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Farmers' Adaptation Strategies, Coping Behaviour and Barriers to Effective Adaptation to Current Climatic Risks: A Study on Sundarban Region

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ABSTRACT

The Sundarban region is one of the worst climate change hotspots that influences the lives and livelihoods of millions of people. This study was designed to examine the farmers' coping behaviour, adaptation strategies, and barriers to effective adaptation to current climatic risks. The study was conducted in the Sundarban Region of West Bengal state. Two villages from Kultoli block of South 24 Parganas district were selected. With 40 respondents from each village, total 80 respondents were selected randomly. The main reported adaptation strategies were crop diversification, change in cropping sequence, increase of bund height, diversification of income and livelihood. Farmers have shifted from field crops and fruit orchards to vegetable cultivation. Income from agriculture, fishing and livestock rearing have decreased and people forced to rely more on daily labour.Mainly reported coping strategies were migration, reduction of daily meal in amount and frequency, work as a daily labourand alternate income generating activity. The main barriers for effective adaptation to current climatic risks were lack of resource, lack of knowledge, lack of institutional support, poor extension system and lack of infrastructure.

Key words: Adaptation strategies, coping behaviour and barriers

INTRODUCTION

The effects of climate change are evident all over the world. But susceptibility to climate change differs across sectors and regions. Agriculture and natural eco-systems are inherently more sensitive to climatic conditions as compared to other sector like energy, industry and transportation, hence are frequently cited as vulnerable sectors to anticipated climate change (Parry and Carter, 1985; Rosenzweig and Parry, 1994; Bradshaw *et al.,* 2004). Climate change may affect agriculture in different dimensions like shift in agro-climatic zones, soil organic matter and soil fertility, biological health of soil, soil erosion and sediment transport, reduced soil water availability, impact on soil processes, salinization and alkalization, pest, diseases and weeds, *etc* (Khan *et al.,* 2009). Climate-related hazards often accelerated negative outcomes of other stressors on livelihoods, especially for people from socio economically backwards sections. IPCC Fifth Assessment Report (IPCC, 2014) has stated that recent exposure to climate-related extremes, such as heat waves, droughts, floods, cyclones, and wildfires, triggering vulnerability of some ecosystems and many human systems to current climate variability. The Sundarban region is considered as one of the worst climate change hotspots that influences the lives and livelihoods of millions of people in India and Bangladesh. The physical feature of this region is very critical as it is crisscrossed by numerous tidal rivers and canals. By nature, it is an area subjected to periodical tidal flooding and frequent storm from the Bay of Bengal. In response to climate change and its negative impacts, different long term strategic adjustment used to make to reduce harm or exploit beneficial opportunities. Adaptation is the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate harm or exploit beneficial opportunities (Kandlinkar and Risbey, 2000). The main goals of climate change adaptation are to

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reduce vulnerability and build resilience to the impacts brought by climate change (Brooks and Adger, 2005). Coping is a way of responding to an experienced impact with a shorter-term vision. It includes use of available skills, resources, and opportunities to address, manage and overcome adverse conditions, with the aim of achieving basic functioning of people, institutions, organizations and systems in the short term. Coping behavior is motivated by crisis. Common adaptation strategies in agriculture include the use of new crop varieties and livestock species that are better suited to changing conditions, farm diversification, crop insurance, changes in agricultural calendar, changes in land use pattern, water saving technologies and indigenous technical knowledge (ITK). But Adaptation is place and context specific. There is no single appropriate approach for reducing risks across all settings.There is a need to carry out household level analysis on farmers' adaptation and coping strategies as well as the constraints they faced in the way of effective adaptation in order to fine-tune the hot spot areas that need immediate interventions. This study was designed to examine the farmers' coping behavior, adaptation strategies and barriers for effective adaptation to current climatic risks.

METHODOLOGY

The study was conducted in the Sundarban Region of West Bengal state. Two villages from Kultoli block of South 24 Parganas district were selected. And 40 respondents from each village, total 80 respondents were selected randomly. Quantitative and qualitative data were collected through focused group discussion and individual interview. A semi structured interview schedule was developed for data collection. Different adaptation and cropping strategies to adjust climatic risk were identified and their level of adoption was studied.

South 24 Parganas district lies in the south and south – eastern part of West Bengal. The area is the part of the lower Gangetic plain where the delta building process is still active especially in the southern part. The land is criss-crossed by several rivers. The active delta of the Sundarban is a land of Mangroves forest, which have special ability to adapt themselves to the highly saline soil, strong winds and saline water logging. Due to being very rich in biodiversity the Sundarban was declared as a 'World Heritage Site' in 1994 and as a 'Biosphere reserve' in 1989.With critical geographical position and its proximity to the Bay of Bengal, the area is very much prone to the cyclones, tidal disturbances and flood, especially during the monsoon.

RESULT AND DISCUSSION

Adaptation strategies

Main reported adopted strategies were crop diversification, change in cropping sequence, increase of bund height, diversification of income and livelihood. About three fourth (76.25 %) of the respondents have adopted crop diversification. More than two third (68.75 %) of the respondents have diversified their income and livelihood. About two third (66.25 %) of the respondents reported that they have changed their cropping sequence. Majority of respondents reported that they have increased the bund height. The activity of bund height increase was done as a joint effort of villagers with the help of gram panchayet. Other reported adaptation strategies were change in sowing time (41.25 %), change in crop calendar (40.00 %), mixed cropping (8.75 %), and shifting from agriculture to shrimp cultivation (7.50 %).

