



Taiyeba Tabassum
Lecturer,
Social Work, Bangamata
Sheikh Fojilatunnesa Mujib
Science and Technology
University, Bangladesh;
www.bsfmstu.ac.bd
taiyebataba94@gmail.com
Mobile: +8801731010395

Climate Change Impacts in Food and Nutrition Status: A Study on Coastal Ecology of Paddapukur Union, Satkhira, Bangladesh

Taiyeba Tabassum

Abstract:

The coastal regions of Bangladesh consist of 19 districts that cover 32% of Bangladesh and comprise 36,000 sq km in area, and because of the area's fertile agriculture and fishing, the population density is particularly high. Ecology of the coastal region, especially in the southwest region is greatly concerned with salinity. The total amount of salinity-affected land in Bangladesh was 83.3 million hectares in 1973, which had increased to 105.6 million hectares in 2009, which is a great issue of concern that impedes national development. This research paper aims to explore the scenario of the impacts of climate change on food security in the coastal ecology of Paddapukur union of Shyamnagar upazilla in Satkhira district, Bangladesh. Reflecting on an empirical study, the research has been carried out following both quantitative and qualitative methods, and the paper is mainly developed based on primary and secondary sources of data. The purposive sampling method has been applied for the study of 433 population samples of 150 households. The cross-sectional study has been used for this study. Every responsible agent should come ahead to take the required initiatives and its reformation to improve the food security of coastal zones of Bangladesh in a broader essence. Limited access to health care facilities, miserable poverty, illiteracy, salinity intrusion, and shortage of social safety net measures regarding the betterment of food, nutrition, hygiene and health care issues. But life cannot exist without food and proper nutrition. From prehistory to date, food is regarded as one of the basic and essential parts of human culture.

Key Words: Climate change, food, nutrition status, coastal ecology.

1. Introduction of the Study:

Under-nutrition continues to be one of the major socioeconomic and health issues in the world that receives the least attention (Horton et al., 2009¹; FAO, 2010²; SUN, 2010³). In 2010, 925 million

¹Horton S., Shekar M., McDonald C., Mahal A., Brooks J.K. (2009). Scaling Up Nutrition: What Will It Cost? Washington DC: The World Bank.

²Food and Agriculture Organization of the United Nations (2010). The State of Food Insecurity in the World. Addressing food insecurity in protracted crises. Rome: FAO.

³ Scaling Up Nutrition (SUN), 2010. Scaling Up Nutrition: A Framework for Action. Accessed online at: http://www.unscn.org/en/nut-working/scaling_up_nutrition_sun/sun_purpose.php on 10 November 2010

people were considered to be hungry, and under-nutrition in mothers and children remained widespread (SUN, 2010; Black et al., 2008⁴). Almost one-third of children underweight or stunted lives in underdeveloped nations. Infectious diseases and under-nutrition combine to cause an estimated 3.5 million avoidable deaths of mothers and children each year widespread (FAO, 2010; SUN, 2010; Black et al., 2008). In addition to undermining present initiatives to prevent hunger and safeguard and improve nutrition, climate change has an impact on food and nutrition security (Black et al., 2008; FAO-2008⁵; WHO-2008⁶). Nutrition security is threatened along with the livelihood of people affected by climate change (Costello et al, 2009⁷).

Climate Change is the biggest global health threat of the 21st century and is already contributing to the global burden of disease and premature death. Bangladesh is one of the most unstable and precarious nations because of climate hazards (Bangladesh Country Study, 2013). Climate change impacts under-nutrition through multiple pathways: food security, water, hygiene and sanitation, health, and maternal and childcare practice. There have been an estimated 3.3 million deaths from natural hazards in the 40 years up to 2010 (82,500 per annum) with 95% of these happening in developing countries (WFP 2015⁸). Maternal and child under-nutrition is the underlying cause of 3.5 million deaths each year and 35% of the disease burden in children younger than 5 years. At the same time, Bangladesh is still classified as having a high prevalence of chronic under-nutrition and over six million children are stunted. At present stunting is 31%, wasting 14%, and underweight 22%, which all indicate the status of nutrition, and the major cause is inadequate food intake (BDHS 2018⁹).

1.1. Study Context and Rationale:

Climate change impacts food security both directly and indirectly. Bangladesh is still classified as having a high prevalence of under-nutrition of children, adolescent girls, pregnant and lactating mothers. Besides, the prevalence of anaemia is very high among the population groups. Under nutrition already costs Bangladesh more than 7,000 crore taka (US\$1 billion) in lost productivity every year, and even more in health costs. Malnutrition is the cause of more than 10% less

⁴Black, R.E., Allen, L.H., Bhutta, Z.A., de Onis, M., Mathers, C. & Rivera, J. (2008). Maternal and child undernutrition: Global and regional exposures and health consequences. *The Lancet* 371 (9608, January 19): 243-260.

⁵Food and Agriculture Organization of the United Nations (FAO) (2008). *Climate Change, Bioenergy and Nutrition*. FAO High Level Conference on Food Security and the Challenges of Climate Change and Bioenergy. Rome: FAO.

