

Research Paper

on

**Heatwaves Causing Agricultural Transition:  
Do Farmers in Shomvuganj, Mymensingh, Bangladesh Have  
Second Career Choice to Avoid Climate Vulnerability?**

**Submitted by**

Kanij Fatima Maisha

Master of Social Sciences (MSS)

Bachelor of Social Sciences (BSS)

Department of International Relations

Faculty of Security and Strategic Studies

Bangladesh University of Professionals (BUP)

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## **Declaration of Originality**

I, hereby, declare that the Research paper titled, **Heatwaves Causing Agricultural Transition: Do Farmers in Shomvuganj, Mymensingh, Bangladesh Have Second Career Choice to Avoid Climate Vulnerability?** has not been submitted for any recognition in the past. The entire paper is solely my dedicated work. No part of this paper contains plagiarism without any proper acknowledgment. Proper references for each chapter have been maintained in this research paper.

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**Kanij Fatima Maisha**

MSS in International Relations

BSS (Hons) in International Relations

Faculty of Security and Strategic Studies (FSSS)

Bangladesh University of Professionals (BUP)

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## **List of Acronyms**

BRRI	Bangladesh Rice Research Institute
DAE	The Department of Agricultural Extension
MoA	The Ministry of Agriculture
UNEP	The United Nations Environment Program
FGD	Focus Group Discussion
KII	Key Informant Interview

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## **Abstract**

The research paper argues that the heatwaves in recent years have contributed to the agricultural changes in the entire world, specifically in Bangladesh. The agricultural transition here means two specific things: The transition of farming into the adoption of new heat-resistant seeds, or rice varieties, and the adoption of technology from planting seeds to the harvesting season. Another transition is from farmers having any second career choice to avoid the climate vulnerability that results in both financial causes and physical causes. Heat waves do not only bring heat stress under the scorching sun which makes the situation for farmers to work in the field terrible, but they also cause unprecedented financial costs during irrigation. To understand these two things, the paper adopts a qualitative research methodology under which phenomenological approaches have been covered in an exploratory matter (shifting into the second career choice). Both primary and secondary sources of data have contributed to the results and findings of this paper. With the recommendation of having more groundwork surveys in the locality of the selected sites of Shomvuganj, Mymensingh, the paper ends with the positive connotation that even though farmers deal with unknown insects and viruses attack during heatwave days such incidents do not result in their amount of rice production that ensure the food security of the region.

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## Chapter One: Introduction

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### 1.1 Background of the Study

Global food production has been affected by Climate Change. This climate change has far-reaching implications for agricultural production. Heatwave is also a part of Climate change that is likely to challenge food security. According to meteorologists, 36 to 38 degrees Celsius is a mild heatwave, 38 to 40 degrees are moderate heatwaves, whereas beyond 40 degrees Celsius is nothing but a categorization of severe heatwaves (Senior Correspondent & Senior Correspondent, 2023). July 2023 was the extreme heatwaves in parts of the Northern Hemisphere, China, Southern Europe, Southwest US, and Mexico (*Extreme Heat in North America, Europe, and China in July 2023 Made Much More Likely by Climate Change – World Weather Attribution*, n.d.). Heat waves not only lead to yield losses in food production but also result in food security and increased prices of staple food (FutureLearn, 2022).

The heat wave as the result of climate change is quite new in Bangladesh. It has an indirect impact not only on farmers' lives but also on the growth and development of vegetables, supplies, and overall consumption. Usually what happens during the heat wave is that many farmers cannot grow as well as harvest vegetables properly (Shabuj & Parvez, 2023).

In the year 2021, heatwaves damaged around 46,971 hectares of paddy in at least 7 districts of the Northeast and Southern divisions of Bangladesh. This damage had further implications for higher prices of rice in Dhaka. Apart from such heatwave-related crop damage, there was also the damage of dreams shattered to wishing for having a good crop. Most of the farmers in the Northern districts of Bangladesh faced their paddy getting burnt down, sheaves drying out, and the unusual heat with its continuing effect on the morning as well as the night.

According to a report from the Bangladesh Rice Research Institute (BRRI), Farmers are having trouble ensuring the rice fields get irrigated during the heatwave period since the year 2021 heatstroke. It has also been advised by BRRI to farmers to retain 2-3 inches of water on the lands of harvest to save crops.

Consequently, the supply chain demand for the market is affected. Many farmers sought to opt out of irrigation in the fields to prevent the cultivation of the greens according to a report from the Department of Agricultural Extension (DAE) (Shabuj & Parvez, 2023).

There is also a chance that the crop will be damaged due to the heatwave. Around 21,000 hectares of rice crops were ruined during the heat shock of 2021 (Abusiddique, 2023). Bogura is one of the main vegetable-producing districts where farmers were unable to grow and properly harvest vegetables. Not only does the entire suffering belong to farmers, but also it hampers the supply of vegetables to the markets (Parvez, 2023).

In another literature review titled, “On and Off-Farm Mechanization in Bangladesh: A Sustainable Approach to Ensure Food Security” the author Dr. Chayan Kumar Saha, Professor at Bangladesh Agricultural University (BAU) gave a reference to FAO Statistics of 2017. According to the statistics, on-farm labor employment was around 43% in the year 2017 and it would reduce to 36% by the year 2020, and 20% by the year 2030. The reason is shared in that literature that the agricultural land is getting reduced every year by 0.5% (*On- And Off-Farm Mechanization in Bangladesh: A Sustainable Approach to Ensure Food Security*, n.d.).

Mymensingh is one of the hotspots of the crucial attack of heatwaves. At the time the author wrote the article, people, crops, and vegetable fields all were burning at a 40-degree Celsius temperature. Due to the high humidity in the air, the discomfort was prevalent. Starting from upazilas like Mymensingh Sadar, Gafargaon, Bhaluka, Nandail, Gauripur, Haluaghat, Muktagacha, and Fulbaria. All these districts have a similar pattern of heat waves. According to the Mymensingh Agricultural Information Service Office, vegetables might get damaged if the heat continues to be the same for a while as per the prediction given on the 2023 heatwaves pattern Asad (2021).

According to the deputy director of the DAE, the damage of heatwaves in the agricultural sector is serious in plain or non-haor lands. In Mymensingh around, 5275 hectares of paddy were affected due to the heatwave in the year 2021. The affected areas have always been Trishal, Gafargaon, Muktagacha, and Phulbaria upazilas of Mymensingh (Jahid & Islam, 2021).

As the temperature rises during the summer season, it has an extent of heat affecting the plant growth. Farmers, especially growers of plants, do not expect such hot temperatures. They did not even feel such heat waves in the past. Because the temperature in Bangladesh used to remain at an average of 25-26 degrees Celsius. The last high temperature experienced was 26.58 Celsius in the year 2009. From 1901 to 2021, the average temperature has been 25.45 Celsius. In return, the heatwave affects the growth of crops as crops are getting smaller in size (TRADING ECONOMICS, n.d.).

In the absence of rain, farmers seek to delay planting vegetables and crops for not having the land prepared before. The importance of the protection of surface water bodies is now everyone's concern as this procedure will increase the capacity of water holding with the increase of the organic content in soil to grow crops (Shabuj & Parvez, 2023).

While discussing the impact of heatwave on food production, it has been noticed that among the different types of rice, Boro Rice experienced a major loss as per the primary estimation of the year 2021. This had an impact on the landless sharecroppers as they invested a lot in Boro rice. The impact of heatwaves is there in agriculture. Now it depends on the Ministry of Agriculture on how they seek to deal with such situations every year. (*Bangladesh Farmers Need Bailout to Recover from Heatwave-Induced Crop Loss*, 2021)

## **1.2 Literature Review**

In an article titled 'Heat wave hits summer vegetables', authors Mostafa Shabuj and Sohel Parvez argued that due to the heatwave, many farmers could not grow and harvest vegetables in a proper manner which also has an impact on the supply to the market. As a result, they have to irrigate frequently because there is no rain. Also, there is an impact on the financial aspect as the cost has increased. They also argued that the temperature rise has a direct effect on plant growth. Sometimes the additional water does not work because the top of the plant dries up quickly in the heat (Shabuj & Parvez, 2023).

In this literature on data-driven storytelling under modern agriculture titled, "Most Farmers Need Second Jobs to Survive", the author Jesse Hirsch reflects on the fact that farmers may need to look for outside income apart from farming to make ends meet and it is a phenomenon. The author gave a reference to the report titled "The Importance of off-farm

Income to the Agricultural Economy” where farmers’ reliance on secondary careers or income sources was a part of the investigation. The entire phenomenon of ‘secondary income source’ is a part of off-farm work which is a new pattern in rural America. This literature review also presents the information that farmers primarily work now in non-farming jobs to earn their livelihood. The notion of solely relying on income generation from agricultural activities is diminishing (Hirsch, 2022).

In this research paper titled, “On-Farm and Off-farm Works: Complement or Substitute? Evidence from Rural Nigeria,” Babatunde, R.O. discussed that farming, being a primary income source, fails to guarantee a sufficient livelihood in developing countries. Although the research study is based in Sub-Saharan Africa, the author made it clear that diversifying the income sources in off-farm activities has started becoming the norm. The paper also reflected a negative side that off-farm activities tend to a decline in own-farm agricultural production (Babatunde, 2013).

Also, fields that were used for irrigation before, cannot be used today because of the draught-like situation. That means lands that are chosen for cultivating summer vegetables have been reduced by hectares. According to the authors, farmers used to cultivate summer vegetables on 6,500 hectares of land in Bogura District in the year 2022. In 2023, the area has been limited to nearly 4,500 hectares. The authors of the paper recommended that surface water has to be protected and retained so that farmers can grow crops (Shabuj & Parvez, 2023).

In another article titled ‘Bangladesh farmers need bailout to recover from heatwave-induced crop loss,’ it has been said that agricultural officials have started to ask the government to arrange immediate bailouts for farmers who have been affected due to the heatwave. Also, the high temperature influences spikelet sterility. Although officials from the Ministry of Agriculture (MoA) have yet to figure out how best they can assist, the recommendations would include the deployment of combined harvesting at free cost in affected areas to reap the destroyed yield. Other than that, for farmers, it would be difficult to bear the costs of harvesting as a part of a partial crop. Rice fields in Mymensingh are no exception from the effect of heatwave as well (*Bangladesh Farmers Need Bailout to Recover From Heatwave-induced Crop Loss*, 2021).

In a literature titled ‘Irrigation crisis hampers Aman cultivation in Mymensingh,’ the writer Sultan Mahmud Konik from Mymensingh, explores the Aman paddy farmers’ dealing with irrigation crisis during the heatwave. Lack of rain in Mymensingh causes the planted Aman saplings to be on the verge of drying out position. Usually, Aman paddy cultivation starts from the Bengali month of Srabon. Farmers used to ready the seedbeds in hopes of cultivating Aman paddy in the monsoon.