Table 1: Adaptation strategies employed by the respondents n=80

Strategies	Frequency	Percentage
Crop insurance	0	0.00
Change in sowing time	33	41.25
Changed cropping sequence	53	66.25
Adoption of agro-forestry	0	0.00
Crop diversification	61	76.25
Mixed cropping	7	8.75
Adoption of salt tolerant variety	0	0.00
Change in crop calendar	32	40.00
Diversification of income and livelihood	55	68.75
Cultivating short duration crops	0	0.00
Shifting from agriculture to shrimp cultivation	6	8.75
Increase of bund height	57	71.25

In spite of having immense potentiality other promising strategies, like crop insurance, adoption of salt tolerant varieties, cultivating short duration crops were not adopted by the farmers. Farmers were not properly aware of crop insurance and appropriate salt tolerant varieties.

Farmers'adjustment in land utilization pattern in response to present climatic risk was analyzed. The results are presented in Table 2. It is clear from the table that the farmers have shifted from field crops and fruit orchards to vegetable cultivation. About half of the respondents (51.25 %) have reported that their area under field crops had decreased. The majority of the respondents (82.50 %) have reported that the area under fruit orchard has decreased. About two third of the respondents (76.25 %) have expressed that area under vegetable crops has increased.

Table 2: Adaptation through change in land utilization pattern

n=80

Activities	Increase	Decrease	No change
Field crop	13 (16.25)	41 (51.25)	26 (32.50)
Vegetable crop	61 (76.25)	0 (0.00)	19 (23.75)
Fruit	0 (0.00)	66 (82.50)	14 (17.50)

Figures in parentheses denote Percentage

Farmers of the Sundarban mainly rely on agriculture and fishing from river. Farmers' adjustment in livelihood pattern in response to present climatic risk was analyzed and the result is presented in table 3. A cursory look at the Table 3 reveals that income from agriculture, fishing from river and livestock rearing have decreased and people forced to rely more on daily labour. More than half of the respondents (58.75 %) have reported that their income from agriculture has decreased. The percentages of the farmers reported decrease in income from fishing, livestock farming and agricultural labour was 50, 75 and 57.50 respectively. More than half of the respondents have expressed that contribution of daily labour in their total income has increased.

Table 3: Change in income from different livelihood

	Increase	Decrease	No change
Agriculture	13 (16.25)	47 (58.75)	20 (25.00)
Fishing from river	19 (23.75)	40 (50.00)	21 (26.25)
Livestock farming	6 (7.50)	60 (75.00)	14 (17.50)
Agricultural labour	13 (16.25)	46 (57.50)	21 (26.25)
Daily labour	47 (58.75)	6 (7.50)	27 (33.75)

Figures in parentheses denote Percentage

Coping behaviour:

Respondents were asked to answer the question that what they immediately did just after the natural disaster to cope up.

Table 4: Coping behaviour of farmers

n=80

	Often	Sometimes	Never
Migration	27 (33.75)	21 (26.25)	32 (40.00)
Take loan from relatives	7 (8.75)	34 (42.50)	39 (48.75)
Work in MNREGA	0 (0.00)	33 (41.25)	47 (58.75)
Start alternate income generating activity	21 (26.25)	42 (52.50)	17 (21.25)
Reduction of daily meal in amount and frequency	7 (8.75)	46 (57.50)	27 (33.75)
Work as a daily labour	13 (16.25)	34 (42.50)	33 (41.25)

Figures in parentheses denote Percentage

Mainly reported coping strategies were migration, reduction of daily meal in amount and frequency, work as a daily labour, alternate income generating activity.More than half of the respondents(60 %) have reported that at least one member oftheir family forced to migrate in such a condition. More than half of the respondents (51.25 %) reported that they took loan from relatives to cope up. More than three fourth of the respondents (78.75 %) reported that they started alternate income generating activity rather than agriculture. About two third of the respondents (66.25 %) reported that due to the shortage of food just after the cyclone or flood they opted to reduce daily meal in amount and frequency. But the majority of the respondents (57.50%) opted to reduce daily meal in amount and frequency sometimes only and few (8.75%) forced to do it often. A majority of the respondents (58.75 %) choose to work as a daily labour. Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) scheme was not considered as an effective option to cope up adverse condition. More than half of the respondents (58.75 %) never got any effective support from MGNREGA.

Barriers to effective adaptation to current climatic risks

Barriers to effective adaptation to current climatic risks were identified and ranked. Lack of resource (mean score 4.16), was ranked 1st followed by lack of knowledge (mean score 3.83), lack of institutional support (mean score 3.80), poor extension system (mean score 3.49), lack of infrastructure (mean score 3.35), poor communication (mean score 3.35), lack of political will (mean score 3.11), lack of seed of the salt tolerant variety (mean score 2.76), lack of prior weather information (mean score 1.60).

Table 5: Barriers to effective adaptation

n=80

Barriers	Mean Score	Rank
Lack of knowledge	3.83	II
Lack of resource	4.16	1
Lack of infrastructure	3.35	V
Lack of political will	3.11	VII
Lack of prior weather information	1.60	IX
Lack of seed of salt tolerant variety	2.76	VIII
Poor communication	3.35	VI
Poor extension system	3.49	IV
Lack of institutional support	3.80	III

CONCLUSION

The majority of the farmers of Sundarban region is resource poor. Underprivileged adaptive capacity is making them more vulnerable. There is an urgent need of improving infrastructure and providing institutional support. Development and implementation of effective adaptation strategy at the different level may help this region to achieve climate change resilience and sustainable development.

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