⁶World Health Organization (2008). *Protecting Health from Climate Change*. Geneva: WHO.

⁷Costello A, Abbas M, Allen A, Ball A, Bell S, Bellamy R, Friel S, Groce N, Johnson A, Kett M, Lee M, Levy C, Maslin M, McCoy D, McGuire B, Montgomery H, Patterson C (2009) *Managing the health effects of climate change*. *The Lancet* 373: 1693–733.

⁸WFP (2015). *Impact of climate-related shocks and stresses on nutrition and food security in selected rural areas of Bangladesh*, World Food Programme, Dhaka, Bangladesh.

⁹National Institute of Population Research and Training - NIPORT, Ministry of Health and Family Welfare, and ICF. 2020. *Bangladesh Demographic and Health Survey 2017-18*. Dhaka, Bangladesh: NIPORT/ICF. Available at <https://www.dhsprogram.com/pubs/pdf/FR344/FR344.pdf>

productivity in an individual lifetime (GoB,2015¹⁰). Researchers concluded that under-nutrition should be the top priority for policy-makers because it is the best buy for development. The benefit-cost ratios from investing in nutrition are highly competitive with investments in roads, irrigation, and health. Every \$1 spent on improving nutrition can have a \$30 return on investment. Nutrition was one of the priority agenda in MDGs. Nutrition is also a priority agenda in the Sustainable Development Goals (SDG) directly Goal-2 that is 'End hunger, achieve food security and improved nutrition and promote sustainable agriculture. Food and Nutrition are also inbuilt among the different Goals 1,3,4,5 and 6. Article 18 (1) in the Constitution of Bangladesh declares "The State shall regard the raising of the level of nutrition and improvement of public health as among its primary duties" (GoB, 2015¹¹). Under-nutrition prevalence is chronically high in the coastal areas as is in the entire country. The nutritional status of especially those under five children as well as pregnant and lactating women can deteriorate quickly in the event of a disaster. It is therefore important to find out how climate change impacts on nutrition security and how to adapt particularly in disaster-prone coastal areas.

2. Literature Review:

Some relevant works of literature are reviewed to acquire knowledge to conduct this research. Published books, reports, journals, articles, and other documents on key areas of food security in coastal areas were identified through searches of all available electronic databases.

According to Meybeck et.al. (2018)¹² in the book "*Food Security and Nutrition in the Age of Climate Change*" contains numerous writings from many scholars across the globe on the topic of nutrition security and climate change. The book consists of many valuable articles, some most important are presented here. All areas of the world are encountering, and will keep on encountering, the impacts of climate change with shifting greatness and outcomes. Climate change compounds the different weights of lack of healthy sustenance because of its consequences for food security, public cleanliness, water supplies and quality, sanitation, and maternal and youngster medical care. Clashes can expand the dangers of food frailty and ailing health because of the harm they cause to rural land and food frameworks, yield and animal plundering, and the subsequent loss of resources and income for neighborhood populaces. The outcomes of climate change, for example, catastrophic events and the disturbance of the environment, thwart food production and the food chain.

¹⁰GoB, (2015). The National Nutrition Policy 2015, Ministry of Food, Dhaka, Government of Bangladesh.

¹¹GoB, (2015). The National Food Policy, Plan of Action, and Country Investment Plan- Monitoring Report, Food Planning and Monitoring Unit, Ministry of Food, Dhaka, Government of Bangladesh.

¹²Meybeck A. (2018), *Food Security in the Age of Climate Change*, proceedings of the International Symposium Organized by the Government of Quebec in Collaboration with Food and Agricultural Organization (FAO) of the United States, Quebec City, September 24-27, 2017, Rome, FAO. pp. 132. Licence: CC BY-NC-SA 3.0 IGO.

According to Tirado et al. (2013)¹³ in the book of “Climate Change and Nutrition: Creating a Climate for Nutrition Security” endeavor to recognize and attempt a cross-sectoral study of the effects of climate change on nutrition security and the current components, techniques, and arrangements to address them. The insightful structure incorporates the communications of the three fundamental reasons for under-nutrition with climate change, vulnerability, and adaptation. This paper proposes strategy bearings to address nutrition in the climate change plan and proposals for thought by the UN Framework Convention on Climate Change (UNFCCC).

