Ca+Mg (meq/l)	Na (meq/l)	Sum Cation	SAR
	Easting	Northing							
151	631008	1032835	F5B/1042	1.00	8.1	5.00	2.10	7.10	1.3
152	628447	1033313	WRC224	0.51	8.4	3.25	1.38	4.63	1.1
153	631029	1032840	F5A/11A	1.45	7.8	11.60	2.45	14.05	1.0
154	628427	1025639	F3/1/18	1.85	8.4	13.00	4.42	17.42	1.7
155	631234	1032553	F5B17	0.77	8.8	3.10	2.28	5.38	1.8
156	627834	1024458	F3/1/12	2.10	8.7	6.60	6.28	12.88	3.5
157	625527	1026042	F3/3/33	35.10	7.5	382.80	20.30	403.10	1.5
158	625705	1026461	F3/3/34	1.41	8.4	8.70	3.78	12.48	1.8
159	626331	1025441	F3/2/24	53.00	7.4	435.20	103.22	538.42	7.0
160	631635	1035494	F9/1/4	3.93	8.0	32.30	3.24	35.54	0.8
161	625592	1025494	F3/2/19	27.60	7.2	270.00	27.64	297.64	2.4
162	621026	1033536	F5B/12A	4.51	7.9	33.40	4.49	37.89	1.1
163	627761	1038107	AIP39	12.76	7.5	114.20	10.59	124.79	1.4
164	630994	1031220	F5A/4A	0.49	9.0	2.30	1.27	3.57	1.2
165	628234	1025230	F3/1/16	0.82	8.4	4.60	2.63	7.23	1.7
166	624691	1025356	4A9	0.72	8.2	5.60	1.27	6.87	0.8
167	620914	1025319	F1/2C/22	6.21	7.4	66.10	7.89	73.99	1.4
168	621526	1024655	F1/1/13	82.10	6.5	656.40	45.80	702.20	2.5
169	620667	1026719	F1/3/28(Aband.)	32.70	7.1	362.00	23.80	385.80	1.8
170	623357	1025987	F1/2B/57	0.84	8.5	5.30	2.63	7.93	1.6
171	623154	1027849	F1/3/42	0.66	8.7	4.30	0.91	5.21	0.6
172	620617	1026474	F1/3/27(Aband.)	27.90	7.2	258.60	20.63	279.23	1.8
173	621371	1024736	F1/1/12	3.80	7.9	33.40	3.42	36.82	0.8
174	623651	1022034	1C5(Abandand)	34.10	7.1	439.20	21.70	460.90	1.5
175	622252	1024454	Banana farm	0.57	8.8	3.50	1.27	4.77	1.0
176	622778	1023128	1A7	65.50	6.9	457.00	41.12	498.12	2.7
177	621316	1023948	F1/1/10	23.40	7.5	169.60	19.31	188.91	2.1
178	623010	1023066	1B6	0.75	8.8	4.80	2.34	7.14	1.5
179	622674	1022234	AIP2	1.29	9.1	4.60	3.24	7.84	2.1
180	622305	1027241	F1/2B/50	0.45	8.5	2.30	1.27	3.57	1.2

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lab.no.	Coordinate		Field no.	Ec (ds/m)	pH	Ca+Mg (meq/l)	Na (meq/l)	Sum Cation	SAR
	Easting	Northing							
181	621719	1022786	F1/1/5	1.10	8.8	4.00	3.06	7.06	2.2
182	624626	1023191	2A4	0.38	8.4	2.50	1.09	3.59	1.0
183	622767	1023695	1A9	0.57	7.9	2.50	1.27	3.77	1.1
184	623841	1026527	F1/2B/60	0.59	7.9	1.90	1.27	3.17	1.3
185	621425	1024557	F1/1/12(Aband.)	56.90	6.7	375.90	30.03	405.93	2.2
186	621857	1027019	F1/2b/47	0.41	8.4	2.30	1.27	3.57	1.2
187	625664	1028309	F1/2b/73	0.36	8.3	2.40	0.91	3.31	0.8
188	621477	1024834	F1/1/13	22.60	7.1	162.40	12.71	175.11	1.4
189	623726	1022221	1C7(Aband.)	78.30	6.5	580.80	49.44	630.24	2.9
190	622849	1023095	1A7	20.10	7.3	211.00	20.63	231.63	2.0
191	623037	1023109	1B7	0.76	8.3	4.50	1.99	6.49	1.3
192	621232	1024390	F1/1/11	44.10	6.9	334.60	23.01	357.61	1.8
193	621949	1024482	F1/1/15	14.58	7.4	177.00	8.48	185.48	0.9
194	622636	1022592	1A5	19.49	7.3	115.50	16.93	132.43	2.2
195	622576	1021839	1A4	0.69	8.2	4.70	1.76	6.46	1.1
196	623818	1026511	F1/2B/59	1.38	8.2	10.10	2.54	12.64	1.1
197	623932	1023260	2A3	0.97	8.5	7.00	2.72	9.72	1.5
198	621184	1024422	F1/1/11(Aband)	37.00	7.0	261.40	27.32	288.72	2.4
199	622733	1023132	A7(Aband)	31.20	7.4	211.20	24.09	235.29	2.3
200	623036	1025591	F1/2A/21	0.40	8.0	2.60	1.23	3.83	1.1
201	622679	1021776	1B2	0.91	8.6	3.50	2.90	6.40	2.2
202	622281	1024671	F1/2A/16	0.50	8.3	3.40	1.47	4.87	1.1
203	623390	1022360		19.70	8.0	110.60	58.21	168.81	7.8
204	623329	1025969	F1/2B/56	0.76	8.6	3.80	2.36	6.16	1.7
205	621409	1023973	F1/1/10	24.70	7.8	151.20	38.77	189.97	4.5
206	623434	1022544	1C8	15.62	7.6	143.20	13.53	156.73	1.6
207	622862	1022526	1B4	1.10	8.6	7.10	2.72	9.82	1.4
208	622745	1023606	1A9	0.79	6.9	3.70	2.18	5.88	1.6
209	623154	1021296	AIP27	0.43	8.4	2.00	1.29	3.29	1.3
210	620745	1025870	F1/2C/25	6.72	7.8	51.80	7.91	59.71	1.6

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lab.no.	Coordinate		Field no.	Ec (ds/m)	pH	Ca+Mg (meq/l)	Na (meq/l)	Sum Cation	SAR
	Easting	Northing							
211	630652	1036076	AIP42	37.50	6.8	295.50	21.98	317.48	1.8
212	622019	1027441	F1/3/35	12.57	7.2	114.90	9.88	124.78	1.3
213	620787	1025728	F1/2C/24	9.87	7.6	69.90	12.92	82.82	2.2
214	620702	1026711	F1/3/28(Aband)	42.80	8.0	225.60	31.87	257.47	3.0
215	623706	1026248	AIP25	0.74	8.5	5.90	1.41	7.31	0.8
216	621476	1024362	F1/1/12	47.00	7.9	291.10	23.12	314.22	1.9
217	622285	1024275	F1/1/10	77.70	7.8	661.20	33.26	694.46	1.8
218	625856	1023508	F3/2/19	25.00	8.6	59.40	62.26	121.66	11.4
219	625738	1026386	F3/2/22	10.73	7.2	84.50	7.55	92.05	1.2
220	631454	1034716	F6/12(Aband)	17.85	7.1	170.40	13.53	183.93	1.5
221	631482	1034719	F6/12	0.65	8.0	3.30	1.47	4.77	1.1
222	631046	1031625	F5B/5	0.40	8.2	2.10	1.41	3.51	1.4
223	631625	1035481	F9/1/4(Aband)	16.20	7.1	159.80	11.85	171.65	1.3
224	627971	1026321	F3/2/32	10.90	7.5	80.80	14.89	95.69	2.3
225	628028	1033699	WRC228	0.43	8.2	2.90	1.11	4.01	0.9
226	624694	1025587	4A9(Aband)	34.44	7.2	179.20	69.17	248.37	7.3
227	627127	1023814	F3/1/8	0.41	8.4	3.40	1.29	4.69	1.0
228	629300	1040379	AL	0.52	7.7	3.13	1.36	4.49	1.1
229	631725	1037199	AL	0.86	7.8	4.47	1.59	6.06	1.1
230	635130	1045263	F9/1/7	0.73	7.8	1.27	1.09	2.36	1.4
231	633005	1043371	AM	0.93	7.5	5.50	1.11	6.61	0.7
232	627865	1040187	AL	1.43	7.8	8.20	1.17	9.37	0.6
233	629308	1041710	AL	0.99	7.7	5.30	1.12	6.42	0.7
234	629326	1040410	AL	1.23	7.7	7.85	3.51	11.36	1.8
235	635750	1042434	F11/8/14	0.68	7.7	0.61	5.20	5.81	9.4
236	633936	1042832	F10/9/4	2.54	7.8	14.02	9.02	23.04	3.4
237	633320	1039609	F10/2/4	0.66	8.2	1.95	4.04	5.99	4.1
238	634041	1041505	F10/2/11	0.68	7.6	2.80	3.94	6.74	3.3
239	628609	1036677	C6/1	0.84	7.8	4.53	4.90	9.43	3.3
240	637245	1042590	F11/8/8	0.88	7.9	2.00	6.24	8.24	6.2

…….. (Continued)

lab.no.	Coordinate		Field no.	Ec (ds/m)	pH	Ca+Mg (meq/l)	Na (meq/l)	Sum Cation	SAR
	Easting	Northing							
241	635013	1039985	F11/6/4	0.85	7.9	3.87	5.28	9.15	3.8
242	628928	1038389	D4/5	0.84	7.8	3.33	6.05	9.38	4.7
243	631650	1037173	F9/2/4	0.80	7.8	1.33	7.30	8.63	8.9
244	627384	1035852	1A2/0/P	0.94	7.7	4.80	5.76	10.56	3.7
245	631654	1042139	AM	2.11	7.8	14.66	7.49	22.15	2.8
246	630277	1043051	AM	0.87	8.0	3.20	5.76	8.96	4.5
247	629830	1033808	AB/3	1.97	7.8	10.80	8.16	18.96	3.5
248	633562	1035925	F5B/19	1.48	8.5	6.67	7.01	13.67	3.8
249	630777	1041739	F10/6/4	3.54	7.8	23.59	9.93	33.53	2.9

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Investigating the Q-factor and BER of a WDM system in Optical Fiber Communication Network by using SOA

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ABSTRACT: This paper represents the analysis of Quality-factor and Bit Error Rate of an Optical signal in WDM system of a Fiber Optic communication network by using SOA. Vertical Cavity Surface Emitting Laser (VCSEL) is used as a transmitter. It is observed that by varying the frequency of bandwidth up to 34GHz a low BER with a high Q-factor is obtained. At 34GHz bandwidth maximum Q-factor of 13.1248 and minimum BER of $1.16972e^{-039}$ is obtained for 100km optical fiber length.

KEYWORDS: SOA, BER, Q-factor, WDM system, Optical Fiber.

1 INTRODUCTION

Q-factor and BER is one of the most important factors that limiting the transmission distance in optical communication systems. In order to transmit signals over long distances, it is necessary to have a low BER and high Q-factor within the fiber. The main advantage of optical amplifiers is that the optical signals to be directly amplified optically without any conversion [1], [2]. Here semiconductor optical amplifier (SOA) used as the fiber amplifier with WDM system [3].

This thesis aims to implement the SOA in WDM system and analyzed the performance in terms of BER and Q-Factor by varying the bandwidth.

Q factor measures the quality of an analog transmission signal in terms of its signal-to-noise ratio (SNR). As such, it takes into account physical impairments to the signal –for example, noise, chromatic dispersion and any polarization or non-linear effects – which can degrade the signal and ultimately cause bit errors. In other words, the higher the value of Q factor the better the SNR and therefore the lower the probability of bit errors [4].

In telecommunication transmission, the bit error rate (BER) is the percentage of bits that have errors relative to the total number of bits received in a transmission. For example, a transmission might have a BER of 10^{-6}, meaning that, out of 1,000,000 bits transmitted, one bit was in error. The BER is an indication of how often data has to be retransmitted because of an error. Too high a BER may indicate that a slower data rate would actually improve overall transmission time for a given amount of transmitted data since the BER might be reduced, lowering the number of packets that had to be present.

Wavelength Division Multiplexing (WDM) is a technology which multiplexes a number of optical signals onto a single optical fiber by using different wavelengths of laser light [5], [6]. In WDM, several different wavelengths are transmitted over one single mode fiber at the same time. To increase the capacity of the system is to add additional channels by laying more fibers which is impractical because higher cost is responsible for such system. So, WDM systems are very popular for telecommunication companies because it permits them to extend the capacity of the system without laying more fibers. Capacity of a given system can be expanded simply by upgrading the multiplexers and de-multiplexers at each end without having to overhaul the backbone network. Generally a basic WDM system has been divided into three parts [7]: (i) Transmitter section, (ii) Transmission link section and (iii) Receiver section.

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2 SIMULATION MODEL

For the simulation work Optisystem Simulation software is used. In transmitter section, externally modulated transmitter is used in order to achieve stability. This also helps to reduce the chirps and non-linear effects. Here, Pseudo Random Bit Sequence (PRBS) is used to generate digital data and Non-return zero (NRZ) pulse generator is used to convert digital signal into electrical signal. After that modulator mixes the electrical signal with the light source input signal and generate optical output signal which is then sent into the multiplexer.

In this design four transmitters are used of equal channel spacing of 50GHz starting from 193.1Thz.

In this transmission link design, single mode fiber (SMF) is used which has dispersion around 16.75 ps/nm.km and attenuation of 0.3 dB/km. Fiber Bragg Grating (FBG) is used to compensate the dispersion effect and SOA is used as amplifier to compensate the fiber linear loss(attenuation).

In receiver section, PIN photo-detector is connected to the output to detect the optical signal and convert it to electrical signal and send it to low pass Bessel filter which pass the low frequency signal and discard high frequency carrier signal. Then BER Analyzer is used to analyze the bit error rate and quality factor of the designed system.

