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# Farmers' cowpea production constraints and varietal preferences in the sudano-sahelian zone of Cameroon

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**ABSTRACT:** Cowpea (*Vigna unguicilata* Walp) is a multi-purpose crop grown in the sub-Saharan regions of Africa for its grains and leaves which contribute to food security. Despite the high yield potential of cowpea and its ability to withstand poor conditions, yield at farmers' level is still low. Past works led to release of several improved varieties. However some of them fell or recorded low rate of adoption because farmers' needs were not involved in the process of varietal development. The present study untaken in the Sudano-Sahelian zone of Cameroon aim to: determine cowpea production constraints according to farmers' perception, determine farmers' strategies of insect pests control and determine farmers' preferred cowpea traits. A survey was conducted in four villages: Sanguéré, Souccoundou, Gazawa and Koza. Questionnaires were administered to 150 farmers' followed by a focus group discussion with groups of 10 to 15 participants. Data collected were analyzed on Statistical Package for the Social Sciences (SPSS) version 20.0. Frequency distributions were estimated and pair-wise ranking method was performed. Farmers ranked insect pests as the most important cowpea production constraint followed by the lack of improved varieties, drought and Striga. Cowpea flower bud thrips was reported as the most damaging, followed by the flower beetles, maruca, aphids and pod-sucking bugs. Farmers' most preferred traits were high grain yield, tolerance/resistance to insect, large seed size, white seed coat and fast cooking suggesting that research programs should consider these traits when developing improved cowpea varieties for the benefit of farmers.

**KEYWORDS:** Farmers' Perception, Participatory Rural Appraisal, Insect Pests, Traits.

## 1 INTRODUCTION

Due to its multifunctional proprieties, cowpea constitutes an important component of subsistence agriculture particularly in Sudano-Sahelian zone (SSZ) of the northern Cameroon, similar to several areas in sub-Saharan Africa [1]. The SSZ of Cameroon is predominantly an agro-pastoral zone where cowpea is usually grown as sole or intercropped with cotton or cereals such as sorghum, maize and millet. After harvesting the pods, the fodder is stored on top of roofs or trees. When animal feed becomes scarce, especially during the dry season (November to June), the stored fodder serves to supplement animal nutrition, whereas the grain contributes significantly to the household food security [2], [3]. In addition to its high minerals contribution to the diets, it is a valuable and dependable commodity that generates income for farmers and traders in that zone [4]. Despite the widespread use of cowpea in the cropping system, the contribution of Cameroon (0.4%) to the whole African production

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is still low [5], [6]. This is mainly attributed to insects attacks coupled with diseases, drought, low or erratic rainfall, soil nutrient deficiency and low adoption of improved varieties. In order to alleviate this trend, efficient research approaches needed to be set up.

In northern Cameroon, effective cowpea research programs initiated by the national agricultural research system in 1979s focused on screening of cultivars for high grain yields [2]. However, the yield at the farmers' field is still low, less than 500kgha$^{-1}$ [7]. [8] highlighted that unsuitable improved varieties are less adopted and this results in low production. Yet, farmers' needs and conditions could be easily met if there is close synergies between farmers, the agricultural extension system and the research. Involving farmers as protagonists of their own agricultural research agenda is one means of permitting continual innovation, allowing the moving target of sustainability to be kept continually in the "crosshairs" of local people [9], [10]. Therefore, participatory rural appraisal (PRA) technique is crucial to generate information on factors that affect cowpea production in the SSZ of Cameroon in order to respond more appropriately to the specific farmers' needs. This approach has been used widely in agricultural research programs and has facilitated improvement of crops for many traits of economic importance. Definitely, participatory rural appraisal techniques are vital to optimize production, adoption and food sovereignty through improved local adoption of cultivars to relevant abiotic and biotic pressures as well as to prevalent cultural norms [11], [12]. The objectives of this study were to: assess farmers' perceptions on major cowpea production constraints, determine farmers' strategies in insect pest control, and determine farmers' preferred cowpea traits in the SSZ of Cameroon.