According to Ismail (2016)¹⁴ in his book on “Climate Change, Food and Water Security in Bangladesh” said that Bangladesh faces critical difficulties in adapting to the effects of climate change. The huge populace places critical tension ashore and water assets, prompting contamination, the fast exhaustion of groundwater assets and adverse effects on food creation. These difficulties are exacerbated by the impacts of climate change, which is set to affect Bangladesh to a more noteworthy degree than some other countries by 2025. An absence of occupations and significant degrees of destitution make it extra difficulties for Bangladesh to create and execute adaptation strategies for its susceptible people. According to Amir and Ahmed (2003)¹⁵ “Climate Change and Its Impact on Food Security in Bangladesh: A Case Study on Kalapara, Patuakhali, Bangladesh” explores the impacts of climate change and its effect on food security in the Kalapara Upazila of Patuakhali region in Bangladesh. The paper explores present climate change situations for Kalapara, illustrates the connection between climate change situations and agrarian production and afterwards endorses versatile measures to climate change. Recorded yearly temperature and precipitation information from the Bangladesh Meteorological Department (BMD) and harvest yield information were utilized. The outcomes demonstrated proof of climate change through examination of climate information, crop yields and farmer's discernments. National Nutrition Policy 2015¹⁶, talked about the betterment in the nutrition status, formulates to sustain world promise with like Sustainable development goals (SDGs), World Health Assembly. It's motive to promote nutrition for children, adolescent girls, pregnant and lactating mothers. National Food and Nutrition Security Policy of Bangladesh (NFNSP), 2020¹⁷ the vision is to deliver food and security and active life for all Bangladeshi people. The rate of undernourishment has declined from 35% in 1990-2002 to 14.7% in 2016-2018.

¹³Tirado MC, Crahay P, Mahy L, et al. Climate Change and Nutrition: Creating a Climate for Nutrition Security. Food and Nutrition Bulletin. 2013;34(4):533-547. doi:10.1177/156482651303400415.

¹⁴Ismail H., (2016). Climate change, food and water security in Bangladesh. Future Directions International. <https://www.futuredirections.org.au/publication/climate-change-food-water-security-bangladesh/>. Accessed 10 Nov 2021.

¹⁵Amir KI, Ahmed T, (2013). Climate Change and Its Impact on Food Security in Bangladesh: A Case Study on Kalapara, Patuakhali, Bangladesh. J Earth SciClim Change 4: 155. doi:10.4172/2157-7617.1000155

¹⁶National Nutrition Policy 2015.

¹⁷National Food and Nutrition Security Policy of Bangladesh (NFNSP), 2020.

3. Objective of the Study:

3.1 General Objective:

The general objective of the proposed study is to assess the impacts of climate change on food and nutrition status in coastal ecology of Paddapukur union, Bangladesh.

3.2 Specific Objectives:

- (i) To explore the situation of food and nutrition in terms of climate change.
- (ii) To assess the health and nutrition situation of the study participants.
- (iii) To find out the coping strategy of food intake as well as nutrition security.

3.3 Research Questions

1. Is there any significant impact of climate change on Nutrition security?
2. Is there any resilience of climate change on Nutrition security?

4. Methodology of Study:

4.1 Study Design:

Both qualitative and quantitative integrated methods have been used in this exploratory study. In this regard, quantitative data has been collected through in-depth interviews with semi-structured interview schedules from different target groups. On the other hand, several techniques were applied to collecting, manipulating and fixing the evidence such as key informant technique, checklist, case study, life history and focus group discussion for collecting the qualitative data. At the same time, few direct and indirect methods of nutritional assessment like anthropometric measurement, MUAC, anemia test have been applied for data collection, particularly for pregnant women, lactating mothers and under five children. Data has been gathered from both primary and secondary sources.

4.2. Population and Sample Size:

Table 1: Distribution of the respondents by category (n=583)

Category of the respondents	Frequency (n)	Percentage (%)
Households	150	26
Pregnant Women	28	4.5
Lactating Mothers	55	9.5
Six to 59 months children	300	51
Adolescent girls	50	9
Total	583	100

The dietary data has been collected from 150 households and the dietary data of 28 pregnant women, 55 lactating mothers, 300 children six to 59 months old, and 50 adolescent girls. The total number of the study population is 583. The purposive sampling method has been applied to the study sample.

4.3 Duration of the Study: The study period was one and half years from June 2022 to November 2023.

4.4 Study Area:

The study area is the Padmapukur union at Shyamnagar upazila of Satkhira district under the Khulna division of Bangladesh. a purposive sampling has been done from all 13 villages of Paddapukur Union of Shaymnagar Upazial under Satkhira district.

