International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2020): 7.803

Tea Garden Workers and their Food Security Assessment

Shubhankar Das[1], Mashrat Jahan[2*], Kaynath Akhi[3], Sajia Sharmin[4]

[1, 2, 3, 4]Department of Agricultural Economics, Faculty of Agricultural economics and rural development, Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Bangladesh

*Corresponding Author Email: *mjahan.aec[at]bsmrau.edu.bd*

Abstract: ***The study analyzed the food security of tea garden workers in BarlekhaUpazila of Moulvibazar districtin Bangladesh. A total of 100 respondents (from three tea garden New Somonbag Tea Garden, Patharia Tea Garden and Mukam Tea Garden) were interviewed to evaluate the food security. This study also deals with different aspects of food security and socio-economic conditions of tea garden worker. Analytical techniques employed included descriptive statistics of respondents' characteristics and linear regression analysis to identify factors affecting calorie intake. It was found that literacy rate of the tea garden workers was 47 percent out of which 33 percent were primary level and 13 percent were secondary level. Average Body Mass Index (BMI) 19.9 which was normal. The study found that average daily per capita calorie intake by tea garden workers was 2013 kcal lower than the national average of 2200 kcal. In addition, around 46.98% of the total calorie intake was received from the rice and 32.08% of the total calorie intake was received from the wheat consumption. Ordinary Least Square model analysis result showed that factors such as, food expenditure, family size, household labour, farm income and agricultural land of households were positive and significant influence on calorie intake. It has been suggested in the study that all out efforts must be made to raise awareness among the tea garden worker about food security and related matters.***

Keywords: Food security, Socio-economic condition, Tea Garden, Tea garden workers

1. Introduction

Tea is the important agro-industrial crop of Bangladesh and is one of the major foreign export earners. It is consuming by a wider section of people of the country and the taste of Bangladeshi tea is popular within and outside the country of origin. Around 2% of world tea production is recorded in Bangladesh by exporting which in different countries Bangladesh earns US$25 million every year (BBS, 2016). Although tea is an important commercial crop in Bangladesh, the livelihood patterns of the laborers working in the different tea gardens are exceedingly miserable and untowardly. Deliberate social exclusion, ignorance, illiteracy and economic hardship force them to maintain a traditional life even with minimum opportunities (Ahmad *et al*., 2015). The tea industry in Bangladesh is an agro-based labour intensive industry which demands the laborious involvement of workers at every stage of production. The British colonial planters brought workers (Adivasis/ indigenous people) for tea gardens from Assam, Bihar, Madras, Orissa and other parts of India (Sen, 2002). Historically, the opening up of tea and other plantations worldwide has been built on migrant unskilled labor and women workers constitute the majority of workers of tea garden in India and Bangladesh (Wal, 2008). The reliance of families on the tea plantations for food, water, shelter, education, health and sanitation makes them extremely vulnerable to closures. After passing from the lower primary schools of the gardens, they are forced to join the tea labor workforce as unskilled workers with no educational and alternative employment opportunity. Generation after generation, they remain tied to the gardens. They born in the gardens and die in the gardens. They are the epitome of modern day-basis labor the forced and unfree labor (Lahiri, 2000). Tea garden workers are nearly 14% of the total ethnic minorities and 0.22% of the total population in Bangladesh. According to Bangladesh Tea Board, there are 89,812 registered and 19,592 casual laborers working in 163 tea gardens. Among them 44.1% are men, 43.8% are women and rest 12.1% are adolescents. Workers of tea gardens, in total, are deprived of housing, food, clothing, health, education, etc. which are basic human rights. High rate of illiteracy, ignorance, social exclusion, economic hardship, etc. bound them to maintain traditional life without minimum opportunities (Ahmad *et al*., 2015). At present the production of Bangladesh tea is increasing @ 1.16% per annum whereas consumption is increasing @ 6.5% per annum (Saha*et al*., 2017). So, in order to meet the increasing domestic consumption, productivity should be increased by increasing the efficiency of tea labourer. Productivity mainly depends upon the working efficiency of tea workers. Women tea workers mainly work in the garden and pluck leaves. While, male workers mostly work in the factory and in garden. They make drainage, provide irrigation, fertilization and pruning. The tea garden workers are considered to be among the poorest and most deprived section of organized labor (Sankrityayana, 2006). Labour may be considered as raw material in tea production. Labour cost on different operations incurred 40.85% of the total cost (Saha, 2001). Manpower development will enhance the tea output and improve the quality of tea and simultaneously reduce the cost of production. The tea industry offers rural employment (more than 118,000 tea workers) opportunities especially to women and contributes to poverty reduction in the rural areas (ITC, 2011). Workers living in tea gardens are not facilitated with sanitary toilet rather majority of them are used to use open place for excretion of feces, even they are very unaware of or often ignore their rights regarding sanitation (Ahmed *et al*., 2006). People often must draw on the help of other family members (including children) to meet this target. If they fall in short, their wages are cut, but they get additional remuneration for plucking extra leaves. However, there are common complaints that plucked leaves

