International Journal of Innovation and Applied Studies
ISSN 2028-9324 Vol. 12 No. 3 Aug. 2015, pp. 747-755

http://www.ijias.issr-journals.org/

Livestock and Rural Household Food Security: A Case of Gazipur District of Bangladesh

Jabin Afza[1], Riffat Ara Zannat Tama[1], Ismat Ara Begum[1], and Dilshad Zahan Ethen[2]

[1]Dept. of Agricultural Economics,
Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

[2]Dept. of Agribusiness and Marketing,
Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

ABSTRACT: The study was conducted to illuminate the food security status of livestock rearing small farmers in some selected areas of Gazipur district and to examine whether their food security are affected by livestock assets and in what extent. Data were collected from 50 farmers using purposive random sampling method during January-March, 2014. In order to collect data, a questionnaire was administered through face-to-face interviews. Data were analyzed by using descriptive statistics and logit model was used for statistical analysis. The results of descriptive statistics showed that only 4 percent of the sample small farmers crossed the secondary level of education, 14 percent of them were able to sign only and 8 percent of them were illiterate. Agriculture was identified as the main source of income among the sample small farmers and livestock rearing was identified as the subsidiary occupation of them. The descriptive study revealed that 58 percent of their total income came from crop cultivation and 37 percent came from livestock. The food security status of the sample farmers were checked by using recommended minimum calorie requirement (i.e. 2122 kcal). The results of the descriptive analysis revealed that, 50 percent of the sample farmers were food secured and the rest 50 percent were food insecure. The results of the logit model indicated that, out of six variables, four variables- annual income, education level of household head, number of small and large animals had significant positive influence on household's food security. Finally based on findings some policy measures were recommended.

KEYWORDS: Food Security, Livestock, Rural Household, Small Farmer.

1 BACKGROUND OF THE STUDY

Bangladesh is an overpopulated country having a population of 150 million with a growing rate of 1.4 per year. Provision for food for all, is therefore a real challenge. Food security situation in Bangladesh has improved, especially on the availability side, and further improvements on access and utilization, to be sustainable and large-scale, needs renewed efforts from the government, civil society (including media) and the development partners (SFYP, 2011).

Livestock rearing in Bangladesh is an integral agricultural activity among most rural households, particularly landless, marginal and small landholders. Though Bangladesh is almost self-sufficient in food, the proportion of undernourished population is very high. Most of the farmer owns less than 5 hectares of land who are the most vulnerable ones to become food insecure. Livestock has a significant positive impact on equity in terms of income, employment and poverty reduction in rural areas as distribution of livestock is more egalitarian as compared to land. An adequate quantity of balanced and nutritious food is a primary indicator of quality of life, human welfare and development. Animal are important source of food, particularly of high quality protein, minerals, vitamins and micronutrients. The value of dietary animal protein is in excess of its production in diets because it contains essential amino acids that are deficient in cereals. As a source of supplying animal protein to human diet, milk occupies second position after meat & egg. Empirical evidence shows that livestock rearing has a positive impact on equity of income and employment for resource poor rural households. Use of appropriate livestock enterprises can help increase the domestic production, which in turn can increase income or increase

access to food of the households. Labor intensive sustainable livestock enterprises would also increase the income of landless laborers & marginal farmers, thus increasing the food security of the people of rural Bangladesh.

Livestock assets include cows, goats and poultry. Livestock, by transforming vegetation from non-arable land, crop residues, by-products from food processing, and organic waste into human food of high nutrient density and nutritional quality contribute to human food security directly. Livestock also contribute indirectly to food security and nutrition by increasing crop output through providing manure. Finally, livestock enhance total household labor productivity through smoothing the demand on family labor over seasons, genders and generations. A combine strategy for livestock and staple crop productivity growth, exploiting the close linkage between these two sectors, would have the strongest income multipliers and poverty reduction benefits.

The purpose of the current study is to estimate the impact of livestock ownership on household food security. The motivation of the study stems from the belief that many studies have estimated on profitability of livestock production but a few on its impact on food security in different countries. This study focuses on livestock rearing small farmers to identify their food security level. Various factors contributing to food security are discussed so that recommendations can be made for better strategies and measures to assist farmers in order to address household food insecurity.

2 MATERIAL AND METHODS

2.1 SELECTION OF THE STUDY AREA

Gazipur Sadar Upazila in Gazipur district was selected purposively as the study area. Five adjacent villages named Harinal, Laghalia, Titarkul, Norun, Marta were selected for collecting necessary information for the study.