Heatwaves come with frequent load-shedding, and many farmers are unable to plant the seedlings after the irrigation of their fields using pumps. Meanwhile, the planted samplings dry out because of the lack of irrigation. In cultivation, agriculture has shifted from the cow-plow method to modern machinery. On the other hand, modern machinery comes with the cultivation cost and compared to that cost, rice price in the market is too low. Farmers ultimately face losses. So, raising the price is one of the demands that farmers seek when it comes to cultivation during heatwaves. Farmers expect to make a profit but lose interest in paddy cultivation. Their losing interest has a direct effect on the disruption of the food production of the entire country, Bangladesh (*Irrigation Crisis Hampers Aman Cultivation in Mymensingh*, 2022).

In a research article published in Elsevier journal titled, ‘Climate change, climatic extremes, and households’ food consumption in Bangladesh: A longitudinal data analysis,’ Authors recommended that to have less impact on agriculture due to climate change, it is important to intensify enough budget allocation to the launching of crop insurance schemes, early warning systems, and technology sustaining the drought (Islam et al., 2022).

In this special issue published in the Daily Sun titled ‘Drought affects crops, fruits, and fish farming,’ it has been argued that heat wave has an impact on crop production, seasonal fruits, and fish. The issue also involves the high rate of production cost and extra irrigation expenditure. Moderate heatwaves frequently sweep over Mymensingh. Due to the shortage of normal rainfall, most farmers are dependent on irrigation (Sun, 2021).

In the article titled, ‘Severe heat wave causes misery,’ published in the Bangladesh Post, it has been explored that the heat wave brings the worst sufferings to working-class people that also include farmers who work outdoors. The livelihoods and well-being both have been seriously disrupted in non-urban communities during the hot weather. Also, the

prolonged rainless condition creates a hazardous condition for public health (*Severe Heat Wave Causes Misery*, 2023)

On the website named Agriculture Dive, in the article ‘Extreme heat waves leave farmers on edge,’ the reporter Nathan Owens talked about how producers take preventive measures to avoid any losses of crops and livestock in the United States. According to experts cited in his article, prolonged high temperature means even farmers or producers can do anything to mitigate risk (*Extreme Heat Waves Leave Farmers on Edge*, n.d.).

Another report published by the UN Environment Program has argued by Climate change adaptation finance expert Sumalee Khosla at UNEP, that extreme heat brings consequences for the agricultural sector. Climate-related heat stresses increase drought. It exacerbates the water scarcity for irrigation (*In South Asia, Record Heat Threatens the Future of Farming*, 2022).

The agricultural transition in this research paper denotes the shift from traditional farming practices to the adoption of modern technology in farming to reduce the impact of heat waves. Introducing heat-resistant seeds and mitigating the negative impacts of heatwave on agricultural productivity are also part of the agricultural transition. This transition means the adaptation strategies and farming practices regarding heat tolerant crop selection, irrigation system management, and planting and harvesting sooner or later depending on the temperatures. Also, farmers may choose to shift their career to off-farming and it is also a part of agricultural transition.

In Mymensingh, this agricultural transition is seen as a latent revolution because a lot of farmers are changing their traditional notion of rice cultivation to engage in fish hatching and other cultivation areas. Most of these farmers do not want to disclose their opinions (N. Abdullah, 2023)

### **1.3 Statement of the Problem**

Heat waves happen globally. But in Bangladesh, heatwaves have a direct impact on Agricultural transition. Firstly, Bangladesh, being the third highest rice-producing country in the world, is self-sufficient in food production now. However, problems arise when farmers face a climate crisis. Under the climate crisis, heatwave is one of the major reasons.

Rice under high temperatures goes through critical growth and it can also lead to reduced yields. The major problem farmers face is in the irrigation process due to water scarcity. Plants require frequent water as they dry up quickly due to Heat. It also leads to adopting climate-resilient crops and seeds. That means, crop failures and shifts to another variety, adopting climate-resilient practices, and incentives for farmers to adopt these practices all are ways of agricultural transition.

As Agricultural production follows modernization, heatwaves cause an unprecedented impact on farmers' lives. They face losses in producing crops, related vegetables, fruits, and whatnot. The study explores whether they think climate change has any crucial impact on their staying in the same occupation as producers or whether climate change influences their decision to switch occupations. In the agricultural transition context farmer's having a second livelihood alternative can be explained by environmental justice. Farmers can seek to diversify their income streams to a less climate-vulnerable area where they will not suffer financially, and health and safety would be maintained well during the heatwave period.

## **1.4 Research Question**

### **1.4.1 Primary Research Question**

Given the impact of heatwaves on the agricultural sector, more specifically farmer's ability to produce food from planting to harvesting seasons, do farmers in Bangladesh have alternative income generation sources to avoid climate vulnerability?

### **1.4.2 Secondary Research Questions**

1. Does the impact of Heatwaves cause an agricultural transition in the proposed area-Shomvuganj, Mymensingh?
2. How do farmers in Mymensingh Bangladesh get affected by Heatwaves?
3. Do farmers have any second occupation choices alongside Agriculture, especially farmers in Mymensingh, Bangladesh?

## **1.5 Research Objective**

Here are some research objectives given in the following:

1. To identify the factors behind the agricultural transition, especially in the pattern of farming, due to Heatwaves in Bangladesh.
2. To portray how Farmers have been greatly affected due to the heat waves, especially in Mymensingh, Bangladesh.
3. To assess farmers' point of view for supporting and not supporting any second choice of occupation alongside farming during heatwaves months.

## **1.6 Significance of the Study**

Heatwave is a huge part of climate change that enables farmers to adopt new agricultural technologies and sustainable adaptability. To fight back against Heatwaves, what is important is to introduce climate-resilient seeds, heat-tolerant rice varieties, agricultural mechanization, and the use of ICT in farming. But in the current scenario, farmers in Bangladesh are tackling irrigation support systems, electricity is also a problem in certain areas. Overall, the direct impact falls on the farmer's ability to take on the cost of food production.

In this research, the author wants to analyze, as farming is getting expensive nowadays, whether farmers want to shift to any other alternative income generation source apart from farming in heatwaves days, more specifically (May to August) of every year. Because, by diversifying income generated area in the given months, farmers would not have to take the risk of low amount of crop cultivation and their livelihood would not be under any financial risk. Since heat waves have been addressed in Bangladesh very recently, the study undoubtedly takes a rational approach in terms of the social science research arena. Besides, the approach goes beyond agricultural subjects and the area of employment opportunities for all directing to the policy level.



## Chapter Two: Research Methodology

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### 2.1 Research Method

The main purpose of this research project paper is to explore how heatwave has an impact on farmer's livelihood improvement by having a second career choice. The core idea is to explain the reasons behind farmers shifting from on-farming to both on-farming and off-farming sectors apart from rice cultivation. Therefore, **Qualitative Research Methodology** has been undertaken to gain a better understanding of the farmer's current situation of tackling climate change indicator- Heatwaves.

### 2.2 Research Approach

An **exploratory research approach** has been conducted in this research paper. It investigates the primary and secondary research questions given in the first chapter, in a detailed version. The author wanted to explore a general idea of farmers' approach to tackling heatwaves in the on-farming sector and whether they (farmers) wish to shift to any other sectors of both on-farming and off-farming due to reasons associated with cultivation.

### 2.3 Research Instruments

In this research, the research instruments- **Focus Group Discussion (FGD), Key Informant Interview (KII), and Literature analysis** have been used. For conducting Focus Group discussions and Key Informant Interviews under primary data collection, two sets of questionnaires have been prepared. The determinants behind choosing participants for Focus Group Discussion (FGD) are local people associated with farming for years and like to contribute their opinions to this research study.

On the other hand, Key Informant Interview (KII) participants were chosen based on their years of experience in on-farming sectors, participants under whom many other farmers work, and they have direct communication with dealers who provide farming-related materials.

## **2.4 Study Area and Selection of Sites**

The study area, in a broader perspective, is the Mymensingh division, Bangladesh. It is one of the 8<sup>th</sup> administrative divisions of Bangladesh. For primary data collection, a few villages have been visited named: Char Kalibari Moddhopara, Bogar Para, Kanda Para, and Purbo Para. The entire area also covered the Shomvuganj Highway and China Mor Market.

The reasons behind selecting these villages or sites are: Easy to look for farmers as there are many villages and paddy fields, the sites are near to the place where the author stayed for a few days, and the entire area which is covered is underdeveloped. The author has also explored how farmers fall into the agricultural transition during the Heatwave that is also associated with their second career choice.

## **2.5 Sources of Data**

The data collected for this research study has been taken from both primary and secondary sources. Visiting sites with prepared questionnaires (open questionnaires) have involved Focus Group Discussions and Key Informant Interviews with the local farmers and individuals associated with farming.

Meanwhile, secondary data collection through prior research of Journals, Newspapers, Articles, books, Periodicals, Reports, and Agendas has been analyzed as references. Primary data collection respondents have been local inhabitants of the farming profession.

## **2.6 Sampling Size and Design**

For this research paper, 10 Key Informant Interviews (KII), and Two Focus Group Discussions (FGD) have been undertaken in the villages named Char Kalibari Moddhopara, Bogar Para, Kanda Para, and Purbo Para.

Key Informant Interviews have been one-to-one interview sessions whereas focus group discussions contained 8 to 9 farmers and individuals associated with farming. Responses have been written in a transcendental approach.

Qualitative Methodology							
Char Kalibari Moddhopara		Bogar Para		Kanda Para		Purbo Para	
FGD	KII	FGD	KII	FGD	KII	FGD	KII
1	2		2		3	1	3

**Table 1: FGD and KII Respondents under Sampling Size**

## 2.7 Data Analysis Method

The research paper follows a **phenomenological research approach** to data collection. For data collection analysis, interpretive phenomenological analysis (IPA) has been used. Interpretive Phenomenological Analysis helps to understand the personal experiences of farmers concerning heatwaves affecting their agricultural transition. Personal experiences and opinions play an important role in analyzing the data set.

## 2.8 Ethical Consideration

While conducting the primary data collection, extensive ethical considerations have been followed. The ethical considerations include acknowledging the reason behind collecting data, the place where the author comes from, seeking permission to ask questions, and permission to take photos. The author has also made sure that the paper maintains ethical grounds so that any question does not spread any kind of negativity to anyone and any profession.

## 2.9 Limitations of the Study

Unlike any other research paper, this paper also has some limitations. First, the duration given for the research study does not align with the research paper topic involving climate change indicator-Heatwave. The author had to make things very clear for farmers to understand that the paper is based on heatwave or excessive heat climate.