are not weighed accurately, meaning workers get underpaid. Working hours are supposed to be eight hours per day, with typically only one short break for lunch; but workers can be forced to work two shifts consecutively in peak seasons in some cases, for no extra pay. Moreover, the requirement to meet a daily target or lose wages means that workers can often end up working longer hours (Masum, 2016).Food security achievement is the key development priority for all developing countries such as Bangladesh (Parvin and Ahsan, 2013). Food availability refers to the physical presence of food at various levels from household to national level, be that from own production or through markets (FANTA, 2006). Poverty is another factor that makes access to food difficult and ultimately create food insecurity (Bishwajit*et al*., 2014). Income inequalities have made food access difficult economically. The food intake should concern both enough calorie intake and nutritional adequacy to ensure good health and reduce morbidity rates (Mittal and Sethi, 2009). For realizing the status of middle-income country and ending poverty, it is important to increase labour productivity. Proper wage and fulfilment of basic needs can improve the productivity of labourers. So, it becomes necessary to investigate into the livelihood and poverty level of the tea garden workers as they are the most isolated community in the society. Their living conditions and dietary diversity status are very effective tool to investigate overall livelihood status in this regard. Moreover, health, literacy level, wage rate, food consumption patterns are very significant for improving their livelihood and basic human rights.

Food security is of prime concern in Bangladesh, despite marked improvements in food production and the incidence of poverty since the country's independence in 1971. The rate of poverty decreased from 48.9 per cent in 2000 to 24.3 per cent in 2016 (The World Bank, 2017) while the population growth rate has decreased from 2.4 in 1970 to 1.47 in 2011 (BBS, 2013). About 852 million people worldwide are chronically malnourished and over 60% of the world's undernourished people live in Asia; while a quarter live in Africa (Ayantoye*et al.*, 2011). The Food and Agricultural Organization (FAO) noted that between 2006 and 2008, 850 million people worldwide (13% of the population) were undernourished. Although this figure is an improvement over the 2000-2002 estimates of 836 million, much more efforts need to be put in to ensure the attainment of MDG 1 targets (FAO, 2011). Around 55 million people consume less than the minimum daily recommended amount of food (HIES, 2015). Ensuring food security for all is one of the major challenges that Bangladesh face today. This is almost synonymous to agricultural development in Bangladesh, as income and livelihood of the vast majority population directly or indirectly depends on agriculture. In developing country like as Bangladesh the extremely low income of the majority of the people pushes health care to low priority.

The food requirement of a person working in the informal sector in the tea garden is the same as other people and infact more (Jha, 2003). In Sylhet division of Bangladesh, 20% households are below the line of acceptable but low food consumption and 32% households receive cash support from various social safety net programs (Chowdhury *et al*., 2011). In the country context, food security is grossly measured in term of food availability at the national level compared with needs as well as import requirements compared with the countries capacity to import. National availability and household access to food alone are not sufficient to guarantee food security. It is also important how household members utilize the food (FAO, 2001). From above discussion it is clear that tea garden workers' food security is not kept in mind because their effort that they provide to their job and what they get in return are not equilibrium. They are deprived of not only in the field of their job, but also in all other fields like nutrition and health.

The main focus of the study was to determine the existing food security status and factors that effects food security of the tea garden worker in Moulvibazar district and identify ways of improving the status. Overcoming challenges to food security has played and continues to play a significant role in the development agenda of Bangladesh. Bangladesh's food security is still fragile and major challenges remain (Noman, 2013). Tea garden workers are the major part of tea production. But now-a-days numbers of workers are decreasing day by day for very poor salary, vulnerable living and socio-economic conditions (Ahmad *et al.*, 2015). As they are less facilitated, thus they are remaining in a traditional system and maintain some other negative social and cultural practices. Child and early marriage, unscientific food practice and personal hygiene are very common which are also acting negatively. Unhealthy working environment and occupational health hazards remain unchanged and limited facilities bound them to cope with situation without any question (Majumder and Roy, 2012).

A century later tea garden worker still found themselves illiterate. Their food insecurity, poor housing conditions, low wages, long working hours, social discrimination, deprive of many human basic needs and rights are well known for the sake of our media that every human being must have for personal as well as societal progress. These conditions make sure that the children of tea workers can do nothing else but become tea workers. Ownership, rights of the tea workers and their struggle for legitimate demands, the use of land granted for tea cultivation and different trends of tea production also help to understand the conditions in which the indentured tea garden workers have been confined. Since tea industry is a great source of revenue a large number of laborer force are working here, most of the laborer claim to be increased their wages and fringe benefit, so the study has a greatest importance for the sake of the country.

Most of the studies done on food security and dietary diversity issues in Bangladesh were not in the context of tea workers. Though a few studies were found in Bangladesh, they were not closely related to the dietary diversity and food security of tea workers. Considering this research gap, the present study is an attempt to amplify strategies that will simplify the accessibility of food at individual and household levels for the tea workers in Bangladesh. Moreover, the present research has taken an initiative to understand the factors that influences the food security status of the individuals as well as find their food security status.

