Original Research Article

Are Dairy Farmers of *Haor* Areas Food Secured?

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Authors' contributions

This work was carried out in collaboration among all authors.

ABSTRACT

The present study was conducted to assess the status of food security dairy farmers in *haor* area of Sunamgonj district. Food security index and binary logistic regression analysis were applied to analyze the data collected by face to face interview of randomly selected dairy farmers with a structured questionnaire. About 56 percent of the dairy farmers were food insecure as they took below 2122 kilo calorie per day per person and rest 44 percent was food secure. Occupation and number of milking cows were found significantly interrelated with food security of dairy farmer and education was also responsible for the food security of respondents. So it may be concluded that the government and other developmental organization should take essential steps which will ensure better dairy farming to improve the food security condition of dairy farmer and help to keep the dairy sector alive.

Keywords: Food security, Dairy farming, Farming household, Haor, Bangladesh

INTRODUCTION

The concept of food security is elastic in the sense that different institutions as well as researchers defined "Food security" based on their own views. The most general definition of food security defines food security as a situation when people have access to safe, sufficient, and nutritious food to maintain healthy and productive lives at all the time (FAO 1996). After 1996, FAO redefined Food security which is, "Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2002).

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Around the globe, we have about one billion people (undernourished people increased to 815 million in 2016, up from 777 million in 2015) who are food insecure and the number is increasing in spite of availability of some improved technology to ensure maximum food production and food safety. In addition, one in twelve of all children in 2016 were undernourished and half of them lived in Southern Asia (FAO, IFAD, UNICEF, WFP and WHO. 2017). In Bangladesh approximately half of its people are unable to access adequate food to meet their nutritional needs (USAID, 2019).

And, it is determined by three dimensions which are availability, accessibility and utilization. But, sometimes, Nature, which has significant impact on *haor* ecology as well as the agrological system, is considered as fourth exogenous element which has substantial role in food security. All the three dimensions of food security are severely affected by natural calamities most of the times and this scenario is worst in case of developing and less developed country (Begum et al. 2013). Almost one quarter of the population in Bangladesh still found to be food insecure and nearly 11 million people suffer from acute hunger indicating alarming situation in the country (WFP 2018). Sometimes 12-15 percent of the households experiences chronic under-consumption and are frequently worried about food access, but up to 30 percent people are accounted for facing with such food scarcity (Titumir, 2012). In *haor* areas of Bangladesh, however, this scenario is more vulnerable due to its adverse geographical and environmental condition where flash flood, heavy rain, lack of nutritious fodder and other required ingredients are seen to be main drawback factor for optimum production to maintain food security (Sheuli, 2017).

Sunamganj district is one of the main area where most of the place covering nearly 373 *haors* where 19.37 million people live their lives depending directly or indirectly on *haor* (Master plan of *Haor* area-2012). Of its contribution to the national GDP is around 6-8%, but it has long been lagging behind mainstream national development as most of the people depend only on livestock farming, fishing and agribusiness for their livings.

Although a substantial number of the total population live in the *haor* area and majority of them are fisherman and dairy farmer, they lead a miserable life due to lack of education, sanitation, regular loss of land, lack of developed communication facilities with several causes (Hossain and Salam 2007). So, food security is the prime concern for them as the area has been facing frequently natural disasters like regular loss of crops field by upcoming flood, drought etc for last

few years. Recently, the food security atlas of World Food Program (WFP) Bangladesh has categorized the *haor* region as the highly food insecure areas of Bangladesh. Although, dairies generally can make direct and indirect contributions to food security; they make affordable milk available and accessible to poor populations and are a key mean to sustain livelihoods of marginalized and vulnerable populations, its importance has often underestimated or sometimes ignored. Till now, there are inadequate number of published documents regarding the relation among *haor* community, food security and household level dairy farming (Reliefweb 2016; Sarma, 2010; Talukder 2014). So Sunamgonj has been taken as representative of *haor* areas to know the socio-economic status, food security level and factors affecting them.