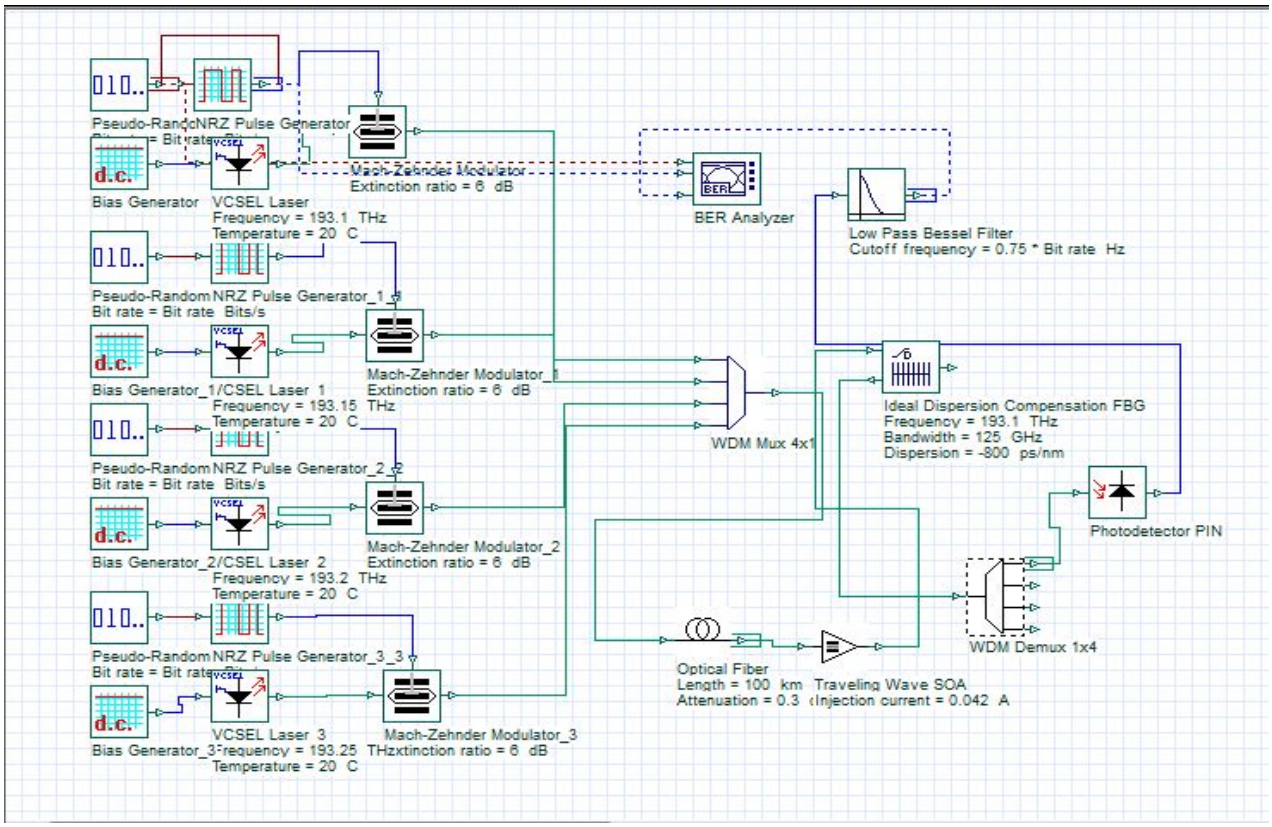

Fig. 1. WDM system using SOA

The circuit is designed for 100km optical fiber length where the SOA injection current is 0.042A, attenuation of the fiber is 0.3dB/km and the frequencies of the four channels are 193.1THz, 193.15THz, 193.2 THz and 193.25 THz.

3 RESULTS AND SIMULATION

The proposed circuit of figure 1 starts to operate at 6GHz bandwidth. At 6GHz the Q-factor is 1.87555 and BER is 0.0299241 which is very poor. The eye diagram of 6GHz bandwidth is given below:

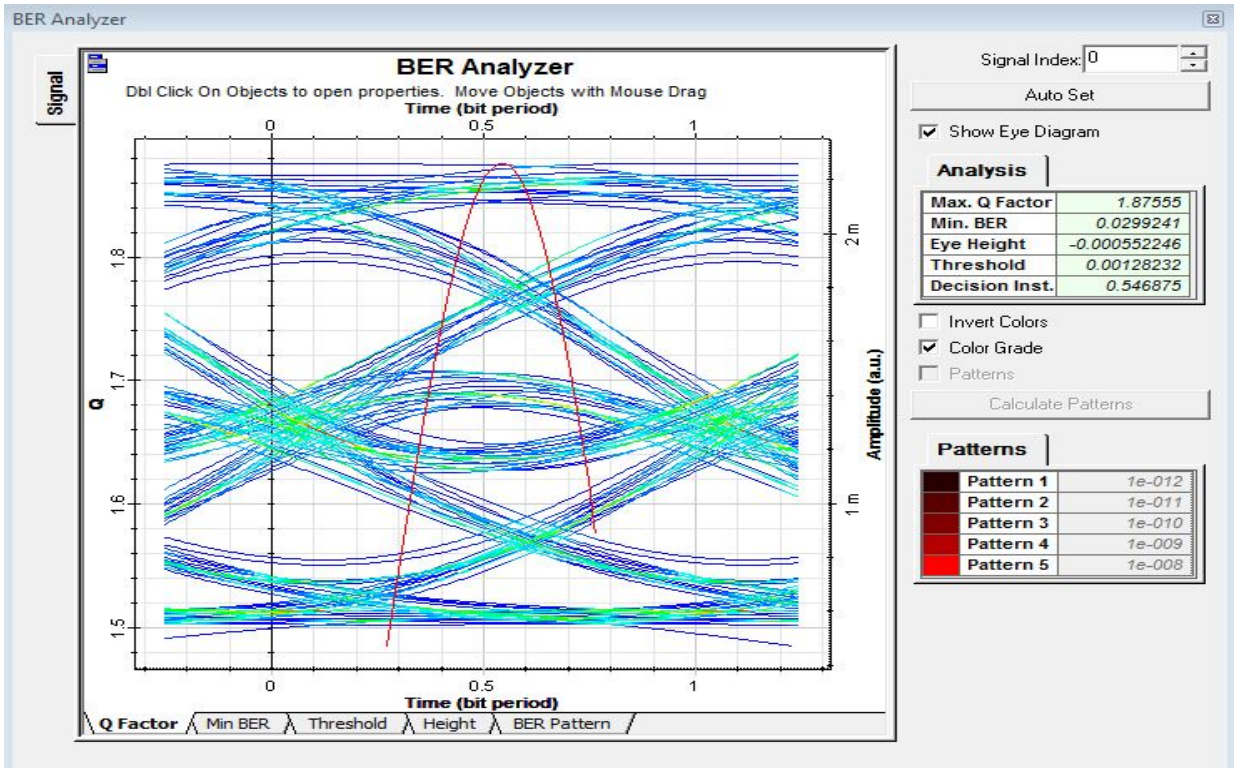

Fig. 2. Eye diagram for 6GHz bandwidth

If we increase the bandwidth up to 34GHz the Q-factor increases and BER decreases which is required for any optical transmission. Above 34GHz bandwidth Q-factor starts to decrease and BER increases. The value of Q-factor, BER and the corresponding eye diagrams for different values of bandwidth is given below:

For 10GHz the Q-factor is 4.18004 and BER is $1.43505e^{-005}$ and the eye diagram is given below:

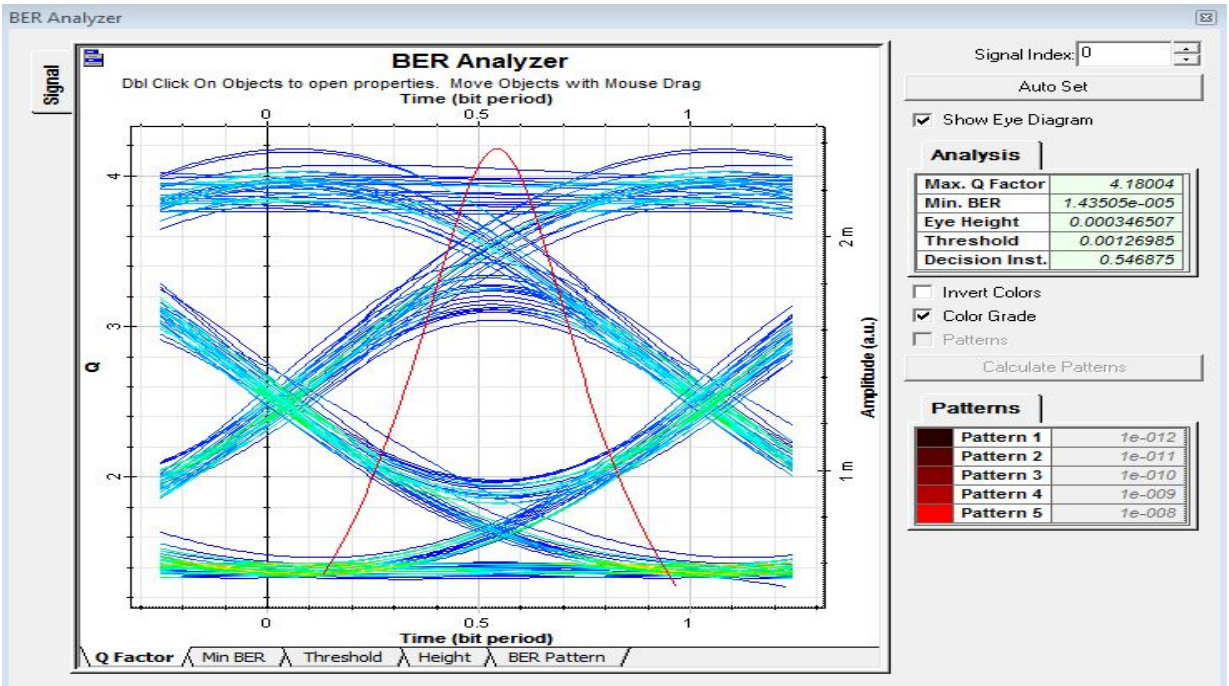

Fig. 3. Eye diagram for 10GHz bandwidth

For 20GHz the Q-factor is 11.3986and BER is $2.11826e^{-030}$ and the eye diagram is given below:

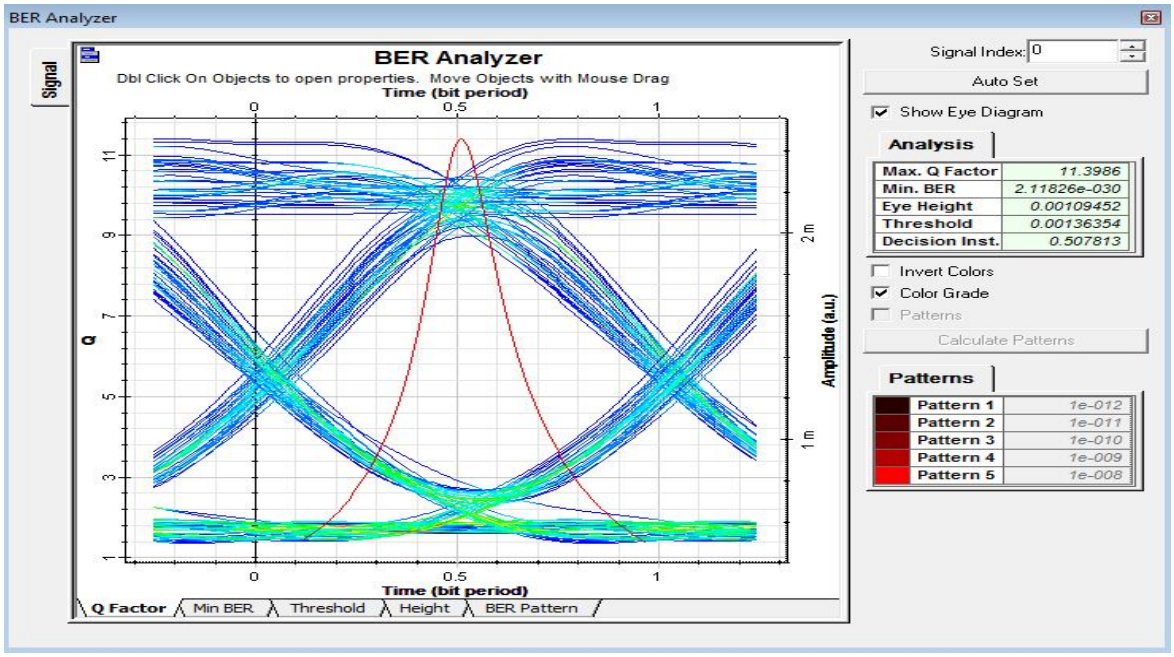

Fig. 4. Eye diagram for 20GHz bandwidth

For 30GHz the Q-factor is 13.0646 and BER is $2.59822e^{-039}$ and the eye diagram is given below:

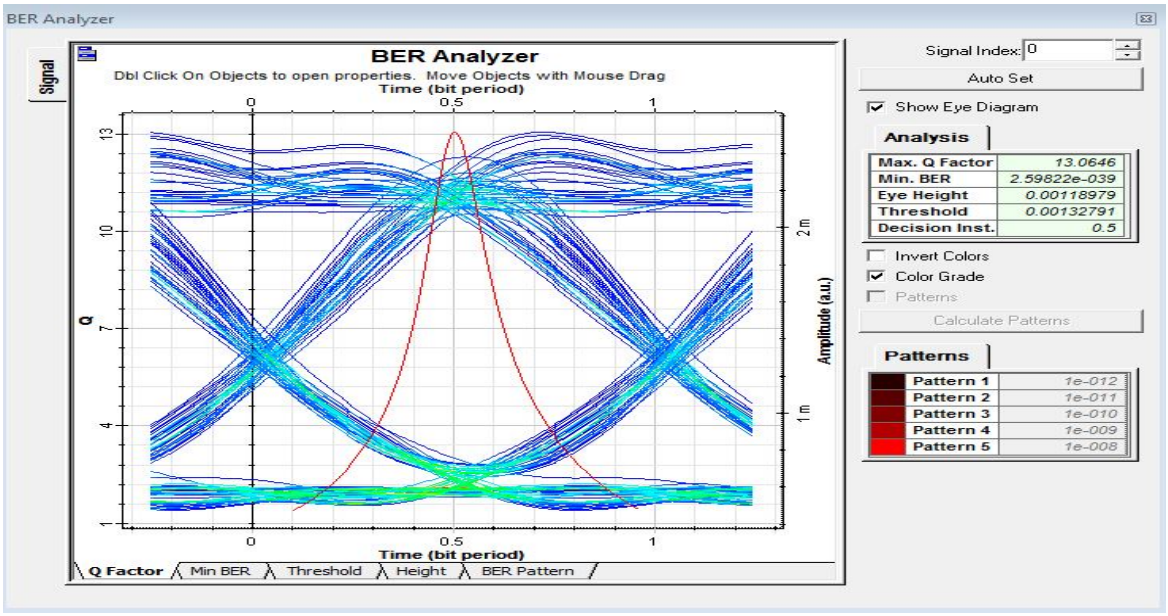

Fig. 5. Eye diagram for 30GHz bandwidth

At 34GHz maximum Q-factor of 13.1248 and minimum BER of $1.16972e^{-039}$ is obtained and the eye diagram is given below:

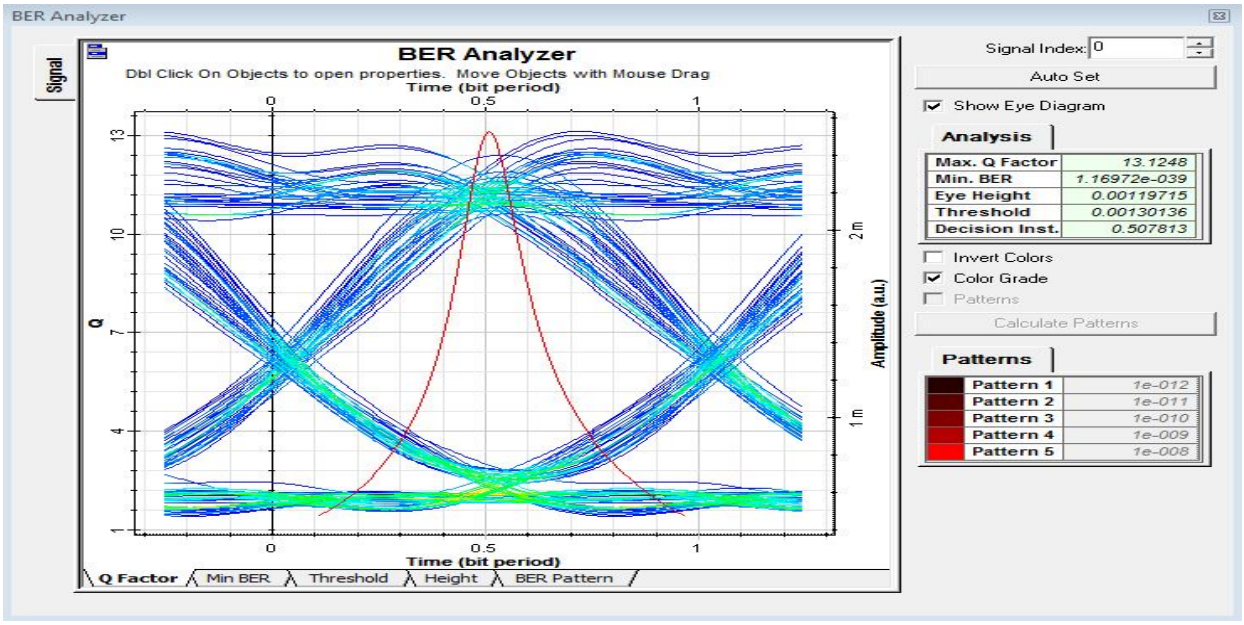

Fig. 6. Eye diagram for 34GHz bandwidth

Above 34GHz the Q-factor gradually decreases and BER increases as a result eye diagram become worst. For example at 40 GHz the Q-factor is 13.0616 and min BER is 2.67739e$^{-039.}$