2. Data & Methodology

In order to collect reliable and valid information from the respondent, an interview schedule was prepared carefully keeping the objectives of the study in mind. The schedule contained both open and closed ended questions. Primary data were collected through face to face interview by the researcher. To get valid and relevant information the researcher made all possible efforts to explain the purpose of study to the respondents. Rapports were established with the respondents prior to interview and the objectives were clearly expressed to avoid bias in data collection.

2.1 Empirical model

Ordinary Least Squares (OLS) method was chosen to estimate the relationship between dependent and independent variables. For exploring relationships between dependent and independent variables Coefficient of Correlation (r) was employed. The linear model is given below-

$Y=\alpha+b_1X_1+ b_2X_2+ b_3X_3+ b_4X_4+ b_5X_5+ b_6X_6+ b_7X_7+ b_8X_8 +U_i$ (1)

Where,

Y= Calorie Intake (kcal/day/person)

X_1= Age of the Respondents (years)

X_2 = Education of the Respondents (class)

X_3 = Family Size of the Respondents (Number)

X_4 = Household Labor (Number)

X_5 = Household Food Expenditure (tk.)

X_6 = Household Farm Income (tk.)

X_7 = Agricultural Land (decimal)

X_8 = Livestock Wealth (tk.)

α = Intercept

U_i= Error Term

$b_1, b_2 \ldots\ldots b_8$ = Coefficient of Respective Variables

Table 1: Nutrient Composition of different Food Items

Items	Energy (per 100 gm.) kcal	Items	Energy (per 100 gm.) kcal	Items	Energy (per 100 gm.) kcal
Rice	365	Spiny gourd	61	Soya bean oil	900
Wheat	339	Lal shak	26	Mustered oil	900
Egg	139	Mukhi (eddoes)	120	Banana	95
Milk	63	Ribbed Gourd	60	Guava	63
Chicken	128	Rui	90	Onion	59
Pigeon	141	Shorputi	175	Garlic	147
Potato	67	Mola fish	106	Ginger	72
Lady's finger	39	Chana dal	364	Turmeric powder	335
Pumpkin	18	Lentil	317	Coriander powder	336

Source: USAID, 2010

Note: 1 medium egg is 63 to 73gram (average 68 gram). 1 medium size banana average weight 60gram, 1 medium size guava average weight 80 gram

An individual intakes calorie through consumption of different food ingredients like cereals, meats, milk, eggs, pulses, oils, vegetables, fruits etc. Each item of these food ingredient contains different amounts of calories.

Total calorie needed by the family members was known from the average Recommended Desired Intake (RDI) (kcal/capita/day) of food item which employed the rate of dietary needs as 2200 kcal/ person/day (Anonymous, 2008). The respondents were distributed according to their calorie intake (per capita/day). Calorie level is group into four categories: much below optimum (Up to 1800), below optimum (>1800-2122), optimum (>2122-2444), above optimum (>2444) (Bidita, 2012). The respondents were asked about their intake of different foods items during the last seven days of the interview. Calorie obtained from all the food items were than estimated following conversion rate given in Table 1. Than per person calorie consumption was estimated by dividing number of household members. Finally, calorie consumption was measured at per day.

2.2. Body Mass Index Measurement

Body mass index was measured by dividing the weight of the respondents by the square of height of the respondents. It's a function of weight and height; the equation of BMI given below-

$BMI=[W(kg)]/[H(m)^2]$(2)

Where,

Weight of the respondent= W

Height of the respondent= H

Height and weight estimated the researcher during interview by using measuring tape and weight machine.

3. Results and Discussion

3.1 Socio-economic and demographic results

To get a complete and accurate scenario of food security status of the respondents, it is required to know their socio-economic characteristics. An effort has, therefore, been made to describe briefly some of the socio-economic and demographic characteristics of the respondents that may influence their food security status.

Table 2: Demographic Characteristics of the Sample Households

Characteristics	Categories	Percentage of the respondents
Marital Status	Unmarried	5
	Married	86
	Widow	9
Household Size	Small (1-4)	30
	Medium (5-7)	50
	Large (above 7)	20
	Average household members	6
Household structure	Tin shed	5
	Half pakka	42
	Pakka	3

	Mud	50
Water source	Cisterns	89
	Shallow Tube Well	11
Sanitation	Sanitary	2
	Bamboo made	98
Health facility	Upazila hospital	5
	Garden hospital	95

Maximum 86% of the respondents were married, 9% widow and only 5% respondents were unmarried. The common trend with the tea garden workers was to get married at early age. On basis of household size tea garden workers were classified under three categories small, medium and large. Fifty percent of the respondents were medium (5-7) size family, 30% small (1-4) size and 20% large (more than 7) size family. Average household size was 6 people per family.