2.2 SAMPLING TECHNIQUE

Considering all the circumstances, 50 sample farmers were selected for the study. At first, the researcher prepared a list of small farmers holding livestock with the help of upazilla livestock officer of Gazipur Sadar Upazilla. Then by purposive random sampling method, the sample farmers were selected of which 10 sample from Harinal, 10 sample from Laghalia, 10 sample from Titarkul, 10 sample from Norun and 10 sample from Marta village were taken. For this study, only the small farmers were selected as sample in order to avoid difficulties. Small ruminants were not counted. Only the cow as large animal and goat for small animal were covered as livestock assets.

2.3 PERIOD OF DATA COLLECTION AND PREPARATION OF INTERVIEW SCHEDULE

Data were collected by the researcher herself during the month January to March, 2014. At first, a draft interview schedule was pre-tested on few respondents. In the pre-test, attention was given to identify any information that was not included in the previous draft interview schedule. Then some parts of the questionnaire were improved, re-arranged and modified.

2.4 METHOD OF DATA COLLECTION

Most of the data required were collected from primary sources by face to face interview method by the researcher herself. Before going to data collection, the researcher gave a brief description about the nature and purpose of the study to each of the respondent. The responses of the farmers were directly recorded in the interview schedule.

2.5 PROCESSING, TABULATION AND ANALYSIS

For the analysis of the data, the result was first recorded in the interview schedule at the time of interview. Then the collected data were classified, tabulated and analyzed in terms of the objectives set for the study.

2.6 ANALYTICAL TECHNIQUE

The following techniques were used for analyzing data

1. Tabular technique
2. Statistical technique

2.6.1 TABULAR TECHNIQUE

Tabular technique is the technique which is commonly followed to find out the crude association between variables.

2.6.2 STATISTICAL TECHNIQUE

The Logit model was estimated to identify the determinants of food security.

A two stage approach was adopted here to ensure the meaningfulness and accuracy of the empirical analysis. In first stage, food security of the households was measured by calculating their per capita calorie intake. A household with per capita calorie intake equivalent to or above 2122 kcal/capita/day was considered as food secured household following the government guideline. Mathematically, the food security status of the household can be written as:

$FS_i = \sum C_i - 2122 \geq 0$ (Bashir et. al. 2012)

Where,

FS_i is the food security status of the i^{th} household (1 for food secure and 0 for food insecure)
C_i is the daily per capita calorie intakes of i^{th} household

The dependent variable food security is a binary variable in the form of "0" for food insecure and "1" for food secure. The model can be written as:

$FS_i = \sum \beta X_i + e_i$

Where,

FS_i = Food security status of i^{th} household
β = Vector of the parameter estimates
X_i = Vector of explanatory variables
e_i = Error term

The independent variables are:
X_1 = Total number of large animal (cow and buffalo)
X_2 = Total number of small animal (goats and sheep)
X_3 = Annual income of household
X_4 = Age of household head
X_5 = Education level of household head
X_6 = Household type

FOOD SECURITY INDEX

Food security index (Z) was constructed using the recommended daily calorie intake (2122 Kcal). The mathematical representation is as follows:

$Z_i = Y_i/R$ (Mannaf, 2012)

Where,
Z_i = Food security Index
Y_i = Daily per capita calorie intake of i^{th} household;
R = Recommended per capita daily calorie intake.

SURPLUS OR SHORTFALL INDEX

This tool was used to measure the extent to which a household is food secure or insecure. The index is given as:

$P = \frac{1}{N}\sum_{J=1}^{m} G_j$ (Seid, 2007)

$G_j = (X_j - L)/L$ (Seid, 2007)

Where,

P = Surplus/ Shortfall Index;

L = Recommended daily per capita requirements (2122 Kcal)

G_i = Calorie deficiency faced by household j

X_j = Per-capita food consumption available to household j

N = Number of households that are food secure (for surplus index) or food insecure (for shortfall index)

H = { EQ \F(q,n) } (Seid, 2007)

Where,

H = Head-count index;

n= Population size;

q = Number of individuals below food poverty line.

3 RESULT AND DISCUSSIONS

3.1 SOCIO-ECONOMIC CHARACTERISTICS OF THE SAMPLE FARMERS

3.1.1 AGE COMPOSITION OF THE SAMPLE FARMERS

From the table, it is observed that 42 percent of the respondent household heads were below 35 years old, 32 percent of them were between 35 to 50 years old and the rest 26 percent were above 50 years old.