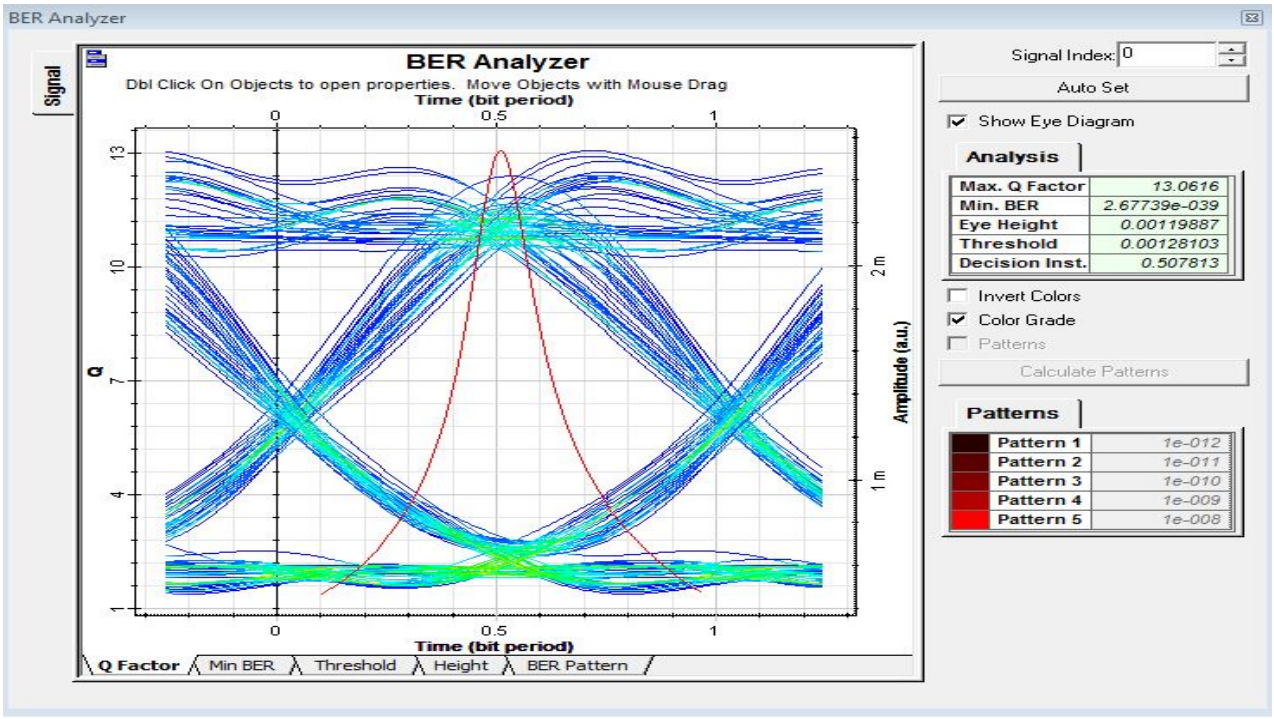

Fig. 7. Eye diagram for 40GHz bandwidth

The bit rate and the sample rate of the circuit of figure 1 is given below:

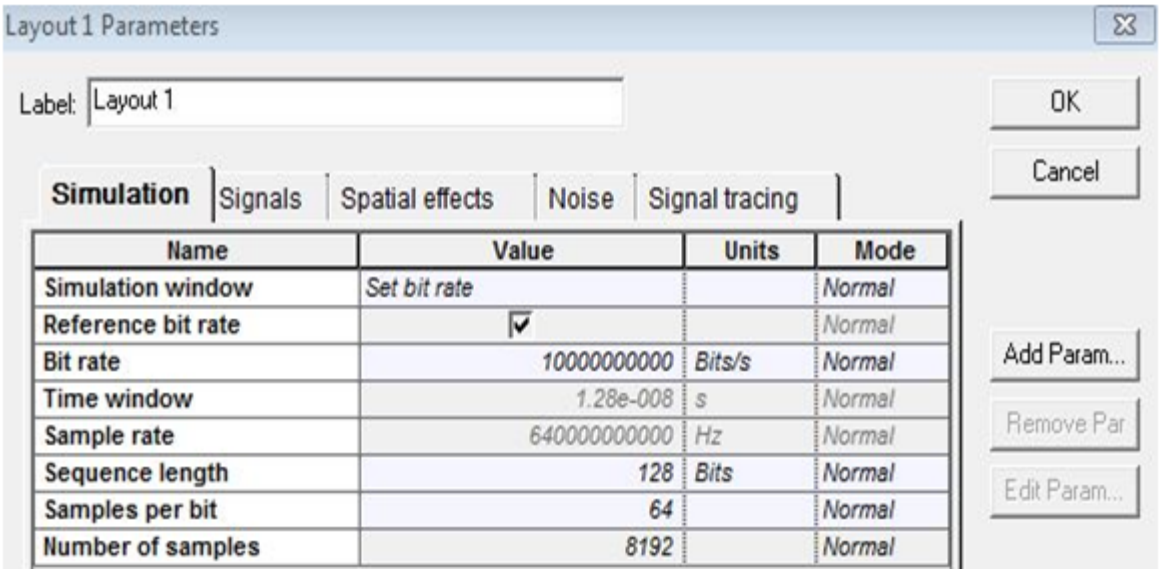

Fig. 8. The bit rate and the sample rate of the circuit of fig. 1

Without SOA the circuit gives zero Q-factor and maximum BER equal to 1. The eye diagram of the circuit without SOA is given below:

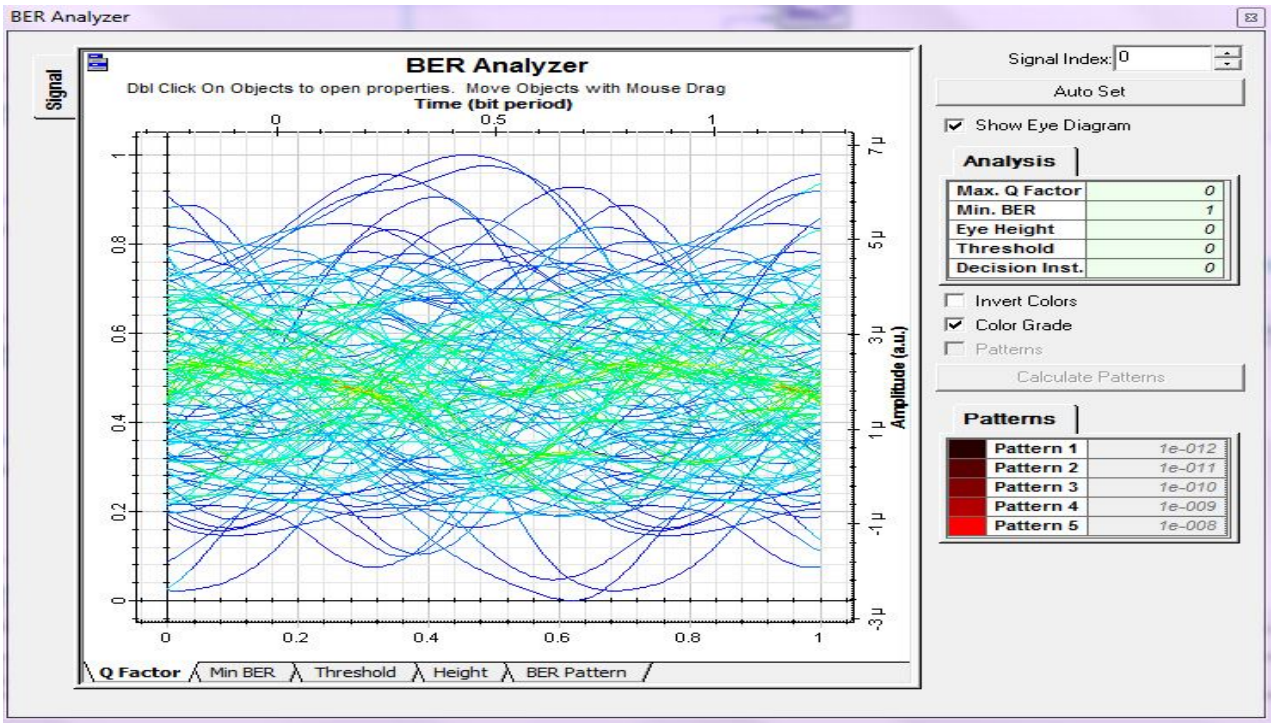

Fig. 9. Eye diagram without SOA

Table 01:Q-Factor and BER by varying the bandwidth using SOA and without SOA

Channel Spacing 50Ghz	With SOA		Without SOA	
Bandwidth (GHz)	Q-Factor	BER	Q-Factor	BER
6	1.8755	0.0299241	0	1
10	4.18004	1.43505e-005	0	1
20	11.3989	2.11826e-030	0	1
30	13.0646	2.59822e-039	0	1
34	13.1248	1.16972e-039	0	1
40	13.0616	2.67739e-039	0	1

From the table we can observe that using SOA with the increase in bandwidth Q-factor increases and bit error rate decreases. Without using SOA Q-factor is always zero and bit error rate is always 1. A plot of bandwidth versus Q-factor is given below:

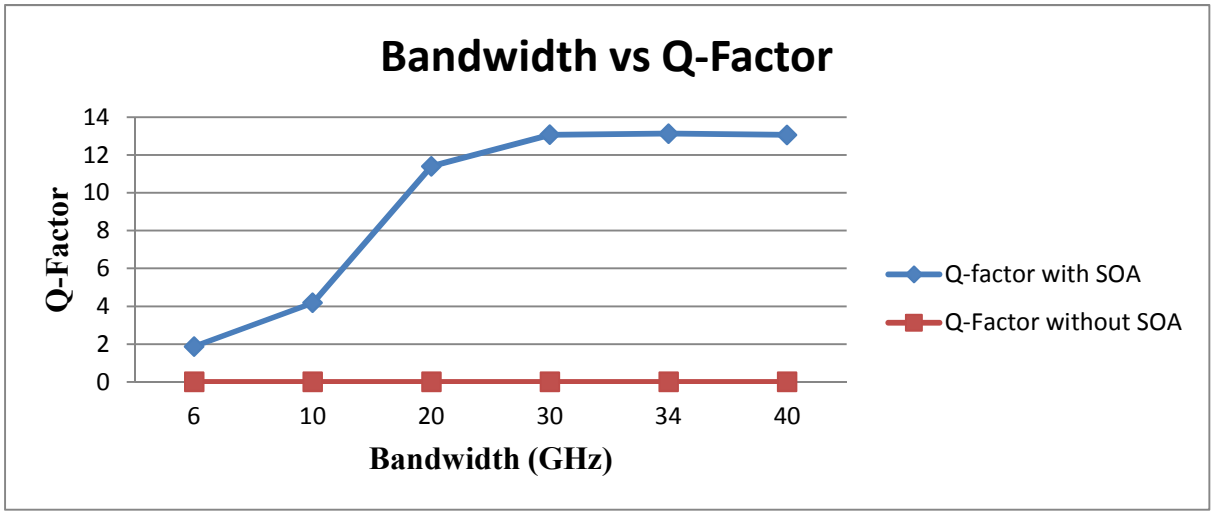

Fig. 10. Plot of Bandwidth vs. Q-factor with and without SOA

Table 02:Q-Factor and BER by varying the optical fiber length using SOA

Fiber Length (km)	Q-Factor	BER
20	2.53573	0.004864
40	1.52787	0.053499
60	3.99168	2.49E-05
80	4.74201	8.13E-07
100	13.0646	2.60E-39
120	9.12772	3.49E-20

From table 2 we can see that if we increase the fiber length up to 100km Q-factor increases and bit error rate decreases but above 100km Q-factor decreases and bit error rate increases. A plot of fiber length versus Q-factor is given below:

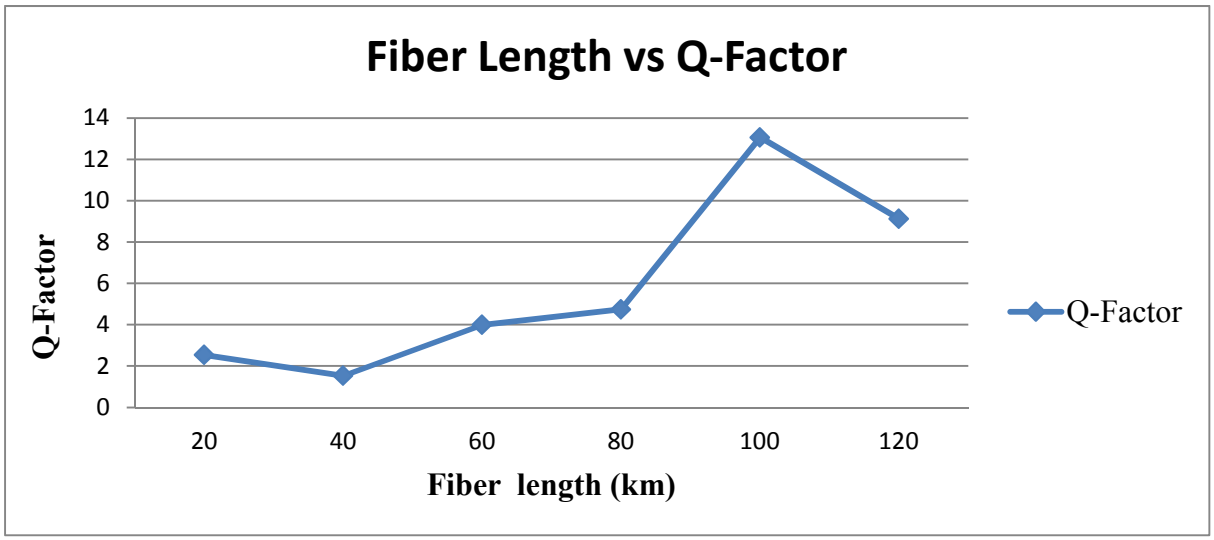

Fig. 11. Plot of Fiber length vs. Q-factor

4 CONCLUSIONS

In this paper a Wide Division Multiplexed (WDM) system using SOA is introduced. A circuit is designed for 100km optical fiber length where the SOA injection current is 0.042A, attenuation of the fiber is 0.3dB/km and the frequencies of the four channels are 193.1THz, 193.15THz, 193.2 THz and 193.25 THz with equal channel spacing of 50GHz. At 34GHz bandwidth a low BER of $1.16972e^{-0}$ with a high Q-factor of 13.1248 is achieved.

