

Farmers' Perception to Climate Change in Barak Valley Zone of Assam: An Empirical Study

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ABSTRACT

Level of awareness about the risk and its components is key to manage the risks. In this study we attempted to capture the farmers' perceptions on climate change and determined the factors affecting it. The findings of study derive its root from the primary data collected from 60 randomly selected farmers from Cachar and Karimganj districts of Assam which witness floods almost every year. Descriptive statistics and correlation analysis were used to draw the logical inference from the findings. Findings revealed that socio-economic factors like gender, size of landholding, education, occupation, farming experience and extension contacts affects farmers' perception on climate change. The study suggest the dissemination of climate smart technologies to the vulnerable should be based on the socio-economic attributes as advocated by the study for their better adoption and risk proofing and creation of local employment opportunities so shield the vulnerable from economic losses due to climate change.

Keywords: Adaptation, barak valley zone, climate change, climate smart technologies, perception.

INTRODUCTION

Climate change refers to deviations in climate over a long time, either due to natural variability or due to human action (IPCC, 2007). It's been projected that an increase in temperature by 2.5 to 4.9°C can cause 32-40 per cent and 41-52 per cent decline in rice and wheat productivity respectively in India, that would eventually cause the gross domestic product (GDP) to fall by 1.8 to 3.4 per cent (Guiteras, 2009; Parikh *et al.* 2002). North-East (NE) India being varied in its topography and rich in forest resources receives maximum annual rainfall. The agricultural land holding in the region being small and marginal, the peasants are vulnerable to weather extremes which have direct impact on their livelihood. Pathak *et al.* (2012) reported that the drought in year 2006 in NE region had exposed the vulnerable communities to high risk. Also, the different components of climate have direct bearing on agriculture productivity, therefore any abrupt variations in these components has direct implications on agricultural production and which in turn led to severe penalty on the food security of the nation. It is observed

that the farmers' perception about climate change is key factor in decision making to adopt the mitigation options by them and advocated for the farmer centric interventions to boost their preparedness (Raghuvanshi *et al.* 2017). Kavi Kumar and Parikh (1998) emphasized that the economic impact of climate change would be significant even after accounting for farm-level adaptation. They estimated the loss in net revenue at the farm level to be between 9 and 25 per cent for a 20°C to 3.50°C rise in temperature.

India being the land of small and marginal farmers is critically vulnerable to impacts of climate change. In India, around 48 per cent of total workforce derives their livelihood support from agriculture and more than 70 per cent population still resides in rural areas. Agriculture being primarily dependent on monsoon the population inclined to it is also vulnerable to climate change. Therefore, it is high time to know how the policy interventions to be taken to push the mitigating technologies for climate change and which factors should not be ignored in implementation of such policies as the

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perception of farmer plays a vital role in technology adoption. On this line, the current study was undertaken with the intent of capturing the awareness level and perception of farmers about climate change and to identify which factors affect their adaptation behaviour.

METHODOLOGY

Two villages each from Borkhola and North Karimganj blocks of Cachar and Karimganj districts of Assam were selected randomly. The districts were purposively selected due to the fact that they fall in that Barak valley zone which is sensitive to floods and these districts are the vulnerable to the climate change (Government of Assam 2015; asmenvis.nic.in). 60 respondents were randomly selected from the four villages (15 from each) following multistage random sampling. The selected respondents were post-stratified into three categories based on the size of landholding *i.e.* marginal (≤ 1 hectare), small (1.01-2.00 hectares) and medium (2.01-4.00 ha). Due to predominance of small, marginal and medium farmers in the region, the study is based on the information from the small, marginal and medium farmers which in fact are seems to be more vulnerable. Data on perception towards climate change and various aspects of rice cultivation was collected from the selected farmers using a pre-tested interview schedule in the year 2018-19. Descriptive statistical tools were used to quantify the socio-economic attributes of the respondents; Karl Pearson coefficient of correlation was calculated to find out the relationship between selected attributes of the farmers with their adaptation towards climate change and ranking tools were used to rank the barriers to adaptation of climate change.

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

With demography, varies the decision making too. Both the districts possess high level of literacy as 79.3 per cent in Cachar and 78.2 per cent in Karimganj with 80 and 70 per cent of their population engaged in agriculture (Government of Assam, 2011). It reflects that the farmers in the surveyed district are well educated which is also reflected in our results. In our sample 57 per cent of the respondents belong to 'middle-age' category (35-50 years) followed by 40 per cent and three per cent in the 'old' (>50 years) and 'youth' category (<35 years) respectively. A high proportion (93%) of the respondents were literate with about 62 per cent having primary education, 27 per cent having matriculation and about 5 per cent having education of graduate level and above. Out of total respondents 93 per cent were male and 83 per cent respondents derive their livelihood earnings from

agriculture only. Despite the fact that 83 per cent respondents have agriculture as their primary occupation but only 53 per cent of the respondents' long years (more than 30 years) of farming experience, whereas, 10 per cent and 37 per cent of them have low and medium farming experience, indicating that the farming in the study region is carried out by the middle-aged and old farmers (Table 1). It also points that the youths are not in agriculture to a significant level as they may be engaged in alternative employments which is good in the sense that their earnings are less risky than agriculture but a matter of concern too as they may not be willing to work in farms in future if employed elsewhere.

