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An Adrift Community in Mainstream Bangladesh: Case of Tea Workers

Kanij Fatema[1*], Dipta Sarker[1,2], Jasim Uddin Ahmed[1], Kausar Ahmed Majumder[1] and Md. Faizul Kabir[3]

[1]Department of Agricultural Economics and Policy, Sylhet Agricultural University, Bangladesh.
[2]Bangladesh Krishi Bank, Bangladesh.
[3]Bangladesh Bank (Central Bank of Bangladesh), Bangladesh.

Authors' contributions

This work was carried out in collaboration among all authors. Authors KF and DS designed the study, performed the statistical analyses, wrote the protocol and wrote the first draft of the manuscript. Author JUA review the manuscript. Author KAM managed the review of literature and analysis of the study. Author MFK designed the methodology, statistical analyses and review the manuscripts. All authors read and approved the final manuscript.

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ABSTRACT

This research was conducted to analyze the status of tea workers of selected areas of Bangladesh. Primary data were collected through direct interview and secondary data were also collected from different sources. A total of 100 tea workers were randomly selected from Ootterbhag and Indanugger tea estate of Moulvibazar. Descriptive statistics and functional analyses were employed to achieve the objectives of the research. Risk facing index, food security index, food consumption score were calculated and binary logistic regression were carried out to identify the factors affecting food security status. The study revealed that the life of tea workers in selected areas are vulnerable. Wages are not adequate to meet basic needs and the wage raises are not keeping pace with the cost of living. Considering 4.51 average family member the respondent family household is far below the international poverty line (1.90 US$). It was observed from the analysis that 52% sample respondents were illiterate. However, the maximum respondents also agreed that they faced various

**Corresponding author: E-mail: kanij.aep@sau.ac.bd, f7kanij@yahoo.com;*

psychological, mechanical and biological hazards. Household calorie availability or consumption behavior was revealed by food consumption score, which exemplified that 49% respondents are in borderline food consumption pattern while 5% and 46% are in poor and acceptable level respectively. The overall average daily per capita calorie intake by tea workers was observed to be 2076.3996 kilo calorie, which is lower than the national average of Bangladesh. Only 35% household were food secure based on calorie intake. Household was food insecure if number of dependent persons in family increases; food secure with increase in household monthly income; and household food security decreases with increase in household size.

Keywords: Tea workers; vulnerability; risk facing index; food consumption score; food security; Bangladesh.

1. INTRODUCTION

Tea, a popular drink plays significant role in the economy of Bangladesh. Meeting the domestic demand of 86,635 thousand kg, Bangladesh exported 16.65 million kilograms of tea in 2019-20 in different countries which worth 36.62 million USD [1]. At present there are 167 tea estates located in seven districts of Bangladesh. The annual expected tea production in 2020 is set at 75.94 million kilograms, whereas 79.33 millions of kilograms have been produced so far till November 2020 which exceed the target by about 4 million kilograms [1]. There are about 100,000 tea workers of which 80,000 are permanent workers and 20,000 are casual workers [2], working in different tea estates. Irrespective of large number of laborer, they are getting very low salary Taka 102 (US$ 1.2 per day), recently, tea workers protested about wage rise up to Taka 300 (US$ 3.52) but the agreement settled by rising only US$ 0.2 per day, now the salary is Taka 120 (US$ 1.42) per day [3]. Most of the tea garden workers lives below poverty line [4], have poor income [5,6], deprived of basic needs [7], which causes problems of poverty [8]. Probable reasons behind this are low income [2], workers are unable to consume nutritious food, socio-economic status, nutritional status and sanitation coverage is poor among the female tea garden workers [9], and poor families had lower dietary diversity than non-poor households in Bangladesh [10]. Since workers are not satisfied with wages including fringe benefit, they are not attentive in increasing productivity which hampers the country's economic growth [11]. Food insufficiency was profoundly predominant, half of children in tea gardens had low dietary diversity [12], risk associated with pregnant women and new born babies, unhygienic and destructive postnatal practices were utilized, misguided judgments and unsafe conventional practices were found to exist among the families in the tea gardens that limiting them from getting quality health care [13]. "Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" [14]. Household food security encompasses four elements i.e., food availability, accessibility, utilization, and stability [14]. Food security indicator is highly sensitive to rice price changes [15]. A study on food security index of the tea gardens in West Bengal, India, marked that unrealistic and irregular wage pattern, inhuman living conditions and frequent closure of the gardens are the focal concerns [16]. In Bangladesh, "proportion of population living below the national upper poverty line has consistently declined reaching 31.5 % in 2010, 24.3 % in 2016, and 20.5 %in 2019", households having access to improved sanitation was 56% in 2012 has increased around 84% in 2019, access to safe drinking water and electricity are respectively 98.5 % and 92.23 % in 2019 [17]. Per capita daily calorie intake at the national level was 2,238.5 kcal in 2005 which has increased to 2,318.3 kcal in 2010 [18]. Bangladesh has made praiseworthy progress in all aspects of millennium development goals between 1992 to 2015 but there are disparities among tea garden workers [2].