Still, many farmers shared experiences on how they are facing challenges in the cultivation of rice during winter or excessive fog days. The duration is also the reason the author could not cover more fieldwork sites as the winter season was here from November to January in Bangladesh.

Apart from that, the existing literature piece is not available in ample amounts. Also, the heatwave is quite a new phenomenon in Bangladesh, the year goes from 2021 to ongoing. Most of the literature has data for the previous five to 10 years including the heatmap. In that case, the author has found difficulty with the recent condition of Heatwave in Bangladesh particularly the Mymensingh division.

Some of the limitations are directly associated with fieldwork. Although newspapers and other literature reflect that rice cultivation becomes difficult and farmers cannot grow enough crops compared to expectations and last year's amount, the fieldwork results show a completely different view. Problems their farmers face problems during heat waves, but farmers are satisfied with the amount of rice they cultivate during heat days.

## Chapter Three: Findings

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Based on the district, Mymensingh stands first in the production of rice in Bangladesh, according to the agricultural statistics yearbook of 2022 (Year Book of Agricultural Statistics of Bangladesh 2022, n.d.). In this research paper, heatwaves as the indicator of climate change and climate vulnerability have been addressed. High temperature, which is a climate factor, is closely linked with agricultural production.

In recent years, the production of rice has become a major concern. Hence, the paper tries to connect whether farmers of today have any second career choice except for farming during high-temperature days.

### **The Core Idea of Agricultural Transition**

The basic idea of agricultural transition that the author refers to in this paper in two points:

1. Farmer's transition from traditional farming to technological advancement adoption.
2. Farmers shifting to a second career during the months or entire year keeping in mind the climate vulnerability they face.

Climate Vulnerability or climate change vulnerability here indicates mostly the environmental aspect. But the social and emotional aspects are also mentioned here. The environmental aspect means the high temperature that goes up higher than 40 degrees Celsius or more. The social aspects indicate farmers getting support from local authorities in terms of financial and local-led adaptation support. Also, the emotional aspect refers to the mental health situation when farmers go through losses or unknown aspects that ultimately damage crops.

### **Variety of Rice in Shomvuganj, Mymensingh**

In Mymensingh district, the most important crops are rice, jute, and wheat. Other than these crops, there are fruits- mango, guava, jackfruit, coconut. Other agricultural pieces are mascalai pulse, lemon, olive, and pomegranate. Pepper, onion, garlic, and ginger all are produced in abundance.

There are a few rice varieties mentioned by farmers that are produced in the mentioned villages of Shomvuganj, Mymensingh. They are:

- BRRI Dhan 81 and 89
- Aman
- Kataribhog
- Jira
- Tulshimala
- BRRI Dhan 34

The paper also identifies the impact of Heatwave in the agricultural sector (which answers the second secondary research question), especially in the fields of:

- Irrigating the Crop Yield
- Variety of Rice Cultivation
- Changes in Agriculture, especially in Crop Yield
- Whether farmers should engage in other income generation sources.

The following aspects have been addressed in the questionnaire of Focus Group Discussion. The Findings are below:

### **Focus Group Discussion: Participants' Responses**

#### **Occupation of Farmers**

Interviewees of Focus Group Discussion (FGD) are mostly from farming backgrounds. Some individuals were the authority under whom many farmers worked. They produce rice, and grain, and grow other vegetables. Rice variants that farmers of Shomvuganj, and Mymensingh cultivate are: Irri, Atash, and Boro.

Farmers in Shomvuganj, Bangladesh get affected by Heatwaves in certain areas, for instance:

- Crop Yield Problem
- Crop Damages and how farmers deal with them.
- Response of Authority on Reducing the Damage

## **Crop Yield Problems Farmers Face**

Some of the major problems that farmers face during high temperatures are:

- Crops turn yellow color.
- Crops yield dry easily.
- Crops get Burned.
- Crop yield requires frequent water.

## **Crop Damage**

According to the Focus Group Discussion findings, crops are damaged by insects. Rice seeds turn white. Sometimes viruses affect crop yield. The size of crops seems to be small during high temperatures or heat waves. Most farmers agree on the fact that at Shomvuganj, Mymensingh, rice production happens in a great manner. They have no problems with the amount of rice production. But in the cultivation or production days, farmers deal with various problems related to climate change indicators- heat waves or High Temperatures.

## **Irrigating the Crop Yield**

Behind this question, the author has wanted to see whether traditional farming or technological advancement is happening at Shomvuganj, Mymensingh. The answer comes from the Focus Group Discussion participants that they use water motors to irrigate the land. Also, they have tubewells for support.

## **Farmers Facing Damages While Farming and How They Deal with Them**

This question is focused on damages or losses that farmers face, related to the Loss and Damage section. Findings show that farmers do not get to produce rice or expectedly cultivate crops. Sometimes, the sale of crops is less due to the damage of crops by insects. When farmers face this type of challenge during rice production, they do not deal with anything. They mostly relied on the dealers' providing necessary fertilizers, medicines for insect killing, and other products.

Also, during high temperatures, farmers continue working in fields. They take a rest for a while and get back to work again. Apart from producing rice, they cultivate grain and sometimes plant gourd and grow vegetables.

### **Response of Authority on Reducing the Damage**

According to what farmers said during the Focus group discussion, farmers do not go to the administration, and no one comes from the agriculture department to know the problems they face. Farmers here at Shomvuganj, Mymensingh have not been encouraged to produce high heat tolerance rice varieties yet.

### **Using Small Makeshift Ponds For Irrigation**

This question was there in the Focus Group Discussion to analyze whether farmers at Shomvuganj, Mymensingh take any local-led adaptation measure for their irrigation challenges. They use and depend on a motor and tubewell here. There are no other small makeshift ponds for irrigation.

The following aspects have been addressed in the questionnaire of Key Informant Interview (KII). The Findings are below:

### **Key Informant Interview: Participants' Responses**

#### **Changes in Agriculture During Heatwaves**

Most of the respondents said that:

- Crops turn dry, reddish, and yellowish color.
- Medicines for insect killing eradicate the challenges as a temporary solution.
- Crops require water which is not available in tubewell always.
- Crop yield is good here or production of rice is satisfactory except for the village Bogar Para
- Crops die if they do not get water straight for two days.
- The water level goes down.

According to farmers, they see these changes due to extreme heat and high temperatures.



## **Should Farmers Engage in Second Income Generation Source?**

### **Why should Farmers have a second career?**

Most of the farmers in the primary data collection shared that they are engaged in farming. Only a handful of them shared that they plant and grow vegetables, work as mechanics, and do other faucet maintenance work in both town and village areas.

Heatwaves Cause and Effect:

- Decreased Yields (Not supported in the primary data context)
- Water Scarcity to Irrigation to Production Cost Increased up [Additional Irrigation System]: One of the problems that farmers shared in their interview sessions is that water goes down during heatwaves. Also, the crop field requires frequent irrigation to support the situation of crop yield getting dried up.

Apart from that:

- Climate Change Uncertainty: There is always an uncertainty that crop production will be less compared to the previous ones.
- Health Risks (Heat stroke, exhaustion): There is the risk of heat stress as farming involves physical labor outdoors under high temperatures. For cooling mechanisms, farmers used to have a bit of rest, use a fan, and other measures like showering. Also, dehydration can lead to excessive sweating as farmers need to work longer hours. Also, irrigation needs to increase to contribute to this exhaustion.
- Diversification of Income (Financial Stability)

Here, a second income generation source means a second career. Farmer's having a second career is not new in the world. But in Bangladesh, the second career or income generation source is not widely recognized. According to farmers' responses, many of them prefer to work in vegetable fields, other than rice production. They sell them in the market. Some of the farmers shared that, they work:

- As a mechanic in the village

- Since flood water has not entered into Shomvuganj for the last few years, farming has become a credible profession to rely on.
- Farmers grow vegetables, garlic, and pepper in the highland as crops grow in proper size.
- One farmer, named Md. Hazrat from Bogar Para, Shomvuganj, Mymensingh shared that he is engaged in faucet work in the town area of Mymensingh.
- Some farmers do seasonal businesses, for example, pie selling during afternoons.
- Farmers suffer financially and physically as they feel hot during high temperatures. They choose to take a rest for a while and get back to work again as most of their only source of livelihood improvement is through farming.

The difference between on-farm, off-farm, and non-farm is given below (*What Is the Difference Between On-farm, Off-farm and Non-farm Activity?* | ResearchGate, n.d.):

- On-farm: Crops and Livestock activities occurring on the farm.
- Off-farm: Activities of crops and livestock occurring outside the field. It also includes processing and packaging.
- Non-farm: Activities that are not related to crop and livestock production.

### **Problems with Irrigation**

Most of the Key Informant Interviews with farmers represent that they face challenges in water availability for rice production. They are dependent on water motors, and tubewell to support the crop yield. During high temperatures, the crop yield requires more water as the yield dries up quickly. Also, electricity is not always available. Sometimes, electricity goes out for 7 to 8 hours, a crucial time for farming. At that time, farmers could not do anything except for doing wait.

### **Solutions Suggested by Farmers**

Most of the farmers, KII participants, shared that:

- **Crop Damage:** Proper medicine minimizes crop damage.

- **Visiting the Field area:** It would be better if any officer from the agriculture department or any authority visited the villages (especially Char Kalibari) to have ground reports on the challenges and eradication.
- **Financial Burden:** As financial costs are there, farmers mostly remain in debt. They rely on borrowing money from associations and other organizations. Financially, farmers hardly get support from anyone.
- **Need for Road:** Purbo Para village participants shared in the key informant interview that the main problem they face there is- the lack of proper roads. There is no road connecting to the main road of China more to Purbo Para gram. It falls under 31 no. road. Without having a proper road leading to the main road of Shomvuganj, they lag in getting benefits in agriculture.

There is this specific framework named sustainable livelihood framework that is related the farmer's having second career choice to avoid climate vulnerability. This particular framework provides a comprehensive approach in assessing the vulnerability to climate change while exploring alternative livelihood options. In that case, farmers' access to resources, skills, community networks, and financial aspects contribute to the determination of the ability to cope with environmental changes (Reed et al., 2013).

## Chapter Four: Discussion and Analysis

This chapter has focused on the analysis of both secondary and primary data mentioned in previous chapters.

**Heatwaves can be categorized into:**

Mild Heatwave	Moderate Heatwave	Severe Heatwave
36 to 38 degrees Celsius	38 to 40 degrees Celsius	Beyond 40 degrees Celsius

Table 1: Categorization of Heatwaves

**Heatwaves (Temperature Data) Experienced in Bangladesh from 2020-Ongoing.**

According to different reports found-

The year 2020	Year 2021	Year 2022	Year 2023	Year 2024
-	0.49% rise Compared to 1986-2005 temperature	41.2 degrees Celsius (Rajshahi)	40.5 degrees Celsius	May rise to 40 degrees Celsius in 3 months

Table 2: Temperature Data of Heatwaves (2020-2024 ongoing)

[Data reference added in the reference section]

As per the secondary data written in the introduction chapter in Northern districts of Bangladesh, farmers face paddy getting burnt down and sheaves drying out. This has matched with the respondents' information from FGD and KII. There is hardly any information received from the interview respondents that Paddy was affected or not. There is also a similarity in both primary and secondary data that the heatwaves influence crops' getting smaller in size.