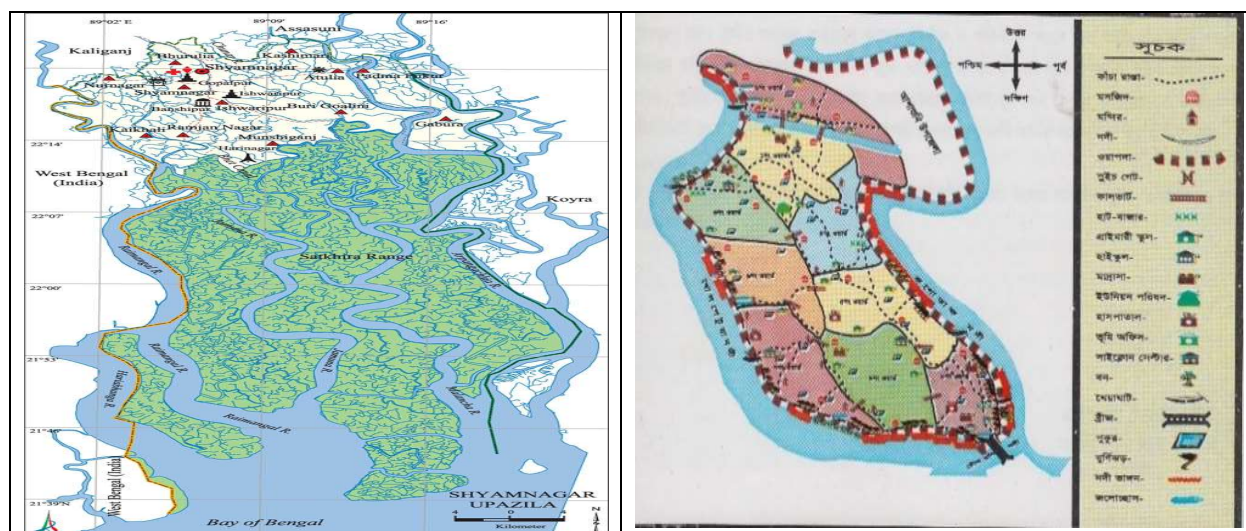


Figure 1. Geographical representation of Paddapukur union, Shyamnagar.

5. Collection of Data:

In this cross-sectional study data has been collected from paddapukur union of Shyamnagar upazilla in Satkhira district, Bangladesh on March 2023 to July 2023. A total number of 150 households and the dietary data of 28 pregnant women, 55 lactating mothers, 300 children six to 59 months old, and 50 adolescent girls were interviewed using semi structure questionnaire to explore newborn care practice. Data has been collected through both qualitative and quantitative ways.

Table 2: Padmapukur union at a glance (Source: Padmapukur union Parishod Office, 2023)

This table

Demographic Components of the Study Area	Unit/Measurement	Demographic Components of the Study Area	Unit/Measurement
Area of the Union	41 Sq.K.M.	Sluice gate	07
Number of mouza	04	Cyclone centre	09
Number of village	15	Education rate	37%
Total population	31895	Land office	01
Number of household	6003	Post office	03
Soling road	9 K.M.	Hatbazar	03
Kacharasta	47 K.M.	Kheaghat	07
River-Khal	35K.M.	Fisheries/Gher land	2225 hac.
Tube well	420	Community Clinic	03
Matir Kella	02	Number of Masque	29
Union Health Centre	01	Number of Mondir	17

shows the geographical components and measurements of the study area.

5.1 Domestic Sources of Food:

Most of the households in the rural area are directly or indirectly involved in agricultural activities Domestic or household source of food can be categorized into two broad spectrum; home grown food and market food. Looking at the stereotypical scenario of the household in the rural area of Bangladesh, it comes to understanding that source of household food depends on the capacity, taste, occupation of the members, have collected data from 150 households through Yes/No indication of have or have not.

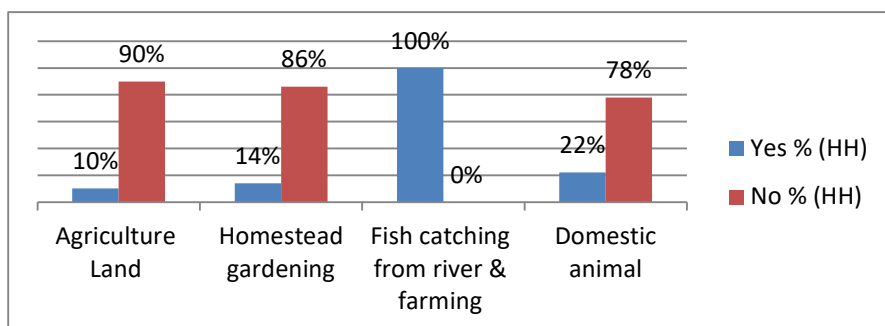


Figure- 2: Domestic Sources of Food

The Figure-2 shows that only 10% of HH have agricultural land and 90% of HH do not have any land for cultivating agricultural products out of 150 households (HH). On the other hand, 14% of HH have food sources for homestead gardening and 86% of HH do not have homestead gardening

scope. Regarding food sources of fish, 100% of HH regularly take fish from rivers and fish farming sources.

5.2 Food Crisis:

Food is one of the basic human needs. Due to the effects of *Aila*, salinity increased in water and soils severely. The respondents of Paddapukur union have lost their production of agriculture, livestock, home gardening, and domestic animal sources. I have collected data from 150 households to know about the food crisis.