The specific objective of the study is to explore the food security status and factor affecting food security status of the dairy farmer in haor areas of Sunamgonj district.

LITERATURE REVIEW

Livestock is known to make substantial contributions to food security and to the livelihood of both South Asia and sub-Saharan African people (Herrero et al. 2013, Kristjanson et al.2010). Globally 40% agricultural production comes from livestock sector and it contributes 1.54% of total GDP (where 14.23 percent from agricultural sector) in Bangladesh (BER, 2018). Development of dairy has assumed a position of pre-eminent importance in the rural economy of Bangladesh (Shamsuddoha 2000). Milk production in the *haor* districts for 2010 has been estimated to be about 0.62 million ton (Master plan of *Haor* area 2012) which is positive sign for the economy. In poorer countries, it assumes that Livestock Derived Food (LDF) plays important role to improve food security and nutritional requirement (Randolph etal. 2007).

METHODS AND MATERIALS

The study area and sample units were selected keeping in mind the objectives of the study. The selected upazila was Dakshin Sunamganj under Sunamganj district.

A set of questions and a draft schedule were prepared to take face to face interview to collect reliable information from the respondents. After making necessary adjustments, a final survey schedule was developed in a logical sequence.

A sample of representative dairy farmer was chosen in such a way that the information meets the purpose of the study. As the size of population was unknown (exact number of dairy farmer was not available in upazila livestock office) and considering the limited time, efforts and fund, eighty sample of dairy farmer were selected from the study area purposively.

After collection the primary data from the study area, these data were summarized and scrutinized carefully before the actual tabulation was done. The processed data were transferred to a MS Excel 2013 sheet and analyzed with SPSS (v19).

The primary data collected from the survey was analyzed by employing statistical tools. Food security index and binary logistic regression analysis were used to analyze the data. The dependent variable of the model was food security status.

Among the different methods (Bashir et al., 2010; Bashir et al., 2012; Gittelsohn, 1998; Che and Chen, 2002; Sindhu et al., 2008; Alinovi et al., 2009; Miller et al., 2011) of assessing food security status, the calories intakes method is one of the widely and popularly used method (Pérez-Escamilla and Segall-Corrêa, 2008; Hussain et al., 2014).

A person, who takes more than 2121 K. Calories was considered as food secured and equal or below 2121 K. Calories was considered as food insecured. This makes application of binary logistic regression appropriate.

In order to measure food security, a household food security index was constructed by defining a minimum level of nutrition necessary to maintain a healthy living. It also indicates the 'food security line' for the population under study (Omotesho*et al*. 2006). Any household above this line was classified as food-secure. The calorie content of both the produced and purchased food items were used to estimate the dietary energy availability in the household. The food security index was calculated using the following formula.

Food Security Index (K_o) = X/Z

Where,

X = Household daily per capita calorie intake which was measure from per day per capita food intake.

Z = Household daily per capita calorie (Z) required.

Thus, for a household to be food-secure K_o must be greater than or equal to one ($K_o \geq 1$) otherwise, the household is considered food insecure.

The binary logistic regression model was used to estimate the determinants of household food security.

The logit model is presented as follows:

$$y = \beta_0 + \beta_1 X + u_i$$

Where y=food security status and X = determines the households household food security status.

By fitting the variables into the model, the model is presented as:

Ln (Pi / 1 - Pi) = y = $\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10}$

Where,

X_1 = Age of household head (Years); X_2 = Gender of household head; X_3 = Marital status of household head; X_4 = Education of household head (Years of schooling); X_5 = Household size (Numbers); X_6 = Occupation of household head; X_7 = Household income (TK/ Year); X_8 = Number of Livestock of the Household; X_9 = Number of milking cow of the household.

There are a various number of factors which influences the food security status of household. Among all the factors education (Kidane, Alemu, & Kundhlande, 2005), gender of the household head (Kassie et al., 2014), size of the family (Bogale, 2012), monthly income (Bashir et al., 2013) etc. were widely considered as determinant. Some other factors were considered based on the socioeconomic and other associated factors of the study area and the target populations.