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TOWARDS A BETTER UNDERSTANDING OF GENERATION-Y EMPLOYEES AT THE WORKPLACE FOR ORGANIZATIONAL COHESION AND SUCCESS

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ABSTRACT: Over the last couple of years, the realities of massive generational change have dawned on many business leaders. While the issues of an ageing population and a new attitude to work have literally been emerging for a generation, it has been a sudden awakening for many organizations. In fact dealing with these demographic changes and specifically recruiting, retaining and managing 'Generation Y' has emerged as one of the biggest issues facing employers today. Based on a library research and a review of existing literature, this paper examines the employers' perceptions of Generation-Y employees with a view to proposing ways to improving relations at the workplace for organizational cohesion and success. From the existing literature, it is documented that employers mostly consider Generation-Y employees as: spoilt/entitled, lazy, having poor work ethics, showing little respect for authority, being too self-centred and individualistic, having overinflated/unrealistic expectations, not committed to work, exhibiting little or no loyalty to their employers, lacking in social skills and a needy lot. Scholars suggest that, to improve work relations and organizational performance, employers need to make necessary adjustments to their perceptions of Generation-Y employees. These adjustments include, among others: approaching younger workers differently, providing constructive criticism that reflects confidence in them; accepting that there may be multiple ways for workers to accomplish their tasks as exhibited by Generation-Y employees; offering flexible work schedules, adjusting the belief that workers need to "put in the hours at the desk" to be effective, and developing a work culture that is pleasant and positive; realizing that asking Generation-Y employees questions can often lead to answers and solutions that are actually more efficient and effective; finding the right mix of individual and team projects that allow these workers to grow professionally; redesigning and rebuilding some of the old career ladders that were destroyed with the flattening of organizations and greatly expand telecommuting and remote working arrangements, and developing a stronger commitment to keeping employees even in bad economic times.

KEYWORDS: Better Understanding, Generation-Y Employees, Workplace, Organizational Cohesion, Success

1 INTRODUCTION

The integration of the newest generation into today's workforce, often referred to as Generation-Y, is forcing organizations to re-evaluate traditional training and on-boarding processes (Frank, Finnegan & Taylor, 2004; Martin & Tulgan, 2002). This generation has its own work-related values, attitudes and behaviours which are inherently different from those of past generations.

Generation-Y workers venture into the workforce with very distinct workplace preferences. Often criticized for their sense of entitlement and exhaustive questioning, this generation expects continuous recognition and need daily feedback (Hastings, 2008; Tulgan & Martin, 2001) which sometimes strain the limited management resources of companies that are operating more efficiently with less human capital today than in the past.

To be successful in today's global rivalry tourism market, for example, enterprises need to focus more on transforming their working environments to motivate and retain their employees to engage in behaviour that is consistent with their goal (Amar, 2004). Agarwal *et al.* (2001) say that the ways of motivating and retaining young employees in the present day business activities are different from those of motivating older employees because the young employees have different

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expectations. Employers not only need to understand the importance of employees' retention and motivation, but should also comprehend the variances in preferences of motivation factors between various groups of employees' generations. Failure in satisfying these aspects could result in a decline in an organizations' total effectiveness. Subsequently, this could result to working environments not conducive for employees which would hinder their contributions towards the success of an enterprise (Fazul, 2011).

Giancola (2006) has found out that many organizations in Africa still view generational diversity and differences with doubt and are not satisfied with their significant differences. Many organizations still continue with their old methods and procedures of guiding and monitoring their generational diversified employees, including employment activities, operation processes organizational procedures, evaluation criteria, appraisal methods, and remuneration packages.

Currently, organizations and researchers alike discuss the effects of 'Generation-Y' joining the workforce and possible challenges entailed by their entry. This group of individuals grew up experiencing another world than generations before them, characterized by rapid change, technological advances and globalization (Edmunds & Turner, 2005). As a result, they are thought to have developed a different set of values and outlooks, affecting their behaviour in a different direction than other generations (Hershatter & Epstein, 2010). As a result, they have been portrayed as hard to interact with (Deal, Altman & Rogelberg, 2010), narcissistic (Twenge & Campbell, 2008), lacking in loyalty (Myers & Sadaghiani, 2010) and overly concerned with extrinsic rewards (Twenge, Campbell, Hoffman & Lance, 2010).

Popular media embrace the business case of a possible generational gap. While the literature is replete with publications suggesting how to manage across generations, a mini industry has been built on the hype (Twenge, Campbell, Hoffman & Lance, 2010), making statements like "The Workplace Generation Gaps" (Elmore, 2010, p. 8) commonly appearing headlines. By some, a generational clash has even been portrayed as inevitable (Reisenwitz & Iyer, 2009), raising concern because it may lead to a self-fulfilling prophecy (Hershatter & Epstein, 2010), spurring narcissistic behaviour through the share effect of Pygmalion (Cherrington, 1989). Furthermore, stereotypes may generate group effects at work, complicating organizational interaction (Passer *et al.*, 2009). Thus, refusing to consider expectations of 'Generation-Y' may contribute to potential for conflicts at work (Angeline, 2011).

The possible presence of generational differences is also important in other respects. If they exist, current reward and recruitment strategies may fail to meet the newcomers' needs, resulting in low motivation at work and a reduced number of applicants (Armstrong, 2005; Posner, 2010). By contrast, increasing the knowledge on how 'Generation-Y' works may enable the development of tailor-made designs for this group of individuals.

Hence, the efficiency of human resource management schemes may be improved (Chen & Choi, 2008) suggesting a valid rationale for why this knowledge needs to be enhanced. Kenya is a developing country with a competitive advantage of the young workforce. Two-thirds of Kenyans in formal employment aged below thirty are not satisfied with their jobs (Synovate, 2011). To effectively attract, manage and retain this new cohort of employees, organizations need a clear understanding of the work values of 'Generation-Y' and how they may differ from the values of previous generations. Organizations that fail to acknowledge generational differences among employees and focus their efforts on only keeping current employees happy are at a large disadvantage over competitors. 'Generation-Y' is a dynamic workforce that holds specific expectations with regards to work factors; that subsequently may not align with perceptions held by their managers (Twenge & Campbell, 2008).

STATEMENT OF THE PROBLEM

Over the last couple of years, the realities of massive generational change have dawned on many business leaders. While the issues of an ageing population and a new attitude to work have literally been emerging for a generation, it has been a sudden awakening for many organizations. In fact, dealing with these demographic changes and specifically recruiting, retaining and managing 'Generation-Y' has emerged as one of the biggest issues facing employers today (McCrindle, 2008).

Excessive employee turnover negatively impacts many functions of a business and impacts the bottom line with its adjacent expenses (Dalton *et al.*, 2001). The need to understand turnover and factors that influence the decision of young employees to leave a business are increasingly being recognized as an issue that is important to the success of organizational business (Waters, 2003). Kenya is a developing country which has the competitive advantage of the young workforce. Two thirds of Kenyans in formal employment aged below thirty are not satisfied with their jobs. These young people, also known as 'Generation-Y', are giving employers sleepless nights since a majority are not willing to stay in the same job for more than a couple of years. As a result, the cost of recruitment for companies has risen and will continue to rise as more of 'Generation-Y' enters the work force (Synovate, 2011).

In the PricewaterhouseCoopers twelfth Annual Global Chief Executive Officers Survey (2009), 61% of the chief executive officers admitted that recruiting and integrating younger employees is a challenge. The survey findings reported that it has become more evident that this younger generation is not clearly understood. Besides, 66% of the respondents of the PricewaterhouseCoopers (2009) National Human Survey reported that 'Generation-Y' employees already make up between 25% and 75% of the work force. With such a high proportion of the work force falling in this bracket, the interest in 'Generation-Y' cannot be considered as a passing fad. This is because 'Generation-Y' individuals are not just the next generation of employees, but the next generation of consumers who will ultimately determine whether businesses will succeed or fail. Employee turnover of 'Generation-Y' is a significant challenge for human resource management strategies and therefore needs to be addressed. Understanding how to work with 'Generation-Y' employees is an opportunity to make the transition of employees in organizations smoother and easier for all involved. It is a chance to determine what does and what does not work for 'Generation-Y'.

2 MAIN DISCUSSION

In his book entitled '*Generation Y Perceptions and Realities*', Hansen (2009) outlines ten perceptions that employers hold for Generation-Y employees. He, however, goes further to demystify these perceptions and gives what he considers the realistic perceptions of this generation and illustrates what should be done by both 'Generation-Y' employees and the employers in order to work harmoniously and achieve organizational goals. Discussed below in this paper are some of the perceptions and what needs to be done to ensure they do not become detrimental to organizational success.

SPOILT/ENTITLED

To an extent, the individuals in this generation do have a sense of entitlement, but it is not an entirely inherent personality flaw but partly the fault of Baby Boomer parents who coddled their children, constantly telling them how special they were and that anything they sought was possible, and rewarding them for every little thing, providing trophies and prizes simply for participating.

These parents stunted their children's growth by proactively removing all obstacles and potentially negative experiences. So, on the surface, 'Generation-Y' workers appear entitled. The key for employers is approaching younger workers differently, providing constructive criticism that reflects confidence in them. 'Generation Y' workers must realize that their bosses are not going to be like their parents, and that part of growing as an employee is learning from past mistakes and accepting constructive criticism.

LAZY

Technology has allowed this generation to multi-task and to find shortcuts in achieving results. Texting, instant messaging, social networking, and Web surfing have all made Generation-Y workers more competent, efficient and productive (if not sometimes overwhelmed). The key for employers is to accept that there may be multiple ways for workers to accomplish their tasks. Generation-Y workers may need to demonstrate that they are working just as hard as everyone else, but perhaps simply performing the job more efficiently.

HAVE POOR WORK ETHICS

'Generation-Y' is the first generation to expect employers to realize there is more to life than work. Just as many Baby Boomers are now discovering later in their careers, 'Generation-Y' sees work as a means to enjoy life and, to them, life comes first. 'Generation-Y' wants work to be fun and flexible because the line between work and life is seamless. They also follow a mantra of working smarter, not harder. The key for employers is offering flexible work schedules, adjusting the belief that workers need to "put in the hours at the desk" to be effective, and developing a work culture that is pleasant and positive. 'Generation-Y' workers may need to readjust some attitudes about work, especially for entry-level positions in which workers have traditionally been expected to work long hours to earn their due.

HAVE LITTLE RESPECT FOR AUTHORITY

While some people refer to this cohort of people as 'Generation Why', for a reason, it is not so much an issue of a lack of respect for authority as much as it is that this group has been raised by their parents to question everything and raise questions when they do not understand something. This generation is very independent and not afraid to challenge the

status-quo. Many 'Generation-Y' employees want a relationship with their employer like the ones they have with their parents. It is not that they have little respect for authority; on the contrary, they feel employers do not respect them. The key for employers is realizing that asking questions can often lead to answers and solutions that are actually more efficient and effective. Unlike with any other set of workers in the past, employers must also provide more autonomy and trust 'Generation-Y' workers to complete the work. 'Generation-Y' workers should learn to choose battles carefully, not question every single decision made, and give employers a chance to adapt to their style of work.

TOO SELF-CENTRED AND INDIVIDUALISTIC

This iPod Generation (named such because iPod commercials focus on individuality while selling the product to every Gen-Y) works well in groups and teams, especially with people their own age. They also have been taught the value of individuality and independent thinking. They see themselves as unique individuals and not tied to any specific labels. And unlike any previous generation, these workers do not plan to let their jobs define who they are. The key for employers is finding the right mix of individual and team projects that allow these workers to grow professionally. 'Generation-Y' workers need to realize that almost all work will be some combination of individual assignments and teamwork with people of all backgrounds and ages.

THOSE WITH OVERINFLATED/UNREALISTIC EXPECTATIONS

While this generation may be more anxious than others to rise quickly to the top, it is less about unrealistic expectations than it is about being better prepared for work than previous generations. They display a touch of the need for instant gratification thrown in. This generation also has no interest whatsoever in working in a cubicle, not because it is beneath them, but because they feel advances in technology should let them be able to choose to work from home, or anywhere there is a Wi-Fi connection. The key for employers is to redesign and rebuild some of the old career ladders that were destroyed with the flattening of organizations and greatly expand telecommuting and remote working arrangements. 'Generation-Y' workers need to see a progressive promotion path or they will move on to the next employer. 'Generation-Y' workers should learn to pace themselves and gain the necessary experience and skills before expecting a promotion to the next level.

NOT COMMITTED TO WORK

This generation has the most educated workforce ever, and partly because of this level of education, 'Generation-Y' workers believe their work should have meaning. This group quote from *Office Space* and have a mistrust of management. More than ever, these workers are seeking greater fulfilment and are only willing to work hard at jobs that provide it.

The key for employers is changing the way they view work and employees. To keep Gen-Y workers, employers may need to not only develop better jobs, but also consider strong corporate values and corporate volunteering programmes. Employers also need to clearly show how the work Gen-Ys complete directly impacts the organization's success. 'Generation-Y' workers should conduct more research on prospective employers to find organizations that not only have meaningful career paths, but also share some of the same values.

THOSE WITHOUT LOYALTY TO EMPLOYERS

Because of more work experiences and greater education, Gen-Y workers are simply more mobile, making it easier to move from one employer to another if they are unhappy with the work. They have also been raised during a period of great downsizing and rightsizing, and many witnessed the grief and frustration their parents felt when being laid off and they do not want to experience that emotion. These are also some of the reasons many Gen-Y workers are diligently planning to start their own businesses. The key for employers is to develop a stronger commitment to keeping employees even in bad economic times. Employers should also to do a better job in training and retaining the workers of this generation, possibly including such benefits as sabbaticals, professional development opportunities, and other options for Gen-Y workers who seek deeper fulfilment. 'Generation-Y' workers should try not to be so sceptical about the motives of employers and learn to trust them more while continuing their professional development as a hedge against any downturns.

THOSE LACKING IN SOCIAL SKILLS

'Generation-Ys' are some of the most social of any generational cohort; it is just that they communicate and socialize much differently from the rest of older or even younger employees. The key for employers is to realize and accept that people communicate differently and to embrace the new techniques while also teaching the Gen-Y workers that business sometimes still needs to use traditional methods of communication. 'Generation-Y' workers need to use those excellent communications and diversity skills to learn to socialize and communicate with people of all ages and backgrounds.

A NEEDY LOT

'Generation-Y' employees are indeed very needy. This is, however, not their fault but their parents' who trained them to be overly needy. In fact, there are stories of 'Generation-Y' job-seekers taking their parents along for the job interview or to help negotiate a job offer. The key for employers is to realize that this generation needs special care and handling. There's no way they can go months without a review; they need constant feedback. 'Generation-Y' workers need to realize that the reality of the workplace is that it is not like home or college and that they are expected to do an excellent job without always expecting praise or prize.

3 CONCLUSION AND WAY FORWARD

On the attitude of the Generation-Y employees seeming spoilt or an element of being entitled, the key for employers is approaching younger workers differently, providing constructive criticism that reflects confidence in them. 'Generation Y' workers must realize that their bosses are not going to be like their parents, and that part of growing as an employee is learning from past mistakes and accepting constructive criticism. On whether or not Generation-Y employees are lazy, the key for employers is to accept that there may be multiple ways for workers to accomplish their tasks. Generation-Y workers may need to demonstrate that they are working just as hard as everyone else, but perhaps simply performing the job more efficiently.

To cope with the seeming poor or lack of work ethics among Generation-Y employees, the key for employers is offering flexible work schedules, adjusting the belief that workers need to "put in the hours at the desk" to be effective, and developing a work culture that is pleasant and positive. 'Generation-Y' workers may need to readjust some attitudes about work, especially for entry-level positions in which workers have traditionally been expected to work long hours to earn their due.