Table 1. Age of the household head

Variable	Class	Number of household	Percentage
Age of Household Head	Below 35	21	42
	Between 35 to 50	16	32
	Above 50	13	26
	Total	50	100

Source: Field Survey, 2014

3.1.2 HOUSEHOLD TYPE AND EDUCATIONAL STATUS OF THE HOUSEHOLD HEAD

In the study, among the total of 50 sample households, 21 household were joint and the rest 29 households were nuclear ones. Table 2 revealed that among the sample farmers, only 2 has crossed the secondary level, hence the percentage is 4. The illiterate percentage is 8 and 14 percent of them can sign only.

Table 2. Literacy level of the household head of the sample farmers

Education level	Number of household head	Percentage
Illiterate	4	8
Can sign only	7	14
Primary	21	42
Secondary	16	32
Above Secondary	2	4

Source: Field Survey, 2014

3.1.3 OCCUPATIONAL STATUS OF THE SAMPLE FARMERS

The table 3 shows that 88 percent of the sample farmers' main occupation is agriculture, 10 percent of them are mainly engaged in livestock rearing, 1 percent are involved in service and taken small business for their livelihood. In the study area, 90 percent of the small farmers have taken livestock rearing as their subsidiary occupation and only 6 percent of them are wage labor.

Table 3. Occupational status of the household head

Occupation	Main (in percentage)	Subsidiary (in percentage)
Agriculture	88	0
Livestock	10	90
Labor	0	6
Service	1	0
Small business	1	0

Source: Field Survey, 2014

3.1.4 LAND OWNERSHIP

The total amount of land properties that the farmer holds is the farm size. The farm size was measured by the following formula:

Farm Size= Homestead area + Own Cultivable Land + Rented-in-land + Area under pond – Rented-out land. The table 5.4 shows the land ownership pattern of the sample farmers. The table 4 shows that the average land holding of the sample farmers is 1.338 acre of which 3.22 percent is used as homestead area, 65.47 percent is the own cultivable land where the rented-out or mortgaged-out are included. 44.25 percent of the land is rented in and 12.9 percent of the land holdings is rented out.

Table 4. Land ownership pattern of the sample farmers in the study area

Types of Land	Area (acre)	Percent
Homestead Area	0.043	3.22
Own Cultivable Land	0.876	65.47
Rented-in-land	0.592	44.25
Rented-out-land	0.173	12.90
Total	1.338	100

Source: Field survey, 2014

3.1.5 INCOME LEVEL AND SOURCES OF INCOME

The annual gross income of the sample farmers was estimated by adding the earnings from all income generating activities of the households. The table 5.5 exposes that, the major part of annual income comes from agriculture which is 58 percent of average total annual income of the sample households. Livestock bears the second large percentage- 37 percent of the total average annual income.

Table 5. Average annual income of sample Farmers

Sources of Income	TK	Percentage
Crop	95119.31	58
Livestock	60679.56	37
Small Business	4509.97	2.75
Wage Labor	573.99	0.35
Others	3115.98	1.9
Total	163998.8	100

Source: Field survey, 2014

3.1.6 LIVESTOCK OWNERSHIP

Livestock population of the sample farmers is presented in table 5.6. It is observed that, the sample farmers own on an average 2.28 cows and calf of which 1.10 number of milch cow, 0.16 number of heifer, 0.80 number of calf and .22 number of bull are owned. It is also revealed that number of goat possession by the sample farmer is 2.24 on an average.

Table 6. Average population of livestock

Types of Animal	Number	Percentage of total	Value (in tk)
Milch cow	1.10	24.34	25380.78
Heifer	0.16	3.54	1498.54
Calf	0.80	17.69	6549.76
Bull	0.22	4.87	5135.87
Goat	2.24	49.56	8467.2
Total	4.52	100	47032.15

Source: Field Survey, 2014

3.2 DETERMINANTS OF HOUSEHOLD FOOD SECURITY

First of all, a food security index was estimated to determine the food security status of the households and then logistic regression model was used to determine the factors influencing the food security condition.

3.2.1 FOOD SECURITY INDEX

At first a minimum level of nutrition necessary to maintain the healthy living was identified, below which households were classified as food-insecure. Then the daily per capita calorie consumption was estimated by calculating the estimated daily calorie supply to the household. Nutrient component of different items was presented in table 7. Household calorie availability was estimated using food nutrient composition which is presented in table 8.

