

IMPACT OF CLIMATE CHANGE ON SOCIO ECONOMIC STATUS OF FARMERS OF RI BHOI DISTRICT, MEGHALAYA

Economics

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ABSTRACT

Climate change not only affects productivity of crops and water resources, but it also has serious impact on the economic and financial resources of the poor and the small and landless farmers. The state of Meghalaya is highly prone to the effects of climate change because of its geo-ecological fragility, humid monsoon climate, and socio-economic conditions. The present study was conducted at Umling and Umsning C and R D Block. In villages of Ri Bhoi District of Meghalaya it has been observed that the farmers are facing extreme weather conditions and the impact of the same are on their production rate, livelihood and the farmers are trying to mitigate the risks.

SUMMARY: The state of Meghalaya is highly prone to the effects of climate change because of its geo-ecological fragility, humid monsoon climate, and socio-economic conditions. More than 80% of the total work force is engaged either directly or indirectly in agriculture and allied sectors. Majority of the districts of Meghalaya have experienced variation in precipitation and temperature (Meghalaya Climate Change, 2013). Meghalaya lies between 24058' N to 2607'N latitudes and 89048'E to 92051' E longitudes. The present study was conducted at Umling and Umsning C and R D Block. For the purpose of the study villages selected were Umdamli, Dewlieh, Khlien Umtrew Umdohbyrthih, Norah Umroi, Khweng, Liarband, Liarbang, Kyrdem, Nonglum and Margnar. According to the people of the study area uncertainty and year to year variability in the rainfall has a lot to do with the agricultural production in these areas. A novel challenge for the farmers of Ri Bhoi District is climate change because agriculture is sensitive to climatic variability. The situation is amplified due to socio economic status of the farmers in the study area. Results after analysis indicate that farmers are aware that the area is getting warmer and there is changing trends of temperature and rainfall which is translated into reduction in quality and quantity of food products, markets prices and pattern of trade. The overall impact is on the standard of living as farmers find it difficult to meet other expenditures such as education and health. Majority of the farmers agree that the government must implement projects to mitigate the effect of climate change.

KEYWORDS

Farmers, Socio Economic, Temperature, Rainfall

INTRODUCTION

India is a large developing country with nearly 700 million rural population directly depending on climate-sensitive sectors and natural resources such as water, biodiversity, mangroves, coastal zones, and grasslands for their livelihood (Mall 2006). According to 2001 census, population of India stood at 1.02 billion. At present India's population is estimated to have increased to around 1.38 billion (Balasubramanian 2018). With the alarming growth in India's population, it is putting stress to the country's resources. Demands of agricultural production may need to double up by 2050 to meet increasing demands of the population (Sathaye 2017). Cities and towns of India are also facing severe water and sanitation stress. According to the World Bank report, India is fast running out of water and forecasts that by 2050 demand will outstrip supply.

Climate change is a change in the statistical distribution of weather patterns when that change lasts for an extended period of time (i.e. decades). The change in the expected patterns of average weather of region (or the whole Earth) over a significant period of time.

Climate change is how weather pattern change over decades or longer. The causes of climate change are due to natural and anthropogenic influences. Since industrial revolution humans have contributed to climate change through emissions of GHGs aerosols, and land use changes resulting in a rise of temperature and occurrence of erratic weather conditions.

Climate change is a reality and it is the greatest environmental challenge that has an impact on the agricultural production in many ways. In general terms, agricultural production depends on climatic conditions, such as temperature, evaporation and the amount of rainfall. The climate is a primary determinant of agricultural productivity and any significant changes in climate in the future will influence crop and livestock productivity, hydrologic balances, and input supplies to agricultural systems (Adams 1998). Climate change is one of the most important global environmental challenges facing humanity with implications for food production, natural ecosystems, freshwater supply, health, etc. (IPCC 2012).