## 2 MATERIALS AND METHODS

### 2.1 STUDY SITES

The study was conducted in the northern and the far north regions of Cameroon, which account for more than 70% of the national cowpea growing areas [13]. Four representative villages were selected based on the importance of cowpea production: Sanguéré (09°16'N; 13°27'E) and Souccoundou (09°55'N; 13°56) in the northern region, Gazawa (10°13'N; 14°51'E) and Koza (10°52'N; 13°52'E) in far north region. They are located in the sudano-sahelian agro-ecological zone of north Cameroon. This zone is located between 8°36" to 12°54" north latitude and 12°30" to 15°42" longitude east. It covers 10.2 million ha, where 0.56 million ha are used for cropping [14]. The climate is tropical with two contrasting seasons (dry and rainy season). The rainfall duration and intensity vary from three months (June – August) and 400 mm per year in the north to seven months (April – October) and 1200 mm per year in the south of the zone [15], [16]. The average temperature is around 28°C with a maximum of 40 to 45°C in April. The vegetation is dominated by the sudanian savannah and the sahelian spiny steppes and prairies [17]. Indigenous trees such as *Acacia albida*, *Celtis integrifolia*, *Ficus spp.*, *Khaya senegalensis*, and *Parkia biglobosa* are also present. The soil types are diverse but dominated by tropical ferruginous soils, vertisoils and planosoils [18]. In the SSZ of Cameroon, the population is unequally distributed ranging from 17 inhabitant km$^{-2}$ in the north to 80 inhabitant km$^{-2}$ in the far north region [19]. They belong to different ethnic groups and religions. However, *foulfouldé* is the dominant local language [20]. Food insecurity is one of the most common problems in this area. This situation is attributed not only to the recurrent natural catastrophes such as flooding and drought but mainly to insect pest attacks. Their damages are recorded on legumes (cowpea, groundnut, Bambara groundnut and sesame) and cereals crops (sorghum, millet, maize and rice) principally grown by farmers for subsistence. Livestock is a secondary activity undertaken by most of the population, and more than 80% of the national cattle are found in the northern part of Cameroon [19].

### 2.2 METHODS

Participatory Rural Appraisal (PRA) was conducted using focus group discussions (FGD) and the semi-structured questionnaires administration. The participants were farmers with different cowpea cultivation experiences and they belonged to various age and ethnic groups.

#### 2.2.1 FOCUS GROUP DISCUSSION

In each village, one Focus Group Discussion (FGD) was conducted. The discussions were carried out with the assistance of AEA and the farmers' association leader; they facilitated the interaction and encouraged all the participants to speak. The discussion was conducted either in French or in the most common local language *foulfouldé*. Each group discussion involved ten to fifteen farmers from cowpea farmers' associations. The farmers' NGOs were selected based on the quantity of cowpea produced during the past five years. The FG helped to design questionnaires that were used for formal survey.

#### 2.2.2 QUESTIONNAIRE ADMINISTRATION

Two villages were selected per region based on the importance of cowpea. In each village, farmers involved in cowpea production were gathered with the help of farmers' association representatives, the Agricultural Extension Agent (AEA) and the village head. The interviewers were selected from a list of cowpea producers provided by the AEA. The list of men was separated from the list of women and selection was done so that at the end there was almost equal number of men and women who responded to the questionnaires. The interview was conducted by the student, the AEA and one social scientist. One hundred and fifty (150) questionnaires were administered to 99 farmers in the far north region (54 at Koza and 45 at Gazawa) and 51 in the north region (29 at Sanguéré and 22 at Soucoundou). There were seventy six (76) women and seventy four (74) men who attended the interview. After that, a group composed of the student, the AEA and one farmers' representative made a field visit in each of the village for additional information on identification of the insect pests listed by farmers as constraint to cowpea production.

#### 2.2.3 DATA COLLECTION

Data collection started with general information on the socio-economic characteristics of the respondents. After that, data recorded were related to cowpea cropping system, the constraints to cowpea production, the importance of insect pests in cowpea production, the major insect pests perceived by farmers, the control of insect pest on cowpea, the source of cowpea seeds used, the reasons for adoption of improved varieties and identification of farmers' preferred cowpea traits. The two PRA techniques undertaken were on farmers' production constraints and identifying their preferences through the listing and the ranking approaches.