Problems with irrigation refer to frequent irrigation as the water level drops down. Also, farmers face irritation and terrible sickness under the scorching sun to working in the crop field. Sweating makes them unable to work but they do not have other options as their profession is based on farming and plantation.

The research paper aims to answer the primary question-whether farmers in Bangladesh have alternative income generation sources alongside farming. The respondents' answers provide a view that they mostly choose farming (growing vegetables, rice, and grain production). Alongside farming, a few of them prefer to work in diverse areas: Some of them are pie-sellers during winter seasons, some of them work in faucet maintenance, and a handful of them are mechanics in their villages.

The reason behind choosing farming despite living far away is the condition of farming in today's context. In an article published in The Daily Star, Sohel Parvez referred to the former director of BRRI, Jiban Krishna Biswas's statement that farmers now manage fields better as there is a balanced use of fertilizer after introducing a non-urea fertilizer subsidy. Also, there is the cultivation of new varieties.

One thing that almost every respondent of Focus Group Discussion and Key Informant Interview suggested is that they now cultivate a great number of crops. There is no issue in the crop cultivation amount compared to last year's amount. Farmers seemed to be satisfied with their crop cultivation technique and other locally-led adaptations. It also means that farmers now are more focused on ensuring food security. Although they do not make surplus grains always in the market, they do not lose either. That also refers to the great amount of supply in response to the demand.

The problems farmers referred to in the questionnaire are mostly based on irrigation support as water is needed during high temperatures. Also, insects and unknown virus attacks have an impact on crop cultivation. These are some indicators that heatwaves have an impact on rice production. Since the food production growth and production are now satisfactory, the authority needs to ensure the farmer's dependency on farming with less damage and loss financially and physically. Farmers' attempts to cultivate crops as per the demand will not be futile if proper ground-based survey work is done.

Farmers have been affected due to the heatwave and their responses are quite similar to the information available on secondary sources. One thing that seems to be dissimilar is the crop production damage. In Shomvuganj, Mymensingh, farmers seemed to be satisfied with the food security and the amount of rice production. There are a few problems that farmers face involving irrigation, water scarcity, and insects. Another reason farmers do

not get affected during the mid-year, the heatwave months, is because a certain variety of crops get cut down during that time. So, farmers need to just prepare the crop field for the next production.

## Chapter Five: Recommendation

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The research paper argues that the agricultural transition in technological advancement (encouraging farmers to heat-resistant crops production) and farmers' having second career choice are not in a flourished mode, rather the agricultural transition is now at the beginner level if it is measured level-wise.

### **(1) The Authority should focus on more Groundwork Survey**

When farmers or participants in focus group discussions (FGDs) and key informant interviews (KIIs) express that they lack financial support and platforms to share their concerns, it suggests that there may be shortcomings in the way surveys and assessments are conducted at the grassroots level (such as village-to-village surveys). This indicates a need for more comprehensive and inclusive approaches to gather insights directly from farmers and ensure that their voices are heard.

While current crop production might be satisfactory, it's essential to consider potential future challenges, such as changing climate conditions. Even if heat-resistant crops are not immediately necessary, anticipating future needs is crucial for agricultural sustainability. Research and development efforts should be proactive in addressing these potential challenges to ensure that farmers have access to suitable crop varieties in the future.

Moreover, the lack of access to technological aspects of crop production, including machinery, is a significant barrier for many farmers. This highlights the importance of providing training and support to enhance farmers' technological capabilities, which can improve efficiency, productivity, and resilience in agricultural practices.

Besides, conducting thorough groundwork surveys in Shomvuganj, Mymensingh Sadar, and Mymensingh, can indeed provide valuable insights and benefit farmers from the ground up. Such surveys can help identify specific challenges faced by farmers in the area, assess their needs, and inform the development of targeted interventions and support programs.

## Chapter Six: Conclusion

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In Mymensingh, agriculture is the primary livelihood for farmers. Heat waves, being one of the determinants of terrible climate change indicators, can cause severe consequences on the financial aspects and health aspects of farmers. Extreme heat can not only damage crops by reducing yields and losses of livestock but also causes financial losses for farmers who belong to marginalized socio-economic communities.

Also, adapting to a completely new notion of farming requires time and effort. For instance, training and investment in heat-resistant crops. In this case, farms that are supported financially are equipped with a heatwave adaptation strategy well compared to resource-constrained smaller farms. Even if farmers feel that continuing to work under the scorching sun will not be enough to protect their crops, they still risk their health. Because there is economic pressure they cannot avoid.

Heatwaves can cause agricultural transition and there is no doubt. But the bigger picture is still not out of sight as the entire cause and effect are just a beginning. Farmers have started to second career choices due to being concerned about the climate change uncertainty, health risks, the available time, and to support their livelihood a little better. Their adoption of heat-resistant measures is still on the way. However, this paper can be a good source of reference if soon, more farmers shift to the second career choice to avoid the climate vulnerability caused by heatwaves.



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## Appendix A:

### Questionnaire 1: Focus Group Discussion (FGD)

Respondent Personal Information:

Date:

Time:

Interviewer's Name:

Interviewee's Name:

- Gender: Male/Female
- Occupation:
- Village: Bogar Para/Kanda para/ Char kalibari
- Area:

1. What kind of crops/agriculture do you grow? (আপনারা কি ধরনের ফসল/কৃষিপণ্য চাষ করে থাকেন?)
2. What kind of crop yield problems do you face in extreme heat/heat flux/high temperature/heat shock? (অনেক গরম/তাপপ্রবাহে/ উচ্চ তাপমাত্রায়/হিট শকে ফসল ফলনে কি ধরনের সমস্যার সম্মুখীন হন?)
3. What kind of crop damage occurs during extreme heat/heat waves? (ফসলের কি ধরনের ক্ষতি হয়ে থাকে অনেক গরম/তাপপ্রবাহের সময়ে?)
4. How do you irrigate the land in heat? (অনেক গরম/তাপপ্রবাহে জমিতে সেচ কিভাবে দিয়ে থাকেন?)
5. What kind of damage, you farmers face while farming? (আপনাদের, কৃষক হিসেবে কি ধরনের ক্ষতি হয়ে থাকে?)
6. How do you deal with this loss of crops or vegetables? (ফসল কিংবা শাকসবজির এই ক্ষতি কিভাবে মোকাবেলা করে থাকেন?)
7. In the case of crop or vegetable production, in excessive heat, what kind of measures do you take so that the heat is less or the damage to the crop is reduced?

- (ফসল কিংবা শাকসবজি ফলনের ক্ষেত্রে, অতিরিক্ত গরমে, আপনারা কি ধরনের ব্যবস্থা নিয়ে থাকেন যাতে তাপ কম লাগে বা ফসলের ক্ষতি কম হয়ে থাকে?)
8. Have you ever felt like engaging in another profession during this extreme heat/heat wave? (আপনাদের কি কখনও এমন মনে হয়েছে, এই অতিরিক্ত গরম/তাপপ্রবাহের সময়ে অন্য কোনো পেশায় নিজেকে নিযুক্ত করি?)
  9. How is the local administration helping your farmers to reduce the damage? (ক্ষতি যাতে কম হয় সেইক্ষেত্রে স্থানীয় প্রশাসন কিভাবে সহায়তা করছে আপনাদের কৃষকদের?)
  10. Are you encouraged to produce high heat tolerant rice varieties? (উচ্চ তাপ সহনশীল ধানের জাত উৎপাদনে কি আপনাদের উদ্বুদ্ধ করা হয়?)
  11. Do authorities give importance to the development of high yielding rice varieties that are resistant to high temperature and resistant to diseases and insects? (উচ্চ তাপমাত্রা সহনশীল এবং রোগ ও পোকামাকড় প্রতিরোধক উচ্চ ফলনশীল ধানের জাত উদ্ভাবনের বিষয়ে কর্তৃপক্ষ গুরুত্ব দিচ্ছে?)
  12. Do you use small makeshift ponds when water is needed for irrigation during extreme heat waves? (অতিরিক্ত তাপপ্রবাহের সময় সেচ কার্য চালানোর জন্য পানির প্রয়োজন দেখা দেয়, সেই সময়ে কি ছোটো অস্থায়ী পুকুরের ব্যবস্থা আপনারা করে থাকেন?)

## Response 1: Focus Group Discussion (FGD)

Respondent Personal Information:

Date: February 12, 2024

Time: 4:45 pm

Interviewer's Name: Kanij Fatima Maisha

Interviewee's Name: Harun Ur Rashid, Bacchu Mondol, Abdul Kadir, Mosharraf Hossain, Rafikul Islam, Md. Asad Alid, Abdul Latif, Fayzul Islam

- Gender: Male
- Occupation: Farmers and individuals associated with farming
- Village : Char kalibari
- Area: Shomvuganj

1. What kind of crops/agriculture do you grow? (আপনারা কি ধরনের ফসল/কৃষিপণ্য চাষ করে থাকেন?)

Here, most of us engage in rice cultivation. Some of us also grow vegetables which are associated with grain.

2. What kind of crop yield problems do you face in extreme heat/heat flux/high temperature/heat shock? (অনেক গরম/তাপপ্রবাহে/ উচ্চ তাপমাত্রায়/হিট শকে ফসল ফলনে কি ধরনের সমস্যার সম্মুখীন হন?)

Our crops turn yellow during the extreme heat season. Also, crop yields become dry easily in extreme heat. We feel restless to stay in crop yield to do our chores. We can't stand heat while working.

3. What kind of crop damage occurs during extreme heat/heat waves? (ফসলের কি ধরনের ক্ষতি হয়ে থাকে অনেক গরম/তাপপ্রবাহের সময়ে?)

Crops are damaged by insects mostly. Then there is the time when our crops turn yellow. In summer paddy gets burned, and rice seeds turn white. Sometimes, we cannot grow enough crops as crops are affected by viruses.

4. How do you irrigate the land in heat? (অনেক গরম/তাপপ্রবাহে জমিতে সেচ কিভাবে দিয়ে থাকেন?)

The water goes down. Water does not rise in the faucet. We usually use motor, and tubewell here.

Abdul Latif: We use here Jol motor (Water motor).

