

DETERMINANTS OF FOOD INSECURITY STATUS OF FISHERIES COMMUNITY IN COASTAL REGIONS OF BANGLADESH

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ABSTRACT

Food insecurity is a notable state of the well-being of people. However, the common determinants of food insecurity have nevertheless to be formally known, especially for the coastal region. This study aims to investigate the demographic and socio-economic determinants of food insecurity of the fishermen communities in the coastal areas, namely Galachipa, Kalapara and Dumki upazilas in Patuakhali district of Bangladesh. A two-stage cluster sampling technique has been used for getting the primary data (n=200). The food insecurity status was measured by using Food Insecurity Experience Scale (FIES) suggested under the indicator of 2.1.2 of the Sustainable Development Goals (SDGs). Logistic regression model has been used to identify the determinants of food insecurity status. Results reveal that families having larger number of members are more likely to be food insecure than the families with small numbers of members. Also, households having monthly income level below BDT 5000 are more food insecure than their counterparts. Another important determinant by which food insecurity is significantly affected is the education of household head. A range of viable policy interventions for the fishermen communities have been recommended. These include i) diversification of income generating opportunities, ii) improving education status of the community to enable to shift to safer employment when necessary, iii) building awareness on adverse effects of bigger family size through family planning campaign, and iv) providing skilled based training and necessary credit access among the unemployed members of the household.

Keywords: Food insecurity, FIES, SDG indicator 2.1.2, Coastal regions

I. INTRODUCTION

Food security is an important issue for the overall development of human capital and society. Food security is a global concern for every individual; one in nine people around the world (820 million) go hungry every day (FAO 2019). In the last decade, attention has been centered on eliminating the food insecurity and hunger worldwide. End hunger, achieve food security and improve nutrition is the main aim of the sustainable development goals (SDG). The International Conference on Nutrition (1996) and therefore the World Food Summit (1996) each emphasized the prerequisite to be compelled to decrease food insecurity and hunger globally (FAO

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1996). At the 1996 World Food Summit, 182 nations were united to the definition of food security as "access by all people at all times to enough nutritionally adequate and safe food for an active and healthy life" (FAO 1996). This is in line with Nobel laureate Amartya Sen's argument that food insecurity is a function of food distribution, not food production (Sen 1981). Also, as a qualitative approach, food insecurity can be considered as a type of vulnerability such as the risk of not having adequate food (Cafiero *et al.*, 2016). Hence, achieving food security is the key priority for all the countries in the world including Bangladesh (Parvin and Ahsan 2013).

In the recent years, food insecurity has been exacerbated by population growth, a lack of available food and water and climate change. Consideration needs to be given to the effects of global climate change on food production and distribution, and also the impact on food security and public health. Beaumier and Ford (2010) have projected an increase in the number of people 'at risk of hunger', with their study projecting that an additional 175 million people (around 2.6% of the overall population) could be undernourished in 2080 because of climate change. Bangladesh remains extremely food insecure in spite of significant economic and social progress. Bangladesh is ranked 135th among 169 countries in the 2019 Human Development Index (HDI) (UNDP 2019). According to the UN World Food Program, despite of improved availability of food due to increased production, 40 million people – one quarter of the population – remain food insecure, and 11 million suffer from acute hunger (WFP 2020).

The risk of food insecurity in low-income household is associated with lack of access to basic needs, low access to land, single-parent families, and lack of alternative occupation, unstable income level and having a poor family head (Mozdalifa 2012). Household food insecurity is at first characterized by concerning about having enough food, followed by dietary changes to ensure available food last longer, and at last, a decrease in food consumption, first in adults followed by any children (Radimer *et al.*, 1990; Radimer *et al.*, 1992). Further, research has shown that the experience of households living with hunger or food insecurity is consistent in developed and developing countries; and across languages and cultures (Coates *et al.*, 2006). There are indeed significant risks to food security for the most vulnerable populations, even in rich countries. Data from the United States show that many poor households lack the income and other resources needed to ensure access and effectively utilize food, where the percentage of the food insecure population rose from 11 to over 14% during the recent economic recession (Coleman-Jensen *et al.*, 2013). Etim and Patrick (2010) estimate the determinants of poverty among fishing households in Nigeria. Many families particularly in the coastal areas of Nigeria have taken fishing as a food and nutrition security strategy. The study used Tobit regression model to estimate the determinants of poverty for the survey data collected from 120 fishermen in Mbo, Nigeria using structured questionnaire. Using the maximum likelihood estimation technique, they have shown that except for age and

fishing income, all other explanatory variables specified in the model have significant effect.