The above mentioned discussion and review indicated that tea workers are discriminated in many ways in terms of wages and other facilities. There are few studies about socio-economic aspects and livelihood status of tea workers but particular studies about vulnerability, the risk faced by the tea workers and food security status in Bangladesh are rare. Keeping these factors in mind this research answer the following- i) How extent the workers are vulnerable? ii) Are the workers facing any kind of risks? What are the existing risks that the tea workers initially face; iii) Are they food secured?; and iv) What are the factors affecting food security? To find the answer the objectives of this research was to i)

analyze the vulnerability of the tea workers in terms of socio-demographic profiles; ii) explore the risk faced by the workers, iii) analyze the food consumption pattern and food security status of the tea workers; and iv) find out the factors influencing food security status of the respondents.

2. MATERIALS AND METHODS

2.1 Study Area and Sampling Procedure

Moulvibazar, a northeastern district of Bangladesh was the study area. The survey schedule was developed to collect the expected primary data from tea workers of Ootterbhag and Indanugger tea estate of Rajnagar upazila. Additionally, various secondary data was supplemented from different sources. A random sampling method was used for selecting the samples. In total 100 respondents were chosen randomly among 720 workers. Data was collected through questionnaire by personal interview method. The data and information were collected from the sample tea workers from November/2018 to December/2018.

2.2 Data Analysis and Techniques

To achieve the objectives, a combination of descriptive and statistical techniques as demanded by the study was used. Various descriptive statistical measures (i.e. sum, average, percentages, and ratios.) were calculated. Risk facing index, food consumption score, food security index and binary logistic regression analysis were done to fulfill the objectives of this research. STATA 2014 software was used for the analysis.

2.2.1 Risk facing index

Risk were measured in terms of hazards and based on the perception of the workers. Similar with Borgohain [19], present research considered psychological, mechanical and biological hazard encountered by the workers. In this research, risk facing index were calculated and rank have been assigned to find out the highest categories of problems faced by the respondents.

Risk Facing Index (RFI) = 3×H+ 2× F+ 1×L+ 0×S

Here, H, M, L and S means total number respondents mentioning high, fair, little dissatisfaction and satisfaction as a risk of a particular statement respectively.

And RFI= 2× A+ 1×D, where A and D denote agree and disagree with the problem statement respectively.

2.2.2 Determination of household food security

Access to food was measured on the basis of ability to have meals per day. The respondents were directly asked to mention whether they were able to have three meals/day, two meals/day and one meal/day over a period as per described by Talukder [20]. Scores assigned were 1, 2 and 3 for taking 1 meal, 2 and 3 meals per day respectively.