#### 2.2.4 DATA ANALYSIS

Data from questionnaires were computerized on Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 20.0. Frequencies were estimated and pair-wise ranking method was performed. It is a powerful method used to prioritize production constraints or varietal traits preferences listed by farmers [21]. In this method, each item on a list was compared in a systematic way with each other in a constructed matrix table. The number of times a problem had been found to be more important was measured by counting the number of times it appeared in the matrix.

## 3 RESULTS

### 3.1 SOCIOECONOMIC STRUCTURE OF FARMERS

Out of one hundred and fifty farmers interviewed 76 were women (50.7%) and 74 men (49.3%). Close to 40% of farmers had not received any formal education (Table 1). Among the educated farmers, 30.6% had primary level education, 28.6% secondary school and 1.3 % University level educations.

***Table 1. Number, gender and education level of the respondents in the four villages***

| Location | Frequency | Percentage | Gender | | Level of formal education | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Women | Men | None | Primary | Secondary | University |
| **Koza** | 54 | 36.0 | 20 | 34 | 16 | 14 | 22 | 02 |
| **Gazawa** | 45 | 30.0 | 37 | 08 | 30 | 12 | 3 | 0 |
| **Soucoundou** | 22 | 14.7 | 06 | 16 | 06 | 06 | 10 | 0 |
| **Sanguéré** | 29 | 19.3 | 13 | 16 | 07 | 14 | 08 | 0 |
| **Total** | 150 | 100 | 76 | 74 | 59 | 46 | 43 | 02 |

*None = no formal education*

The respondents belonged to different age groups ranging from 15 to above 60 years (Fig. 1). The predominant ages ranged from 21 to 40 years.

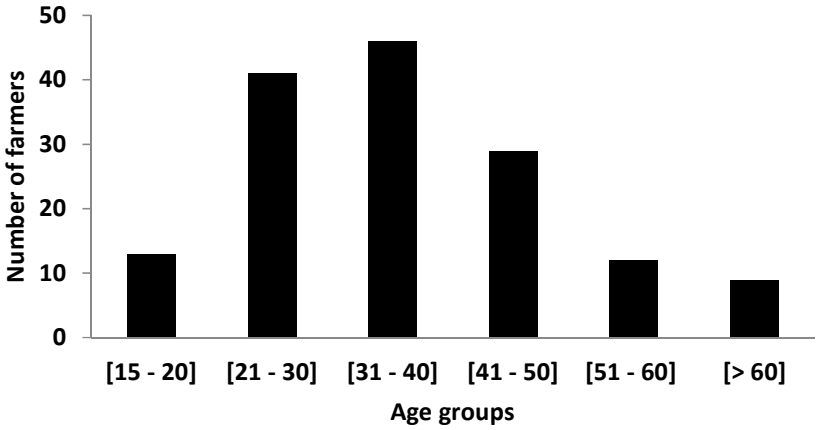


*Fig. 1. Distribution of ages of the respondents in the four villages*

Farming was the main occupation (53.3%), followed by livestock (36.0%) and trading (10.7%). Most of the respondents (72.0%) have been growing cowpea for more than ten years (Table 2).

*Table 2. Main activities of the respondents and their experiences in cowpea farming*

| Location | Activity | | | Experiences in cowpea farming (Years) | | |
|---|---|---|---|---|---|---|
| | Crop production | Livestock | Trade | Less than 5 | 5 to 10 | More than 10 |
| **Koza** | 31 | 21 | 02 | 02 | 06 | 46 |
| **Gazawa** | 24 | 15 | 06 | 04 | 12 | 29 |
| **Soucoundou** | 10 | 08 | 04 | 02 | 03 | 17 |
| **Sanguéré** | 15 | 10 | 04 | 04 | 09 | 16 |
| **Frequency** | 80 | 54 | 16 | 12 | 30 | 108 |
| **Percentage** | 53.3 | 36.0 | 10.7 | 08.0 | 20.0 | 72.0 |

### 3.2 COWPEA CROPPING SYSTEMS AND PRODUCTION CONSTRAINTS OBSERVED

Fig. 2 showed the types of mixed cropping which included the following: cowpea with groundnut (10%), cotton (16%) and with the main cereals crops of the Sudano-sahelian zone of Cameroon such as sorghum (13%), millet (7%) and maize (5%).