Most of the respondent (50%) had mud house. Mud house is made of mud, bamboo and tin. Forty-two percent of the respondent had half pakka house. Half pakka house has brick made wall with tin shed. While 5% tin shed house and 3% pakka house of the respondent. Tin shed house is completely made of tin and pakka house is completely made of brick. Safe drinking water is essential to humans and other life forms even though it provides no calories or organic nutrients. From the study findings it was seen that tea garden worker has no own tube well for drinking water. Most of the tea garden worker are not aware about pure drinking water. Pure drinking water crisis is high in tea garden areas. Most of the respondents (89%) use cisterns water for their daily use, bathe and drink. Only 11% of the respondent use shallow tube well water for their daily use. People use cisterns water because tea garden are located in hilly area. In hilly area set up a tube well is difficult because depth of water layer is more than 300 feet. Plane area of garden tube wells are mainly founded. But maximum people did not use this water because they live far away from the tube well area. They use water form cisterns which is unsafe and unclean.

Tea garden workers are marginalized and disadvantage. These people have limited knowledge about sanitation and hygiene. In the tea garden areas, the workers use unsafe and damage latrine with their neighbors jointly. Majority of the respondents use bamboo made latrine (98%) while only 2% use sanitary latrine.One 55 years old female participant shares her experience: “I face problem due to damage latrine because I feel insecurity for falling in waste when I use it. In this area the number of latrine is fewer with a view to huge people. Our latrine uses 3 families, so we wait for using toilet when anybody uses it, but nobody repair it. This damage latrine creates bad smell and spread with air”. Garden hospital provided primary health service. Medicine of general diseases also provide in here. In critical disease, they refer to UpazilaSadar Hospital and so on. Tea garden authority bears all cost of these services. Tea gardener worker said different condition about the service of the hospital. But the quality of it is not good. But most of the respondent (95%) took primary service from garden hospital only 5% of the respondent use Upazila Sadar Hospital.

The electricity facility in the tea garden is not good. People of higher authority get the benefit of electricity but the tea worker hardly gets this chance. Half of the respondents enjoyed the electricity facility while others had no electricity.

3.2. Satisfaction on the Trade Union and salary

There is a trade union in this garden. But this is just defective. As they said that “the trade union is an organization that is existing only by name”. Only few respondents who were the member of trade union. In spite of the slow activities of the trade union, some people showed satisfaction by the activity of the trade union. But the most people are not satisfied on trade union activities. Maximum of the respondents (45%) are not satisfied with the trade union activities. While 18% of the respondents did not want to express their opinion. No employee is satisfied with their salary they get for their work. The tea garden worker also dissatisfied with their salary. Salary paid at the end of weekend in every Wednesday. They get salary in per day basis. Per day they get Tk. 102 and weekly Tk. 714. They were not satisfied with this salary. Maximum 84% of the worker was not satisfied with the salary they got. They said several times they strike for increase their salary but company not interested to increase their salary. Due to low salary they lead a miserable life. They could not fulfill their basic need with this low amount they get as salary.

Table 3: Level of Satisfaction on the Trade Union and salary

Category	% of population		
	Satisfied	Not satisfied	Neutral
Trade union	37	45	18
Salary	16	84	0

3.3 Ration Facility of the respondents

More or less all the worker get wheat as ration. The amount of ration depends on their agricultural land and number of family member work in the garden as an employee. Fifty-seven percent of the respondents get more than 3.5kg of wheat per family while 26% get 3.5 kg and only 17% get less than 3.5 kg ration.

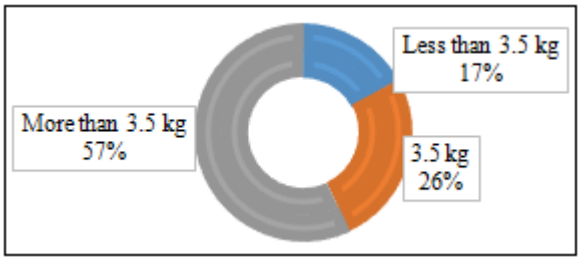

Figure 1: Ration Facility of the Respondents

3.4 Assets of the Respondents

Common agricultural assets owned by the respondents were different livestock such as cow, goat, sheep, hen, cock, pigeon and duck. Among the respondents 75% had cow which average value was Tk. 15930 and 86% of respondent had hen/cock which average value was Tk. 188. Very few

reported to have goats (23%), ducks (10%) and pigeons (13%) whose average value was Tk. 1512, Tk. 200, Tk. 127 respectively. The respondents owned different non-agricultural assets. All of them had furniture (chair, table, bed etc.) in their home. Besides 92% had mobile phone, 41% had bicycle, 35% had fan, 24% had television in their house.