2.2.3 Food consumption score of the respondent

There are two standard threshold levels for food consumption score (FCS) that has been pointed out by WFP [21,22,23]. WFP (2008) defined the FCS as follows: "*FCS is a score calculated using the frequency of consumption of different food groups consumed by a household during the seven days*." The interviewee is asked to respond to the frequency of consumption (in days) for different food groups over a period of time. Different weight has been given to different groups based on nutrient content presented in table 1. To get an individual score for the food group weighted were assigned and have been multiplied by the frequency [21,22,23]. The summation of all food score values provides the final FCS. Similar with Kabir [23,24], the following equation shows the calculation procedure of FCS-

$$FCS = bstapleXstaple + bpulseXpulse + bvegXveg + bfruitXfruit + bmeat\&fishXmeat\&fish + bsugarXsugar + bdairyXdairy + bdairyXdairy + boilXoil$$

It distinguishes the food consumption level. The need of a second limit level emerges due to regular consumption pattern of oil and sugar in some region. Therefore, this threshold level is used for a region or area where oil and sugar consumption are frequent presented in table 2. Oil and sugar simultaneously compose the base of 7 for FCS as their weight is 0.5. Therefore, the standard threshold just raised by 7 points for each three group of consumption level [24,25].

Household calorie availability was estimated using food nutrient composition adopted from WFP 1988, retrieved from [24,25] which is presented in Table 3.

Daily per capita calorie consumption was estimated by dividing the estimated daily calorie supply to the household by the household size [26]. Food security index (Z) was constructed and food security status of each household was determined based on the food security line using the recommended daily calorie intake approach. A household with 2122 kcal per capita consumption [27], was regarded as food secure and the family who were below regarded as food insecure households. The mathematical representations are as follows: Food Security Index, $Zi = Yi/R$

Where, Z_i= Food security status of i^{th} households which take values of 1 for food secure households or 0 for food insecure households; Y_i = Daily per capita calorie intake of i^{th} household; and R = Recommended per capita daily calorie intake. Based on the household food security index (Z), the Logit model was estimated to identify the factors affecting food security status.

The dependent variable is assumed as dummy in nature. 1 = Food secured and 0= Not secured. The list of independent variables with their category and codes which are used in this analysis presented in table 4. A typical logistic regression model used took the following form: Logit $(P_i) = \ln (P_i / 1 – P_i) = \alpha + \beta_1X_1+…..+ \beta_nX_n + U_t$

Pi represents the probability of a household to be food secures and (1 –Pi) represents the probability of a household to be food insecure.

3. RESULTS AND DISCUSSION

3.1 Vulnerability of the Tea Garden Workers

There are more than 12 castes among the tea workers including Bengali workers (10%). Generally, in Bangladesh, the male members are dominating than female members in the household as they are the main income earning persons [8], but in this study area the scenario is far different (71.0%) were female headed while 29 households (29.0%) were male headed. Among all household members, most of the respondents (92.00%) belonged to 15-54 age groups which are economically active group. Only 8 respondents (8.00%) belonged to 55 or above age category while none was under 15 ages. The average age of the household head was found to be about 31 years.

3.1.1 Dependents in the household

The family size and its composition are related to both income pattern and occupation. In this present study a family has been defined as a group of persons living together and taking their meals from the same kitchen. The average family size of the study area was 4.51 appeared to be slightly higher than the national average 4.06 [27]. Among the respondents, 90% of the respondents have two or more earning members in the family. Only 10% of the workers are the only earning member of the family. Only 7% of the respondents have mentioned that one of their family members is working outside the tea garden.

3.1.2 Education

It was observed from the analysis that 52% sample respondents were illiterate and 48% literate, in which 33% had sign only, 14% primary level, 1% secondary level, no one has higher secondary level and Graduation and post-graduation degree.

3.1.3 Wage structure

It is found that most of the tea garden workers inherited their occupation from their parents. Almost all of the family member's profession was found as daily laborer working in the garden. The respondents are categorized into two groups (permanent or not) to find out the respondent job status. The data revealed that 96% of the respondents are permanent and rest 4% of the respondent are casual workers. As the wages of the workers are fixed on the basis of the memorandum of agreement signed between employers represented by Bangladesh Tea Association (BTA) and the tea plantation workers represented by Bangladeshio Cha Sramik Union (BCSU) it may vary depending on registered and not-registered workers. According to the latest agreement on 2020 the permanent workers are getting Taka 120 per day but for this research the data were collected from the laborers in 2018 when the wages was Taka 102.00 per day. The wage structure of the laborer was on weekly basis. It is found that the daily wage of the workers is same (Tk. 102.00) irrespective of permanent, casual, male, female and adolescent workers. The average monthly salary of worker is Tk. 2652. The ration commodities procured from the government at subsidized prices (BDT 2 per kg) and the prices of both rice and wheat were the same for the workers. Each worker is