5. What kind of damage, you farmers face while farming? (আপনাদের, কৃষক হিসেবে কি ধরনের ক্ষতি হয়ে থাকে?)

We do not get to cultivate our expected crops. Crops cultivation gets minimized. Also, insects damage crops. Sometimes, the sale of crops is less.

6. How do you deal with this loss of crops or vegetables? (ফসল কিংবা শাকসবজির এই ক্ষতি কিভাবে মোকাবেলা করে থাকেন?)

During summer, we try to take a rest and get back to work. The problem we face is that the paddy field requires frequent water. Give water to the body so that we feel less heat.

7. In the case of crop or vegetable production, in excessive heat, what kind of measures do you take so that the heat is less or the damage to the crop is reduced? (ফসল কিংবা শাকসবজি ফলনের ক্ষেত্রে, অতিরিক্ত গরমে, আপনারা কি ধরনের ব্যবস্থা নিয়ে থাকেন যাতে তাপ কম লাগে বা ফসলের ক্ষতি কম হয়ে থাকে?)

What happened is that we depend on dealers. Whatever the dealer provides, we use it on our crop cultivation. They know better what is good for crops or not.

8. Have you ever felt like engaging in another profession during this extreme heat/heat wave? (আপনাদের কি কখনও এমন মনে হয়েছে, এই অতিরিক্ত গরম/তাপপ্রবাহের সময়ে অন্য কোনো পেশায় নিজেকে নিযুক্ত করি?)

Apart from crops, we cultivate vegetables, plant gourd, and other vegetables.

9. How is the local administration helping your farmers to reduce the damage? (ক্ষতি যাতে কম হয় সেইক্ষেত্রে স্থানীয় প্রশাসন কিভাবে সহায়তা করছে আপনাদের কৃষকদের?)

No, no one comes here to help us. We do not go to the administration or agricultural officer to talk about our problems.

10. Are you encouraged to produce high heat tolerant rice varieties? (উচ্চ তাপ সহনশীল ধানের জাত উৎপাদনে কি আপনাদের উদ্বুদ্ধ করা হয়?)

If the government provides us seeds or directs us, we will do that.

11. Do authorities give importance to the development of high yielding rice varieties that are resistant to high temperature and resistant to diseases and insects? (উচ্চ তাপমাত্রা সহনশীল এবং রোগ ও পোকামাকড় প্রতিরোধক উচ্চ ফলনশীল ধানের জাত উদ্ভাবনের বিষয়ে কর্তৃপক্ষ গুরুত্ব দিচ্ছে?)

No, no officer comes to this place.

12. Do you use small makeshift ponds when water is needed for irrigation during extreme heat waves? (অতিরিক্ত তাপপ্রবাহের সময় সেচ কার্য চালানোর জন্য পানির প্রয়োজন দেখা দেয়, সেই সময়ে কি ছোটো অস্থায়ী পুকুরের ব্যবস্থা আপনারা করে থাকেন?)

No, we only use a water motor here. If electricity goes, we must wait for it to come. Then we start working again.



## Response 2: Focus Group Discussion (FGD)

Respondent Personal Information:

Date: February 13, 2024

Time: 11:40 pm

Interviewer's Name: Kanij Fatima Maisha

Interviewee's Name: Sardar Ali, Parvina Begum, Hasnat Karim, Zobeda, (others do not like to share their names)

- Gender: Male/Female (both)
- Occupation: Farming, they have paddy fields under which other farmers work
- Village: Purbo Para
- Area: China Mor, Shomvuganj.

1. What kind of crops/agriculture do you grow? (আপনারা কি ধরনের ফসল/কৃষিপণ্য চাষ করে থাকেন?)

We cultivate rice, irri, stash, boro, and a few vegetables.

2. What kind of crop yield problems do you face in extreme heat/heat flux/high temperature/heat shock? (অনেক গরম/তাপপ্রবাহে/ উচ্চ তাপমাত্রায়/হিট শকে ফসল ফলনে কি ধরনের সমস্যার সম্মুখীন হন?)

We feel hot and restless. We cannot tolerate heat. Our crops get burned. They require a lot of water.

3. What kind of crop damage occurs during extreme heat/heat waves? (ফসলের কি ধরনের ক্ষতি হয়ে থাকে অনেক গরম/তাপপ্রবাহের সময়ে?)

Crops cultivation is good here. We face problems during winter. Fog affects crop cultivation. Other than that, during summer, the size of crops becomes small.

4. How do you irrigate the land in heat? (অনেক গরম/তাপপ্রবাহে জমিতে সেচ কিভাবে দিয়ে থাকেন?)

We use water motors here to irrigate the land. Also, tubewells are here.

5. What kind of damage, you farmers face while farming? (আপনাদের, কৃষক হিসেবে কি ধরনের ক্ষতি হয়ে থাকে?)

Crops grow slowly and the sizes of crops are small.

6. How do you deal with this loss of crops or vegetables? (ফসল কিংবা শাকসবজির এই ক্ষতি কিভাবে মোকাবেলা করে থাকেন?)

We only cultivate crops. We do not deal with anything.

7. In the case of crop or vegetable production, in excessive heat, what kind of measures do you take so that the heat is less or the damage to the crop is reduced? (ফসল কিংবা শাকসবজি ফলনের ক্ষেত্রে, অতিরিক্ত গরমে, আপনারা কি ধরনের ব্যবস্থা নিয়ে থাকেন যাতে তাপ কম লাগে বা ফসলের ক্ষতি কম হয়ে থাকে?)

We rest for a while and get back to work again. There is nothing much to do for our crops.

8. Have you ever felt like engaging in another profession during this extreme heat/heat wave? (আপনাদের কি কখনও এমন মনে হয়েছে, এই অতিরিক্ত গরম/তাপপ্রবাহের সময়ে অন্য কোনো পেশায় নিজেেকে নিযুক্ত করি?)

No, we only grow vegetables here and cultivate rice. Other than that, we do not do anything.

9. How is the local administration helping you, farmers, to reduce the damage? (ক্ষতি যাতে কম হয় সেইক্ষেত্রে স্থানীয় প্রশাসন কিভাবে সহায়তা করছে আপনাদের কৃষকদের?)

They do not do anything. They do not come here. Even if we do not get to them with our problems.

10. Are you encouraged to produce high heat tolerant rice varieties? (উচ্চ তাপ সহনশীল ধানের জাত উৎপাদনে কি আপনাদের উদ্বুদ্ধ করা হয়?)

No, it does not happen here.

11. Do authorities give importance to the development of high yielding rice varieties that are resistant to high temperature and resistant to diseases and insects? (উচ্চ তাপমাত্রা সহনশীল এবং রোগ ও পোকামাকড় প্রতিরোধক উচ্চ ফলনশীল ধানের জাত উদ্ভাবনের বিষয়ে কর্তৃপক্ষ গুরুত্ব দিচ্ছে?)

No. For insects or other problems we face while cultivating, we look for dealers to give us some fertilizers and medicines if required.

12. Do you use small makeshift ponds when water is needed for irrigation during extreme heat waves? (অতিরিক্ত তাপপ্রবাহের সময় সেচ কার্য চালানোর জন্য পানির প্রয়োজন দেখা দেয়, সেই সময়ে কি ছোটো অস্থায়ী পুকুরের ব্যবস্থা আপনারা করে থাকেন?)

No. We only use motor and tubewell here.

## Questionnaire 2: Key Informant Interview (KII)

Respondent Personal Information:

Date:

Time:

Interviewer's Name:

Interviewee's Name:

- Gender: Male/Female
- Occupation:
- Village: Char kalibari
- Area:

1. Do you think you will see any changes in agriculture or crop yields due to additional heat waves? (আপনার কি মনে হয় অতিরিক্ত তাপপ্রবাহের কারণে আপনারা কৃষিতে বা ফসল ফলনের ক্ষেত্রে কোনো পরিবর্তন দেখতে পাচ্ছেন?)
2. Why do you see such changes in agriculture? (কৃষিতে কেনও এমন পরিবর্তন দেখতে পাচ্ছেন?)
3. What kind of damage do you think farmers are more likely to suffer from high temperatures or heat shock? (উচ্চ তাপমাত্রা বা হিট শকে কৃষকদের কি ধরনের ক্ষতির সম্ভাবনা বেশি বলে আপনারা মনে করেন?)
4. Do you think farmers should engage in other occupations during high temperatures? (আপনার কি মনে হয়, উচ্চ তাপমাত্রার সময়ে কৃষকদের অন্য কোনো পেশায় নিজেদের নিয়োজিত করা উচিত?)
5. What kind of damage do you think the farmers are suffering due to excessive heat - financial / mental / physical? (অতিরিক্ত গরমে কৃষকদের কি ধরনের ক্ষতি বেশি হচ্ছে বলে আপনি মনে করেন-আর্থিক/ মানসিক/ শারীরিক?)

6. According to the research, in Mymensingh, there is a shortage of irrigation in paddy cultivation, do you agree with it? (গবেষণা মতে, ময়মনসিংহে, ধান চাষে সেচ সংকট দেখা দেয়, আপনি কি এর সাথে একমত?)
7. How do you think it is possible to solve the problems faced by farmers in the production of crops during excessive heat? (অতিরিক্ত গরমে কৃষকেরা ফসল উৎপাদনে যে ধরনের সমস্যার সম্মুখীন হয় তা কিভাবে নিরসন করা সম্ভব বলে আপনআর মনে হয়?)

### Response 1: Key Informant Interview (KII)

Respondent Personal Information:

Date: February 12, 2024

Time: 5:00 pm

Interviewer's Name: Kanij Fatima Maisha

Interviewee's Name: Amir Hossain

- Gender: **Male**/ Female
- Occupation: Farmer + Seasonal Pitha (pie) Seller
- Village: Char Kalibari
- Area: Shomvuganj

1. Do you think you will see any changes in agriculture or crop yields due to additional heat waves? (আপনার কি মনে হয় অতিরিক্ত তাপপ্রবাহের কারণে আপনারা কৃষিতে বা ফসল ফলনের ক্ষেত্রে কোনো পরিবর্তন দেখতে পাচ্ছেন?)

Yes, I can see that crops turn yellowish color during extreme heat. I use medicine that dealers give me to eradicate the situation. Also, to kill insects, I use medicine.

2. Why do you see such changes in agriculture? (কৃষিতে কেনও এমন পরিবর্তন দেখতে পাচ্ছেন?)

This is because of the extreme heat. During extreme heat, insects damage crops, and vegetables get damaged as well.

3. What kind of damage do you think farmers are more likely to suffer from high temperatures or heat shock? (উচ্চ তাপমাত্রা বা হিট শকে কৃষকদের কি ধরনের ক্ষতির সম্ভাবনা বেশি বলে আপনারা মনে করেন?)

Heat, insects, and damage to vegetables, and crops are the damages that we face.