Table 1: Socio-economic profile of respondents

Particulars	n	%
Age (Year)		
Youth (<35 yrs)	2	3.33
Middle-age (35-50yrs)	34	56.67
Old (>50 yrs)	24	40.00
Gender		
Male	56	93.33
Female	4	6.67
Land holding		
Marginal (<1 ha)	36	60.00
Small (1-2 ha)	22	36.67
Medium (2-4 ha)	2	3.33
Large (>4 ha)	0	0.00
Educational level		
Illiterate	4	6.66
Primary	37	61.67
Matriculate	16	26.67
Graduate & above	3	5.00
Occupation		
Farming	50	83.33
Farming with others	10	16.67
Farming experiences (years)		
Low (15 to 20)	6	10.00
Medium (>20 to <30)	22	36.67
High (>30)	32	53.33

(n= Frequency, %= Percentage)

Contact with the different extension agencies also influences the awareness, and perception about any technology/event/phenomenon which further affects the behavior of the farmer. In our study region, we found that 50 percent of the respondents have always contacted different extension agencies; However, 26 and 29 per cent of them have sometimes and never contacted any of the extension agencies (Fig. 1).

However, the most preferred agency consult was State Agricultural Department (SAD) may be due to its close and regular linkages with the farmers owing to its proximity than any other agency in the study region.

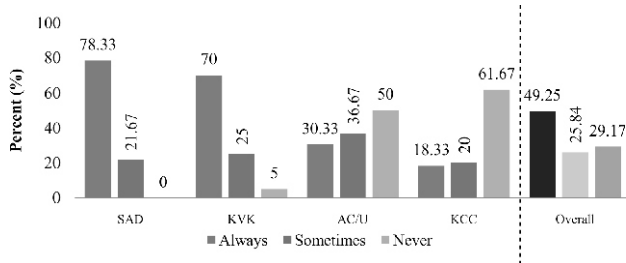


Figure 1: Extent of contact between farmers and different extension agencies

Awareness of the farmers about components of climate change

It was found that in the study area majority of the respondents could identify major indicators of climate change in the form of erratic rainfall, increase in temperature, high winds and prolonged drought. This may be due to the fact that these changes are more observable and experienced by most of the farmers and the good contact they have with extension agencies. However, we also observed that only 10 per cent respondents agreed to the occurrence of drought due to climate change, while 77 per cent responded in favour of erratic rainfall (Table 2), whereas, Legesse *et al.* (2013) found that 95 per cent of farmer households perceived increases in the frequency of occurrence of drought due to climate change. This, contradiction is primarily due to the fact that the NE India receive higher annual rainfall and that too throughout the year and may be due to this drought as a consequence of climate change is less pronounced in the region. Studies showed that farmers are aware that flooding, erratic rainfall, drought (Parganiha 2016), irregular and unpredictable rainfall (Sarkar *et al.* (2010; Kemausor *et al.* 2011) and increased temperature (Sarkar *et al.* (2010; Baul *et al.* 2013; Shashidhra *et al.* 2016) are common events due to climate change. Hence, our results do support these findings of earlier studies conducted in different parts of India.

Table 2: Level of awareness about components of climate change

Statements	High		Medium		Low	
	n	%	n	%	n	%
Drought is the result of climate change	6	10.00	26	43.33	28	46.67
High winds are due to climate change	16	26.67	22	36.67	22	36.67
Climate change has led to increase in temperature	36	60.00	16	26.67	8	13.33
Erratic rainfalls are caused due to climate change	46	76.67	8	13.33	6	10.00

(n= Frequency, %= Percentage)

Perception of farmers on the impacts of climate change

Perception of respondents on impacts of climate change indicates that about 77 per cent of farmers under

study opine that productivity declines due to climate change while others are either undecided or disagree with majority. This contrasting opinion prevails as one set of respondents believe that, flood erode away the fertile soil and therefore render the land unproductive or less productive, while other set of respondents believe that flood deposits the silt in the region which is rich in humus and thus adds to the soil fertility and land productivity. About 63 per cent of farmers opine that crop failure is the most significant impact of climate change, while 60 per cent were in opinion that flood is the most important impact of climate change. About 40 and 13 per cent respondents believe human disease and livestock disease outbreak respectively are the consequences of climate change. Similar findings were also reported by Sarkar *et al.* (2010) and Shankara *et al.* (2013) in eastern dry zone of Karnataka and West Bengal respectively. Raghuvanshi *et al.* (2017) added emigration as one of the significant impact of climate change in hilly tracks of Uttarakhand. Contrary to it, our results show that about 47 and 40 per cent farmers disagree and undecided respectively with migration due to climate change. This is because, the economic conditions of farmers in the region is not sound enough to afford migration to other states. Also, the lack of industries and entrepreneurial ventures in the region were important reasons why the poor farmers do not opt to migrate away.