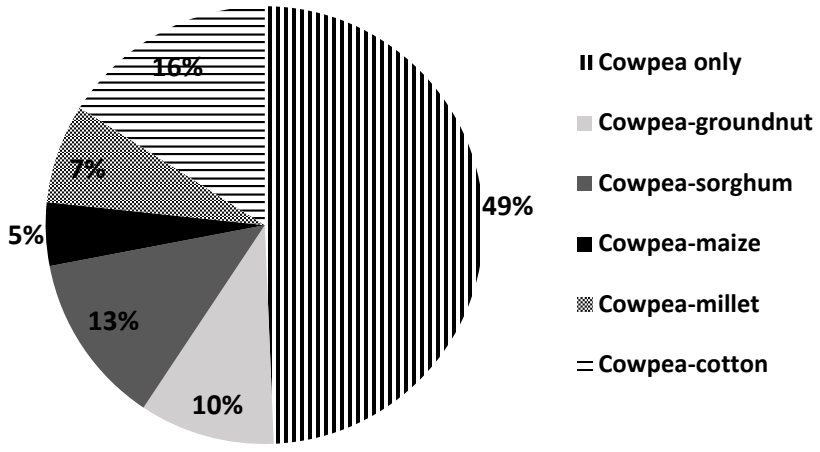


*Fig. 2. Cowpea cropping systems in the four villages*

Farmers reported seven important factors that were responsible for cowpea yield losses in their fields (Fig. 3). Insect pests (33%) were ranked first followed by drought (19%), lack of improved varieties (15%), Striga (14%), diseases (12%), low soil fertility (4%) and the lack of markets (2%)

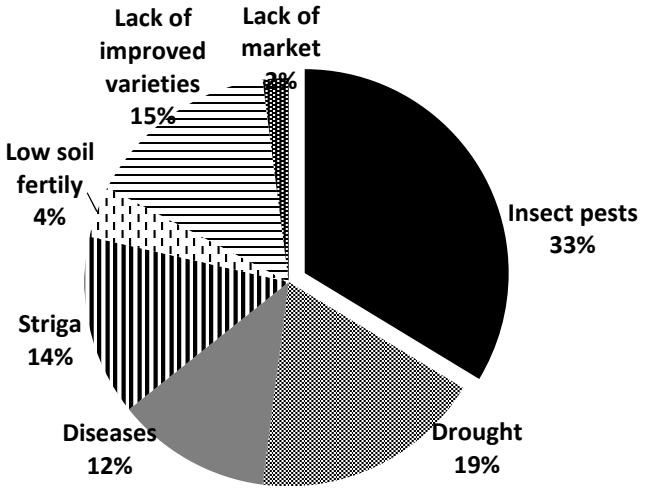


*Fig. 3. Cowpea production constraints in the four villages*

Based on the results across the locations, insect pests were perceived as the most important limiting factor for cowpea production across all the villages and lack of markets occupied the last position. Five other constraints were ranked differently from one village to another (Table 3). At Koza, insect pests (1) was followed by diseases (2), lack of improved varieties (3), drought (4), Striga (5), low soil fertility (6) and the lack of markets (7). Whereas farmers at Gazawa ranked Striga (2) at the second position after insect pests (1), then drought (3), low soil fertility (4), disease (5), lack of improved varieties (6) and finally the lack markets (7). In Soucoundou, the lack of improved varieties (2) was the second most important constraint after insect pests (1), Striga was third (3), diseases forth (4), drought fifth (5) and low soil fertility sixth (6), just before the lack of markets (7). Farmers from Sanguéré perceived the lack of improved varieties (2) as the second most important constraint to cowpea production while insect pests ranked the top like in the three other villages. Other constraints highlighted included drought (3), Striga (4), low soil fertility (5), diseases (6) and the lack of market (7) in this village.