Table 7. Nutrient Composition of different food items

Items	**Energy (per 100gm) kcal**	**Items**	**Energy (per 100gm) kcal**	**Items**	**Energy (per 100gm) kcal**
Rice	365	Potato	80.2	Oil	900
Wheat	341	Brinjal	42	Spices	146
Lentil	343	Helencha Shak	41	Onion	50
Fish	159	Data shak	28.66	Garlic	145
Dry Fish	279.79	Egg	179	Chili	40.71
Rohi	120.55	Meat	146	Turmeric	349
Telapia	127.5	Beef	136.4	Reddish	23
Mrigel	98	Mutton	194	Turnip	26
Pangas	170.23	Chicken	125.29	Pepper Black	286
Sarputi	161	Duck	205.97	Sugar	380
Vegetables	48	Milk	70	Gur	310

Source: WFP, 1988

Including both the food secured and insecure household, the study shows that the average per capita calorie intake of small farmers was 2060 kcal, which is lower than the recommended daily calorie intake 2122 kcal per day.

Table 8: Calorie Intake from different food items by Family Members of the households

Kcal/capita/day

Food Items	Kcal intake by farm households
Rice	1780
Wheat	15.42
Lentil	38
Fish	15.5
Egg	7.5
Vegetables	55
Meat	2
Milk	1.5
Sugar or Gur	3.8
Spices	10.5
Edible Oil	130.78
Average	2060
Rice	1780

Source: Author's calculation, 2014

Table 9. Food Security Indices for the Small Farmers

Food Security Indices	Food Secure Households	Food Insecure Households	All
Food Security Index (Z)	1.08	0.85	0.97
Percentage of Household (%)	50	50	100
Per capita calorie availability	2304.79	1815.21	2060
Food insecurity Gap/Surplus Index	0.08	-0.15	
Head Count Index	0.50	0.50	

Source: Author's estimation, 2014

Based on the recommended daily calorie intake of 2122 kcal, it is observed that 50 percent of the small farmers are food secured and the rest 50 percent of them are food insecure. The food security index for the food secured farmers is 1.08 where the surplus index is 0.08 and for the food insecure farmers the food security index is 0.85 that means the food insecurity gap is 0.15 whether the food security index for the total small farmers is 0.97. The surplus index shows that the food secured households exceeded the food poverty line by 8 percent and the food insecure household fell short of the required calorie intake by 15 percent. Average kcal intake by the small farmer is 2060; where the food secure households calorie intake was 2304.79 kcal per day which is higher than the national average calorie intake and the food insecure households' calorie intake was 1815.21 kcal per day which was lower than the national average calorie intake.

3.2.2 DETERMINANTS OF FOOD SECURITY IN THE STUDY AREAS

HYPOTHESIS OF THE LOGIT MODEL

The model used the various household resources as the factors influencing food security based on the following hypothesis:

The assumption here was the higher the age of the household head, the better the food security status as there may be more options of making food available from both agricultural and non-farm opportunities. As well as it is expected that, the higher the age of the household head, the higher the probability of being experienced which also makes the higher the probability of becoming food secured. In the survey, the household heads' grade level was imputed directly by taking the year of schooling instead of taking binomial value "1" or "0" for literate or illiterate so as to identify the significance level more clearly. In the analysis, two types of households were identified; nuclear and joint which took value "0" for nuclear and "1" for joint family. It was expected that the nuclear families had the chances to become more food secure than the joint ones as the total number of family members are larger in the joint families than the nuclear families. Increase in the total

number of large animal by one unit should have a positive impact on the total income of the household level, as well as the food security status of the household level. Total number of small animals is also another important variable expected to reduce food insecurity. Here, an attempt was made to see the differences brought by the number of small animals available to households' food security. The income is expected to boost households' food production and also access to more quantity and quality food. The expected effect of this variable on food security is positive.

3.2.2.1 PRAGMATIC RESULTS OF FACTORS INFLUENCING THE FOOD SECURITY STATUS OF FARM HOUSEHOLDS

TOTAL NUMBER OF LARGE ANIMAL

The result shows that having large livestock positively impact on rural household food security. An increase of one animal increases the chances of households being food secure by about 1.902 times. Haile *et al*. (2005) found the similar result.

TOTAL NUMBER OF SMALL ANIMAL

Table 10 shows that the explanatory variable, total number of small animal is significant at 5% level and the value of the odds ratio is 1.725 which means that an increase in one small animal increases the chances of the household to be food secure by 1.725 times. This result is similar with Bashir *et.al.* (2012).

ANNUAL INCOME OF THE HOUSEHOLD

As expected the impact of annual household income on food security is positive. The odds ratio 1.00 for annual income implies that one unit increase in annual income increases the chances of a household being food secure by 1.00 times. Bashir *et al*. (2012). Sindhu *et al*. (2008) got the similar result.