provided a simple ration card giving his/her personal details. If both husband and wife of a family are workers, a maximum of three dependents are entitled to get ration of that family. If a family has 2 or more permanent worker in the family, each of them will get the allocated ration. Weekly ration for 1 to 8 years old dependents are 1.5 kg., 9 to 12 years old dependents are 2.50 kg. and who are more than 12 years old are not entitled to get ration. A worker gets 3.5 kg. of rice or wheat per week (0.5 kg per day). The average rations that the respondents have got per week were about 4.6 kg. It is obligatory for the tea garden authority to employ at least one of the families (son/daughter) of a worker in the particular garden by agreement.

3.1.4 Income and expenditure

Annual household income of the tea workers was Tk. 49645 (586 US$) which is equivalent income of Tk 137 (1.62 US$) per day for a family. Considering 4.51 average family members the respondent family household is far below the international poverty line (1.90 US$). Household annual expenditure was Tk. 47496 (560 US$) of which about 62% of total expenditure were spend on consumption of food items, 22% for education, 12% for clothing, 10% for medicine and rest 4% for others such as communication, transportation, housing, festivals, feed for cattle and livestock.

3.1.5 Type of house, Sanitation and toilet facilities

There are quarters for the permanent workers and they get the repairing facilities from the authority too. Three types of housing structure have seen where 18, 74 and 8% of the workers lived in i.e., *Pucca* (building), *Kutcha* (house made with mud wall and tin), and houses made with bamboo and grass respectively. 68% of the respondents have mentioned that the accommodation provided by the authority is sufficient for their family while, 32% have stated that the house is not sufficient for living. It is not healthy to stay in such small houses where they had to share the rooms with several members of the household. It is a matter of concern that the sanitation facilities is very poor in research area. 21% of the respondents have mentioned that they do not have any toilet at all. About 79% respondents have toilet at their home of whom 31% have sanitary toilets and the rest of them use traditional toilet. These toilets are direct pit toilets (without water seals) connected to open pits. The construction is mostly made of tin walls and roof. It was found that open defecation is a frequent phenomenon among the tea garden workers. This practice has serious adverse effect on their health and environment as well. This demonstrates the lack of awareness of the workers about hygiene and healthy life. Among the respondents 17% set up toilets at their own cost, 38% have got assistance from the authority and 45% mentioned that they did not get any assistance from the authority to set up toilet.

3.1.6 Access to drinking water, gas and electricity

Almost all of the respondents have mentioned that they have access to tube-well for drinking water. All of the labor lines have more than two tube-wells with 4 to 5 families sharing a tube-well. These tube-wells are provided by the authority. But the workers expressed dissatisfaction over sharing the tube-well with more than two families. The garden has electricity access inside it. Most of the houses have electricity access. Every household has to pay for the electricity use that has connection. 10% of households in the labor lines of the garden have no electricity connection and 90% of the houses have electricity connection provided by the government agencies. Some of them mention that they are not taking the electricity connection due to poverty. Though, the garden has gas connection, only the factory and managerial staff use gas in their houses. Thus, they mention that they cannot afford the cost of getting energy.

3.1.7 Membership of organizations, access to credit and saving

The organization includes different co-operative societies, NGOs, social institutions which help the tribal people to share their common economic social and cultural problems. A large number of respondents were member of any organization which is 88% of total respondents while 12% were not member of any organization. In the tea worker communities, most of the people take credit from different NGOs and banks. The credit accessibility of the respondents revealed that only 25% sampled respondent had access to credit while 75% had no access to credit. It was found that only 31% respondents had savings and 69% had no savings.

3.2 Risk Faced by the Respondents

Psychological hazards refers any difficulties that affects mental wellbeing of tea worker, which results redundancy on work chores. Observed from Table 5, most dissatisfaction was related with their job because of minimum wages which led them to lower per capita income, they also had dissatisfaction with the weekly ration. They had problems regarding sanitation facilities, especially women workers faces difficulties and various health issues.