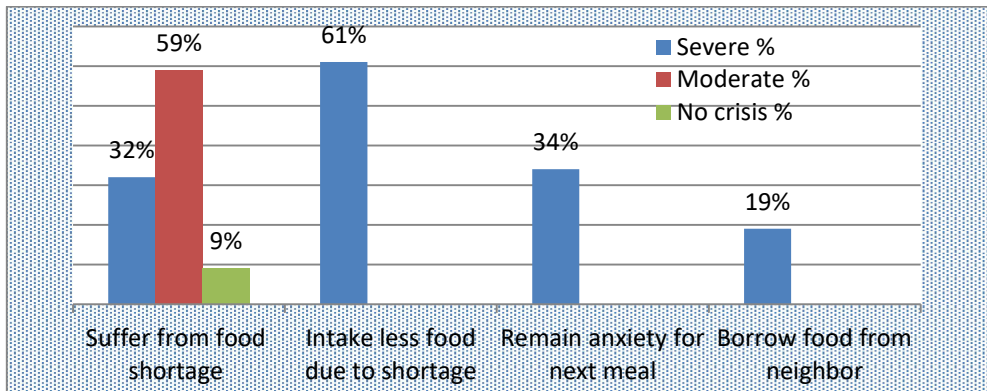


Figure -3: Food Crisis

It shows suffering from food shortage, among the 150 HH, 32% HH severely and 59% HH moderately suffer from food. Only 9% of HH has no sufferings for food because of their food production sources and purchasing capacity. It indicates the majority of HH (91%) suffer from the adequate food crisis.

5.3: Sources of Drinking Water:

Pure drinking water is no alternatives in our healthy daily life. There are 3 types of water sources these are surface water, groundwater, and other substitute sources. The people of the study area collect water for drinking from 6 sources through 3 types of maiden sources which are shown in below figure.

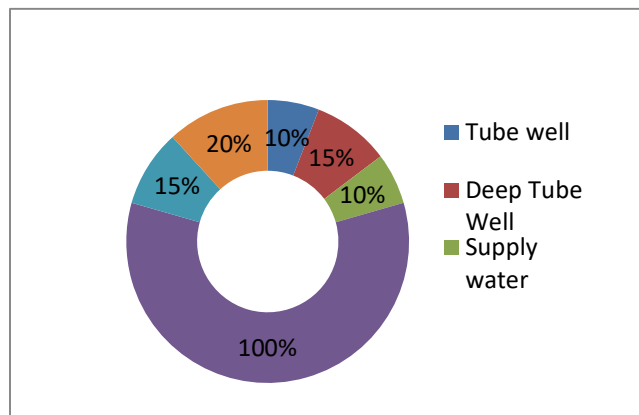


Figure -4: Sources of Drinking Water

In the study area of Paddapukur, only 10% households use tube-well water, 20% use deep tube-well water, 10% use supply water.

5.4: Saline Water Intrusion

The journey of saline water intrusion has been going on even with fast rate in the new form and devastation. As climate change induced cyclone has increased, so the rate of saline water attacks. Comparing to starting times, most of the arable lands of Padmapukur union are now fostering salinity in its heart reluctantly. Once the green lands with agricultural crop are now white with saline water. there is a severe shortage of fresh water in this area.

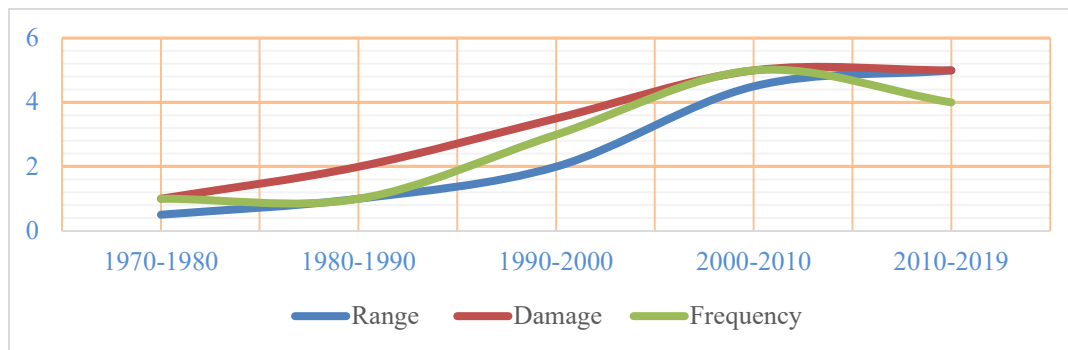


Figure- 5: Trend of Saline Water Intrusion

According to the figure initially drawn in the large brown paper by the active participation of local people, the incidence of salinity intrusion was very infrequent during 1970s. The number of salinity intrusion incidence, range or magnitude and damage started to rise dramatically during 1980s, and reach at the peak in 2000s. During the period between 2000 and 2010, two major cyclone *Sidr* and *Aila* hit Paddapukur union are very badly that this decade experienced most loss and damage by salinity intrusion. New arable lands and even homestead of people is still being affected by saline water.

5.5: Child Underweight:

Underweight is stand for Weight-for-age, it is a composite index of weight-for-height and height-for-age. A total of 300 children's data were collected from the study area. After collecting the data were analyzed as the WHO growth standard protocol. Children whose weight-for-age is below two standard deviations (-2 SD) from the median of the reference population are classified as underweight. Children whose weight-for-age is below three standard deviations (-3SD) from the median he/she considered severely underweight.