On their seeming lack of respect for authority at the workplaces, employers should realize that asking Generation-Y employees questions can often lead to answers and solutions that are actually more efficient and effective. Unlike with any other set of workers in the past, employers must also provide more autonomy and trust 'Generation Y' workers to complete the work. 'Generation-Y' workers should learn to choose battles carefully, not question every single decision made, and give employers a chance to adapt to their style of work.

To understand the seeming sense of self-centredness and individualism exhibited by the Generation-Y employees at the workplace, the key for employers is finding the right mix of individual and team projects that allow these workers to grow professionally. 'Generation-Y' workers need to realize that almost all work will be some combination of individual assignments and teamwork with people of all backgrounds and ages. On whether or not Generation-Y employees have overinflated/unrealistic expectations, employers should redesign and rebuild some of the old career ladders that were destroyed with the flattening of organizations and greatly expand telecommuting and remote working arrangements. 'Generation-Y' workers need to see a progressive promotion path or they will move on to the next employer. 'Generation-Y' workers should learn to pace themselves and gain the necessary experience and skills before expecting a promotion to the next level.

On commitment to work, to keep Gen-Y workers, employers may need to not only develop better jobs, but also consider strong corporate values and corporate volunteering programs. Employers also need to clearly show how the work Gen-Ys complete directly impacts the organization's success. 'Generation-Y' workers should conduct more research on prospective employers to find organizations that not only have meaningful career paths, but also share some of the same values. To improve the loyalty of Generation-Y employees to the organization, employers should develop a stronger commitment to keeping employees even in bad economic times. Employers should also to do a better job in training and retaining the workers of this generation, possibly including such benefits as sabbaticals, professional development opportunities, and other options for Gen-Y workers who seek deeper fulfilment.

'Generation-Y' workers should try not to be so sceptical about the motives of employers and learn to trust them more while continuing their professional development as a hedge against any downturns. Moreover, to improve communication and cohesion in the organizations, employers should realize and accept that people communicate differently and to embrace the new techniques while also teaching the Gen-Y workers that business sometimes still needs to use traditional methods of communication. 'Generation-Y' workers need to use those excellent communications and diversity skills to learn to socialize and communicate with people of all ages and backgrounds.

To meet the needs of Generation-Y employees, employers need to realize that this generation needs special care and handling. There's no way they can go months without a review; they need constant feedback. 'Generation-Y' workers need to realize that the reality of the workplace is that it is not like home or college and that they are expected to do an excellent job without always expecting praise or prize.

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ETUDE DE LA QUALITE PHYSICO-CHIMIQUE ET MYCOLOGIQUE DU CACAO (*THEOBROMA CACAO*) PRODUIT DANS LES ZONES DE YAMOUSSOUKRO ET SOUBRE (Côte d'Ivoire)

[Study of physicochemical and mycologic quality of *Theobroma Cocoa* product in Yamoussoukro and Soubré (Côte d'Ivoire)]

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ABSTRACT: Cocoa beans are the principal raw material of chocolate manufacture.The beans are subject to post-harvest treatments in the first stage in chocolate production. The current study is designed to investigate the incidence of mycoflora in cocoa beans samples collected from Yamoussoukro and Soubré (Côte d'Ivoire) and the presence of ochratoxinogenic fungi on these samples using direct and dilution techniques. In this work, we evaluated the correlation between physicochemical factors (moisture content and pH) and fungi and mycotoxins contamination. This study highlights the physicochemical composition of cocoa beans, fungal contamination frequency and the fungus population description in different samples of cocoa beans. Our results revealed that the fungi contamination frequency varies according to physicochemical factors; on the one hand it increases proportionally to the moisture content. On the other hand, it decreases with the increase of pH rate. Mycotoxicologically, these results revealed the importance of the initial rate of pollution with a ochratoxinogenic species, as it reflects the risk of the toxinic impregnation, in other words, the higher the rate is, the more considerable the risk of finding mycotoxins in foodstuffs is.

KEYWORDS: Côte d'Ivoire, cocoa, contamination, pH, fungal, ochratoxigenic.

RÉSUMÉ: Les fèves de cacao sont la matière première principale dans la fabrication du chocolat. Elles subissent des traitements post-récoltes dans les premières étapes de la production du chocolat. Cette étude a été réalisée pour étudier l'incidence de microflore sur les échantillons de fèves de cacao collectés à Yamoussoukro et à Soubré (Côte d'Ivoire) et révéler la présence des moisissures ochratoxigéniques par la méthode directe et de dilution. Dans ce travail nous avons évalué le rapport entre les facteurs physicochimiques (humidité, pH..) et la contamination fongique et ochratoxigénique. Nos travaux ont permis de mettre en évidence les caractéristiques physicochimiques des fèves de cacao et la fréquence de contamination fongique ; puis la description de la population fongique dans nos différents échantillons de fèves de cacao. Les résultats obtenus montrent que la fréquence de contamination fongique varie en fonction des paramètres physicochimiques; elle augmente proportionnellement à la valeur de l'humidité, en revanche, elle diminue avec l'augmentation de la valeur du pH. Du point de vue mycotoxicologique, ces résultats mettent en évidence l'importance du taux initial de la pollution par une espèce ochratoxigénique car il reflète le risque d'imprégnation toxinique c'est-à-dire plus le taux sera élevé, plus le risque de trouver les mycotoxines dans un aliment à des niveaux élevés sera important.

MOTS-CLEFS: Côte d'Ivoire, cacao, qualité, pH, teneur en eau, contamination, ochratoxigène, *A. ochraceus*.

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1 INTRODUCTION

Le cacao est un ingrédient très important dans les produits pharmaceutiques ainsi que dans différentes sortes d'aliments, tels que les tourteaux, les biscuits, les confiseries à base de chocolat, le chocolat à tartiner, les boissons au cacao, les aliments pour enfants, les glaces ainsi que les sucreries [**1**]. Les pays d'Afrique de l'ouest tel que le Ghana, le Nigeria et la Côte d'Ivoire produisent deux-tiers du cacao dans le monde [**2]**. La Côte d'Ivoire est le premier exportateur mondial de fèves de cacao qui constitue un produit agricole de rente de grande importance économique pour celle-ci [**3**].

La transformation technologique en chocolat et produits dérivés du cacao nécessite un processus primaire de manutention post-récolte comprenant l'écabossage, la fermentation et le séchage **[4]**; **[5]**. De nos jours, l'un des problèmes généralisés dans les pays de l'Union Européenne est la qualité et la sécurité alimentaire. En effet, des dispositions légales et réglementaires sont actuellement prises au niveau international par le Codex Alimentarius (CAC) [**6]** et certains partenaires au développement pour le renforcement des exigences de sécurité alimentaire, en particulier au niveau de l'Union Européenne en vue de protéger les consommateurs des effets néfastes des contaminants chimiques et des mycotoxines, notamment de l'ochratoxine A (OTA) [**7]**. En Côte d'Ivoire, la production de cacao est dominée par les petits exploitants. La libéralisation de la filière cacao en Côte d'Ivoire a conduit à l'abandon des vergers, à la réduction de la production de cacao et, le plus inquiétant, à l'augmentation des parasites qui donnent lieu à une dégradation significative de la qualité de fèves de cacao [**8]**. Ce qui a pour conséquence la baisse de la qualité des fèves.

Dans tous les pays chauds et humides, les conditions météorologiques et agronomiques sont favorables à la croissance des champignons et en conséquence à la détérioration de la qualité des aliments. La contamination par les moisissures de la nourriture humaine et animale est difficile à prévoir, car elle dépend d'une interaction complexe de facteurs tels que la température, l'humidité, espèces fongiques endogènes, les conditions et le temps de stockage [**9]**. Or les conditions de traitement des aliments et en particulier le cacao sont difficilement contrôlées dans les pays tropicaux. La contamination par les champignons est donc possible en de nombreux points critiques de la chaîne de production de cacao [**10]**. L'activité fongique peut se traduire par la contamination des mycotoxines et pourrait poser un risque pour la santé des consommateurs [**11],** [**12]**. Les mycotoxines sont principalement produite par les espèces d'*Aspergillus, Penicillium* et *Fusarium* qui peuvent contaminer les cabosses et les fèves de cacao [**13]**. Dans le cacao, des traitements post-récoltes mal effectuées peuvent conduire à la diffusion des moisissures telles qu'*Aspergillus* et *Penicillium* responsables de la production d'ochratoxine A (OTA) par exemple **[14].**

L'ochratoxine A est un métabolite secondaire produit par plusieurs espèces d'*Aspergillus* et de *Penicillium* [**15],** qui peut être présent dans une denrée alimentaire même lorsque la moisissure visible n'est pas apparente. L'OTA est caractérisée comme néphrotoxique, immunotoxique, tératogène et cancérogène [**16]**, [**17]**, [**18]**, [**19]**. Elle se positionne déjà comme une sérieuse menace pour le cacao ivoirien. L'OTA est un contaminant alimentaire qui, si rien n'est fait, pourrait discréditer au niveau du marché mondial, divers produits de consommation « made in Côte d'Ivoire » **[20].** Plusieurs études antérieures ont signalé la présence d'ochratoxine A dans le cacao et divers sous-produits [**21]**, [**22]**, [**1]**. En Côte d'Ivoire, cette mycotoxine (OTA) a été trouvé dans le cacao de deux zones de production et les ports ivoiriens [**23]**, [**24]**.

Il existe un potentiel important pour les champignons filamenteux à croître dans les fèves de cacao en provoquant sa détérioration et compromettant sa qualité par la production de mycotoxines. En Côte d'Ivoire, les informations disponibles sur la présence naturelle de moisissures dans les premières étapes de transformation des fèves de cacao restent insuffisantes. Il est donc important d'identifier les contaminants fongiques dans les fèves de cacao, car certaines moisissures peuvent développer et produire l'ochratoxine A.

L'objectif premier de la présente étude est d'isoler et identifier d'une part des souches de moisissures contaminant naturellement les fèves de cacao en particulier les champignons ochratoxinogéniques afin d'apprécier la qualité marchande des fèves, et d'autre part, d'étudier les paramètres physicochimique en vue de connaitre l'environnement dans lequel se developpe les moisissures productrice de l'OTA.

2 MATÉRIEL ET MÉTHODES

2.1 MATÉRIEL

L'étude a été réalisée sur des fèves de cacao de la variété Forastero. Ces fèves proviennent de deux zones de production de la Côte d 'Ivoire (Soubré et Yamoussoukro).

2.2 MÉTHODES

2.2.1 ECHANTILLONNAGE

Cinq cent vingt-huit (528) échantillons de fèves de cacao (*Theobroma cacao)* ont été recueillis auprès de coopératives agricoles de Soubré et Yamoussoukro. Ces échantillons prélevés durant la période de Décembre 2009 à Février 2010, comprenaient 27 échantillons d'écabossage, 158 échantillons de différentes périodes de fermentation (1 à 6 jours), 241 échantillons de différentes périodes de séchage (1 à 8 jours) au soleil sur claie, en serre et aire cimentée et 102 échantillons stockés dans des sacs en jute (2 à 7 jours).

2.2.2 ZONE D'ÉTUDE

Deux régions productrices de cacao en Côte d 'Ivoire, caractérisées par la diversité des conditions climatiques au cours de la récolte et leur rendement dans la production de cacao, ont été sélectionnées pour l'étude. Les régions sont les suivantes: (i) Soubré, zone centre ouest, région pluvieuse tempérée avec une moyenne de 26-27°C et 29-65 mm / mois de précipitations, une altitude modérée en dessous de 600 m, grande région de production de cacao (ii) Yamoussoukro, zone centre, une région pluvieuse chaude modérée avec une moyenne de 25-24°C et 15-36 mm/mois de précipitations, une altitude à 213 m, petite région de production de cacao.

2.2.3 DÉTERMINATION DU TAUX D'HUMIDITÉ

La détermination de la teneur en eau est effectuée par une dessiccation de l'échantillon dans une étuve (Mermmert, Germany) réglée à 105 ±2°C jusqu'à une masse constante. Une tare (Pt) est séchée et pesée. Par la suite, 5 g d'échantillon sont mis dans la tare et pesés (Po). L'ensemble est placé dans l'étuve pendant 3 h puis refroidit dans un dessiccateur pendant 15 min. Il est ensuite pesé jusqu'à l'obtention d'un poids constant (P_1). Le taux d'humidité (TH (%) est calculée par différence relative des masses de prise d'essai avant et après séchage à l'étuve [**25]**.

$$\mathbf{TH}(\%) = \frac{(\mathbf{P_0}-\mathbf{P_t})-(\mathbf{P_1}-\mathbf{P_t})}{(\mathbf{P_0}-\mathbf{P_t})}\mathbf{X100} \qquad (1)$$

2.2.4 MESURE DU PH

Pour l'estimation de l'acidité ou l'alcalinité, un échantillon de 20 g est additionné à une solution de 100 mL d'eau distillée bouillante. Après un refroidissement sous agitation continue, la mesure du pH est réalisée à l'aide d'un pH-mètre de type Agimatic-N **[26]**.

2.2.5 ANALYSE MYCOLOGIQUE

La numération de la population fongique a été réalisée par inoculation en surface du milieu Pomme de terre Dextrose Agar au chloramphènicol (Merck). L'inoculum est obtenu par trempage de 10 g fèves de cacao dans 90 mL d'une solution d'eau peptonée stérile (0,1% w/v) pendant 10 min. Des dilutions décimales ont été réalisées puis 0,1mL de chaque dilution a été étalé sur le milieu [**27**]. Les boîtes de pétri sont ensuite incubées à 25°C pendant 5 à 7 jours.

Après incubation, les fèves présentant une croissance fongique ont été isolées sur Czapek Yeast Extrait Agar (CYA) (Merck) et Yeast extract Agar (YES) (Merck) **[28]**. L'identification des champignons potentiellement ochratoxinogènes, fondée à la fois sur les caractères macroscopiques (diamètre de la colonie, la couleur, l'exsudat et production de pigment soluble) et microscopiques, a été effectuée suivant les clés **[29]; [30]; [31]; [32]; [33].** La fréquence d'isolement (Fr) et la densité relative (RD) des espèces sont calculées selon [**34]**:

$$\mathbf{Fr}(\%) = \frac{\mathbf{Nombre\ d'échantillons\ par\ espèce\ ou\ genre}}{\mathbf{nombre\ total\ d'echantillons}}\mathbf{X100} \qquad (2)$$

$$\mathbf{RD}(\%) = \frac{\mathbf{Nombre\ d'échantillons\ avec\ une\ espèce\ ou\ d'un\ genre}}{\mathbf{Nombre\ totale\ de\ champignons\ isolés}}\mathbf{X10} \qquad (3)$$

Le taux de contamination (N) est calculé selon [**35]**:

$$N = \frac{\sum C}{V \times n \times d} \quad (4)$$

N = nombre d'unités formants colonies par gramme d'échantillon (UFC/g).
***∑C*=** la somme de toutes les colonies des boites de comptage.
V= le volume de dilution étalé par boite en ml.
n= nombre des boites qui peuvent être évaluées.
d= facteur de dilution.

2.2.6 ANALYSES STATISTIQUES

L'analyse statistique des valeurs a été réalisée avec le logiciel Statistica 7.1.

3 RÉSULTATS

3.1 ETUDE PHYSICO-CHIMIQUE ET PRESENCE DES MOISISSURES DANS LES FEVES DE CACAO

L'analyse des paramètres physico-chimiques des fèves de cacao révèlent que des taux d'humidité varient de l'ecabossage au stockage. Les teneurs en eau diminuent dans les fèves tout au long des phases de traitements. Elles sont de l'ordre de 56±3,48 % à l'ouverture des cabosses et 7±1,76 % pendant le conditionnement. La perte d'eau dans les fèves est considérable lors du passage de la fermentation au séchage.