Table 4: Value and Ownership of Agricultural and non-agricultural Assets

Items	Average Value (Tk.)	Percentage of respondent
Cow	15930	75
Goat	1512	23
Sheep	42500	1
Hen/Cock	188	86
Duck	200	10
Pigeon	127	13
Mobile	1485	92
Television	2113	24
Bicycle	2239	41
Fan	1144	35
Furniture	2119	100
Others (Showcase, locker etc.)	1100	4

3.5 Expenditure on Non-Food Items

There had found different types of cost items of the respondents on non-food items. The average monthly expenditure was about Tk. 3555. Highest expenditure on health purpose which is 30% percent of total expenditure on non-food items.

Table 5: Expenditure on Non-Food Items

Items	Average cost (Tk.)	Percentage
Cloths	159	4
Education	461	13
Festive	109	3
Health	1068	30
House Repairing	584	16
Social Cost	877	25
Others	297	8
Total	3555	100

Health expenditure was highest compared to other expenditure due to women caesarian and medical test cost of many respondent families. They spent 25% of their total non-food expenditure on social cost (Like as visit of relative house). Visiting relative house was their main recreation. They spend 16% on house repairing, 13% on education purpose, 4% on cloths, 3% on festival (Durga puja, 1stBoishak and Kali puja etc.). of their total expenditure.

3.6 Household Income and Savings of the respondent

Salary is the main factors that determine the economic position and life standard of tea garden workers. Number of earning family members is another determinant of household income of the tea garden workers. Two-third of the households of the tea garden workers have more than one earning member. And one-third households have more than two earning members. As the monthly personal income of the respondents was same so the monthly family income was recorded. It was found that average monthly income was Tk. 7701 per month and monthly savings an amount from their earnings for future (Tk. 619) which was 8% of their monthly income. The respondents basically worked around 8 hours in a day. No overtime allowed in tea garden. Yearly bonus of the garden worker was Tk. 3600. Which is equal for all workers.

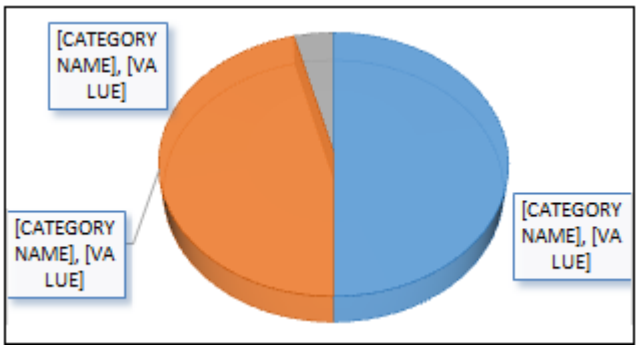

Figure 2*:* Household Income and Savings of the respondents

3.7 Food Security Status of the Respondents

Food security has different dimensions and this study mainly utilized two of them: Body Mass Index (BMI) and calorie intake. Besides, access to meal through accessing cost and price, frequency of different food item intake and calorie sources were analyzed.

3.8 Meal intake per day

Meals taken by the respondents were categorized into three groups that was breakfast, lunch and dinner. Main food items were rice, wheat, vegetable, pulse, egg, fish and meat. All the respondents reported to taken rice at dinner. Maximum respondent (92%) eat wheat at breakfast remaining 8% eat rice at breakfast. Frequency of consuming meat is low, compared to that of egg and fish. The respondents consumed meat very rarely, mostly during relative comes. But they preferred fish and egg. Because most of them had hen/cock/duck/pigeon in house. They drink milk with tea which is negligible. That's why milk was not included. All respondents are taken rice or wheat and vegetable in three times. Only 64% of respondents eat fish in dinner. And meat is actually low as they like to take meat only one/two in a month or when relatives came to visit. They prefer vegetable and pulse in their daily meals.

Table 61: Meal intake per day/respondent

Time	Meal intake % form respondents						
	Rice	Wheat	Vegetables	Pulse	Egg	Fish	Meat
Breakfast	8	92	99	91	2	0	0
Lunch	39	61	94	93	34	5	1
Dinner	100	0	95	93	53	64	39

3.9 Calorie intake

Daily per capita calorie consumption was estimated by dividing the estimated daily calorie supply to the household by the household size (Babatunde *et al*, 2007). An individual can intake calorie through consumption of different food ingredients like cereals, meats, eggs, pulses, oils, vegetables,

fruits etc. Each item of these food ingredients contains different amounts of calories. On an average each member of the surveyed households consumed 2013.01 kcal which is lower than the recommended dose of 2200 kcal/person/day (Anonymous, 2008). But average per capita per day food intake by the residence in Bangladesh is 2430 kcal/capita/day (NFPCSP, 2013).

Table 7: Calorie Intake from Different Food Items by the Respondents

Items	Amount Intake (gm/day/capita)	Calorie (Kcal/day/capita)	Percent of Total Calorie (%)
Rice	259	945.72	46.98
Wheat	191	645.8	32.08
Egg	18.19	25.84	1.28
Chicken	6.18	7.89	0.39
Pigeon	0.001	0.05	0
Vegetables	106.2	89.24	4.43
Fish	7	7.48	0.37
Pulse	33.5	119.53	5.94
Oil	10.32	91.65	4.55
Fruits	48.73	36.14	1.8
Spices	12.95	43.7	2.17
Total	693.07	2013.01	100

The causes of lower calorie intake of the respondents are explained from the table 7.