A study by Huq *et al.* (2015) reveals that the consequences of climate change have impact on the livelihood implications of these smallholder agricultural communities of coastal Bangladesh. They indicate that food insecurity was not only caused by the impacts of climatic events, but also a number of socio-ecological and economic factors worsened the already dire food security situation. Uddin (2012) found that coastal marginal farmers are most susceptible to food insecurity and suffering from least change in crop, fish and livestock farming. Alam *et al.* (2020) determined the food security status and also revealed that the respondent's gender, level of nutritional knowledge, and level of monthly income are important variables that have a significant correlation with food security in selected households from the coastal belt region of the Noakhali district. As a part of global consensus almost every country is trying to improve the status of food insecurity. Bangladesh is also trying to improve the food security condition, especially of the coastal people as they remain climatic vulnerable. This research aims to address the question, 'What are the underlying factors that are associated with food insecurity status among the fishing communities in the coastal regions in Bangladesh in the context of climate change?' Thus, the specific objective of this study has been set to identify the significant demographic and socio-economic factors contributing to food insecurity among fishermen community of Patuakhali district. The findings will provide useful information to the policymakers for formulating various support and policies to improve their food security status.

II. METHODOLOGY

Data

This study depended mainly on primary data, which was collected by three-stage cluster sampling technique from randomly selected three *upazilas* (first stage units) namely, Galachipa, Kalapara and Dumki of Patuakhali district. From each of the selected *upazila* two/three unions (second stage units) were selected randomly and a circular systematic sample of the households (25 from each selected unions) (third stage units) were selected within these areas. Primary data were collected in a field survey by direct interview method from the three targeted *upazilas* [$n = 200$; Galachipa (N_c : Galachipa- 950; Panpotti- 1015; Ratanodi Taltoli- 870; $n_1 = 75$), Kalapara (N_c : Mohipur- 2222; Kuakata – 1315; $n_2 = 50$) and Dumki (N_c : Pangasia- 620; Angaria- 345; Lebukhali-280; $n_3 = 75$), where $n =$ sample size, n_i is the sub-sample size in i^{th} *upazila*, and N_c refers to the population size in each union]. In coastal regions most of the vulnerable people involved in fisheries related work, so we selected household heads (all were males) of fisheries community as our primary respondents. Demographic and socio-economic data and information of selected areas were collected through questionnaire surveys. Some demographic data were

also collected from local government institutions. The assessment of the impact of household's socio-economic status on food insecurity outcomes was conducted by means of χ^2 statistics.

Measure of food insecurity- FIES Methods

Defining a standard metric which will be accustomed to identifying the determinants of food insecurity across different countries has so far been lacking. This is made possible by the Food and Agriculture Organization's (FAO) Voices of the Hungry (VoH) project, that has developed an experiential measure of food insecurity—the Food Insecurity Experience Scale (FIES) (Cafiero *et al.*, 2016). The aim of VoH is to produce annual comparable estimates of food insecurity around the world. The FIES is the first survey protocol to measure people's direct experiences of food insecurity at the individual level on a worldwide scale. This is suggested under the SDG Indicator 2.1.2: Prevalence of moderate or severe food insecurity in the population (UN 2020).

The ideas underlying the experience-based food security measurement studies were to understand the experience of hunger. The approach accustomed to analyzing FIES data comes from Item Response Theory (IRT), a branch of statistics that allows the measurement of unobservable traits through analysis of responses to surveys and tests. As food security itself is an inherently imperceptible characteristic like attitude or intelligence, it can be measured only by examining its observable manifestations. The specific IRT model applied to FIES data is that the Rasch model, which is widely employed in health, education and psychology (Cafiero *et al.*, 2016).

Each of eight FIES questions (Box 1 in Annex) refers to a distinctive experience (measured at 0 or 1 depending on presence) and is related to a special level of severity of food insecurity. One of the unique contributions of the FIES and similar experienced-based food insecurity measures is that, in addition to considering compromised diet quality and reduced food quantity, they additionally capture psychosocial components associated with anxiety or uncertainty concerning the flexibility to acquire enough food, a fact that other measures do not. In our study, if a respondent report to experience food insecurity condition in any of the eight questions she/he is considered as food insecure (19.5% of which 87.2% reported yes to all eight questions), rest are considered as food secure (80.5%).

Dependent and Independent variables

The dependent variable, food insecurity (1 = yes, 0 = no), considered in this study has been derived using the methodology described in the earlier section. The independent variables considered in regression analysis were household size, religion of the respondents, age of the respondents, location, education level, monthly income level, number of nets, household house ownership.