Global climate change results are likely to cause reduced food production, leading to higher food prices and making food less affordable for poor people. According to IPCC (2007), the global community is facing the impact of climate change now and into the future. The most affected livelihoods are in rural areas in developing countries, where poverty is widespread and agricultural productivity is

low due to, amongst others, degrading natural resources, lack of markets and climate risks.

The State of Meghalaya was carved out of Assam as an autonomous State in April 1970 and was declared a full-fledged State in January 1972. Meghalaya, situated in the north eastern region of India is a narrow stretch of land, running between Bangladesh on the South and West and Assam on the North and East, Meghalaya lies between 24058' N to 2607'N latitudes and 89048'E to 92051' E longitudes. It covers an area of 22,429 sq. km.

Climate change is affecting food security in Ri Bhoi district of Meghalaya due to projected increase in temperature, changes in precipitation pattern and reduction in water availability to the locals for agricultural activities. Increase in the frequency and severity extreme weather events can also interrupt food delivery, resulting spikes in food prices after extreme events which are expected to be more frequent in the future. Increasing temperatures can contribute to spoilage and contamination stored food. While climate change is a global phenomenon, it is at the local level that impacts are most felt, and from where responses to climate change are enacted. It is increasingly urgent that communities possess the capacity to respond to climate change, now and in the future.

The state of Meghalaya is highly prone to the effects of climate change because of its geo-ecological fragility, humid monsoon climate, and socio-economic conditions. More than 80% of the total work force is engaged either directly or indirectly in agriculture and allied sectors. Majority of the districts of Meghalaya have experienced variation in precipitation and temperature (Meghalaya Climate Change 2013). This study is proposed to assess climate change vulnerability of communities in Ri Bhoi District and strategize adaptation measures to make them resilient. The study focuses on capturing community perspectives on impact of climate change on agriculture and agricultural production.

According to research on climate change done by Mubaya the alteration in climatic conditions has adversely affected crop productivity, resulting in food and livelihood security issues. This climate change coupled with the increasing poverty and unavailability of food has led to the immensity of food security challenges which further poses a threat to the nation, in its entirety.

The present study should help the farmers, NGOs and Government officials better understand the problems faced by the farmers due to

climate change and to find ways to tackle such problems so as to make agriculture sustainable. This research work will in some way or the other assist the local farmers to increase their production by following the remedial guidelines so given whereby they can shift to more economical and practicable farming activities for the benefit of all. This will eventually be an insight into bringing about sufficiency and raise the economy of the farmers in particular and the public in general.

Study Area

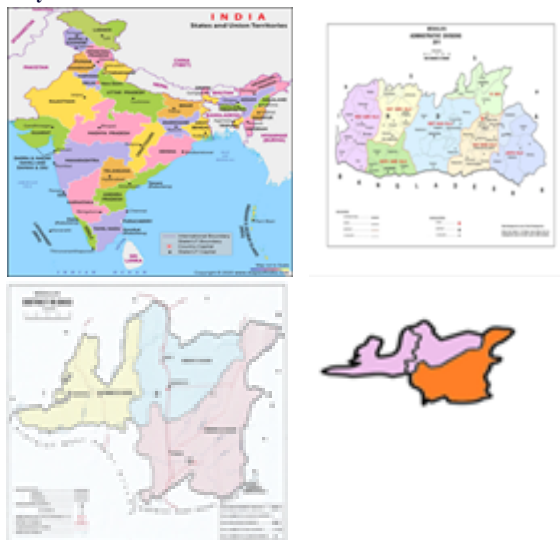


Fig 1. Location map of the study area

The study was conducted in State of Meghalaya (Fig 1) situated in the north eastern region of India is a narrow stretch of land, running between Bangladesh on the South and West and Assam on the North and East, Meghalaya lies between 24° 58' N to 26° 07' N latitudes and 89° 48' E to 92° 51' E longitudes.

Ri Bhoi District came into existence on the 4th June 1992 with Nongpoh as the District Headquarters.

The District consists of three Community and Rural Development Blocks that includes Umsning C and RD Block with its headquarters at Umsning, Umling C and RD Block with its headquarters at Nongpoh and Jirang C and RD Block with its headquarters at Patharkmah.