*Table 3. Ranking of cowpea production constraints per village*

| Constraints | Ranking per location | | | |
|---|---|---|---|---|
| | Koza | Gazawa | Soucoundou | Sanguéré |
| **Insect pests** | 1 | 1 | 1 | 1 |
| **Diseases** | 2 | 5 | 4 | 6 |
| **Lack of improved varieties** | 3 | 6 | 2 | 2 |
| **Drought** | 4 | 3 | 5 | 3 |
| **Striga** | 5 | 2 | 3 | 4 |
| **Low soil fertility** | 6 | 4 | 6 | 5 |
| **Lack of market** | 7 | 7 | 7 | 7 |

### 3.3 FARMERS' PERCEPTION ON THE EFFECT OF INSECT ATTACKS ON COWPEA PRODUCTION

Farmers listed the five most important cowpea pests perceived as presented in Table 4. The flower bud thrips (*Megalurothrips sjostedti* Trybom) was ranked as the most damaging followed by the flower beetles (*Mylabris spp*.). Other important insects reported were pod borers, maruca (*Maruca testulalis* Gayer), aphids (*Aphis craccivora* Koch) and the pod bug suckers (*Riptortus spp*.). The cowpea storage insect pests (*Callosobruchus maculatus Fabricus*) were not mentioned. Farmers said bruchids were efficiently controlled by the use of the triple plastic bags technology called PICS (Purdue Improved Crops Storage) developed by the Purdue University which has been largely adopted.

*Table 4. Ranking of the five major cowpea insects revealed by farmers across locations*

| Major insects | Rank | Percentage | Sign of attacks described |
|---|---|---|---|
| **Flower bud thrips (*M. sjostedti*)** | 1 | 56.0 | Distortion, drying and abortion of flowers; visible shiny black and small insect on the flowers and buds. |
| **Flower beetles (*Mylabris spp*.)** | 2 | 20.0 | Destruction of flowers by feeding; sign of damages on flowers. |
| **Maruca (*M. testulalis*)** | 3 | 12.7 | Round holes on the flowers and pod; leaves stuck together; presence of caterpillars in flowers and its fecal matter outside of the pods. |
| **Aphid (*A. craccivora*)** | 4 | 8.0 | Presence of dark insects with shiny abdomen, on young stems, leaves buds and pods. |
| **Pods sucking bugs (*Riptortus spp*.)** | 5 | 3.3 | Young pods dried and deformed and have reduced seeds; feeding puncture wounds are |
| **Total** | | 100 | visible on pods. |

### 3.4 PEST MANAGEMENT CONTROL DEPLOYED BY FARMERS

Pest control strategies utilized by farmers included insecticides, neem (*Azadirachta indica*) extract, the PICS bags especially for storage and ash (Table 5). Farmers adopted four different methods of pest control depending on their financial resources and knowledge of control methods. Throughout the four sites of study, chemical methods were predominantly used (61.4%) followed by *neem* extract (18.6%), PICS bags (14.0%) and the application of ash (6.0%).

*Table 5. Major pest control measures observed in the four villages*

| Control methods | Frequency | Percentage | Reasons |
|---|---|---|---|
| **Chemicals** | 92 | 61.4 | More efficient, only method known, use the remaining from cotton field |
| **Neem extracts** | 28 | 18.6 | Lack of means to afford insecticides, efficient less harmful, easy to access |
| **PICS bags** | 21 | 14.0 | More efficient storage, no use of chemical |
| **Ash** | 09 | 6.0 | Limited access to insecticides |

### 3.5 FARMERS' PREFERRED COWPEA TRAITS

In the sudano-sahelian zone of north Cameroon, the cowpea traits preferred by farmers are summarized in Table 6. Farmers' preferred traits varied according to regions. In the north region, a successful improved variety is expected to have the following characters: high yield first, then large seed size, tolerance or resistance to insects. White coat and fast to cook, resistance to Striga, sweet taste, early maturing and finally tolerance to drought. In the far north, region farmers ranked the following traits as their expectation for improved variety: high yield, resistant to insect, large seed size and tolerance to drought, resistance to Striga, sweet taste, early maturing, white seeds, high market value and fast cooking.