Les valeurs moyennes du pH des différents échantillons des fèves de cacao sont comprises entre 4,7±0,27 et 5,4±0,42.

La figure 1 montre le rapport entre les paramètres physico-chimiques et la fréquence de contamination durant les différentes phases de traitement post-récolte. La fréquence de contamination (FC) varie en fonction des paramètres physicochimiques (TH, pH). Elle diminue au fur à mesure que les fèves de cacao perdent de l'eau tandis que le pH augmente au cours du traitement post-récolte. Les moisissures évoluant dans ce milieu connaissent une prolifération de leur nombre à la fermentation, puis une légère baisse au séchage avant chuter au stockage. Quant au pH, il chute à la fermentation avant de remonter jusqu'au stockage.

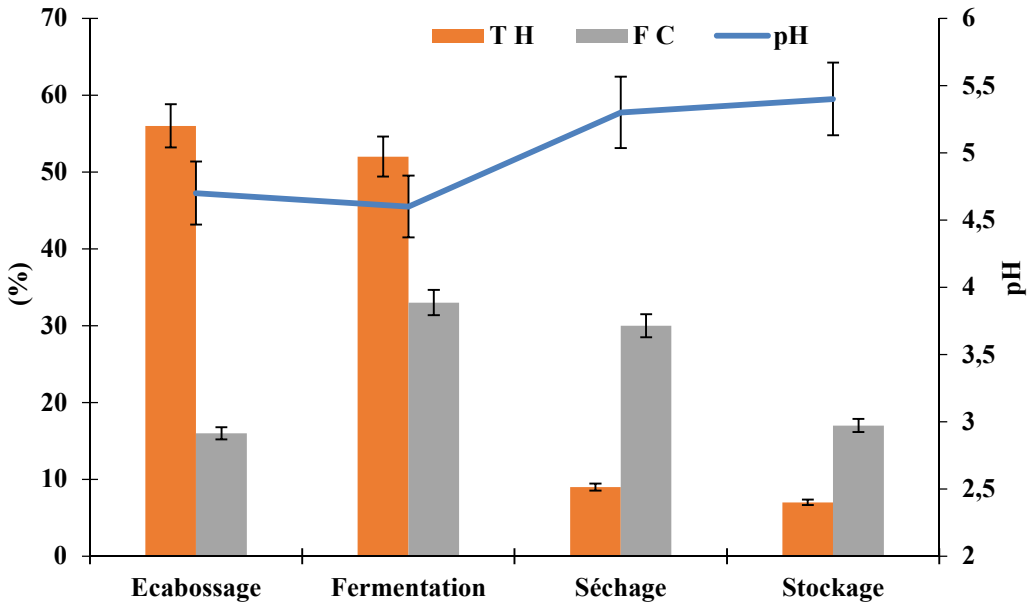

Figure 1 : Rapport entre les paramètres physico-chimiques et la fréquence de contamination

3.2 ETUDE DE LA MICROFLORE

L'étude des caractères macroscopiques pourtant sur la couleur, l'aspect de colonie et le revers des boites, et microscopiques dont la forme du thalle et des spores des souches fongiques isolées, a permis d'identifier les genres *Aspergillus, Penicillium, Mucor* et *Fusarium*. La figure 2 montre quelques souches de moisissures isolées des différents échantillons observées au microscope optique (HM-Lux 3) au grossissement X100.

Suivant les clefs d'identification de [28] et [30], l'espèce *Penicillium chrysogenum* a été identifiée. Pour le genre *Aspergillus*, les espèces *Aspergillus flavus, Aspergillus clavatus, Aspergillus fumigatus, Aspergillus carbonarius, Aspergillus tubingensis, Aspergillus niger, Aspergillus versicolor* et *Aspergillus ochraceus* ont été identifiées. Du point de vue diversité des souches isolées, il n'y avait pas de différence significative entre les échantillons de fèves de cacao analysés dans les deux zones.

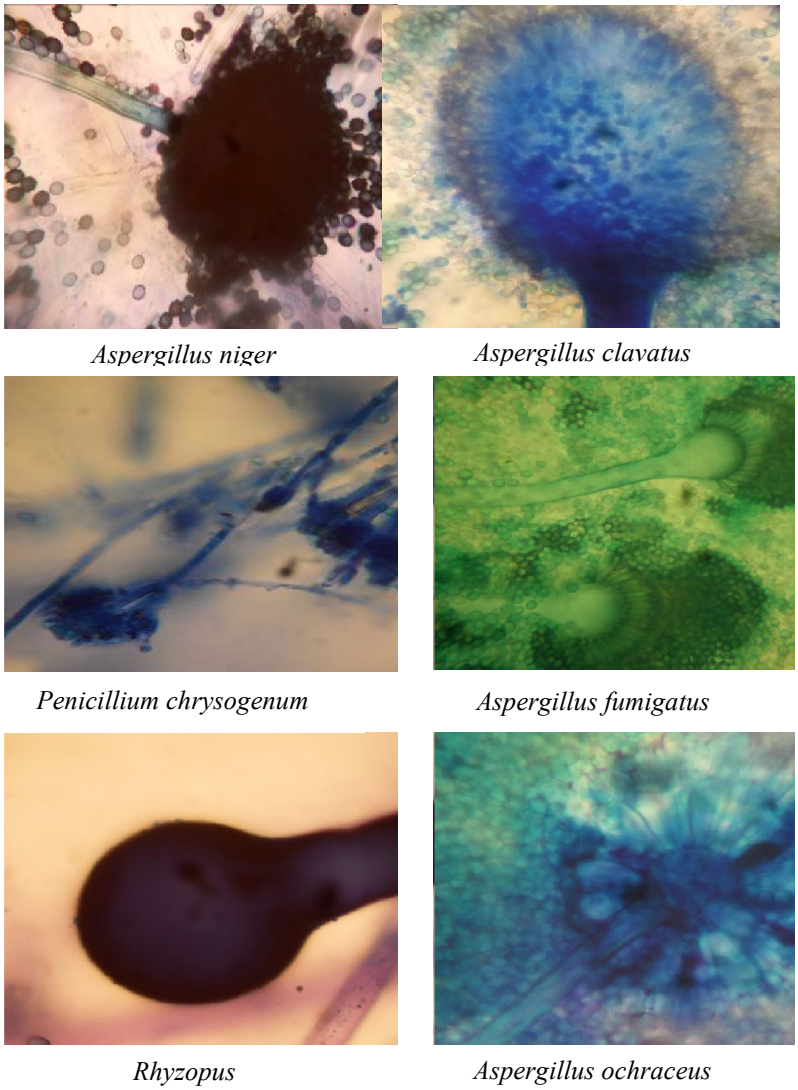

Figure 2 : Aspect microscopique des souches au grossissement optique(X100).

L'utilisation du milieu PDA a permis de révéler les mêmes souches fongiques dans les deux zones (Soubré et Yamoussoukro) (Figure 2 et 3). Les échantillons de fèves de cacao sont contaminés par différentes moisissures. 78,91 % des contaminations sont le fait des *Mucors*, 54,05 % pour *Aspergillus*, 30,4% pour *Penicillium* et le genre *Fusarium* 21,81%. Les résultats de l'analyse mycologique ont montré quelle que soit la zone, une nette dominance du genre *Aspergillus*. Le genre *Aspergillus* présente le plus grand nombre d'espèces isolées des fèves de cacao dont *A. niger* et *aggregats* (36,54%) a été

isolé le plus régulièrement suivie par *A. flavus* (22,64%), *A. fumigatus* (16,98%), *A. versicolor* (13,21%), *A. carbonarius* (4,97%), *A. ochraceus* (3,77%) et *A. clavatus* (1,89%).

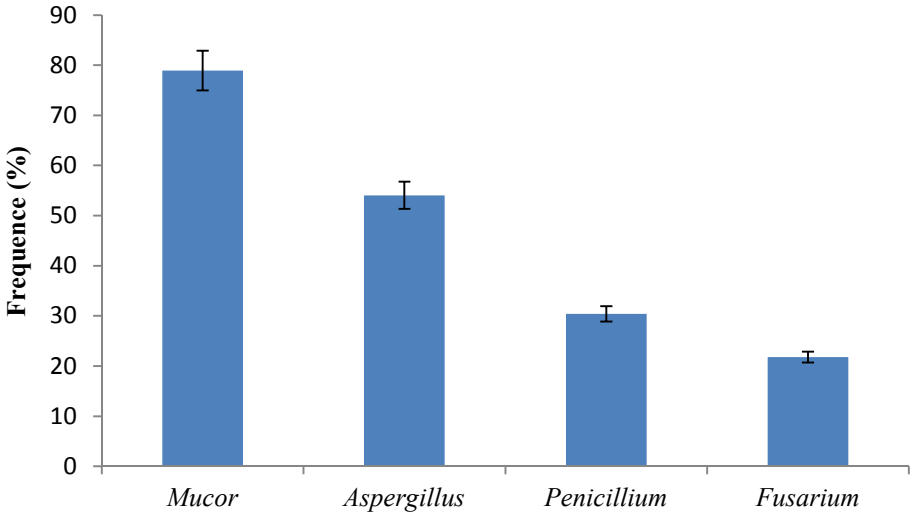

Figure 2 : Microflore des fèves de cacao détectée sur milieu PDA

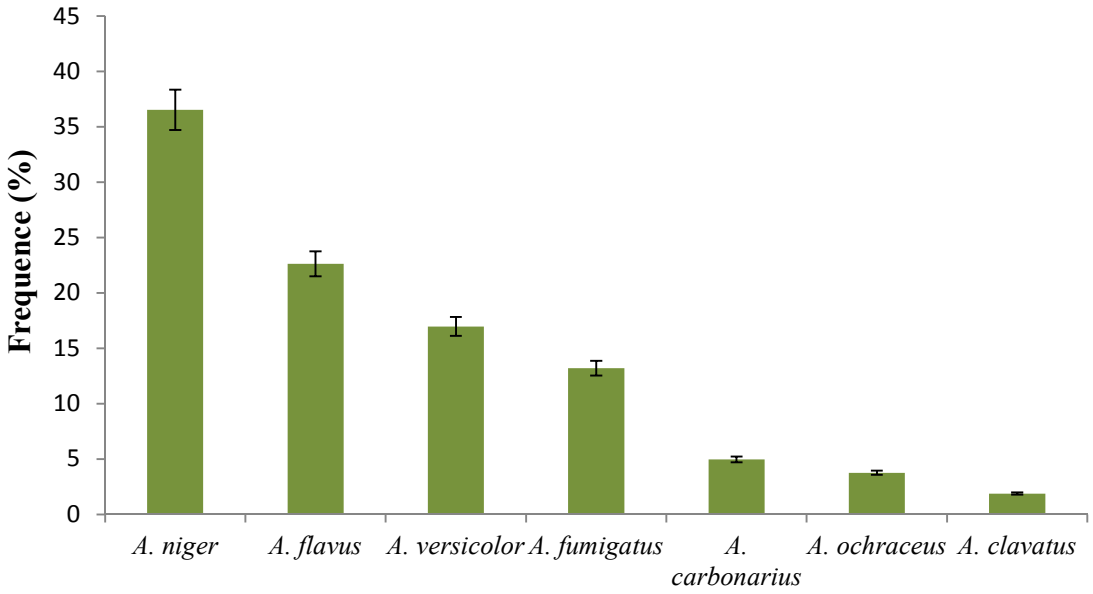

Figure 3 : Fréquence d'observation des espèces d'Aspergillus.

Le tableau 1 nous présente la quantité de moisissure déterminée au cours du traitement post-récolte. La charge fongique totale, ainsi que les différentes souches fongiques apparues sur les fèves de cacao témoignent d'un taux de contamination par une flore fongique élevée (×10^2UFC/g).Ce taux est de l'ordre 68,28 x10^2UFC/g. Le taux de contamination des fèves de cacao provenant de Soubré est plus élevé que celui de Yamoussoukro. La fermentation est l'étape pendant laquelle le taux de moisissure est plus élevé au cours du traitement.

Tableau 1 : Quantité de moisissures déterminée dans les différentes zones

	Soubré (UFC/g)	Yamoussoukro(UFC/g)
Ecabossage	06,10. 10^2±1.5	03,96. 10^2±0.9
Fermentation	15,51.10^2±3,09	10,14.10^2±2,09
Séchage	12,03 .10^2± 0.5	7,89 .10^2±0,21
Stockage	7,12 .10^2± 0,21	5,53. 10^2± 0,14

3.3 ETUDE MYCOTOXICOLOGIQUE

L'analyse des fèves de cacao a mis en évidence la présence de moisissures ochratoxigéniques tout au long des phases de traitement. *Aspergillus ochraceus* et les *Aspergillus* noirs sont potentiellement ochratoxinogènes. Les *Aspergillus* noirs présents sont composés d'*Aspergillus carbonarius*, *Aspergillus niger* et *aggregats* La présence de ces moisissures est observée dès le début des opérations post-récoltes.

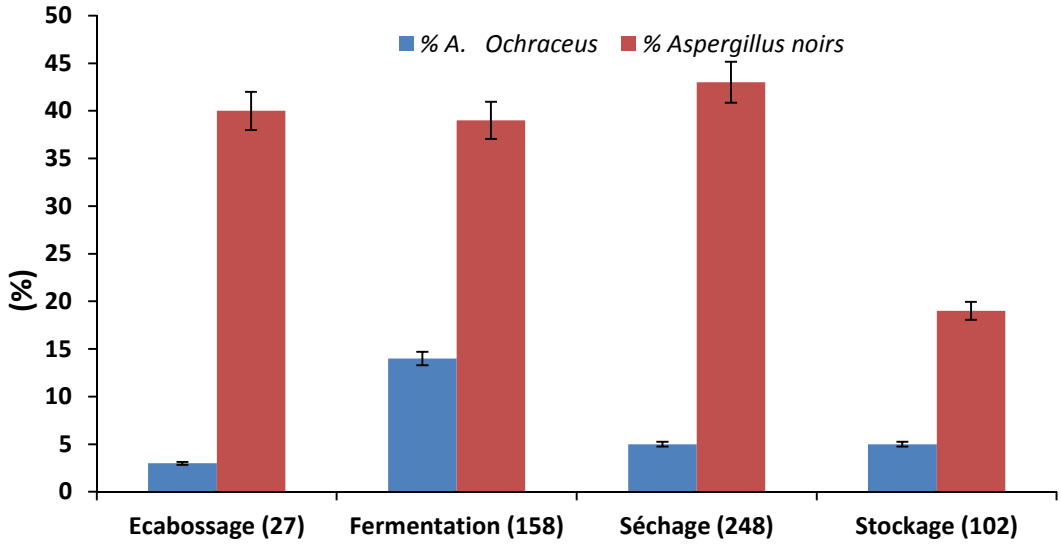

Figure 3: Fréquence de contamination par les moisissures ochratoxigéniques.

3.4 DISCUSSION

Les traitements post-récoltes qui vont de la récolte au stockage sont un enchaînement de phases (récolte, fermentation et séchage, stockage) responsables de la production d'un cacao marchand. Lors de la contamination des fèves de cacao, les paramètres régulant la croissance fongique et permettant la production de toxines sont nombreux. On cite principalement la charge initiale en microflore, la présence de fèves brisées, le taux d'humidité élevé, le pH et la température de stockage des fèves **[36].**

Les résultats attribués à la qualité physico-chimique indiquent que le pH des différents échantillons de fèves de cacao est acide (4,7-5,4). A ce pH, les fèves de cacao sont un substrat favorable à la prolifération des moisissures et par conséquent d'acidifier le substrat. En effet, Selon [**37**], les champignons peuvent se développer à des pH compris entre 3 et 8 avec un optimum de croissance compris entre 5 et 6.