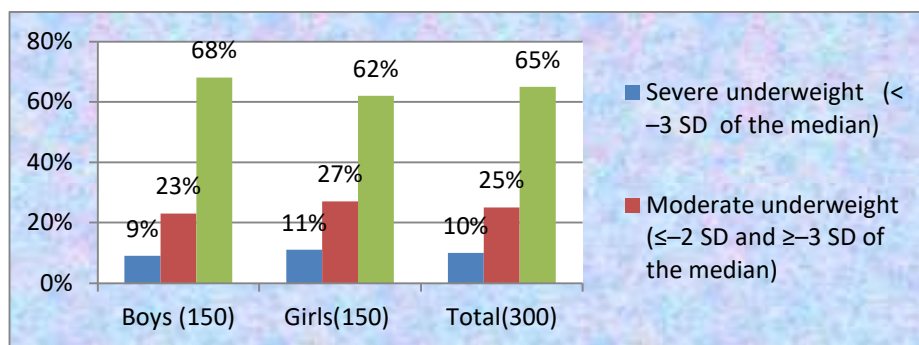


Figure- 6: Underweight 6-59 Months Children.

Out of 300 children, 10% children are severely underweight and 25% are moderately underweight. Regarding boys and girls, girls are more underweight in both indicators- severe and moderate than boys which are 9% are boys and 11% are girls severely underweight and 23% are boys and 27% are girls moderately underweight.

5. 6: Children’s Nutrition Measurement by MUAC:

MUAC is a proper option for estimating a kid's weight-for-length/tallness z-score (WHZ). Kid's MUAC tape is graduated in millimeters with a range of up to 26.5cm. MUAC was estimated of 300 children aged 6 to 59 months old by MUAC tape which utilizing at wellbeing offices in Bangladesh. MUAC tape shows the nourishment status as Severe Acute Malnutrition (SAM) '<11.50cm', Moderate Acute Malnutrition (MAM)'11.50 to 12.49 cm', and ordinary sustenance '12.50 cm and above'.

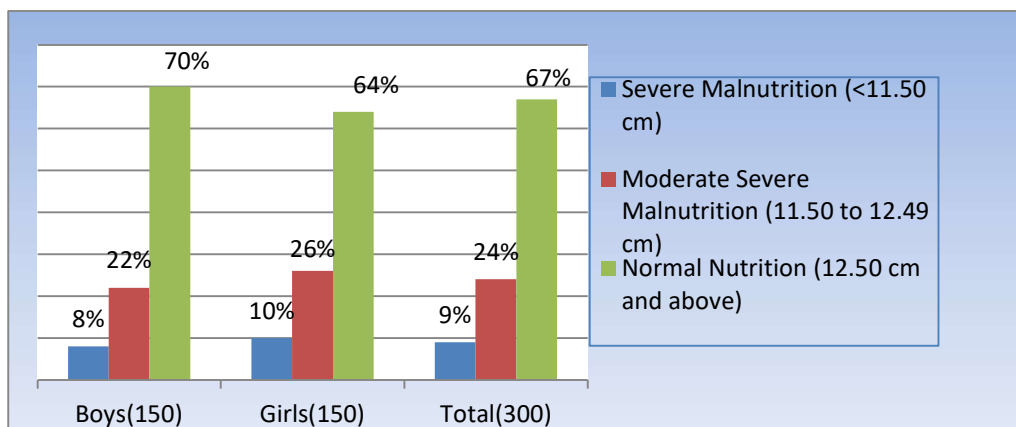


Figure-7: 6-59 Months Children MUAC Measurement

MUAC measurement analysis data shows that out of 300 children, 9% of children are suffering from Severe Acute Malnutrition (SAM) and 24% are moderately severe malnutrition. Data shows that 8% of boys and 10% of girls are severely acute malnourished and 22% of boys and 26% of girls are moderately acute malnourished.

5.7: Anemia Situation in Study Area:

Anemia most likely is the largest public health crisis in Bangladesh. For the preliminary detection of anemia, commonly two methods are used a) fingernail color, and b) anterior conjunctiva of the eye. The present study has observed 28 pregnant women, 55 lactating mothers, 50 adolescent girls, and 300 under five children for anemia (from the sample respondent's family and other families in the study area) detection following the method.

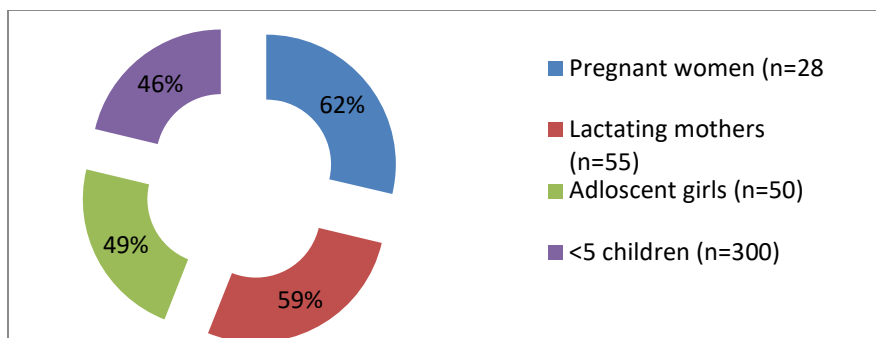


Figure -8: Anemia Situation in Study Area

Out of 28 pregnant women, 62% are suffering from anemia, among the 55 lactating mothers 59% are suffering from anemia. The chart also shows that out of 50 adolescent girls, 49% are suffering from anemia. Among the 300 under 5 children, 46% of children are suffering from anemia. The chart shows that the pregnant women situation is worse (62%) than lactating mothers (59%), adolescent girls (49%), and under five years children (46%).