*Table 6. Frequency and ranking of farmers' preferred cowpea traits*

| Traits | North region | | Far North region | |
|---|---|---|---|---|
| | Frequency | Rank | Frequency | Rank |
| **High yield** | 14 | 1 | 30 | 1 |
| **Sweetness** | 3 | 7 | 7 | 6 |
| **Fast cooking** | 5 | 4 | 2 | 10 |
| **Tolerant/resistant to insects** | 7 | 3 | 20 | 2 |
| **Large seed size** | 9 | 2 | 11 | 3 |
| **White seed coat** | 5 | 4 | 3 | 8 |
| **Resistant to Striga** | 4 | 6 | 9 | 5 |
| **Early maturing** | 2 | 8 | 4 | 7 |
| **Tolerant to drought** | 1 | 9 | 11 | 3 |
| **High market value** | 1 | 9 | 2 | 9 |

## 4 DISCUSSIONS

Out of seven important constraints listed by farmers, insect pests were the most damaging to cowpea (33%). These observations agreed with the findings from the studies conducted by [22] in Ghana and [23] in Mozambique where insect pests were consistently ranked at the top position among the cowpea major constraints. Furthermore [1], [24], [25], [26] demonstrated the negative impact of insect pests on cowpea production. Moreover, the consistency of the ranking observed across the four villages suggested that farmers perceived insect pests as an urgent matter that research needs to address as a priority. Lack of improved varieties was the second most important constraint mentioned by farmers in Soucoundou and Sanguéré villages of the north region while Striga and diseases were second for farmers in Gazawa and Koza respectively, which are in the far north region. These limiting factors are also important and should be included in further research programs. All the farmers agreed that lack of market was among the major cowpea production constraints, but they suggested that emphasis should be put on those indicated.

The results of the survey revealed that farmers' needs could be met if new improved varieties with the following traits are developed: high yield, tolerant/resistant to insects and large seeds. The high ranking of yield and yield related traits indicate that farmers grow cowpea primarily for their livelihoods and food security in the sudano-sahelian zone of Cameroon. These observations are in agreement with the findings of [2] who reported that cowpea contributes significantly to household food security in northern Cameroon. The immediate implication of these results is that combining yield and yield related traits as well as the resistance or tolerance to cowpea flower bud thrips should be the first target while breeding for new improved cowpea varieties. Such varieties can help to mitigate yield losses and guarantee food security to resource-poor farmers in Cameroon. Future cowpea research programs could take into account the incorporation of other traits like seed color, taste, fast cooking, earliness, and drought tolerance.

Cowpea was one of the cultivated crops and it was in a large extent grown as sole crop (about 50%) because of its economic importance. More than being only for subsistence, it is also a cash crop like cotton [27]. This may explain why in a sample of one hundred and fifty farmers were distributed across four different villages, namely Koza, Gazawa, Soucoundou and Sanguéré, the number of men (74) was almost the same as that of women (76). The most active population fall between the ages of 21 to 40. A part from sole cropping, cowpea was mostly mixed cropped with cotton (16%). This constitutes a strategy developed by farmers to control thrips in cowpea. Indeed, farmers usually receive pesticides from the cotton company to control insects in cotton field. By spraying cotton plants to protect them against insects, cowpea plants were indirectly protected as they were planted between the rows of cotton. Close to 90% of respondents had attained primary or secondary education. In the context of climatic change where rainfall has become uncertain, youths who left school went into cowpea farming. This crop has the ability to perform in dry areas. Most of the respondents indicated that they were responsible for the whole families' upkeep, and hence devoted to agriculture, which constituted their main occupation (53.3%). In the northern part of Cameroon, farming and livestock are complementary activities in a system where residues from farms are used to feed animals during the dry season when grasses become scarce. This observation agrees with the findings of [2], who reported the multiple benefits from cowpea, leaves and stem used by resources limited farmers to feed their livestock during the dry season and to earn cash through sale in the local market in northern Cameroon. A large portion of the population (72.0%) had good knowledge about cowpea because they had been involved in growing this crop since the early stages of their life. Farmers adopted intercropping in order to maximize their crop production. This system provides a sort of compensation by giving farmers the opportunity to have at least a harvest when losses occur in the other crops. In the four villages Koza, Gazawa, Soucoundou and Sanguéré, 51% of the respondents preferred mixed cropping. The recurrent types of intercropping were cowpea-groundnut, cowpea-sorghum,