4. Do you think farmers should engage in other occupations during high temperatures? (আপনার কি মনে হয়, উচ্চ তাপমাত্রার সময়ে কৃষকদের অন্য কোনো পেশায় নিজেস্ব নিয়োজিত করা উচিত?)

I am a farmer and a seasonal pie seller during winter afternoons. I think farmers should get involved if their crops are damaged due to heat.

5. What kind of damage do you think the farmers are suffering due to excessive heat - financial / mental / physical? (অতিরিক্ত গরমে কৃষকদের কি ধরনের ক্ষতি বেশি হচ্ছে বলে আপনি মনে করেন-আর্থিক/ মানসিক/ শারীরিক?)

I feel hot during extreme heat. Besides, as farmers, we do not get any financial assistance. We arrange money for ourselves to grow crops and other vegetables.

6. According to the research, in Mymensingh, there is a shortage of irrigation in paddy cultivation, do you agree with it? (গবেষণা মতে, ময়মনসিংহে, ধান চাষে সেচ সংকট দেখা দেয়, আপনি কি এর সাথে একমত?)

Yes, a shortage of irrigation is there. Because water does not rise during the summer season. The paddy field requires a lot of water.

7. How do you think it is possible to solve the problems faced by farmers in the production of crops during excessive heat? (অতিরিক্ত গরমে কৃষকেরা ফসল উৎপাদনে যে ধরনের সমস্যার সম্মুখীন হয় তা কিভাবে নিরসন করা সম্ভব বলে আপনআর মনে হয়?)

Proper medicine can minimize the crop damage caused by insects and flies. Also, it would be better if the agriculture officer visited this place.

### **Response 2: Key Informant Interview (KII)**

Respondent Personal Information:

Date: February 13, 2024

Time: 10:30 am

Interviewer's Name: Kanij Fatima Maisha

Interviewee's Name: Not Mentioned

- Gender: Female
- Occupation: Associated with farming. She has fields under which other farmers work.
- Village: Purbo Para
- Area: China Mor

1. Do you think you will see any changes in agriculture or crop yields due to additional heat waves? (আপনার কি মনে হয় অতিরিক্ত তাপপ্রবাহের কারণে আপনারা কৃষিতে বা ফসল ফলনের ক্ষেত্রে কোনো পরিবর্তন দেখতে পাচ্ছেন?)

Yes, crops die, and sometimes they require extra water but water is not available in tubewell always.

2. Why do you see such changes in agriculture? (কৃষিতে কেনও এমন পরিবর্তন দেখতে পাচ্ছেন?)

Everything is similar to the previous but here, crop yield cultivation happens in good amounts. Electricity is also here. No problem with that.

3. What kind of damage do you think farmers are more likely to suffer from high temperatures or heat shock? (উচ্চ তাপমাত্রা বা হিট শকে কৃষকদের কি ধরনের ক্ষতির সম্ভাবনা বেশি বলে আপনারা মনে করেন?)

They suffer in extreme heat. They take a rest for a few hours and again get back to work. Crop yield cultivation here is good. No problem with that. Sometimes insects damage a few crops' yields but after giving medicine, crops get better.

4. Do you think farmers should engage in other occupations during high temperatures? (আপনার কি মনে হয়, উচ্চ তাপমাত্রার সময়ে কৃষকদের অন্য কোনো পেশায় নিজেদের নিয়োজিত করা উচিত?)

They only do farming. Apart from crop yield, they grow vegetables here. Many farmers come from distant places to work here.

5. What kind of damage do you think the farmers are suffering due to excessive heat - financial / mental / physical? (অতিরিক্ত গরমে কৃষকদের কি ধরনের ক্ষতি বেশি হচ্ছে বলে আপনি মনে করেন-আর্থিক/ মানসিক/ শারীরিক?)

Financial costs are there but they also suffer physically due to extreme heat. It becomes terrible for them to work here.

6. According to the research, in Mymensingh, there is a shortage of irrigation in paddy cultivation, do you agree with it? (গবেষণা মতে, ময়মনসিংহে, ধান চাষে সেচ সংকট দেখা দেয়, আপনি কি এর সাথে একমত?)

No, there is no shortage of irrigation, but plants require more water during the summer season. They need to take care.



7. How do you think it is possible to solve the problems faced by farmers in the production of crops during excessive heat? (অতিরিক্ত গরমে কৃষকেরা ফসল উৎপাদনে যে ধরনের সমস্যার সম্মুখীন হয় তা কিভাবে নিরসন করা সম্ভব বলে আপনআর মনে হয়?)

There is a water motor, but we do not use them here. Crop yield is good but not always.

### **Response 3: Key Informant Interview (KII)**

Respondent Personal Information:

Date: February 13, 2024

Time: 10:15 am

Interviewer's Name: Kanij Fatima Maisha

Interviewee's Name: Did not want to mention it.

- Gender: Male
- Occupation: Farming
- Village: Purbopara
- Area: Shomvuganj

1. Do you think you will see any changes in agriculture or crop yields due to additional heat waves? (আপনার কি মনে হয় অতিরিক্ত তাপপ্রবাহের কারণে আপনারা কৃষিতে বা ফসল ফলনের ক্ষেত্রে কোনো পরিবর্তন দেখতে পাচ্ছেন?)

Yes, crop yield requires water frequently. But in Tubewell, we hardly get that. Also, we use a water motor here. But overall crop yield is good here.

2. Why do you see such changes in agriculture? (কৃষিতে কেনও এমন পরিবর্তন দেখতে পাচ্ছেন?)

I think changes happen due to extreme heat. Because during winter, problems are different. At that time, fog limited the growth of crops and plants.

3. What kind of damage do you think farmers are more likely to suffer from high temperatures or heat shock? (উচ্চ তাপমাত্রা বা হিট শকে কৃষকদের কি ধরনের ক্ষতির সম্ভাবনা বেশি বলে আপনারা মনে করেন?)

The situation here is similar to drought. But crops sometimes get damaged. Farmers suffer a lot while working in the field under extreme heat.

4. Do you think farmers should engage in other occupations during high temperatures? (আপনার কি মনে হয়, উচ্চ তাপমাত্রার সময়ে কৃষকদের অন্য কোনো পেশায় নিজে থেকে নিয়োজিত করা উচিত?)

They work in other fields. Also, whole year, they grow vegetables on separate land and sell them.

5. What kind of damage do you think the farmers are suffering due to excessive heat - financial / mental / physical? (অতিরিক্ত গরমে কৃষকদের কি ধরনের ক্ষতি বেশি হচ্ছে বলে আপনি মনে করেন-আর্থিক/ মানসিক/ শারীরিক?)

The costs are there. Farmers including me remain in debt. We had to borrow money from Shamiti (Local Association).

6. According to the research, in Mymensingh, there is a shortage of irrigation in paddy cultivation, do you agree with it? (গবেষণা মতে, ময়মনসিংহে, ধান চাষে সেচ সংকট দেখা দেয়, আপনি কি এর সাথে একমত?)

No. Here is the water motor and tubewell. They come in great use.

7. How do you think it is possible to solve the problems faced by farmers in the production of crops during excessive heat? (অতিরিক্ত গরমে কৃষকেরা ফসল উৎপাদনে যে ধরনের সমস্যার সম্মুখীন হয় তা কিভাবে নিরসন করা সম্ভব বলে আপনআর মনে হয়?)

There is a motor but we do not use it much. Because we do not need it. The main problem here is, that there is no road in this Purbo para Gram (Purbo Para Village). The area falls under 31 no. ward.

#### **Response 4: Key Informant Interview (KII)**

Respondent Personal Information:

Date: February 13, 2024

Time: 9:15 am

Interviewer's Name: Kanij Fatima Maisha

Interviewee's Name: Md. Hazrat

- Gender: Male
- Occupation: Farmer
- Village: Bogar Para
- Area: Shomvuganj

1. Do you think you will see any changes in agriculture or crop yields due to additional heat waves? (আপনার কি মনে হয় অতিরিক্ত তাপপ্রবাহের কারণে আপনারা কৃষিতে বা ফসল ফলনের ক্ষেত্রে কোনো পরিবর্তন দেখতে পাচ্ছেন?)

Not a great amount of rice is produced here. Additional water is required. Other than that, everything is the same.

2. Why do you see such changes in agriculture? (কৃষিতে কেনও এমন পরিবর্তন দেখতে পাচ্ছেন?)

It is because of the extreme heat. In Bawar Season, it happens a lot.

3. What kind of damage do you think farmers are more likely to suffer from high temperatures or heat shock? (উচ্চ তাপমাত্রা বা হিট শকে কৃষকদের কি ধরনের ক্ষতির সম্ভাবনা বেশি বলে আপনারা মনে করেন?)

Crops are damaged sometimes.

4. Do you think farmers should engage in other occupations during high temperatures? (আপনার কি মনে হয়, উচ্চ তাপমাত্রার সময়ে কৃষকদের অন্য কোনো পেশায় নিজেকে নিয়োজিত করা উচিত?)

I am engaged in faucet work in the town area. I also do farming.

5. What kind of damage do you think the farmers are suffering due to excessive heat - financial / mental / physical? (অতিরিক্ত গরমে কৃষকদের কি ধরনের ক্ষতি বেশি হচ্ছে বলে আপনি মনে করেন-আর্থিক/ মানসিক/ শারীরিক?)

All the mentioned damages happen. Financial costs cannot be explained.

6. According to the research, in Mymensingh, there is a shortage of irrigation in paddy cultivation, do you agree with it? (গবেষণা মতে, ময়মনসিংহে, ধান চাষে সেচ সংকট দেখা দেয়, আপনি কি এর সাথে একমত?)

No, it does not happen here.

7. How do you think it is possible to solve the problems faced by farmers in the production of crops during excessive heat? (অতিরিক্ত গরমে কৃষকেরা ফসল উৎপাদনে যে ধরনের সমস্যার সম্মুখীন হয় তা কিভাবে নিরসন করা সম্ভব বলে আপনআর মনে হয়?)

Proper fertilizer is required. I have to remain in debt to arrange necessary things regarding farming. Otherwise, I cannot survive in this profession.

## Response 5: Key Informant Interview (KII)

Respondent Personal Information:

Date: February 14, 2024

Time: 12:30 pm

Interviewer's Name: Kanij Fatima Maisha

Interviewee's Name: Not mentioned.

- Gender: Male
- Occupation: Farming
- Village: Kanda Para
- Area: Shomvuganj, Mymensingh Sadar

1. Do you think you will see any changes in agriculture or crop yields due to additional heat waves? (আপনার কি মনে হয় অতিরিক্ত তাপপ্রবাহের কারণে আপনারা কৃষিতে বা ফসল ফলনের ক্ষেত্রে কোনো পরিবর্তন দেখতে পাচ্ছেন?)

Crops tend to damage but not in a great amount. Here, the crop yield rate is good.