6. Study findings:

The various study findings are in the following:

- Domestic sources of food are agricultural land, homestead gardening, fish farming and domestic animals. Out of 150 households (HH), only 10% of HH have agricultural land and 90% of HH do not have any land for cultivating agricultural products. Out of 150 HH, only 22% of HH have domestic animal sources of food and 78% of HH do not have domestic animal sources. So, the domestic sources of food are very limited among the study population.
- Only 5% of households' intake is 'acceptable food consumption'. On the other hand regarding food consumption of pregnant women, 57% of pregnant women take 'poor food consumption'. 32% of pregnant women take 'borderline food consumption' and 11% of pregnant women take 'Acceptable Food Consumption'. The data also shows among the 150 respondents, 61% of HH said they intake less food and 19% of HH said they sometimes borrow food from neighbors. Among the 150 respondents, 34% said they remain anxious for the next meal.

- (c) Out of 300 children, 10% children are severely underweight and 25% are moderately underweight. Regarding boys and girls, girls are more underweight in both indicators- severe and moderate than boys which are 9% are boys and 11% are girls severely underweight and 23% are boys and 27% are girls moderately underweight.
- (d) 8% of boys and 10% of girls are severely acute malnourished and 22% of boys and 26% of girls are moderately acute malnourished.
- (e) The anemia situation is very alarming among all groups' pregnant women, lactating mothers, adolescent girls, and children. Out of 28 pregnant women, 62% are suffering from anemia, among the 55 lactating mothers 59% are suffering from anemia. The chart also shows that out of 50 adolescent girls, 49% are suffering from anemia. Among the 300 under 5 children, 46% of children are suffering from anemia. The pregnant women situation is worse (62%) than lactating mothers (59%), adolescent girls (49%), and under five years children (46%).

The overall present study findings from the Paddapukur union show that the level of education, income, hygiene, sanitation, health facilities and overall food and nutrition security is very poor and alarming. These consequences have long-term effects on our food, and nutrition status that impede our national development.

7. Suggestions:

In order to reduce the impacts of climate change on food and nutrition security, climate change mitigation measures need to be put in place urgently in all the sectors. A combination of action on climate change adaptation and mitigation supported by research and technological development can reduce the threats to food and nutrition security. The scenario of food and nutrition insecurity is not the same for women and children compared to their male partners. As stated before, women of Bangladesh are behind men in terms of food consumption, food quality and quantity, and nutrition. There are some recommendations following-

- Farmers in the area need to take adaptation and coping strategies to minimize the loss and damage in the agricultural sectors. For example, planting paddy before or after a flood or heavy rainfall. Additionally, more water-tolerant crops are planted for crop diversification. Essence of integrated agro-forestry systems, especially in regions with traditional agro-forestry expertise that lessen deforestation and encourage the sustainable utilization of nutrient-rich non-wood forest products.
- Encouragement of healthy eating and personal cleanliness, including deworming programs, breastfeeding, supplemental feeding for babies older than six months, and better hand washing techniques. Supplementing with micro nutrients (e.g., daily vitamin A supplements and therapeutic zinc supplements for the treatment of diarrhea) for young children and their mothers; Need to intake food according to Bangladesh Dietary Guideline.

- The government should keep an eye on the nutrition and health conditions of pregnant women, lactating mothers, under five years old children, and adolescent girls who are more vulnerable. Need to better protect those who are already food and nutrition insecure by developing nutrition-sensitive disaster risk reduction strategies and risk management practices; coordinate among nutrition and food-related policy as well as disaster management policy. All phases of the Awareness-building programs, decision-making, planning, and implementation processes require the social engagement and empowerment of women and other disadvantaged groups needs to additional investment to address the new challenges posed by climate change on food and nutrition security.

8. Limitations of the study

It was very difficult to collect data from all respondents. When I collect information from this field, they think that I've come from an NGO. Some of them expect money from me because they are so poor. And it was also challenging to adjust to this environment.

9. Conclusions:

The situation of food and nutrition security in the study area is much worse. Local people of the Paddapukur union have limited capacity to cope with the abrupt impacts of climate change on their locality. Due to unavailability and lack of accessibility, food consumption scores are poor among the study population. They did not intake daily food as required by the Bangladesh Dietary Guideline. Pregnant women, lactating mothers, under five years old children, and adolescent girls openly suffer due to inadequate and diversified food. Therefore, in essence, the impacts of global climate change on the lives, livelihood, food, and nutrition security of the people of Padmapukur Union are presented along with the adaptation process in climate change generates various impacts in the area including cyclones, floods, embankment erosion, thunderstorm, low rainfall, heat and cold wave, etc. which have various surrounding casualties. For this reason, the present study emphasizes future empirical research to account changing activities of local people in response to climate change impacts on food production, consumption, distribution, and nutrition status in Bangladesh and the world as well.