cowpea-maize, cowpea-millet and cowpea-cotton. Cowpea and cotton are high pesticides demanding crops. Chemicals were easily provided to cotton farmers' by the cotton company, conversely cowpea farmers' have limited access to pesticides. Advantages associated with the practices of mixed cropping have been reported by [28] in the north of Nigeria. These include yield stability and minimization of risk, efficient land and labour use, protection of soils against soil erosion leading to profit maximization. Cowpea in sole cropping (49%) was also an important part of the cropping system. Frequently, when other leguminous crops, cereals or cotton failed to establish on a given area farmers preferred to convert it to cowpea farm because even at late planting cowpea was able to produce given that some of the varieties cultivated are early maturing compared to other crops. Furthermore, marginal soils are usually assigned to cowpea due to its inherent ability to perform on these types of soils. Despite these advantages, there were limitations to cowpea production in the northern and the far north regions of Cameroon. Based on the morphological description of insects, the stages of the plant, the plant parts attacked and the symptoms of the damages on cowpea plant, farmers were able to identify five most predominant cowpea insects including the cowpea flower bud thrips, the flower beetles, the pod borer maruca, aphids and the pods sucking bugs. These results are consistent with findings of [24] who pointed out insects as the most important constraints to cowpea production in Nigeria. Fifty six per cent of the famers ranked thrips (*M. sjostedti*) as the most important insect pest in terms of magnitude of damage caused to cowpea. They described thrips as a very small insect usually found inside the flowers, which feed on the white parts and the powder of flowers. They reported that by feeding on cowpea flowers, thrips provoked flower deformation and abortion resulting in yield reduction. These observations are consistent with thrips symptoms described by [29], [30] who reported that feeding damage of flower bud thrips lead to necrosis, abscission of flower buds and flowers with yield losses estimated between 20 – 70%. Farmers indicated that the damage caused by the other four important cowpea insects were less compared to thrips. The results suggested that *M. sjostedti* is a key insect for cowpea production in general and especially in the sudano-sahelian zone of the northern Cameroon. This implies that breeding for cowpea resistance to thrips should be one of the main breeding objectives for the national agricultural research program in order to improve production and productivity at the national level. Cowpea resistance to flower beetles, maruca, aphids and the pods sucking bugs should also be incorporated in cowpea improvement programs. Depending on the accessibility, ease of use and the financial resources, farmers developed various strategies to control insect pests in cowpea fields. Most of them applied chemical sprays to protect their crops. Those who had limited resources used *neem* extract or ash. The widespread use of insecticides, to a large extent is related to the fact that farmers received chemicals from the cotton company SODECOTON to protect cotton. This is consistent with reports by [31] who stated that farmers in the north of Cameroon frequently sprayed pesticides, but it may not be used properly. Furthermore, past studies revealed that at farmers' level, chemical application is carried out without any knowledge on the concept of economic injuries level [32]. Aqueous neem extract at 5% has been successfully used to control aphid in cowpea [24], [33]. However, there is no documented information on the efficiency of ash in controlling insect pests in cowpea. The main reasons for utilization of pesticides were the efficiency, ease to access and the lack of information on the existence of alternative control methods. These results suggest that more information and training should be given to farmers to help them better control insects in the field. Farmers indicated that they obtained their cowpea seeds from diverse sources. However, 85% of the respondents usually saved seeds from their previous harvest and most of the varieties were their local materials. They reported that the varieties used were capable of yielding in mixed cropping, easy to harvest, had large seeds, were sweet, early maturing, good storability and high quality fodder and leaves. Conversely, farmers pointed the scarcity of improved varieties, the susceptibility to drought, diseases and pests and low market value to explain the low success of some cowpea varieties. These observations imply that research should consider information from farmers and integrate into research activities in Cameroon.

## 5 CONCLUSIONS

Farmers ranked insect pests as the most important cowpea production constraint followed by the lack of improved varieties, drought and Striga (*S. gesnerioides*) respectively. Cowpea flower bud thrips was reported as the most damaging insect pest followed by the flower beetles, maruca, aphids and the pod-sucking bugs. Farmers' most preferred traits were high grain yield, tolerance/resistance to insects, large seed size, white seed coat and fast cooking. They attached less importance to the marketability value of the varieties as food security was at the top of their priorities. Insecticides application was the control measure mostly adopted by farmers. However, the specificity and the precautions for use of these chemicals were generally, not respected. Farmers' criteria of selection are important to guide the breeding programs in order to develop well-adopted and improved varieties.

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