RESULTS AND DISCUSSION

Socioeconomic characteristics

Socio economic characteristic varies from person to persona and it's a vital component for assessing the current livelihood situation under which the study was conducted and age, land size, education, family type, family size, education level etc are taken into consideration to analyze it. Result showed that demographic condition of the household level dairy farmers. One third of farmers in the area were found as landless in the study area. Data showed that maximum number of farmers in the study area was belonging to the age group 36 to 55 years which comprise of 77.5 percent. This is because, the young people prefer more to service sector rather than agriculture. In education the dairy farmers were found illiterate (41 .25%) although most of their children are school going. As an alternative of education they participate in different types of trainings (designed for illiterate farmers) offered by different government and non-government organization to achieve dairy farming related knowledge.

Food Security Status of the Dairy Farmers

Food and nutrition security are important as underlying factors in each individual's food intake and health, in their physical and cognitive capacities, and in a nation's capacity for economic and social growth and development. The geographical setting of *Haor* area makes them food insecurity (FAO and WHO, 2014). This study provides information on dietary intake levels of households and about the types of foods consumed to determine sources of energy as well as food security of the *haor* community.

Households Food Consumption Pattern

As well as all the areas of Bangladesh, in *haor* area rice is the staple food for consumption and also other foods they consume. The data of consumption of different food items including rice, fish, dry fish, vegetables, meat, pulses, eggs, milk, spices etc. by the household members was collected through interview schedules. Intake of food according to food items by using proper conversion factor (Food energy – methods of analysis and conversion factors; FAO, 2003) for every item was considered. Food energy intake is measured by the unit of kilocalorie. The overall average daily per capita calorie intake by respondents was observed to be 1969.39 kilocalorie, which is lower than the national average of 2218.3 kilocalorie reported by household income and expenditure survey (HIES) in 2010. Around 83.57percent of the total calorie intake was received from the rice consumption. The second highest contribution to calorie intake came from edible oil consumption which was closely followed by wheat consumption.

Rice is the main item of foods for human consumption in the *haor* areas. Average per capita per day intake of rice was 495.75 gram, which is higher than the amount of total cereals consumed by nationally at 463.9 gram according to HIES in 2010. The second important food item was observed to be vegetables and the consumption rate was 94.39 gram per capita per day. The next important food item was fish followed by chili and wheat respectively. Total amount of food consumption was observed to be 750.17gram per capita per day to the selected area of Sunamganj.

Classification through calorie intake

On the basis of the amount of food taken by the respondents and their family members per capita calorie intake was measured.

Number and percentage of caloric intake per person per day at Dekhar *haor* are shown in Table 2. Table 2 depicts the percentage of calorie intake with respect to per person per day average calorie intake by the sample household. About 21.25% of the respondents belonged to ultra-poor whose per day per person calorie intake was 1411.387 Kcal. The persons belonged to hard core poor whose average per person per day calorie intake was 1700.306 k.cal. About 25% of the respondents had an average per person per day calorie intake 1994.702 k. calorie and they belonged to absolute poor. The rest 43.75% of the respondents took above 2122 k.cal. Therefore, it can be summarized that, most of the respondents are poor in term of calories intake.

Food Security Status of the Dairy Households

Food security and insecurity are used to describe whether or not households have access to sufficient quality and quantity of food. Food insecurity is a complex development issue dealing with physical and economic constraints to safe and nutritious food to maintain healthy living. The typical measurement of food insecurity involves comparing calorie consumption with a fixed requirement value.

Table 3 shows, 56.25 percent of the sample households are measured to be food insecure and 43.75 percent households are food secure. The average per capita daily calories availability for food secured household was 2287.48 k.cal and for food insecured household it was 1722.00 k. cal. The estimated food security index for food secured and insecured household was 1.08 and 0.92 respectively (Table 3)

Determinants of Household Food Security

Collected data were used to calculate 9 different variables that described food security at the household level. Indicators of food security were associated with selected household and socioeconomic variables and later integrated into a binomial regression model.