The present study was conducted at Umling and Umsning C and R D Block. For the purpose of the study villages selected were Umdamli, Dewlieh, Khlien Umtrew Umdohbyrthih, Norah Umroi, Khweng, Liarband, Liarbang, Kyrdem, Nonglum and Margnar. The selected villages have poor infrastructures (civic amenities, roads etc.). The villages are predominantly inhabited by good proportion of marginal farmers, dominance of and below poverty line (BPL) families and high migration out flow due to poverty. A good number of adult males have migrated to cities.

Data collection

Both Primary and Secondary data have been used in the present study. Primary data was collected through questionnaire, surveys, observations, personal interviews were conducted, and focus group discussions with knowledgeable people and village headmen of the study area to find out what the farmers think of the issues pertaining to climate change. Data gathered consisted of qualitative as well as quantitative. The discussions facilitated friendly environment for the respondents to express their concerns and opinion.

Interview arrangement

At the onset of research unstructured personnel interview was conducted on few selected knowledgeable individuals on farming and the present weather condition. In order to find out the challenges faced by the farmers of Umling and Umsning block personal interview was conducted.

Objectives

1. To ascertain the impact of climate change on the various agricultural activities in Ri Bhoi District

2. To analyze the socio economic challenges faced by the farmers due to climate change
3. To identify and recommend measures for sustainable socio economic development of farmers in Ri Bhoi District amidst changing climate scenario

RESULTS AND DISCUSSION

Umsning C and RD Block is inhabited by people belonging to Khasi tribe and agriculture is the most important occupation of the people. In the study area the family size is of 6 to 9 members. Three hundred and fifty questionnaires were distributed among the farmers in the five villages of the study area. Fifty farmers did not respond to the questionnaire. Most of the farmers are residing in this area since birth.

The agricultural sector in Umsning is threatened by climate change the existing stresses prevailing in the region are limited availability of water resources, and land degradation. The situation will become more sensitive and vulnerable in times to come. Agricultural yields, water quality and quantity and livelihoods are affected by climate change.

In general, local food security is at risk in the region it can be said that the effects of climate change on agriculture are being felt in the region.

Agriculture represents a core part of the economy of villagers in Umling and Umsning Block and provides livelihood and food. Most farmers are either cultivators or agricultural laborers. Variability in climate has a direct impact on the livelihood of the farmers and agricultural productivity. In order to cope with changing weather conditions the farmers are shifting crop patterns.

Landless farmers rent a field to work on. There are farmers that who cultivate cash crops on a large scale. Most farmers follow conventional farming. A few farmers are still practicing the traditional terrace farming. There are some farmers who practice both traditional as well as conventional farming. There is a huge difference in income of landlords cultivating large fields and the landless farmers who cultivate on rented lands.

According to the people of the study area uncertainty and year to year variability in the rainfall has a lot to do with the agricultural production in these areas.

Socioeconomic characteristics of Farmers

Table 1. Gender distribution of the respondents

Gender				
Frequency	Percent	Valid Percent	Cumulative Percent	
Female	193	63.3	63.3	63.3
Male	112	36.7	36.7	100.0
Total	305	100.0	100.0	

Among the total respondents, 36.7 % respondents were males and 63.3% females (Table 1). This pattern indicates that majority of the farmers are female. Females are heading the houses in the study area and a great percentage of women control the land tenure and work in the field. Majority of the women farmers are single mothers.