Le taux d'humidité qui est la quantité d'eau libre disponible dans l'échantillon est responsable de plusieurs phénomènes d'altération biologique de l'aliment notamment mycologique. Les résultats obtenus indiquent que plus le taux d'humidité est élevé plus le pourcentage de contamination est accru. Ce rapport peut s'expliquer par le fait que la majorité des moisissures préfèrent des taux d'humidité élevés [**38**]; en particulier en phase de fermentation où les fèves sont exposées.

Il est su que le facteur qui limite l'augmentation de moisissures et la production de la toxine est l'activité de l'eau dans les aliments [**39**]. Cependant, le séchage est l'étape du traitement au cours duquel l'eau dans les fèves est éliminée, avec une réduction de l'humidité initiale de 56% à 9%. Cette étape est importante parce qu'en plus d'arrêter le processus de l'acidification qui commence dans la fermentation, elle permet de sécher des fèves. De plus, les processus chimiques qui ont

lieu à l'intérieur de la fève donnent la couleur, le goût et la senteur particulière de chocolat [**40**]. La réduction de l'humidité des fèves à 7% est importante car elle permet aussi d'éviter la prolifération de moisissures qui peuvent contaminer les fèves pendant le stockage.

Au stockage, les fèves de cacao contiennent une teneur en eau de 7%. Les faibles teneurs en humidité de nos fèves en fin de traitement permettent de classer les fèves de cacao dans la catégorie des produits peu hydratés; avantage qui n'exclut pas leur contamination par une flore fongique xérotolérante prépondérante [**41**]. La disponibilité en eau a une influence déterminante sur le développement du champignon notamment dans les denrées peu hydratées comme le cacao marchand. [**42**]. La diminution de l'activité de l'eau réduit le nombre de concurrents dus à la sensibilité élevée des bactéries et levures à la basse disponibilité de l'eau [**43**]. Cependant beaucoup de produits pauvres en eau libre tel que le cacao marchand non altérables par les bactéries peuvent donc être altérés par les champignons [**37**].

Les moisissures contaminant les fèves de cacao sont mal connues. Dans des études précédentes, *Mucor, Penicillium, Rhyzopus, Absidia* et particulièrement *Aspergillus* ont été fréquemment isolés dans les fèves de cacao **[44]**, **[3]**, **[45]**. La dominance des *Aspergillus* semble être favorisée par l'humidité élevée dans les fèves de cacao et l'acidité. La dominance du genre *Aspergillus* dans la flore contaminée des aliments a été reportée dans plusieurs travaux notamment dans les céréales **[46],[47]**. Presque toutes les espèces des moisissures récupérées dans le travail actuel peuvent être considérées comme des moisissures saprophytes et de stockage. Les autres genres de mucorales et *Fusarium* isolés sont naturellement présents sur les cultures au niveau des champs et dans le sol **[48]**. En effet, quelques moisissures pouvant entamer la détérioration proviennent des champs tandis que d'autres prolifèrent après la récolte lorsque les défenses principales de la plantes sont réduites ou éliminées.

Des différences au niveau des taux de moisissures contaminants de fèves du cacao ont aussi été constatées entre les zones d'étude. Nos résultats sont identiques à ceux de **[3]**. En effet, ces auteurs ont trouvés des différences au niveau du taux de moisissures dans leurs zones de prélèvement (Alépé, Duékoué et Soubré). Cette différence pourrait être influencée parfois par les conditions climatiques, le stockage (humidité, température et système de ventilation) et l'installation d'une charge fongique importante, ce qui peut entraîner une modification qualitative et quantitative de la microflore **[49]**.

[50] rapportent que la contamination fongique des céréales au champ ou pendant le stockage est directement liée aux conditions hydrothermiques. Les résultats suggèrent donc que les différences météorologiques entre les zones d'étude seraient responsables des différences entre les taux de contamination. Les taux élevés dans la zone de Soubré sont probablement dû à l'humidité stagnante qui est plus 70%. La second raison est en rapport avec la mauvaise gestion de la récolte. Dans l'ensemble, le taux de contamination élevé, ainsi que la biodiversité assez importante constatée dans le cacao pourraient s'expliquer par l'état des feves, les méthodes de travail (fermentation et séchage) et les conditions de stockage [**45**].

Du point de vu mycotoxicologique, la présence d'*Aspergillus flavus, Aspergillus noirs* (*A. carbonarius* et *A. niger*) et surtout d'*A. ochraceus,* implique un risque de production de mycotoxine. Ces résultats mettent en évidence l'importance du taux initial de la pollution par une espèce toxinogène et reflètent le risque d'imprégnation toxémique, c'est-à-dire, plus le taux sera élevé et plus le risque de trouver les mycotoxines dans un aliment à des niveaux élevés sera important (**Gwlady et Tap, 2004**)**51[40]**. *A. ochraceus, A. carbonaruis* et *A. niger* isolés et identifiés lors de nos analyses sont potentiellement capables de produire de l'OTA. Dans notre travail, les *Aspergillus* ochratoxigéniques ont été isolés des fèves durant les différentes étapes post récoltes. Cette contamination pourrait provenir du fait que lorsque les cabosses sont semi-ouvertes, les fèves de cacao sont en contact direct avec l'air et le sol, source possible d'*A. carbonarius, A.niger et A.ochraceus*. Des travaux sommaires sur la mycoflore des fèves de cacao et le milieu de l'exploitation ont montré que les champignons capables de produire l'OTA étaient présents dans les échantillons de fèves et dans le milieu et le matériel agricole **[52]**. Cela nous confirme l'hypothèse selon laquelle la contamination par ces moisissures peut être effectuée à toutes les étapes post-récoltes. Nos résultats concordent aussi avec ceux obtenus d'autres auteurs tel que **[53]** dans leurs études sur le cacao au Brésil**.** En effet, les 92 isolats de *A. carbonarius* et les 10 isolats issus de *Aspergillus* section Circumdati (6 *A. melleus*, 2 *A. ochraceus* et 2 *A. westerdijkiae*) étaient capables de produire de l'OTA. Il en est de même pour **[54]**. Leurs résultats ont montré que les échantillons positifs à la présence ochratoxigénique et d'altération fongique étaient dû uniquement à *A. niger* et *A. ochraceus*. **[55], [56], [57]** dans leurs travaux ont montré la capacité d'*A. carbonarius, A.niger et A.ochraceus* à produire de l'OTA dans le café. Ces moisissures ont donc le potentiel de produire de l'OTA dans le cacao.

Les températures optimales de production de la toxine par les espèces d'*Aspergillus* ochratoxinogènes sont autour de 20°C avec une activité d'eau (Aw) comprise entre 0,86 et 0,98 **[58]**. Généralement, une valeur de 17% à 18% d'humidité pour la plupart des grains est équivalent à une activité d'eau (Aw) comprise entre 0,80 à 0,83. Les fèves du cacao sont très hygroscopiques, elles peuvent absorber l'humidité pendant leur stockage et transport. Or, le taux d'humidité critique dans les

fèves de cacao est autour de 6 et 8%, équivalent à une Aw de 0,75 à 0,85 **[59]** Par conséquent, les conditions rendent favorables l'augmentation de moisissures sur les fèves et de la production de l'ochratoxine A possible.

4 CONCLUSION

Les paramètres physico-chimiques tels que le pH et l'humidité constituent des facteurs importants dans la croissance des microorganismes notamment les moisissures. Depuis la récolte jusqu'au stockage, plusieurs paramètres doivent être pris en compte tels que les méthodes de travail des paysans, les instruments utilisés et le lieu de stockage. La présence de moisissures telles que *Aspergillus ochraceus*, *Aspergillus carbonarius*, *Aspergillus niger* productrice d'OTA dans le cacao ivoirien est un danger pour celui-ci. La démarche qualité pour un contrôle sanitaire des fèves depuis sa récolte, lors du stockage et jusqu'à sa transformation en chocolat serait le meilleur moyen de prévention et de gestion du risque au niveau de la filière cacao.

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Internet Capabilities for Effective Learning and Research

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ABSTRACT: The Internet has continued to span great geographical space and generality interests. It has provided enough space for social interaction and information exchange. It is hard to imagine a world without the internet. Like other fields of human endeavours, the internet is no doubt revolutionising the act of researching, especially in the sciences. Regardless of any viewpoint, research outlines formal, methodical and rigorous processes, specifically the application of scientific methods of problem recognition, definition, solution development, data collection, analysis and conclusions. Expectedly, the introduction of the Internet heralded the upswing of the new soft form of learning; with the aim of achieving speedy and cost effective diffusion of knowledge. Secondly, the internet has also helped in aggregating with ease such knowledge which can be shared amongst geographically-detached partners. So, whether it involves fundamental/pure or basic distributed research, action, applied research or research and development, the internet could be effectively employed to improve and meet the limitations of information synchronization, speedy information verification, and reduce the time and the cost of conducting research. In this paper, we propose a structured step-by-step internet-assisted research model that explores known methods like web surveys, nonreactive Internet-based methods, web-based psychological testing and web-based experimenting. They include research features such as Research and Grants Acquisitions, Information Aggregation, Communication and Collaboration, Data Selection and Analysis, Publishing. Also, it involves exploring popular internet services like electronic-mail, web directories, World Wide Web (WWW), VoIP Conferencing, News/Mailing Lists, Chat Applications, File Transfer Protocols etc. The internet is surely one remarkable point for engaging various tools for research that cannot be ignored by modern day researchers.

KEYWORDS: Internet Research, Online Research, Scientific Research, Research in Science

1 INTRODUCTION

Research as we know generally has not enjoyed the luxury of unified definition. However, its concepts are not far-fetched as several schools of thoughts have construed or better still absorbed self-suiting definitions which eventually does not stray too far from common concepts. Not minding the perspective, research generally outlines a formal, methodical and rigorous process of searching out a particular idea or a structured body of knowledge. It has been defined as "the systematic, testable and objective analysis and recording of controlled observations that may lead to the development of generalizations, principles or theories" [1]. More specifically, scientific research outlines the application of scientific method (problem recognition, problem definition, solution development, data collection, analysis and conclusions) to investigation of problems [1]. In the time past, scientific research methodologies have all assumed manual procedures as the means to an end. This phenomenon is gradually changing form today with the advent of digital technologies; more specifically; the internet Technology. Since its inception, the internet has spanned geographical space and generates interests, great weights in changes to information dissemination, commerce and interaction [2], and it has not left its mark in the domains of scientific research either. Dwelling on the motivations of knowledge propagation, scholars have continued to pursue and respond to the dynamism of research, especially the changes in 'How' research is being carried out. With the internet, these 'hows' are changing over time, and as another scholar puts it, "the Internet is perhaps one of the most revolutionary developments with

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profound impact on research process and dissemination of information" [3] in [4]. Truly, the introduction of the Internet prefigured the rise of a new form of learning material; the soft form. The utmost advantage of which has been and still is the diffusion of knowledge within a shorter time and at marginal costs globally via a network of computers [4]. The internet has also transformed the way scientists and (or) researchers collaborate. How? By increasing the comfort with which they can share information and work with geographically distant partners [5] in [2].

Like it has been, data and information are gradually changing habitation (from physical or manual to digital environments). Given that research is mainly focused on data and information, it is only ideal that research also respond to same technological switches to ensure utmost relevance and profitability. Already interests are already underway, with scientific scholars changing their research course and stooping to the internet for better and more convenient research experience. For instance, a Web Survey Methodology (WebSM) revealed that research via the internet accounted for $960 million in spending in 2004. Same survey indicated that 8% of survey studies in 2001 were performed through the Internet. The number rose to 60% in 2004 [6].

Thus, this study is aimed at exposing learner and researchers to the potent potentials for exploring the internet for academic purposes. Specific objectives include; unveiling how much changes and impacts the internet has done to learning and research in comparison to the traditional methodologies. Showing some practical ways in which researches can be engaged using the platform of the internet and showing through review of existing literature, a structured approach (model) for engaging the internet.

The world is indeed changing, and so is everything about it. The knowledge gained from this discourse will become useful to both staff and students of tertiary institutions in Nigeria. The study would also provide reference point on the effective internet skills like the concepts of search optimizations. The remaining parts of this work are structured as follow; section 2 gives an overview of the internet, outlining its key characteristics. Section 3 covers details about review related works that that show previous research efforts on uncovering the significance of the internet to educational learning and research. Section 4 emphasizes more on how the internet could be leveraged as a tool for effective researching, with practical steps and techniques that could be applied for achieving good research endeavour via the internet, while section 5 forms the concluding part of the work with recommendations.

2 OVERVIEW AND CHARACTERISTICS OF THE INTERNET

The internet is a public communication system. There are two key characteristics that distinguish it from other communications systems such as the specific protocols and services it offers. The internet is essentially a global network of networks (computers and other electronic devices) which provides a variety of resources, several services and assorted data. These services/data can be in form of applications which must run with a set of standard protocols like the physical layer such as WiFi, network/transport layer such as Transfer Control Protocol/ Internet Protocol (TCP/IP) and the presentation layer such as Hypertext Transfer Markup Language (HTML) and Moving Picture Expert Groups (MPEG) format of file/data. These protocols require hardware and software tools for implementation. The examples of the services or applications includes domain name resolution, the www (e.g. Websites, forum, blogs), e-mail services like Gmail, search engines like Google, open sourced software (e.g. WordPress, Drupal), download services (e.g. music, game, apps, video, etc), e-commerce services (e.g. books, electronics, etc), social networks (e.g. Facebook, MySpace, etc), voice communications like internet calls, audio and video conferencing, instant messaging (e.g. Yahoo messenger), etc. Like the protocols, these services also require hardware and software tools for implementation like a computer system/laptop with the required operating system.

The Internet presents scholars with several opportunities. Like we noted earlier, it could lower the costs associated with data collection, and could be used for online experiments and surveys, it could allow observers to monitor trend changes, and offer the mining of archival data sources to mention a few [2].

3 INTERNET LEARNING AND RESEARCH POTENTIALS: RELATED WORKS

Typically, learning and research are both characterized by various activities which collectively point towards the same goal; projecting knowledge.

With emphasis on learning, the internet is labeled a rich, multidimensional, and ever-changing textual environment [7], commonly used as a medium of communication among students and researchers in higher institutions. A related work by [8], records that most of the links between universities' homepages were connected to information on education or research. Similarly, internet usage has impacted positively on critical thinking, problem solving, prompt feedback and networking [9].

A survey of over 2000 teachers, [10] disclosed that most teachers are likely to use internet for learning or educational purposes rather than for entertainment. This supports the findings of [11] whose report revealed that more than 90% of sampled lecturers designated that the internet had topped the value of their academic pursuits with regards quick access to research resources.

Another research showed that more than 74% of respondents (majorly students) admitted to using the internet for learning and educational purposes [12]. It is reported that most students use internet because of its alleged effectiveness for information access on assignments and research projects [13]. Particularly, an average of 3.5hrs per week of internet usage is reported among undergraduates in Nigeria [14] buttressing on the point of students' perception on the significance of the internet. Thus, the internet is posed to increase student access to learning, boost curriculum and quality of instruction, and increase academic productivity [15].

A nearly related study was undertaken for secondary school students by [16] to evaluate the level of awareness in the use of Internet for resources gathering, and determining the potential resources generated from internet-assisted research as compared to traditional library system research. The outcome showed …. a substantial variation in outputs between traditional library system research and internet-assisted research. The result showed that the internet offered better prospect for greater productivity and relevance of contents, as well as present learner with refined and up-to-date information.