It was found that large portion of calorie intake comes from rice (46.98%) and wheat (32.08%) both are carbohydrate. Others calorie intake were low comparing to rice and wheat such as egg (1.28%), chicken (0.39%), vegetables (4.43%), pulse (5.94%), fish (0.37%), edible oil (4.55%), fruits (1.8%) and spices (2.17%). It is clearly shown that it's not a balance diet. This is the result of their low calorie as they largely depend upon carbohydrate (rice and wheat) than fat, protein, vitamins and minerals. Near about 10 glasses of water in a day were drunken by the respondents which was only in sound position

3.10 Body Mass Index (BMI) Measurement

The average height of the respondents was 156.36 cm. Among the respondents 19% had less than 150 cm height and rest 81% of the respondents were more than 150 cm. In case of weight, the average weight of the respondents was 48.7 kg. Among the respondents 77% fall in the category "normal". Thus, average BMI was 19.9 and shows normal BMI.

Table 8: Table of Body Mass Index (BMI) Measurement (BMI)

Range	Category	Respondent	Percentage (%)
< 18.5	Underweight	22	22
18.5-25	Normal	77	77
25-30	Overweight	1	1
30-35	Obese	0	0

3.11 Factors that Affecting the Food Security

Food security defined as 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 that means consistent, dependable access to enough food for active, healthy living (Coleman-Jensen et al., 2011, FAO, 2008).

Being a developing country the paramount challenge is making food accessible for all irrespective of race, religion, castes, ethnicity, rich, poor and urban or rural. A number of factors influence household food security. Here, three factors are discussed that affect the food security such as age (Mango et al., 2014), education (Kidane et al., 2005) and income (Bashir et al., 2013a) of the respondents of tea workers. Because household socio-economic attributes like education, gender and age have a strong hold on food accessibility for low-income households (Masuku et al., 2017). In order to make food accessible the most dominant determinant is nothing other than the level and the growth of income (Hossain, 2013).

Respondent were divided into four groups on the basis of education level. Fifty-three percent of the respondents were illiterate and food security level of a large portion 45% was below optimum (1800-2122 Kcal). In primary level Optimum (2123-2444 Kcal) is higher than other level that is 55% and in secondary level below optimum (1800-2122 Kcal) is higher than other level that is 62%. But above secondary level education, their food security level was optimum that is 100%. That means with the increase in education level food security level also increases. Because educated people normally conscious about health and balance diet than uneducated people. The age of the respondents was divided into three groups (young, middle and old age). Among the middle age respondents their food security level optimum

Table 9: Respondent's calorie intake as per education level, age group and household income

Particulars	Percentage of the Respondents	Calorie intake (% respondents)			
		Much below optimum (< 1800 Kcal)	Below optimum (1800-2122 Kcal)	Optimum (>2123-2444 kcal)	Above Optimum (>2444 Kcal)
Education level					
Illiterate	53	25	45	26	4
Primary (1-5)	33	21	24	55	0
Secondary (6-10)	13	0	62	38	0
Above Secondary	1	0	0	100	0
Age Group					
Young (less than 35)	37	19	43	38	0
Middle (35-50)	47	15	38	41	6
Old (above 50)	16	38	38	24	0
Income Level (Tk./Month)					

<6000	23	35	57	8	0
6000-10000	52	21	44	35	0
>10000	25	4	16	72	8

(2123-2444 Kcal) 41% and 38% for the young which was higher than old level. Generally, company like to employ the workers of young and middle age because of their working efficiency. As there was all physical work in tea garden for these labour based work. On the basis of income level the respondents were divided into three groups. Income level (>10000 Tk.) their food security was optimum level 72% (2123-2444 Kcal) and above optimum 8% (>2444 Kcal) than the other groups. Because of low income they are mostly live under poverty line and their calorie intake was low than higher income people.

3.12 Effects of different variables on calorie intake

The determinants of calorie consumption derived through the OLS regression are presented in Table 10. Food expenditure, family size, household labour, farm income and agricultural land are significantly and positively correlated with calorie intake. The estimated coefficient of the food expenditure implies that a one-taka increase in food expenditure will increase calorie consumption by 0.243 kcal/person/day. Similarly, one-taka increase in household farm income will increases calorie consumption by 0.007 kcal/person/day. One-unit increase in agricultural land will increases calorie consumption by 0.003 kcal/person/day. Increase of household labor by one person will increases calorie consumption by 0.03 kcal/person/day. Food secure increases by a factor of 0.013 as family size increase by one adult person. Maximum small family consist of husband wife and one or two children. Some consists of only two females or husband-wife. When both husband-wife work in garden they don`t get enough

Table 20: Determinants of Calorie Consumption

Explanatory Variables	Co-efficient	Standard Error (SE)
Constant	8.107***	0.305
Age	0.0001	0.001
Education	-0.002	0.004
Family Size	0.013***	0.006
Household Labour	0.03**	0.016
Household Food Expenditure	0.243***	0.049
Household Farm Income	0.007**	0.004
Agricultural Land	0.003***	0.001
Livestock Wealth	-0.003	0.005
F Value	6.98	
R Square	0.414	

time at morning to cook and in case of two female members they always try to minimize their food cost. They eat what they had or sometime they don`t eat at morning time. As a result, in small size family calorie intake is low compare with large family. The estimated R^2 implies that 41 percent of the total variation can explained by the variations in the explanatory variables.