The Table 6 depicts the risk facing indices of mechanical and biological hazards. Long hour physical work make tea-workers vulnerable to sprains. Nonetheless, the maximum respondents also agreed that they faced hazards of cuts and injuries for using traditional tools or their own hands. They also face challenges with insect bites, fungal infection, malaria etc. Half of the respondents said that they had ulcer, some other also attached with eczema. According to them, nutritional imbalance, narcotic uses, and food insecurity were the causes of their health hazards.

3.3 Food Security Status of Household

3.3.1 Access to food

Number of full meals taken by the family members/day is shown in Table 7. In a normal situation, most of the household had enough food availability. However, during adverse situation, 15% of the respondents shift their response from at least two meal to one meal per day. This might be due to low wage rate, lack of employment and income generation activities for both male and female members of the households.

3.4 Food Security Status as Household Calorie Availability

From the analysis of FCS it has found that 49% respondents are in borderline food consumption pattern and 5% respondents consumption pattern are in poor level. The other 46% of the respondent consumption score are in acceptable level.

Table 8 illustrates average per capita per day intake of calorie for all food items consumed by the respondent's family. The overall average daily per capita calorie intake was observed to be 2076.3996 kilo calorie, which is lower than the national average Bangladesh. The highest average per capita per day kilo calorie intake was received from the rice consumption which is 3696.929 kilo calorie. The second highest contribution to calorie intake came from wheat/flour consumption which was followed by pulse consumption.

Table 9 shows the results for food security situation of the selected households of the study area. According to the results, 65% of the sample households are measured to be food insecure whose average per capita calorie availability were below 1 (0.77) and 35% households are food secure whose average per capita calorie availability were above 1 (1.36). Compared to national average of 2122 kcal, calorie intake of food secured households was 2891.055 kcal and food insecure households was 1637.738 kcal.

3.5 Factors Influencing Food Security Status of the Tea Garden Workers

Results of logistic regression model are presented in Table 10. Household income, family type and no. of dependent person in family were found significant determining factors of food security in a household. It was obvious that the high income, small family size helped a family to be food secured than others. The income is expected to boost household's food production and also access to more quantity and quality food. Household income had significant effect on food security status. The food security status of higher PCI (Per Capita Income) family was additional 0.953 units in index compare to families whose income were less. Family type or size was statistically significant on food security status. The food security status of nuclear families was additional 1.115 unit higher than the families who had joint family. Large household size exerts more pressure on consumption. The food availability declines as family size increases due to population growth. Hence, large family size is more likely related to being food insecure in a household. Having minimum dependent person in a family also found significant than the families who had high dependent persons in family.

Consistent with other study by [28,29] the life of tea workers in Ootterbhag and Indanugger tea estate of Bangladesh are vulnerable. Wages are not adequate to meet basic needs and the wage raises are not keeping pace with the cost of living, results support the study reported by [29]. Considering 4.51 average family member the

respondent family household is far below the international poverty line (1.90 US$). Therefore, increase of daily and monthly wage and other compensation is most essential so that workers can get rid of deficiencies. Provision of providing sugar and lentil as ration can be introduced along with rice and wheat would be helpful to improve worker's health and nutrition.

These results agree with those reported by [30] who established the importance of the socioeconomic conditions of agricultural towns in Panama, this study being fundamental to understand the vulnerability of the population in terms of food security. [29]. Also [30], coincide with our results, due to the vulnerability of the population in terms of food security.

It was observed from the analysis that 52% sample respondents were illiterate, these results coincide with those indicated by [31-33]; which establish that this characteristic of the population has a significant impact on the quality of life in the agricultural areas of Nigeria and Venezuela. Nonetheless, the maximum respondents also agreed that they faced various psychological, mechanical and biological hazards, including health problems and there are lack of medical facilities, results similar to study of [29,34]. Both formal and non-formal education may be introduced for the children, awareness campaign regarding, nutrition, health and sanitation practices through motivational programs among the workers must be undertaken. In this sense, the results of [35-37] agree that awareness and education programs would help motivate agricultural workers and manage knowledge for collective benefit.