The result of binomial regression model is presented in Table 4. The result showed that the model was accurate in explaining the determinants of the food security of the dairy households. Three out of nine variables included in the model were significant in explaining 58.6 percent (R square value 0.586) of the variation of food security situation in the study area.

Age is an important factor affect food security of household. Result showed that age is negatively related to food security and it is insignificant. The value of the coefficient is -0.002. From the table 4it is clear that the value of both gender and marital status is positive and statistically insignificant. The values of coefficients are estimated 0.153 and 0.151.Year of

education was found positively correlated to food security and significant at 10 percent level. The value of coefficient was estimated 0.073 which indicates that if one unit of education increase then the probability of the food security will be increased by 0.073. Occupational status is another important variable which influence food security status. The value of occupation is estimated 0.078 and is significant at one percent level of significant. In the above table, family size is negatively correlated with food security and insignificant. Estimated coefficient is -0.009. Number of milking cow and livestock are positively correlated with food security. The value of coefficient is 0.341 which is significant at 1%.This means one percent increase in milking cow increase food security by 0.341.

CONCLUSION

It reveals that half of the dairy farmers were food insecure who they took energy below optimum level that required being food secured. It is warning for us to ensure effective human resource in the haor areas. Occupation and number of milking cow were found highly correlated with food security of dairy. As it has found, milking cow is highly associated with food security, it's a core need to make dairy farming sustainable to ensure food security in *haor* areas of Bangladesh along with other practices suggested by other findings. That means, dairy farming at household level can promote food security and make it long lasting also.

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Table 1: Calorie intake from different food items by the individual

Food items	Amount (gm/capita/ day)	Calorie intake (kcal/capita/day)	Percentage
Rice	495.75	1645.87	83.57
Wheat/Flour	17.24	60.73	3.08
Vegetables	94.39	17.94	0.91
Pulse	9.23	29.34	1.49
Fish	62.71	53.94	2.74
Eggs	3.20	4.15	0.21
Chicken	8.37	15.81	0.80
Edible oil	9.40	85.15	4.32
Garlic	4.34	6.28	0.32
Chili	19.61	7.97	0.40
Onion	13.41	6.67	0.34
Turmeric	3.90	13.85	0.70
Dried fish	8.62	21.71	1.10
Total	750.17	1969.39	100.00

Table 2: Percentage of calorie intake taken by the dairy farmers comparing with Bangladesh Economic Review (2012)

Categories	No. of respondents (percentages)	Person/day average calorie intake (k. cal)
Ultra poor (<1600 K. Cal)	17(21.25)	1411.387
Hard core poor (1600-1804 K Cal)	8 (10.00)	1700.306
Absolute poor (1805-2121 Kcal)	20(25.00)	1994.702
Non-poor above 2121 Kcal	35(43.75)	2287.48

*Figures within parenthesis indicate percentages of total.

Table 3: Food security indices of dairy farmers

Particulars	Food security index	Percentage of households	Per capita daily calorie availability
Food secured households	1.08	43.75	2287.48
Food insecured households	0.92	56.25	1722.00
All	0.96	100	1969.39

Note:*A Food Secure person have to take at least 2122 K. Cl each day and deviation from it called food insecurity.*

Table 4: Estimates of the binomial regression of determinants of household food security

Explanatory variables	**Estimated coefficient**	**Standard errors**	**t-values**
Intercept	-0.112	0.713	-0.157
Age	-0.002	0.007	-0.024
Gender	0.153	0.214	0.715
Marital status	0.151	0.113	1.333
Education	0.073*	0.036	2.028
Occupation	0.078***	0.017	4.593
Family size	-0.009	0.029	-0.318
No of livestock	0.049	0.059	0.824
No of milking cow	0.341***	0.095	3.571
Income	0.031	0.276	0.114
R^2	0.586		
Adjusted R^2	0.524		
F-value	9.436		

Note: *** indicates significant at 1 percent, ** indicates significant at 5 percent and * indicates significant at 10 percent level.