4. Conclusion

As Bangladesh is an agro-based country, without agricultural improvement it is not possible to improve overall economy of the country. As a tea producing country, Bangladesh is well known in the world. Tea industry also creates employment facilities for a large number of people. The tea garden workers have indigent socio-economic condition especially their level of education and income is inadequate. The present study indicates that family size, household labor, household food expenditure, household farm income, agricultural land as an important factor in calorie consumption as well as food security of the tea workers. Surprisingly, education was found insignificant because most of the workers are illiterate. Due to lack of education worker are not aware about health, sanitation and hygiene. The government should take necessary steps to improve education, health, housing, water and sanitation facilities in the tea garden areas. Extensive socio-economic development programs should be undertaken run to increase salary and income of the garden worker. Bangladesh Tea Board may take initiative to make the workers aware about their health issues. So that worker may have more income, healthy and quality life style.

References

[1] Ahmad, I., Yasin, M., Rowshon, A. &Hoque, A.K.M. (2015). Study on socio-economic and educational condition of tea worker at Sylhet in Bangladesh. Journal of Tea Science Research, 5(5): pp.1-8.DOI: 10.5376/jtsr.2015.05.0005

[2] Ahmed, M., Hoque, M.A., Sarkar, M.S.K.A., Chowdhury, M.A.I., & Begum, A. (2006). Socio-cultural evaluation of sanitation hygiene in Sylhet city of Bangladesh, ARPN Journal of Engineering and Applied Sciences, 1(3), 68-72 https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.611.9345&rep=rep1&type=pdf

[3] Ayantoye, K., Yusuf, S.A., Omonona, B.T. &Amao, J.O. (2011). Food insecurity dynamics and its correlates among rural households in South-Western Nigeria. International Journal of Agriculture and Rural Development, 4(1):43–56. https://doi.org/10.25115/eea.v39i2.3505

[4] Babatunde, R.O., Omotesho, O.A. and Sholotan, O.S. (2007). Factors Influencing Food Security Status of Rural Farming Households in North Central Nigeria. Agricultural Journal, 2(3):351-357. https://medwelljournals.com/abstract/?doi=aj.2007.351.357

[5] Bashir, M.K., Schilizzi, S. & Pandit R. (2013). Impact of socio-economic characteristics of rural households on food security: the case of the Punjab, Pakistan. Journal of Animal and Plant Sciences, 23 (2): 611-618 http://www.thejaps.org.pk/.../42.pdf

[6] BBS (2013). Statistical Year Book of Bangladesh. (2012). Bangladesh Bureau of Statistics. Statistics and Informatics Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

[7] BBS (2016). Statistical Year Book of Bangladesh (2015). Bangladesh Bureau of Statistics. Statistics and

Informatics Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

[8] Bidita, A. (2012). Job Satisfaction and Food Security of the Women Garments Worker in Selected Garments of Gazipur District. Department of Agricultural Extension and Rural Development, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur 1706, Bangladesh.

[9] Bishwajit, G., Barmon, R. & Ghosh, S. (2014). Reviewing the Status of Agricultural Production in Bangladesh from a Food Security Perspective. Russian Journal of Agricultural and Socioeconomic Sciences, 1 (25):19-27. DOI:10.18551/rjoas.2014-01.04

[10] Chowdhury, M.A.I., Hasan, G.M.J. & Karim, M.A. (2011). A study on existing WATSON conditions of two tea gardens in Maulvibazar. Journal of Environ Science & Natural Resources, 4(2):13–18.https://doi.org/10.3329/jesnr.v4i2.10125

[11] FANTA (2006). Food and Nutrition Technical Assistance. Household Food Insecurity Access Scale for Measurement of Food Access. Version 2.