The workers cannot afford the cost of energy and electricity due to their limited wage. Easy access to gas and electricity with free of cost would be very helpful for the community, hence, authority in collaboration with the government and NGOs might take necessary action. Food consumption score has found that 49% respondents are in borderline food consumption pattern while 5% and 46% are in poor and acceptable level respectively. The overall average daily per capita calorie intake by tea workers was observed to be 2076.3996 kilo calorie, which is lower than the national average of Bangladesh. Due to lower wage pattern, limited access to nutritious food and high price of food products they have to face food insecurity. Most of the households were measured to be food insecure whose average per capita calorie availability were below 1 (0.77). Though it was hard to consider all the determinants of food security, among independent variables considered, household income, family type and no. of dependent person in family were the significant factors that affecting food security status of the tea workers. These results agree with the findings of [33,38,39], while study found age and education influenced household food insecurity [33], gender, education, farm size, and expenditure had effect on the income vulnerability of tea workers of Bangladesh [40]. These indicate the need to continue investigating the social, agricultural and economic characteristics of agricultural working environments.

In this context, this type of study developed in Bangladesh, becomes an instrument to achieve a better use of land based on economic, ecological and social sustainability. Within this theme, the agriculture developed by the tea workers from Ootterbhag and Indanugger tea estate of Moulvibazar will be seen to benefit as more rational use of natural resources is achieved, through planning and ordering of space.

Table 1. Food groups and weights for calculating FCS

Food Items	Food Groups	Weight
Maize, maize porridge, rice, sorghum, millet pasta, bread, cassava, potatoes and sweet potatoes and other cereals.	Cereals and Tuber	2
Beans. Peas, groundnuts and cashew nuts	Pulse	3
Vegetables and leaves	Vegetables	1
Fruits	Fruits	1
Beef, goat, poultry, pork, eggs, and fish	Meat and Fish	4
Milk, yogurt, and others dairy products	Milk	4
Sugar and sugar products	Sugar	0.5
Oils, fats, and butter	Oil	0.5
Condiments	Condiments	0

Source: WFP 2008

Table 2. Threshold level for FCS

Threshold	Profile (Food Consumption)	Threshold with regular oil and sugar consumption level
0-21	Poor	0-28
21.5-35	Borderline	28.5-42
>35	Acceptable	>42

Source: WFP&FAO 2008, Kabir, 2018 [23,24]

Table 3. Nutrient composition

Items	Energy (per 100 gm.) kcal	Items	Energy (per 100 gm.) kcal	Items	Energy (per 100 gm.)kcal
Coarse Rice	365	Meat	146	Duck	205.97
Atta (Wheat)	341	Beef	136.40	Milk (Cows)	70
Dal	344	Mutton	194	Oil (Soybean)	900
Lentil	343	Chicken	125.29	Spices	146
Fish	159	Duck	130	Onion	50
Rohi	120.55	Vegetables	48	Garlic	145
Telapia	127.50	Potato	80.20	Chili	40.71
Mrigal	98	Brinjal	42	Turmeric	349
Pangas	170.23	Helenchashak	41	Dry fish	279.79
Sarputi	161	Data shak	28.66	Hen	153
Egg	179				

Source: WFP, 1988 [25,26]. Note: 1 medium egg is 63 to 73 gram (average 68 gram)

Table 4. Independent variables with their category and codes

Variables	Category and codes	Variables	Category and codes
Gender of household head	Male=1, Female=0	Association with cooperatives	Yes-1, No=0
Household income	Above PCI=1, Below PCI=0	Loan accessibility	Yes=1, No=2
Educational status	Literate=1, Illiterate=0	No. of dependent persons in family	Low=1, High=0
Family type	Nuclear family=1, Joint family=0	Safe drinking water facilities	Yes =1, No=0

Table 5. Psychological hazards faced by tea workers in Moulvibazar, Bangladesh

Sl No.	Problems	Extent of problems				RFI	Rank Order
		Highly dissatisfied	Fairly dissatisfied	Little satisfied	Satisfied		
		3	2	1	0		
1	Employers attitude	4	7	73	16	99	8
2	Sick leave	2	34	62	2	136	6
3	Maternity leave	2	32	66	0	136	6
4	Satisfaction with weekly salary	51	37	12	0	136	6
5	Satisfied with job	13	54	33	0	239	1
6	Satisfaction with weekly ration	17	54	29	0	180	3
7	Sanitation facilities	0	28	61	11	188	2
8	Scope of child education	0	21	54	25	96	9
9	Satisfaction with medical facilities	8	57	35	0	173	4