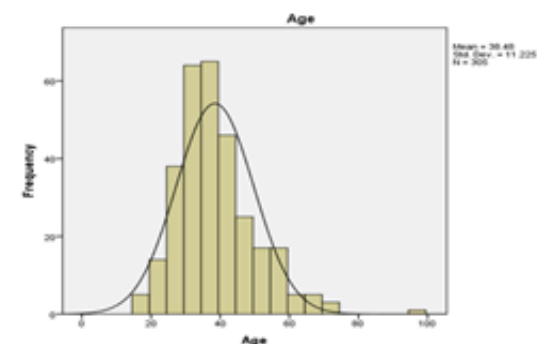


Table 2. Age distribution of the respondents

The age range of the farmers was between 27 to 70 years (Table 2). The elderly farmers were more knowledgeable and opined that the pattern of rainfall has changed during past 10 to 15 years. The younger farmers too stated that overall temperature has increased and rainfall has become erratic. Farmers claim that crop productivity has declined over

the last decade due to erratic and lesser rainfall in the area. The change in the rainfall pattern is becoming worrisome for the farmers as it has affected soil moisture and increased soil erosion, both of which are very important for crop yield.

Table 3. Change in plantation date

Change in plantation date				
	Frequency	Percent	Valid Percent	Cumulative Percent
More than a month	220	73.3	73.3	73.3
One month	47	15.7	15.7	89.0
Few weeks	33	11.0	11.0	100.0
Total	300	100.0	100.0	

Table 3 73.3 % of the farmers said that long term changes in the rainfall pattern have delayed their plantation by more than a month. 15.7 % indicated that sowing of seeds was delayed by one month and 11 % said that the plantation was delayed by few weeks.

Table 4. Percentage of crop loss by farmers

Crop loss				
Crop loss	Frequency	Percent	Valid Percent	Cumulative Percent
35-40 %	30	10.0	10.0	10.0
25-30%	92	30.7	30.7	40.7
20%	148	49.3	49.3	90.0
Less than 20 %	30	10.0	10.0	100.0
Total	300	100.0	100.0	

As a result of variation in weather conditions, pest and diseases infection has increased putting agriculture at risk. Small scale farmers are particularly exposed to food insecurity. At present a major portion of the crop is lost due to pest damage (Table 4). The population dynamics of insects is profoundly affected by abiotic parameters such as rainfall, temperature, wind speed and photoperiod.

Table 5. Educational qualification of farmers

Educational Qualification of the farmers				
Education	Frequency	Percent	Valid Percent	Cumulative Percent
No Formal Education	171	57.0	57.0	57.0
Primary	90	30.0	30.0	87.0
Secondary	20	6.7	6.7	93.7
Higher Secondary	16	5.3	5.3	99.0
Graduate	3	1.0	1.0	100.0
Total	300	100.0	100.0	

Looking at the literacy status of the respondents household heads, it was observed that 57 % of the farmers did not have any formal education followed by 30% completing only primary level of education (up to 5th standard). 6.7 % completed secondary standard i.e. up to class ten 5.3 % completed higher secondary level education that is up to class twelve and only 1 % farmers were graduates (Table 5). The reason behind low literacy rate may be due to poverty, high dependency on farming and not many schools in the area.

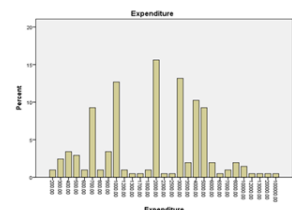


Fig 2: Input rate of farmers on an average

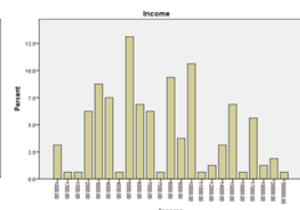


Fig 3: Income earned by Farmers on an average

Interviewed farmers confirmed that there are serious impacts of climate change on the agricultural production past 10 to 12 years. The expenditure incurred at the initial stages of farming varied from Rs 700.00 to Rs. 100000.00 per season (Fig 2). It is observed that majority of the farmers their income is between rupees five thousand to rupees eight thousand (Fig 3). The low earnings of these farmers cannot meet their needs.

A novel challenge for the farmers of Ri Bhoi District is climate change because agriculture is sensitive to climatic variability. The situation is amplified due to socio economic status of the farmers in the study area.