Table 3: Perception on impact of climate change among the respondents

Statements	Agree		Undecided		Disagree	
	n	%	n	%	n	%
Flooding	36	60.00	18	30.00	6	10.00
Crop failure	38	63.33	16	26.67	6	10.00
Livestock disease outbreak	8	13.33	28	46.67	24	40.00
Human disease outbreak	24	40.00	20	33.33	16	26.67
Migration to other places	8	13.33	24	40.00	28	46.67
Decline in soil fertility	14	23.33	28	46.67	18	30.00
Decline in productivity	46	76.67	10	16.67	4	6.67

(n= Frequency, %= Percentage)

Adaptation behavior of farmers on the impacts of climate change

Despite the fact that climate change has direct influence on crop productivity and thereby on livelihood security of the farming community, the farmers use few indigenous practices to reduce their economic losses. It is evident from the study that all the respondents (100%) had changed crop varieties during last few years and 93 percent had altered the planting dates. Other mitigating options practiced by the respondent were mixed cropping (73%); crop diversification (67%); off-farm employment (53%) and engaging in dry season vegetable production (50%) (Figure 2). Our results also supports the previous studies which reported change in crop varieties and crop diversification (Panda *et al.* 2016 and Raghuvanshi *et al.*

2017) and alternation in planting dates and adoption of early maturing varieties (Adebayo *et al.* 2012).

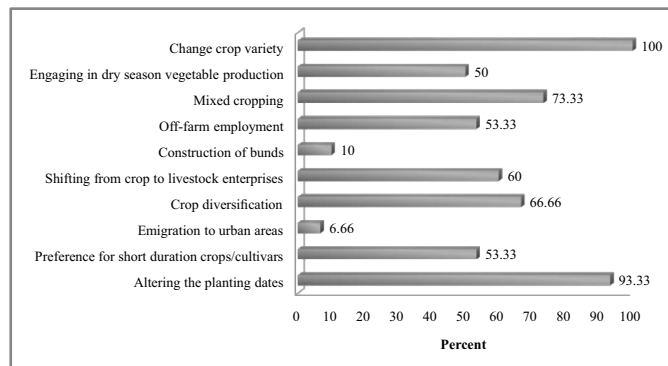


Figure 2: Distribution of the farmers on the basis of type of adaptation practices

Relation between farmers' attributes and adaptation strategies

Socio-economic attributes decides the decision making behavior of the person. Thus, we have used socio-economic attributes like age, gender, size of landholdings, education, and occupation of the head of the family, farming experience, extension contacts and their level of adaptation towards climate change to draw the correlation between adaptation strategies adopted by the respondents. It is evident from the results that all the variables except age were found to have a positive relationship with the dependent variable, *i.e.* farmer's level of adaptation (Table 4). Further, educational level was found to have a significant positive relationship with farmer's level of adaptation. On the other hand, age of the farmer is negatively related to the level of adaptation towards climate change, which may be indicative of the differences of opinion between two generations of farmers. Ansari *et al.* (2018) reported similar kind offindings in their investigation that gender, education, occupation, farming experience and land holding were positively related with farmers' perception about climate change.

Table 4: Relationship between farmers' demographic characteristics and their adaptation

Variables	Karl Pearson's 'r' value
Climate change adoption strategies (Dependent Variable)	
Independent Variables	
Age	-0.023
Gender	0.020
Land Holding	0.049
Educational level	0.717
Occupation	0.120
Farming experience	0.212
Extension contacts	0.075

Barriers to the adaptation of strategies for climate change

Barriers are outlined as factors, conditions or

obstacles that cut back the effectiveness of adaptation ways (Moser and Ekstrom, 2010). It is evident from the results that out of seven perceived barriers to climate change adaptation factors, lack of weather information (100%) was most felt barriers and accordingly it was ranked first followed by lack of own fund for adjustment, problem with getting inputs, lack of knowledge about adaptations, and lack of information about climate change. Whereas, least perceived barriers to climate change adaptation were lacks of market access and adaptation, not a cost-effective statement (Table 5). However, Antwi-Agyei *et al.* (2013) noted financial barriers, institutional barriers and lack of information as obstacles to cope up with the climate change. Shashidahra *et al.* (2016) reported that lack of credit access were foremost cause slow down adaptations.

Table 5: Farmers perceived barriers to adaptation under changing climate

Barriers to adaptation	Frequency	Percentage (%)	Rank
Lack of weather information	60	100.00	I
Lack of knowledge about adaptations	42	70.00	V
Problem with getting inputs	50	83.33	III
Lack of information about climate change	46	76.67	IV
Lack of own fund for adjustment	56	93.33	II
Lack of market access	34	56.67	VI
Adaptation not cost effective	24	40.00	VII

CONCLUSION

With the looking threats of climate on the sustainability of the vulnerable farmers, the livelihoods of them are at stake. Therefore, these vulnerable must be shielded from such threats. The very basic to such shielding is by changing the perception of farmers about the ill effects of climate change, by awareness creation among them about the cause, impacts and mitigation options. Therefore, we suggest that the dissemination of climate smart technologies to the vulnerable should be based on the socio economic attributes as advocated by the study for their better adoption and risk proofing and creation of local employment opportunities so shield the vulnerable from economic losses due to climate change.

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