[12] FAO (2003). Food and Agriculture Organization. Anti-Hunger Program: A Twin-Track Approach to Hunger Reduction: Priorities for National and International Action. FAO. Rome.https://www.fao.org/3/j0563e/j0563e00.htm

[13] FAO (2011). Food and Agriculture Organization. Guidelines for Measuring Household and Individual Dietary Diversity. FAO, Rome.https://www.fao.org/publications/card/en/c/5aacbe39-068f-513b-b17d-1d92959654ea/

[14] FAO, (2008). Deriving Food Security Information from National Household Budget Surveys: Experiences, Achievements, Challenges, Food and Agricultural Organization of the United Nations, Rome.https://reliefweb.int/sites/reliefweb.int/files/resources/ADCEB9DAFC58B14CC1257528004F6230-fao-food-security-dec08.pdf

[15] HIES (2015). Household income and expenditure survey. Bangladesh Bureau of Statistics, Government of the People's Republic of Bangladesh, Dhaka, Bangladesh

[16] Hossain, M. (2013). "Food Security in Bangladesh: Achievement and Challenges" The Daily Star, Published on Wednesday, 30 March. http://bsmrau.edu.bd/wp-content/uploads/sites/230/2018/04/food-security.pdf

[17] Jensen, A., Nord, M., Andrews, M. & Carlson, S. (2012). Statistical Supplement to Household Food Security in the United States in 2010: AP-057 USDA, Economic Research Service. http://www.ers.usda.gov/publications/ap-administrative-publication/ap-057.aspx

[18] Jha, M.K. (2002). Hunger and starvation death: call for public action, Economic and Political Weekly, 37(52):5159-5163. DOI: 10.2307/4413005

[19] Kidane, H., Alemu, Z.G. & Kundhlande, G. (2005). Causes of household food insecurity in Koredegaga peasant association, oromiya zone, Ethiopia.Agrekon, 44 (4): 543-560 https://hdl.handle.net/10520/EJC18315

[20] Lahiri, S. (2000). Bonded Labor and the Tea Plantation Economy. Revolutionary Democracy, 6(2):24-28. https://revolutionarydemocracy.org/rdv6n2/tea.htm

[21] Majumder, S.C. & Roy, S.C. (2012). Socio-economic Conditions of Tea Plantation Workers in Bangladesh: A Case Study on Sreemongal. Indian Journal of Applied Research, 1(10):37-40. DOI: 10.15373/2249555X/JUL2012/14

[22] Masuku, M., M. Selepe, & N. Ngcobo. (2017). "Status of Household Food Security in Rural Areas at uThungulu District, Kwa-Zulu Natal, South Africa." African Journal of Hospitality, Tourism and Leisure, 6(2): 1–11. http://www.ajhtl.com/uploads/7/1/6/3/7163688/article_38_vol_6__2_2017.pdf

[23] Masum, M.R.A. (2016). Rights of tea garden workers in Sylhet, Bangladesh. Bangladesh Legal Aid and Services Trust (BLAST) and Research Initiatives, Bangladesh (RIB).https://www.slideshare.net/MdMasum7/rights-of-dalit-tea-garden-workers-in-sylhet-bangladesh

[24] Mittal, S. &Sethi, D. (2009). Food Security in South Asia: Issues and Opportunities. Working Paper No. 240. Mimeo, ICRIER. http://www.icrier.org/pdf/WorkingPaper240.pdf

[25] N. Mango, B. Zamasiya, C. Makate, K. Nyikahadzoi, S. Siziba. (2014). Factors influencing household food security among smallholder farmers in the Mudzi district of ZimbabweDev. Southern Africa, 31 (4): 625-640. https://doi.org/10.1080/0376835X.2014.911694

[26] Noman, S.M.S. (2013). Determination of Minimum Wage for Garments Worker in Bangladesh Ensuring Firms Profitability. International Journal of Business, 2(3):22-26. http://www.ejournalofbusiness.org/archive/vol2no3/vol2no3_1.pdf

[27] Parvin, G.A. & Ahsan, S.M.R. (2013). Impacts of Climate Change on Food Security of Rural Poor Women in Bangladesh. Management of environmental quality: an international journal, 24 (6):802-814. https://www.emerald.com/insight/content/doi/10.1108/MEQ-04-2013-0033/full/html

[28] Saha, J.K.,Acharjee, D.C. & Rahman, M.M. (2017). A study to assess the socio-economic status of tea workers in selected tea estates of Sylhet district. Journal of Bangladesh Agricultural University, 15(2):.297-303. DOI: 10.3329/jbau.v15i2.35079

[29] Sankrityayana, J. (2006). Productivity, Decent Work and the Tea Industry in North Eastern India-Plantation Labour in the West Bengal Tea Industry. International LabourOrganisation, Background Paper for Productivity & Decent Work in the Tea Industry: A Consultative Meeting. New Delhi: International LabourOrganisation.

[30] Sen, S. (2002). Questions of consent: Women's recruitment for Assam tea gardens, 1859–1900. Studies in History, 18(2):231-260. https://doi.org/10.1177/025764300201800205

[31] The World Bank. (2017). World development indicators. Washington, DC: The World Bank.

[32] USAID (2010). Food Security Indicators for the Use in the Monitoring and Evaluation of Food Security Program, Economic Research Service, Washington DC.
[33] Wal, S.V.D. (2008). Sustainability Issues in the tea sector, A comparative analysis of six leading producing countries. StichtingOnderzoek Multinational Ondernemingen (SOMO), Centre for Research on Multinational Corporations. Amsterdam. pp.31