Determination of food insecurity status

Due to the dichotomous nature of the response variable a binary logistic regression model has been used to identify the determinants of food insecurity. Let, Y be a dichotomous dependent variable, say food insecurity status taking values 0 and 1 and suppose that $Y=1$, if food the household is insecure and $Y=0$, if food secure. Also let X be an independent variable say, income. Then the form of a binary logistic regression model is

$$P = p(Y = 1 / X) = \frac{e^{\beta_0 + \beta_1 X}}{1 + e^{\beta_0 + \beta_1 X}}$$

$$\text{And, } 1 - P = p(Y = 0 | X) = \frac{1}{1 + e^{\beta_0 + \beta_1 X}}$$

Then a transformation of P known as the logit transformation and is defined as

$$g(X) = \text{logit } P = \log \left[\frac{P}{1 - P} \right] = \beta_0 + \beta_1 X$$

There are many desirable properties of this transformation $g(X)$. The logit, $g(x)$ is linear in its parameters. It may be continuous and may range $-\infty$ to $+\infty$. Depending on the range of x for more than one independent variable the model can be generalized as:

$$g(X) = \text{logit } (P_i) = \beta_0 + \sum_{l=1}^k \beta_l X_{il} \quad l=1, 2, \dots, k; \text{ and } i=1, 2, \dots, n$$

The empirical model then can be written as follows.

Logit (P_i) = β_0 + β_1 household size + β_2 religion + β_3 age + β_4 location + β_5 education + β_6 income + β_7 no. of nets + β_8 house ownership.

Where β_i s are coefficients.

III. RESULTS AND DISCUSSION

Association of food insecurity with socio-economic characteristics

Socio-economic characteristics of farm households are significant factors of their food insecurity or security status (Babatunde *et al.*, 2007). Table1 reveals the relationship between food insecurity and different socio economic and demographic characteristics of the surveyed households.

About 28.1 percent of the households having family size with 2 to 4 are food insecure while only 14.8 percent of the households having family size with 5 to 8 members are food insecure and household having 9 and above members have experienced the highest food insecurity (37.5 percent). Generally, households with more family

members tend to possess lower food security (Alam *et al.*, 2018). Our study reveals a confronting result. The reasons may be that with small family size, the number of earning member is less which increases with a little increase in family size. Again, with further increase in family size mainly the number of dependent members (children and elderly) increases pushing them to food insecurity. This is very possible in our study setting because not many alternative income generating opportunities are available there. Hence, all active males may join only in fishing activities. The respondents with age 46 years and above have experienced highest food insecurity (29.7 percent), while for the age group 26 to 45 years the lowest food insecurity (12.3 percent) is observed. This is mainly because respondents between the ages of 26 to 45 years have more earning capability, strength, social networking, experience etc.

Table 1: Food insecurity status by socio-economic and demographic characteristics of the surveyed households

Characteristics	Total	Food Insecure (%)
Household size ($p=0.049$)		
2-4	57	28.1
5-8	135	14.8
9 and above	8	37.5
Age of Respondents ($p=0.012$)		
15-25	22	27.3
26-45	114	12.3
46 and above	64	29.7
Education Level ($p=0.156$)		
No education to Primary	146	21.9
Secondary to Higher education	54	13.0
Monthly Income level ($p=0.001$)		
Below BDT 5000	20	55.0
BDT 5000-15000	97	20.6
BDT 16000-30000	45	13.3
Above BDT 31000	38	5.3
Number of Net ($p=0.120$)		
No Net	26	30.8
Having Net	174	17.8
Household House Owning ($p=0.092$)		
Yes	175	17.7
No	25	32.0

Note 1: Sum of the rows is equal to 100%; Note 2: p values are based on chi- square tests.

In the bi-variate analysis (Table 1), respondents with no education to primary level have the highest food insecurity (21.9 percent). Furthermore, food insecurity decreases (not statistically significant) with the increase in education level. The highest level of food insecurity exists in the income level of BDT 5000 to 15000 (20.6 percent). With the increased amount of monthly income from BDT 16000 to BDT 30000 the food insecurity decreases to 13.3 percent. Income has been

considered as one of the most important determinants of food insecurity and hunger (Rose 1999). For obvious reasons food insecurity is significantly less among those who own a house.

Determinants of food insecurity status

The age of the respondents is negatively significantly associated with food insecurity status. The respondents in age group 26 to 45 years are 0.244 times less likely to be food insecure than the respondents in age group 15 to 25 years. This is mainly because the maximum income earnings group falls into this group (26-45), and their strength and capability are likely to be more than the reference group. Households with moderately large family size (5-8 members) are 0.354 times less likely to be food insecure than families with 2 to 4 members. The reason is already identified in the related discussion of Table 1. Findings of our study also corroborate with other studies. For example, Alam *et al.* (2020) suggested monthly income as a significant determinant of food insecurity in coastal belt in Noakhali district. Also, household income, age of household head, and the level of education of household heads were found as the significant determinants of food insecurity by Ali *et al.* (2016). Rahman *et al.* (2020) identified family size as one of the determinants of food insecurity. According to Bogale and Shimelis (2009), socio-economic variables like family size, annual income, age of the household head, have significant influence on food insecurity in rural areas of Dire Dawa, Eastern Ethiopia. Our finding is somewhat different than the existing literature which advocate that increasing family size is positively related to food insecurity (Tefera and Tefera 2014; Olayemi 2012).