References:

- Amir KI, Ahmed T, (2013). Climate Change and Its Impact on Food Security in Bangladesh: A Case Study on Kalapara, Patuakhali, Bangladesh. *J Earth SciClim Change* 4: 155. doi:10.4172/2157-7617.1000155.
- Black, R.E., Allen, L.H., Bhutta, Z.A., de Onis, M., Mathers, C. & Rivera, J., (2008). Maternal and child undernutrition: Global and regional exposures and health consequences. *The Lancet* 371 (9608, January 19): 243-260.
- Costello A, Abbas M, Allen A, Ball A, Bell S, Bellamy R, Friel S, Groce N, Johnson A, Kett M, Lee M, Levy C, Maslin M, McCoy D, McGuire B, Montgomery H, Patterson C (2009) Managing the health effects of climate change. *The Lancet* 373: 1693–733.

- Enamul Hasib and PritaChathoth (2016). Health Impact of Climate Change in Bangladesh, Virginia, USA.
- Food and Agriculture Organization of the United Nations (FAO) (2008). Climate Change, Bioenergy and Nutrition. FAO High Level Conference on Food Security and the Challenges of Climate Change and Bioenergy. Rome: FAO.
- Food and Agriculture Organization of the United Nations (2010). The State of Food Insecurity in the World. Addressing food insecurity in protracted crises. Rome: FAO.
- GoB, (2015). The National Nutrition Policy 2015, Ministry of Food, Dhaka, Government of Bangladesh.
- GoB, (2015). The National Food Policy, Plan of Action, and Country Investment Plan- Monitoring Report, Food Planning and Monitoring Unit, Ministry of Food, Dhaka, Government of Bangladesh.
- Horton S., Shekar M., McDonald C., Mahal A., Brooks J.K., (2009). Scaling Up Nutrition: What Will It Cost? Washington DC: The World Bank.
- IPCC Fourth Assessment Report, Working Group II, Glossary of Terms: Climate Change and Disaster Risk Reduction Available at: <https://www.wmo.int/pages/prog/dra/vcp/documents/7607>
- Ismail H., (2016). Climate change, food and water security in Bangladesh. Future Directions International. <https://www.futuredirections.org.au/publication/climate-change-food-water-security-Bangladesh/> Accessed 10 Nov 2021.
- Islam S.N, Khan N.I and Akhtaruzzaman M. (2014). Food Composition Tables and Database for Bangladesh with Special Reference to Selected Ethnic Foods, Institute of Nutrition and Food Science, University of Dhaka, Dhaka, Bangladesh.
- Mallik B. and Etzold B. (2014). Environment Migration and Adaptation, A H Development Publishing House, Dhaka, Bangladesh.
- Meybeck A. (2018). Food Security in the Age of Climate Change, proceedings of the International Symposium Organized by the Government of Quebec in Collaboration with Food and Agricultural Organization (FAO) of the United States, Quebec City, September 24-27, 2017, Rome, FAO. pp. 132. Licence: CC BY-NC-SA 3.0 IGO.
- Mirza M.M.Q(2014). Climate Change and Bangladesh, Palli Karma-Sahayak Foundation (PKSF), Agargaon, Dhaka, Bangladesh.
- National Institute of Population Research and Training - NIPORT, Ministry of Health and Family Welfare, and ICF. 2020. Bangladesh Demographic and Health Survey 2017-18. Dhaka, Bangladesh: NIPORT/ICF. Available at <https://www.dhsprogram.com/pubs/pdf/FR344/FR344.pdf>
- Satkhira district government 2016, webportal<http://www.bangladesh.gov.bd/site/page/fc63120c-63e9-406f-904a-48e399ca0f79>
- Scaling Up Nutrition (SUN), 2010. Scaling Up Nutrition: A Framework for Action. Accessed online at: http://www.unscn.org/en/nut-working/scaling_up_nutrition_sun/sun_purpose.php on 10 November 2010.
- SRDI (2010). Saline Soils of Bangladesh; Soil Resources Development Institute (SRDI), Ministry of Agriculture: Dhaka, Bangladesh.
- Tirado MC, Crahay P, Mahy L, et al., (2013). Climate Change and Nutrition: Creating a Climate for Nutrition Security. Food and Nutrition Bulletin. 34(4):533-547. doi:10.1177/156482651303400415.
- UNFCCC (1992). United Nations Framework Convention on Climate change (IPCC Fourth Assessment Report, Working Group II, Glossary of Terms: <http://195.70.10.65/pdf/glossary/ar4-wg2.pdf>.)
- WFP (2015). Impact of climate-related shocks and stresses on nutrition and food security in selected rural areas of Bangladesh, World Food Programme, Dhaka, Bangladesh.
- WFP (2012). Climate impacts on food security and nutrition, Met Office and World Food Program, UK.
- World Health Organization (2008). Protecting Health from Climate Change. Geneva: WHO