A study by [17] shows that some of the most basic motivations for students going online include; school assignments, research, e-mails and social interactions. The use of the internet for research or academic purposes by tertiary education students is further buttressed in [7], [18] and [19]. This is further consolidated today, by the fact that most higher institutions of learning now maintain online presence with journals, newsletters, books and magazines access for staff and students [7]. Additively, is the latest capability for e-learning (covering e-registrations and e-assessments). It can thus be concluded that using internet for learning and academic purposes is not utterly new [14].

Further empirical research which focused on determining the potentials of the internet in enabling research in Nigerian universities using Obafemi Awolowo University Ile-Ife, Nigeria as case study showed an improvement on the level of internet usage and frequency of use for undergraduate students [20]. Implying that, a significant number of the student populations were open to the use of the internet for learning and academic purpose [20].

The authors in [2] outlined some key research activities like Information Gathering, Communication, Data Collection, Publishing, Teaching and Grants Acquisition. The Internet supports and incorporates scientific activities, and brings about a more rapid research progressions. The Internet has ensued great, constructive impacts on the conduct of research, both by altering the costs, energy and resources needed for attaining research, and by making visible interesting research sensations that do not exist in conventional situations [2].

Apparently, the strength of the internet lies in the unparalleled growth of its network globally and its capacity to link computers and several individuals short of geographic space barriers. It has been much-admired as one of the most momentous technological developments of the 20th century and is viewed as poised to impact academic research significantly in the near future.

4 THE INTERNET AS A RESEARCH TOOL

The internet indeed possesses great power. The invention amasses great features and opportunities that cannot be ignored or snubbed. Other spheres of human endeavours have not snubbed it, and the sciences would not either. In this Information Technology age, conscious of the invaluable roles and contributions of the internet to global development, we argue that scientific research can only get better if like others, it pitches it tent with technology, specifically Internet Technology, leveraging the powerful features and openings the internet promises and unveils.

Conventional scientific research methods follow standard procedures like pointed earlier, which are somewhat unavoidable if significance is to be achieved. The basic features of scientific research are seen to be catered for by the internet, making the internet path a must-take for modern day researchers. Furthermore, scientific research can only be considered acceptable, when the basic principles of universality and transparency are achieved and maintained [21], these too, the internet accommodates. In fact, the violation of either of these bi-principles amounts to a misrepresentation of scientific research as well as the internet [22]. Without a doubt, the web or internet is potentially our modern-day research gizmo.

The activities of modern-day, Internet-compliant researcher is characterized by long hours sitting in front of a computing screen; perusing electronic pages (self-configures and otherwise), gathering information, collaborating with other

researchers via emails, Internet Relay Chats (IRC), Newsgroups, and blogs, accessing and submitting publications and reports generated through data mining techniques, online surveys and (or) web experiments. As a research tool, the internet affords both the means and ends to these activities. The means is expressed in the internet's positioning as a medium for exchange of information, domain for publishing researched contents and (or) findings. As an end, it yields an area for piloting research, an abode where researchers explore different traits of logical groups, and engaging in interactions via bulletin boards and real-time internet conversations or meetings [21].

From existing literatures, and the overview of conventional research activities, we thus propose an Internet-Assisted research model that assumes a recurrent nature. This model explores the characteristics of typical scientific researches, outlining the basic activities that are likely to be engaged while doing research using the internet medium. The model components include; Research and Grants Acquisitions, Information Aggregation, Communication and Collaboration, Data Selection and Analysis, Publishing. Although other researchers have mentioned some of these activities, none has considered the need for maintaining a structured flow or transition from one stage to another. Our work seeks to propose such a model to help guide researchers in exploring the internet for effective research. We observe these to be valuable research features that have enjoyed the benefits of the internet, and are being transformed from their traditional approaches to a more productive, speedy and more convenient internet-assisted approach.

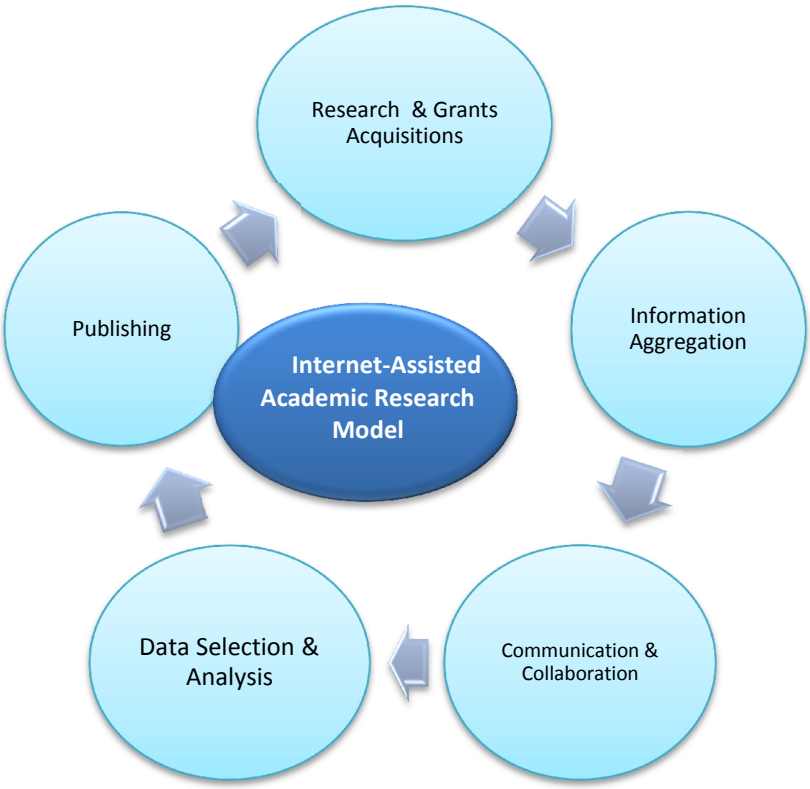

Figure 1: Internet-Assisted Academic Research Model

4.1 INFORMATION AGGREGATION

The internet domain offers easy access to nearly limitless information. With the global connectivity of millions of servers harbouring data and information, access to the internet implies access to these servers for resources required to meet scientific research ends. And, obviously, information gathering is sustained mostly by search engines (Google, yahoo, msn, Ask etc), specialist websites, and aggregation engines (e.g., folksonomies like Flickr, or YouTube), and specifically by scientific data-mining services (e.g., Google Scholar and Web of Science in biblio-metrics) [21].

Unlike in the past, Information currently available on the internet take different forms ranging from text-only data, audio and video formats etc. these could be acquired depending on user needs, skills and search proficiency. The concept of optimized search otherwise referred to as 'search engine optimization, SEO' has helped simplify further the ease at which specified information can be derived from the internet. SEO phenomenon projects an art as well as a science of helping or aiding easy and speedy location of information on major searches. With such technologies, access to university electronic

libraries, archives, research centre archives, conference proceedings, journals and information data bases all come much easier and at less expense both financially and physically.

4.2 COMMUNICATION AND COLLABORATION

Communication is typically the act of sending messages; which again is an important activity in scientific research. Conventionally, this is achieved via manual/paper, hard-copy mails (post office letters, memo etc) to research associates to communicate and (or) exchange research findings or requests, which traditionally takes a sluggish turn, slowing the general research process. However, with the internet, communication with colleagues around the world has increased in speed and quality.

Since the launch of electronic-mail (e-mail), and given the small bandwidth requirement for emails and its mostly text-only nature, e-mails are about the most widely used internet service; allowing for easy and cost effective access by many research centres and educational institutions [21]. E-mailing is noted to be considerably the most common internet activity, with about 90% of all internet user claiming to be active e-mailers [23] in [21]. Interestingly, newer technological developments in the forms of social networking, and the recurrent improvements in connection speed and bandwidth usage for, paving way for the emergence and adoption VoIP systems (Skype, Tango, etc) that allow for hosting virtual meetings and research collaborations without much technical difficulties.

As could be discovered, the internet affords a means for side-stepping most of the limitations of 'academic freedom'; given that it disregards topographical borders and unveils the potentials for evading suppression of scholarly articles in print media [4]. Hence, the internet is not docile to the austere, unbending controls of governments as it applies to print publications, a plus that publishers continue to leverage upon.

4.3 DATA SELECTION AND ANALYSIS

The art of collecting data or sample data selection is an indispensable part of scientific research process. And of course, this is submitting to unparalleled historical transformation in scale and number of opportunities in the sciences [24]. Just like the traditional methods of data collection and (or) selection (surveys, interviews, questionnaires, etc), the internet provides for the extension of such processes into the digital space. Today, with the use of various web application technologies like HTML, XML, PHP, ASP, etc, and 'killer applications' [21] and VoIP schemes, researchers can convenient reach out and in fact harness desired research data from varying respondents with predefined analytical structures that enables the ease of making inferences without much difficulty.

4.4 PUBLISHING

Publishing is another facet of research that has witnessed tremendous change with internet influence. Computerization and (or) digitization has affected automation, workflow and publishing process integration readily expressed in forms of blogging and social / cross media. The most alluring advantage of this developmental phenomenon is the potential riddance of the formerly difficult requirements (elongated publications processing including payment modes) that often delayed or even repressed the unrestricted flow of research submissions and communications

Even more interesting, is the fact that scientific researchers and their institutions are fast tending towards embracing online and (or) open access publishing and institutional or individual self-archiving [21]. In physics as an instance, the process was initiated quite early and is near completion, credits to a formidable, strong-willed efforts of enterprising individuals [25] in [21].

Today, the numbers of online (published) scientific journals are in their thousands and continue to grow daily. For instance, the Journal of Medical Internet Research, the International Journal of Internet Science, and the Journal of Computer-Mediated Communication are all exclusively online journals. Some others like the journals of Atmospheric Chemistry and Physics combine open access with collaborative public review, enabling editor(s) quick checks of submitted manuscripts and eventual publishing as discussion papers [21]. Statistically, it has been revealed that self-archiving or peer-reviewed online publications are more acceptable now by journals with 93% for author self-archiving [26]. Interesting today, articles that are presented online are cited more frequently perhaps because they are simply more reachable [27], [28] in [21].

Intertwined with publishing is the concept of citation analysis which defines the theory of studying the influence and presumed worth of an article, its author or his institution derived from the number or frequencies of such article(s)

and(or) author(s) is cited by others. Information aggregation systems like Google Scholar, and Thomson Scientific Web of Science amass lots of references that can be analyzed, with possibilities for articles trace-backward and forth. With these, locating similar articles and reference list comes easy, can be found by overlap of reference lists. Developing research trends and areas can easily be spotted by monitoring publications with quickly increasing citations rates.

4.5 RESEARCH AND GRANTS ACQUISITIONS

Grant Acquisition is yet another aspect of academic research that has leveraged on the strengths of the internet. Usually, grants follow laid down processes that have enjoyed simplification with the emergence and use of the internet. Online-learning concept is diffusing; and this is eagerly being incorporated into research activities. Today, Funding and (or) research-donor agencies convey research interests and guidelines through their websites, funding applications, proposals, and other research requisitions can be submitted via online mediums (online forms and emails), grants and research sponsorship procedures can also be accessed online thanks to the online capabilities of e-banking.

Given that research evolves and it processes are continuous, we suggest this model should assume a recurrent nature, as might be considered necessary to ensure invaluable output. Hence, the arrow signifies potential transitions from one stage to the order, which could be repeated as many times as possible following the goals of result improvement or upgrade.

5 ONLINE CONTENT SEARCH CAPABILITIES: GOOD SEARCH STRATEGY AND FILTERING METHOD

Researches can be made effective by using the correct syntax, strategy and operators. These allow any internet researcher to create more detailed search criteria. Once an effective search criteria is created, the search assistant performs the search and display the results from sites that most closely match the search chronologically.

The application of these strategy and filtering methods will increase the precision of your research and make your results accurate. This is a very good way to leverage the power of the internet for researchers. A range of search engines use the following syntax to create more sophisticated searches: CAPS, +, -, “, * and Boolean operator like AND, OR and NOT. Their applications are explained as follows:

i. ***Capitalization Method:*** When names (especially English names) and captions are capitalized, the search engine treats it as single name or title. For example, the search FEDERAL UNIVERSITY LOKOJA will get exactly the match while Federal University Lokoja will get the match as well as Federal Bank, Federal University Owerri, Federal Court, etc. If the researcher does not capitalize the name or title, it will be treated like any other group of words, and sites relating to any of the words will be presented. However, lower case search will produce matches of capitalized words. For example, mercy will find matches for mercy, Mercy and MERCY. Also, capital letters in a search will provide an exact case match on the entire word. For example, submitting a search for MerCY will search only for matches of MerCY.

ii. ***Quotation and Hyphenating Strategy:*** Double quotation marks (“ ”) can be used around words or hyphens (-) between words that must appear next to each other. When quotes or hyphens are used, the words appear together. For example, “research in the sciences” or research-in-the-sciences (note: there are no spaces) will find sites with those words adjacent to each other. If the quotes or hyphen is not used, the search engine will find sites that include the word sciences and research.

iii. ***‘Addition’ technique***: More Tips Using a plus sign (+) in front of a word that must appear. To require a word, and increase the precision of your search, type city guides + London. Do not leave a space between the plus sign and the word that must appear.

iv. ***‘Subtraction’ technique***: A minus sign (-) should be put directly or closely in front of a word that must not appear in the search result. This is the simplest technique to exclude a word from your search. For example, science –biology will locate sites on all aspects of science excluding biology. The addition and subtraction techniques can collectively be called operator technique, using the + and – symbols to include and exclude words and phrases respectively.

v. ***Star Notation (Truncation) strategy***: An asterisk (*) can be used to search for partial matches or alternative spelling. For example, looking up for the word kill* will match sites containing killing, kills, killed, killer, etc and looking up for favo*r will find matches for both the British English favour and American English favor.

vi. ***Boolean technique:*** This technique simplifies a complex search by using the keywords AND (to require both terms), OR (to match one or both terms), and NOT (to exclude terms). The use of parentheses to group words and quotation marks to indicate phrases is also applied in Boolean searches. For example, king AND queen AND NOT (“Queen of Nigeria” OR coronation) will search for pages that contain both words “king” and “queen” but not the phrase “Queen of Nigeria” or the word “coronation”.

vii. ***Exclusion strategy:*** It is a good practice to exclude words like “a”, “the”, or “it” from the search criteria. Searching for joy +son will provide an effective result than searching for the joy of a son.

Some search engines allow matching of files of a particular type like multimedia types while most search engines allow controlling the number of links returned per page and to exclude links to potentially offensive material. The Advanced or Help links on the search engine’s home page will offer specific strategies for itself.

6 CONCLUSION AND RECOMMENDATION

Whatever the status of researching today, the reality is that the internet has contributed immensely to the current statuesque. With possibilities for gathering information, online libraries with millions of volumes of resources accessible with ease. Indeed the internet has positive implications for learning and research in the academia, especially in tertiary institutions.

We suggest thus that modern researching should be characterized by the application of modern techniques to modern areas to yield modern knowledge. This status will not be far-fetched if the limitations of low or complete lack of internet re(search) skills, low literacy to computing, inefficient internet services, low or zero knowledge and understanding of internet research capabilities and applications, could be greatly minimized or done away with. Notwithstanding the odds, the cumulative proof of how the Internet is outdoing paper media worldwide and gradually dealing saturation to the aforementioned deficiencies. It is only rational that today’s scholars take internet (online) researching more seriously. It is therefore suggested that researchers can make effective their researches by embracing and submitting to internet proficiency trainings, adopting effective internet research tools, and techniques, by using the correct syntax, strategies and operators. This will overall yield more detailed search criteria and results.

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