2. Why do you see such changes in agriculture? (কৃষিতে কেনও এমন পরিবর্তন দেখতে পাচ্ছেন?)

From summer to winter and winter to summer, some changes happen. It is due to the season and extreme heat.

3. What kind of damage do you think farmers are more likely to suffer from high temperatures or heat shock? (উচ্চ তাপমাত্রা বা হিট শকে কৃষকদের কি ধরনের ক্ষতির সম্ভাবনা বেশি বলে আপনারা মনে করেন?)

Crop yield amount tends to be less sometimes. But crops require water as their crop pulls more water during summer or extreme heat time.

4. Do you think farmers should engage in other occupations during high temperatures?  
(আপনার কি মনে হয়, উচ্চ তাপমাত্রার সময়ে কৃষকদের অন্য কোনো পেশায়  
নিজেকে নিয়োজিত করা উচিত?)

I only do farm all year long. But if farmers think that farming becomes terrible for them under scorched heat, they can shift to any other occupation at that time.

5. What kind of damage do you think the farmers are suffering due to excessive heat - financial / mental / physical? (অতিরিক্ত গরমে কৃষকদের কি ধরনের ক্ষতি বেশি হচ্ছে বলে আপনি মনে করেন-আর্থিক/ মানসিক/ শারীরিক?)

I think physical and financial burdens are there mostly.

6. According to the research, in Mymensingh, there is a shortage of irrigation in paddy cultivation, do you agree with it? (গবেষণা মতে, ময়মনসিংহে, ধান চাষে সেচ সংকট দেখা দেয়, আপনি কি এর সাথে একমত?)

Not always but in our locality, this does not happen.

7. How do you think it is possible to solve the problems faced by farmers in the production of crops during excessive heat? (অতিরিক্ত গরমে কৃষকেরা ফসল উৎপাদনে যে ধরনের সমস্যার সম্মুখীন হয় তা কিভাবে নিরসন করা সম্ভব বলে আপনআর মনে হয়?)

Farmers do not think about themselves while working in the scorching heat. They require additional fertilizers and medicines so that crops grow better.

### **Response 6: Key Informant Interview (KII)**

Respondent Personal Information:

Date: February 13, 2024

Time: 10:45 am

Interviewer's Name: Kanij Fatima Maisha

Interviewee's Name: Md. Moazzem Hossain

- Gender: Male
- Occupation: Farming
- Village: Bogar para
- Area: Mymensingh Sadar

1. Do you think you will see any changes in agriculture or crop yields due to additional heat waves? (আপনার কি মনে হয় অতিরিক্ত তাপপ্রবাহের কারণে আপনারা কৃষিতে বা ফসল ফলনের ক্ষেত্রে কোনো পরিবর্তন দেখতে পাচ্ছেন?)

Plants become small, they die and they require and pull a maximum amount of water.

2. Why do you see such changes in agriculture? (কৃষিতে কেনও এমন পরিবর্তন দেখতে পাচ্ছেন?)

I have a tractor that I use during harvest season. I think plants or crops tend to be small during extreme heat due to the season change. I do not get to see the same during winter.

3. What kind of damage do you think farmers are more likely to suffer from high temperatures or heat shock? (উচ্চ তাপমাত্রা বা হিট শকে কৃষকদের কি ধরনের ক্ষতির সম্ভাবনা বেশি বলে আপনারা মনে করেন?)

Crop yield happens less than the expectation. I grow in my paddy fields Aman, KatariBhog, Jira rice, Choutreesh, Tulshimala. Each of the rice requires a different kind of care.

4. Do you think farmers should engage in other occupations during high temperatures? (আপনার কি মনে হয়, উচ্চ তাপমাত্রার সময়ে কৃষকদের অন্য কোনো পেশায় নিজেকে নিয়োজিত করা উচিত?)

I along with other farmers grow here vegetables, garlic, and pepper on the highland. A type of crop requires 5 months at least to grow in proper size.

5. What kind of damage do you think the farmers are suffering due to excessive heat - financial / mental / physical? (অতিরিক্ত গরমে কৃষকদের কি ধরনের ক্ষতি বেশি হচ্ছে বলে আপনি মনে করেন-আর্থিক/ মানসিক/ শারীরিক?)

I cannot balance or match the expense accounts compared to the hard work I do in the field.

6. According to the research, in Mymensingh, there is a shortage of irrigation in paddy cultivation, do you agree with it? (গবেষণা মতে, ময়মনসিংহে, ধান চাষে সেচ সংকট দেখা দেয়, আপনি কি এর সাথে একমত?)

Shortage of irrigation was there before, nowadays, there is no problem. I have a water motor here run by meter.

7. How do you think it is possible to solve the problems faced by farmers in the production of crops during excessive heat? (অতিরিক্ত গরমে কৃষকেরা ফসল উৎপাদনে যে ধরনের সমস্যার সম্মুখীন হয় তা কিভাবে নিরসন করা সম্ভব বলে আপনআর মনে হয়?)

Medicine is required here I had to buy from the local market or dealers.

### **Response 7: Key Informant Interview (KII)**

Respondent Personal Information:

Date: February 14, 2024

Time: 10:30 am

Interviewer's Name: Kanij Fatima Maisha

Interviewee's Name: Abdullah

- Gender: Male
- Occupation: Farming



- Village: Kanda Para
- Area: Mymensingh Sadar

1. Do you think you will see any changes in agriculture or crop yields due to additional heat waves? (আপনার কি মনে হয় অতিরিক্ত তাপপ্রবাহের কারণে আপনারা কৃষিতে বা ফসল ফলনের ক্ষেত্রে কোনো পরিবর্তন দেখতে পাচ্ছেন?  
Crops become dry during the heat season. We have to water them always.

2. Why do you see such changes in agriculture? (কৃষিতে কেনও এমন পরিবর্তন দেখতে পাচ্ছেন?)  
It happens during the summer season.

3. What kind of damage do you think farmers are more likely to suffer from high temperatures or heat shock? (উচ্চ তাপমাত্রা বা হিট শকে কৃষকদের কি ধরনের ক্ষতির সম্ভাবনা বেশি বলে আপনারা মনে করেন?)  
The thing is here crop yield happens better. In a specific month, the paddy gets cut so damage tends to be low.

4. Do you think farmers should engage in other occupations during high temperatures? (আপনার কি মনে হয়, উচ্চ তাপমাত্রার সময়ে কৃষকদের অন্য কোনো পেশায় নিজেদের নিয়োজিত করা উচিত?)  
Here farming is only the profession that is better right now because flood water does not come now.

5. What kind of damage do you think the farmers are suffering due to excessive heat - financial / mental / physical? (অতিরিক্ত গরমে কৃষকদের কি ধরনের ক্ষতি বেশি হচ্ছে বলে আপনি মনে করেন-আর্থিক/ মানসিক/ শারীরিক?)  
Costs are there, financial costs burden me and other farmers mostly.

6. According to the research, in Mymensingh, there is a shortage of irrigation in paddy cultivation, do you agree with it? (গবেষণা মতে, ময়মনসিংহে, ধান চাষে সেচ সংকট দেখা দেয়, আপনি কি এর সাথে একমত?)

No, it does not happen now.

7. How do you think it is possible to solve the problems faced by farmers in the production of crops during excessive heat? (অতিরিক্ত গরমে কৃষকেরা ফসল উৎপাদনে যে ধরনের সমস্যার সম্মুখীন হয় তা কিভাবে নিরসন করা সম্ভব বলে আপনআর মনে হয়?)

Reaching out to an agriculture officer will minimize the tension of having a good crop.

### **Response 8: Key Informant Interview (KII)**

Respondent Personal Information:

Date: February 13, 2024

Time: 10:05 am

Interviewer's Name: Kanij Fatima Maisha

Interviewee's Name: Md. Ripon

- Gender: Male
- Occupation: Related to Farming
- Village: Purbo Para
- Area:

1. Do you think you will see any changes in agriculture or crop yields due to additional heat waves? (আপনার কি মনে হয় অতিরিক্ত তাপপ্রবাহের কারণে আপনারা কৃষিতে বা ফসল ফলনের ক্ষেত্রে কোনো পরিবর্তন দেখতে পাচ্ছেন?)

The main problem happens with the arrangement of water. Water is not available here. Sometimes, electricity goes for 7 to 8 hours, when we work in the field. Also, if we do not water for 2 days on crops, they die

2. Why do you see such changes in agriculture? (কৃষিতে কেনও এমন পরিবর্তন দেখতে পাচ্ছেন?)

Due to summer, I guess. Because during winter, fog hampers growth as well. Here, we use auto machines for cutting crops.

3. What kind of damage do you think farmers are more likely to suffer from high temperatures or heat shock? (উচ্চ তাপমাত্রা বা হিট শকে কৃষকদের কি ধরনের ক্ষতির সম্ভাবনা বেশি বলে আপনারা মনে করেন?)

Usually, farmers do not feel good during fieldwork. Besides, there is always a fear that less water will cause fewer crops to yield this year.

4. Do you think farmers should engage in other occupations during high temperatures? (আপনার কি মনে হয়, উচ্চ তাপমাত্রার সময়ে কৃষকদের অন্য কোনো পেশায় নিজেকে নিয়োজিত করা উচিত?)

Probably, Even I work as a mechanic in this area apart from farming.

5. What kind of damage do you think the farmers are suffering due to excessive heat - financial / mental / physical? (অতিরিক্ত গরমে কৃষকদের কি ধরনের ক্ষতি বেশি হচ্ছে বলে আপনি মনে করেন-আর্থিক/ মানসিক/ শারীরিক?)

They take a rest and get back to work again. Financial and physical both effects are there.

6. According to the research, in Mymensingh, there is a shortage of irrigation in paddy cultivation, do you agree with it? (গবেষণা মতে, ময়মনসিংহে, ধান চাষে সেচ সংকট দেখা দেয়, আপনি কি এর সাথে একমত?)

No, I have not seen such.

7. How do you think it is possible to solve the problems faced by farmers in the production of crops during excessive heat? (অতিরিক্ত গরমে কৃষকেরা ফসল উৎপাদনে যে ধরনের সমস্যার সম্মুখীন হয় তা কিভাবে নিরসন করা সম্ভব বলে আপনআর মনে হয়?)

Insects are a major issue I face while farming. If we get good fertilizer, then we can produce more healthy crops.

### **Response 9: Key Informant Interview (KII)**

Respondent Personal Information:

Date:

Time: 12:45 pm

Interviewer's Name: Kanij Fatima Maisha

Interviewee's Name: Md. Abdul Jalil

- Gender: Male
- Occupation: Related to farming
- Village: Char Kalibari
- Area: Shomvuganj

1. Do you think you will see any changes in agriculture or crop yields due to additional heat waves? (আপনার কি মনে হয় অতিরিক্ত তাপপ্রবাহের কারণে আপনারা কৃষিতে বা ফসল ফলনের ক্ষেত্রে কোনো পরিবর্তন দেখতে পাচ্ছেন?)