EDUCATION LEVEL OF HOUSEHOLD HEAD

Education level of household head has a positive impact on household food security. This variable is significant at 10% level of significance and the odds ratio takes the value 2.748 indicating the chances of a household being food secured by 2.748 times. Earlier Bashir *et al.* (2012) Bashir *et al.* (2010) found the similar result.

INSIGHT FROM THE ANALYSIS

Based on the observed evidence emanating from this empirical analysis, the following conclusions can be drawn on the findings:

- Household food security increases with increase in both large and small animals;
- Household food security increases with increase in the annual income of the household;
- Increase in the education of the household head increase the household food security.

Table 10. Estimation of the Logistic Regression of Determinants of Food Security Condition of Farm Households

Variable	Coefficient	P >|z|	Exponential of coefficient or odds ratio
Constant	-9.74908**	0.026	N/A
Total number of large animal	0.643809*	0.066	1.902
Total number of small animal	0.545885**	0.022	1.725
Annual income of household	0.000015**	0.027	1.000
Age of household head	0.024999	0.562	1.024
Education level of household head	1.01082*	0.081	2.748
Household type	-3.49543	0.114	0.030

Source: Author's evaluation, 2014

*Note: ** indicates significant at less than 5% level of significance*
** indicates significant at less than 10% level of significance*

4 SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

In the study area, livestock rearing is the subsidiary occupation of most of the sample farmers indicating livestock rearing is in the second position in case of income generation and positively influencing the food security status. The findings of the study revealed that there are considerable opportunities to increase the food security level by livestock rearing. Through scientific application of modern technologies and appropriate management practices, the productivity could be increased.

4.1 POLICY RECOMMENDATIONS

The following are the possible areas of intervention which might decrease the food insecurity problem:

- Enlighten programs on education, health and birth control measures should be directed at the farming households.
- To deal with the issue of illiteracy based on the Millennium Development Goal (MDG), rural household heads' enrolment ratio in adult education especially in the primary level should be increased
- Considering limited resource base, rural households need to be educated on the nutritional proposition of the various food items.
- Feed mills should be established by government and private entrepreneurs for supplying quality feeds with a reasonable price as well as feed marketing policy should be implemented
- Policy concerned to subsidies, taxation, import-export duties, and credit facilities should be focused.
- The Department of Livestock services (DLS) should take steps to issue veterinary card to the farmers to ensure timely supply of veterinary services and medicines at reasonable cost
- BLRI and NGOs should take necessary steps to extend livestock programmes.
- Rural households should be educated on the need to diversify their source of income from agriculture.
- The food security strategies should be designed in a way that would focus on and address the identified determinants as well as other factors that are correlated to achieving household food security

REFERENCES

[1] Bashir M. K., M. K. Naeem and S. A. K. Niazi, "Rural and peri-urban food security: a case of district Faisalabad of Pakistan", WASJ, Vol. 9 pp. 403-411, 2010.

[2] Bashir M. K., S. Steven and R. Pandit, "The determinants of rural household food security in the Punjab, Pakistan: an econometric analysis", Working paper 1203, School of Agricultural and Resource Economics, University of Western Australia, Crawley, Australia
Online available at http://ageconsearch.umn.edu/bitstream/122526/2/working%20paper%20120.pdf, 2012.

[3] Bashir M. K., Schilizzi S. and Pandit R., "Livestock and rural household food security: The Case of small farmers of the Punjab, Pakistan", Working Paper 1207, School of Agricultural and Resource Economics, University of Western Australia, Crawley, Australia, 2012.

[4] Haile H. K., Alemu Z. G. and Kudhlande G., "Causes of household food insecurity in Koredegaga peasent association, Oromiya zone, Ethiopia", Working paper, Department of Agricultural Economics, University of the Free State, South Africa, 2005

[5] Mannaf M., "An Economic Study on Maize Production and its Impact on Food Security in Selected Areas of Bogra District", MS thesis, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh, Bangladesh, 2012.

[6] Seid F.F., "Food insecurity and its determinants in Amhara region", M. S. thesis, Department of Economics, Addis Ababa University, Ethiopia, 2007.

[7] SFYP: Accelerating Growth and Reducing Poverty. Sixth Five Year Plan (SFYP), FY 2011- FY 2015, General Economic Division, Planning Commission, Ministry of Planning, Government of the People's Republic of Bangladesh, 2011.

[8] Sindhu R S, I Kaur and K Vatta, "Food and nutritional insecurity and its determinants in food surplus areas: the case study of Punjab state", Agricultural Economics Research Review, Vol. 21, pp. 91-98, 2008.

[9] WFP: World Food Programme of the United Nations. Available: www.wfp.org/country brief, 1988.