Agriculture is a complex system linked closely to climate and various environmental factors. The direct effects of climate on agriculture are temperature, precipitation etc. Precipitation affects the potential amount of water available in an area, soil type, water holding capacity of the soil and infiltration rate. It is apparent that actual impact of climate change depends on cumulative effects of climatic factors on resources that are the key components of agriculture.

Changing climate climatic conditions over the decades had significant effect on water resources, with broad implications for the agricultural sector of Umling and Umsning block. Rising temperatures and shifting precipitation patterns has altered crop-water availability, crop productivity, and costs of water access, resulting in differential effects on agricultural production. Due to increased erratic precipitation there is an increase in field runoff which has reduced the fraction of infiltration of precipitation in to crop root zones. The results indicated that there was an increase in the number of non-rainy days and the number of warmers days was more in number and the situation was further complicated by unpredictable onset of rains.

According to the farmers there are potential effects of diseases, pests and weeds on yield and quality of crops produce. Warmer temperatures allowed pest population to breed over a longer period each season. Warmer winter temperatures could increase survival, leading to more rapid reestablishment each spring, further increasing severity of pest effects on agriculture (Bale et al. 2010).

Conclusion

The effect of climate change at the local level is very crucial and immediate action is needed to make it possible to mitigate the present situation. The present study ventures into the perception of farmers related to climate change and its impact on socio economic status of the farmers of Ri Bhoi District of Meghalaya. The research makes a platform for the policy makers so that they can frame a farming practice for the farmers of the region which is climate resilient and therefore the socioeconomic conditions of the farmers are not adversely affected due to climate change.

Climate change has effects on the agriculture, environment, society and economy of a State. In villages of Ri Bhoi District of Meghalaya it has been observed that the farmers are facing extreme weather conditions and the impact of the same are on their production rate, livelihood and the farmers are trying to mitigate the risks. From the present study it has been observed that problems such as pests and disease out breaks have increased due to climate change. A change in temperature may favor the development of different inactive pathogens, which could induce an epidemic in near future. The changes in temperature and precipitation regimes have altered the growth stage, development rate, pathogenicity of infectious agents, and the physiology and resistance of the host plants. Frequency of extreme weather conditions has affected soil health and phenology of plants.

The present study represents a preliminary venture into understanding the behavior and perception of the farmers related to climate change. In depth and continued research is required on socio economic aspects of farmers in the region so that policy makers can tailor to their interventions for development of the region in a way that takes into account the implications of climate change. The research suggests for a shift in farming practices with an aim to make the same akin to changing climatic conditions.

Continued research should be carried out to take forward the present study targeting key factors related to climate change and its impact on agriculture which will develop a robust understanding of how to mitigate the situation related to climate change and its impact on socio economic status of farmers of Ri Bhoi District of Meghalaya.

Climate change especially affects the poor farmers who tend to heavily depend on agriculture and natural resources for their livelihoods and whose incomes prohibit them from saving for the types of emergencies that is brought about by climate change. Women are most affected by challenges posed by climate change.

Results after analysis indicate that farmers are aware that the area is getting warmer and there is changing trends of temperature and rainfall which is translated into reduction in quality and quantity of food products, markets prices and pattern of trade. The overall impact is on

the standard of living as farmers find it difficult to meet other expenditures such as education and health.

Majority of the farmers agree that the government must implement projects to mitigate the effect of climate change.

Recommendations

The farmers must be provided with more services and incentives so that the farmers can adapt to climate change farming activities. To diversify and improve their agricultural activities farmers requested provision of loans.

The proposed strategies are:

- a. Sensitization, awareness and capacity building of village councils, youth and women groups to understand and deal with adverse impact of climate change.
- b. Mobilization of rural masses for sustainable utilization of natural resources and generation of additional income for the marginalized families.
- c. Involvement of villagers in developing village development plans and integration of climate resilient measures.
- d. The study advocates that the voice of the community needs to be heard and they should be involved in decision making. The present study is an attempt to record communities' perception and their involvement in identifying locally available options to deal with the threats of climate change at micro-level.

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