In summer, crop yield seems good. Extreme heat is good for crops. I usually grow Aman and Boro crops here. But sometimes, crops get reddish like color and become red. They get burned as well.

2. Why do you see such changes in agriculture? (কৃষিতে কেনও এমন পরিবর্তন দেখতে পাচ্ছেন?)

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3. What kind of damage do you think farmers are more likely to suffer from high temperatures or heat shock? (উচ্চ তাপমাত্রা বা হিট শকে কৃষকদের কি ধরনের ক্ষতির সম্ভাবনা বেশি বলে আপনারা মনে করেন?)

I feel terrible working on fields under the scorching sun.

4. Do you think farmers should engage in other occupations during high temperatures? (আপনার কি মনে হয়, উচ্চ তাপমাত্রার সময়ে কৃষকদের অন্য কোনো পেশায় নিজেদের নিয়োজিত করা উচিত?)

Some farmers grow vegetables, and they sell them in the market too.

5. What kind of damage do you think the farmers are suffering due to excessive heat - financial / mental / physical? (অতিরিক্ত গরমে কৃষকদের কি ধরনের ক্ষতি বেশি হচ্ছে বলে আপনি মনে করেন-আর্থিক/ মানসিক/ শারীরিক?)

Financial costs are there as we need to buy more fertilizer and medicines.

6. According to the research, in Mymensingh, there is a shortage of irrigation in paddy cultivation, do you agree with it? (গবেষণা মতে, ময়মনসিংহে, ধান চাষে সেচ সংকট দেখা দেয়, আপনি কি এর সাথে একমত?)

No but in crop cultivation, more water is needed. We use here Shalo-Tube.

7. How do you think it is possible to solve the problems faced by farmers in the production of crops during excessive heat? (অতিরিক্ত গরমে কৃষকেরা ফসল

উৎপাদনে যে ধরনের সমস্যার সম্মুখীন হয় তা কিভাবে নিরসন করা সম্ভব বলে আপনআর মনে হয়?)

Yes, there is a pond near the field as well.

### Response 10: Key Informant Interview (KII)

Respondent Personal Information:

Date: February 13, 2024

Time: --

Interviewer's Name: Kanij Fatima Maisha

Interviewee's Name: Masud Miah

- Gender: Male
- Occupation: Farming
- Village: China Mor
- Area: Mymensingh

1. Do you think you will see any changes in agriculture or crop yields due to additional heat waves? (আপনার কি মনে হয় অতিরিক্ত তাপপ্রবাহের কারণে আপনারা কৃষিতে বা ফসল ফলনের ক্ষেত্রে কোনো পরিবর্তন দেখতে পাচ্ছেন?)

Yes, farmers have to work hard in fields. They rest for a while but they have to work for crop yield.

2. Why do you see such changes in agriculture? (কৃষিতে কেনও এমন পরিবর্তন দেখতে পাচ্ছেন?)

There is summer and extreme heat.

3. What kind of damage do you think farmers are more likely to suffer from high temperatures or heat shock? (উচ্চ তাপমাত্রা বা হিট শকে কৃষকদের কি ধরনের ক্ষতির সম্ভাবনা বেশি বলে আপনারা মনে করেন?)

We use fertilizer given by the Agriculture officer and use a machine to cut the crops.

4. Do you think farmers should engage in other occupations during high temperatures?  
(আপনার কি মনে হয়, উচ্চ তাপমাত্রার সময়ে কৃষকদের অন্য কোনো পেশায়  
নিজেকে নিয়োজিত করা উচিত?)

Some of them work in vegetable fields.

5. What kind of damage do you think the farmers are suffering due to excessive heat -  
financial / mental / physical? (অতিরিক্ত গরমে কৃষকদের কি ধরনের ক্ষতি বেশি হচ্ছে  
বলে আপনি মনে করেন-আর্থিক/ মানসিক/ শারীরিক?)

We must bear the costs, otherwise, who will do that?

6. According to the research, in Mymensingh, there is a shortage of irrigation in paddy  
cultivation, do you agree with it? (গবেষণা মতে, ময়মনসিংহে, ধান চাষে সেচ সংকট  
দেখা দেয়, আপনি কি এর সাথে একমত?)


No, but the crop yield requires water a lot.

7. How do you think it is possible to solve the problems faced by farmers in the  
production of crops during excessive heat? (অতিরিক্ত গরমে কৃষকেরা ফসল  
উৎপাদনে যে ধরনের সমস্যার সম্মুখীন হয় তা কিভাবে নিরসন করা সম্ভব বলে  
আপনআর মনে হয়?)

No one supports us financially. Farmers like us sometimes fall sick due to the extreme  
heat.

## Appendix B:

### Image of Heatwave Warning for Bangladesh

Govt. of the People's Republic of Bangladesh Bangladesh Meteorological Department Storm Warning Center Agargaon, Dhaka-1207	Govt. of the People's Republic of Bangladesh Bangladesh Meteorological Department Storm Warning Center Agargaon, Dhaka-1207	Phone: 48119881, 48122496 FAX : 58152019, 48113333 Web Site: www.bmd.gov.bd Email: info@bmd.gov.bd	
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DATE: 04.06.2023

**Alert Message for Heat Wave**

The prevailing mild, moderate and severe heat wave condition is likely to continue further for next five to six days over the country.

Due to excessive moisture incursion, the discomfort may increase.

  
(Dr. Muhammad Abul Kalam Mallik)  
Meteorologist  
For Director  
04, 1000 BST

TO

1. HON'BLE MINISTER, MINISTRY OF DISASTER & RELIEF, FAX: 9545405
2. CABINET SECRETARY, FAX: 9566559
3. PRINCIPAL SECRETARY TO THE HON'BLE PRIME MINISTER, FAX: 9143177
4. SENIOR SECRETARY, MINISTRY OF DEFENCE, FAX: 9110325
5. SECRETARY TO THE HON'BLE PRIME MINISTER, FAX: 6128799
6. SECRETARY, MINISTRY OF AGRICULTURE, FAX: 9540335
7. SECRETARY, MINISTRY OF DISASTER MANAGEMENT AND RELIEF, FAX: 9566559/9545405
8. SECRETARY, MINISTRY OF WATER RESOURCES, FAX: 9579773
9. JOINT SECY. (W&D), MOD, FAX: 9133535, 10. SSE, FAX: 8111351/9133691, 11. CPP, FAX: 9338401, 12. DDM: 9851615
13. NHQ, FAX: 8754270, 9883631, 14. SHIPPING MINISTRY, FAX: 9660311, 9562107, 15. NDRCC, FAX: 9549148, 9540567
16. BWTA, FAX: 9553072, 17. BTY, FAX: 8112927, 18. BELAR, FAX: 8117830, 19. FFWC, FAX: 9557380, 20. UNB, FAX: 9344556
21. BSS, FAX: 9557928, 22. MMO, CTG, FAX: 031-2500884, 23. CDMP, FAX: 9490354, 24. COAST GUARD, FAX: 9146092
25. PORT AUTHORITIES, MONGLA 04662-78324, 26. PORT AUTHORITIES, CHITTAGONG 710593, 27. BSS: 9557929, 9551052
28. HON'BLE PRIME MINISTER'S ARMED FORCES DEPT. (AFDL), FAX: 8754199, 8113906, 823233
29. BANGLADESHI ARMY, FAX: 8754455, 30. BANGLADESHI AIR FORCE, FAX: 8751931, 31. REEFERS: 8312976
32. BWTC: 9583653, 33. ATN: 8111876/9139883, 34. UNICR: 8265557, 35. SPARRSO: 8131080, 36. LNDP: 8121199
37. dharmal: 9343674, 38. RTV: 9130839-40, 39. JKA BD: 9891689, 40. PORT AUTHORITIES, PAYRA, FAX: 031-2510889
41. D.C. COX'S BAZAR: 0341-83261, 42. SOMON TV: 9670057, 43. INDEPENDENT TV: 8479001-2, 44. ETV: 8149913-6

Image 1: Alert Message for Heat Wave for Bangladesh (*Heat Wave Warning*\_, n.d.)



## Heatmap of Mymensingh on the Same Alert Message Day

June 4, 2023

Time: 12.00 PM

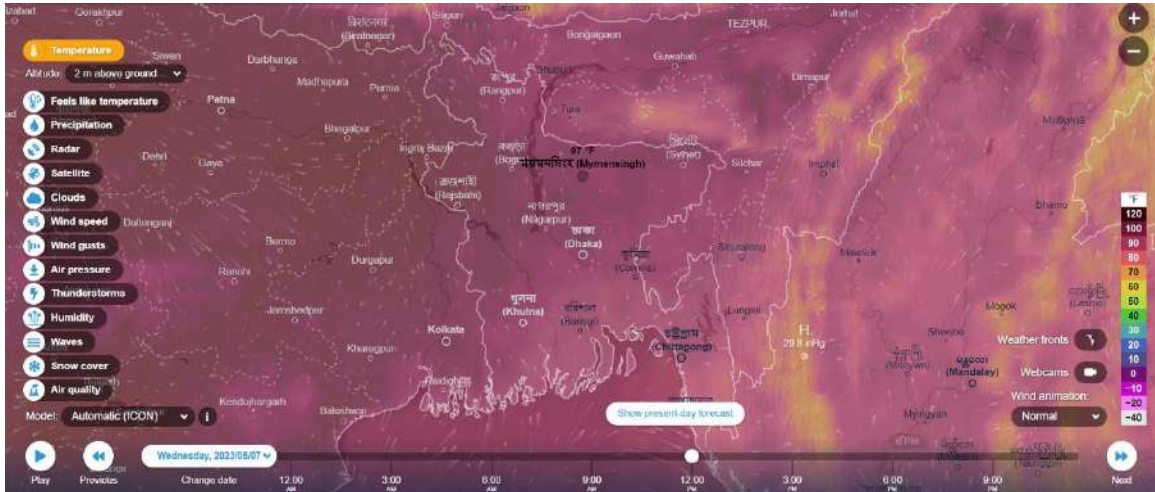


Image 2: Heatmap of Mymensingh District on June 4, 2023 (*Ventusky - Wind, Rain and Temperature Maps, n.d.*)

Source: [Ventusky.com](https://www.ventusky.com)

## Appendix C :

### Images of Data Collection: Field Visit







Participants from Purbo Para, China Mor, Shomvuganj





Participants from Kanda Para for Key Informant Interview



Participants from Bogar Para for Key Informant Interviews



Participants from Char Kalibari of Focus Group Discussion and Key Informant Interview