Table 2: represents the estimates of the effect of socio-economic and demographic characteristics on food insecurity.

Independent Variables	Coefficients (β)	Standard error (SE)	Odds ratio (OR)
Age of Respondents (<i>r</i> : 15-25)			
26-45	-1.411**	0.676	0.244
46-Above	-0.521	0.706	0.594
Household size (<i>r</i> : 2-4)			
5-8	-1.039**	0.450	0.354
9 and Above	0.063	0.875	1.065
Education (<i>r</i> : No education to Primary)			
Secondary to Higher education	-1.213**	0.521	0.297
Monthly Income level (<i>r</i> : Below BDT 5000)			
BDT 5000-15000	-1.779***	0.571	0.169
BDT 16000-30000	-2.093	0.689	0.123
Above BDT 31000	-3.490	0.982	0.031
Constant	2.877	0.976	17.755

Note: Level of significance: * $p < .10$, ** $p < .05$, *** $p < .01$; *r* stands for reference category

When controlling for other factors, education turned out to be a significant predictor of food insecurity. Respondents having secondary or higher-level education were 0.297 times less likely to be food insecure compared to the respondents having primary or no education. Education is clearly linked with food security assuming that household heads with additional human capital seems to suffer less food insecurity (Faridi and Wadood 2010). Feyisa (2018) reveals that illiterate households are more food insecure than literate households, revealing that education contributes to food security particularly through influencing productivity. Food insecurity and educational deprivation are extremely related, and they formulate vicious circle in rural communities of many developing countries (DFID 2005). Using longitudinal data analysis, Mutisya *et al.* (2016) explained that investment in education of households, in the long run, contributes to reduction in the prevalence of food security. Income level is found to be negatively significantly (at 5% level of significance) associated with food insecurity. Result shows that respondents with income level from BDT 5000 to 15000 were 0.169 times less likely to be food insecure than respondents with the income level below BDT 5000. Studies such as the Current Population Survey (CPS) and the Third National Health and Nutrition Examination Survey in US have revealed that there exists a negative relationship between income and food insecurity, indicating that lower income groups experience increasingly higher rates of food insecurity (Alaimo *et al.*, 1998).

IV. CONCLUSION

Food insecurity is a persistent problem in many of the developing countries. Bangladesh with its regular struggle with natural calamity and climate change vulnerability is not an exceptional one. This study tried to shed light on the food insecurity status among the inhabitants of the coastal regions of Bangladesh using the approach prescribed by SDG indicator 2.1.2 using Food Insecurity Experience Scale (FIES). In this study we have identified some major factors that have an effect on the household food insecurity status. Result from the study shows that 19.5 percent of the sample households are food insecure. This study reveals some important determinants of food insecurity, such as age, education, household size and income, which have policy relevance.

Generally, the results of this study suggest that reducing food insecurity in the study area requires adoption of mixed policies and strategies, which will differ from strategies formulated for other regions of the country. For policymaking, it is very important to understand the dynamics of these factors for the alleviation of food insecurity among the vulnerable people. Having an idea about the factors affecting food insecurity might help them revisiting the existing policies like i) introducing diversified income generating opportunities, ii) improving education status of the community to enable them to shift to safer employment when necessary, iii) building awareness on adverse effects of too big family size with higher number of dependents through family planning campaign, and iv) providing skilled based training and

necessary credit access among the unemployed members of the household. Nonetheless, based on the findings of this research, it can be firmly said that efforts to reduce livelihood vulnerability in coastal communities should be multifaceted so as to simultaneously tackle exposure, sensitivity, adaptive capacity and can improve their food insecurity status.

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ANNEX

Box 1: Questions of the Food Insecurity Experience Scale Survey Module

SN	Standard Label	Question wording
1	WORRIED	During the last 12 MONTHS, was there a time when you were worried you would not have enough food to eat because of a lack of money or other resources?
2	HEALTHY	Still thinking about the last 12 MONTHS, was there a time when you were unable to eat healthy and nutritious food because of a lack of money or other resources?
3	FEW FOODS	Was there a time when you ate only a few kinds of foods because of a lack of money or other resources?
4	SKIPPED	Was there a time when you had to skip a meal because there was not enough money or other resources to get food?
5	ATE LESS	Still thinking about the last 12 MONTHS, was there a time when you ate less than you thought you should because of a lack of money or other resources?
6	RAN OUT	Was there a time when your household ran out of food because of a lack of money or other resources?
7	HUNGRY	Was there a time when you were hungry but did not eat because there was not enough money or other resources for food?
8	WHOLE DAY	During the last 12 MONTHS, was there a time when you went without eating for a whole day because of a lack of money or other resources?