Source: Author`s calculation, 2018

Table 6. Mechanical and Biological hazards faced by tea workers in Moulvibazar, Bangladesh

Sl. No.	Problems	Extent of Problems		RFI	Rank order
		Agree	Disagree		
		2	1		
Mechanical Hazards					
1	Cuts	85	15	185	2
2	Injury	86	14	186	1
3	Sprains	82	18	182	3
4	Others	2	76	80	4
Biological Hazards					
1	Insect Bite	90	10	190	1
2	Fungal infection	16	84	116	5
3	Malaria	51	49	151	2
4	Ulcer	51	49	151	2
5	Dermatitis	2	98	102	6
6	Eczema	48	52	148	4

Source: Author`s calculation, 2018

Table 7. Distribution of the respondents based on the number of meal taken per day

Status of access to food	Normal situation		Adverse situation	
	No. of respondents	Percentage	No. of respondents	Percentage
Three meals/day	98	98	30	30
Two meals/day	02	02	55	55
One meal/day	00	00	15	15

Source: Author`s calculation, 2018

Table 8. Calorie intake from different food items by family members of the households (Kcal/day/capita)

Food items	Calorie intake (kcal/capita/day)
Rice	**3696.929**
Wheat/Flour	**1797.557**
Vegetables	594.7669
Pulse	**1076.229**
Fish	396.1371
Eggs	169.3647
Chicken	244.2409
Beef	194.8571
Duck	18.57143
Edible oil	125.4857
Garlic	112.6857
Sugar	294.991
Chili	17.30175
Onion	129.2857
Turmeric	118.4107
Tea	7.951
Dried fish	191.856

Source: Author's estimation based on field survey, 2018

Table 9. Food security indices of tea workers in Moulvibazar, Bangladesh

Particulars	Food secured households	Food insecure households	All
Food security index	1.36	0.77	0.978
Percentage of households	35	65	100
Per capita daily calorie availability (Average)	2891.055	1637.738	2076.399

Source: Author's estimation, 2018

Table 10. Binary logistic regression analysis of factors influencing food security status of the tea garden workers

Independent variables	Co-efficient (β)	*P*-value	Odds ratio
Safe drinking water facilities			
Yes®	---	---	---
No	-22.214	0.999	0.000
Gender of Household head			
Female®	---	---	---
Male	1.734	0.104	5.662
Household income			
Below PCI®	---	---	---
Above PCI	0.953	0.063*	3.341
Educational status			
Illiterate®	-------	---	---
Literate	0.842	0.429	2.593
Family type			
Joint®	-_-----	---	---
Nuclear	1.115	0.026**	1.328
Association with cooperatives			
No®	---	---	---
Yes	-0.138	.0872	0.871
Loan accessibility			
No®	---	---	---
Yes	0.270	0.748	1.310
No of dependent person in family			
High®	---	---	---
Low	1.846	0.016**	1.697

*Source: Author's estimation based on field survey, 2018. Note: ®denotes the reference category; *and ** indicates the levels of significance at 10 and 5% respectively*

4. CONCLUSION

As Bangladesh is marching towards becoming a middle-income country, it is right time to mainstream all the communities in the path of development by fulfilling their basic rights. Hence, it is highly essential to increase the daily wages, ration, sanitation, healthcare and education facilities of the workers and their family members. Appropriate wage, fulfillment of basic needs and healthy food intake can improve the productivity of the laborers. It is also pertinent to create a good relationship among owners, managerial staffs and workers. The study covers only one tea estate of Bangladesh, therefore, the findings of this study should be interpreted with considerable caution to generalize for the all tea garden workers as a whole. The recommendation for future research is to replicate the research with a large sample size that spread over different tea estates of Bangladesh.

CONSENT

As per international standard informed and written participant consent has been collected and preserved by the authors.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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