



## Climate change perception and productivity of rice: the ground truth verification of two selected villages of Bankura district of West Bengal

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### ABSTRACT

The present study entitled "Climate Change Perception and Productivity of Rice: The Ground Truth Verification of Two Selected Villages of Bankura District" was conducted at Seulpahari village of Chhatna Block and Bathan Tora village of Onda block under Bankura district with some specific objectives viz. to study the socio-economic profile of paddy growers in the study areas, to compare the cultivation practices of farmers within a span of 10-15 years, to elicit the perception of farmers regarding climate change, to point out the coping strategies adopted by farmers for mitigating the problems of climate change and to find out the problems they are facing in cultivation and suggestions made by farmers and compare those based on their experience. Data has been collected through personal interview methods from different categories of 70 farmers randomly selected, 35 farmers from each village with the help of a structured interview schedule in the month of June 2018. For analysis of data frequency, percentage, ranking and rank correlation was done. The study reveals that yield, profit has increased from the years 2004-'05 to 2017-'18 but as well as the flora, fauna, fish, bird biodiversity has been decreased very much. And the disease-pest-weed occurrence also increased very much. Farmers perceived that these are happening due to the change of global climate. To redress the adverse effects of climate change, they have adopted some coping strategies. Rank correlation of young age respondents and middle and elder age has become significant in case of their perceived problems and suggestions.

**Keywords:** Biodiversity, climate change, mitigation, perception.

"Climate change means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (UNFCCC, 1992). With increasing global temperature, climate change puts an important and unfavorable role in agriculture. Some studies done by the Indian Agricultural Research Institute (IARI) find that a 1°C increase in temperature, may reduce the yield of wheat, soybean, mustard, potato. Little changes in temperature or rainfall patterns may have some crucial effects on the food quality of horticultural crops and basmati rice. The agriculture sector is crucial for our country's GDP collection as 13% GDP of the country derives from agriculture. Reducing the yield of the crops side by side it plays a key role in GDP and welfare. Kumar and Parikh (2001a and b) studied the effect of climate change on yields of agricultural crops, GDP and welfare in India. Considering a range of equilibrium climate trade situations which project a temperature upward push of 2.5°C to 4.9°C. They estimated that: (a) without considering the carbon dioxide fertilization outcomes yield losses for rice and wheat fluctuate between 32 and forty percent, and forty-one and fifty-two percent, respectively; (b) GDP would drop via between 3.4 to 1.8 per cent It has a large position for changing of cultivation practices of farmers. Climate change becomes a major cause of the changing cultivation practices of

farmers. Due to the changing global climate scenario, many problems for farming are shown. The water crisis is most important among them. Due to delaying monsoon, farmers face a great challenge because agricultural production has an adverse effect not only from increasing or decreasing temperature or total rainfall amount but also from untimely rainfall or shifting of the timing of rainfall. Weed infestation, disease occurrence, pest infestation all has increased to multiple times. Some weeds, pests are also revisiting after many years of the inactive stage. So that farmers have to change their cultivation practices. So, we have compared the cultivation practices farmers were followed 10 years before and are following now to read the changes that occurred due to climate change.

### Objective

1. To compare the cultivation practices of farmers within a span of 10-15 years.
2. To identify the coping strategies of farmers for mitigating the problems of climate change.

### MATERIALS AND METHODS

With the view of the global climate change scenario, we have compared some cultivation practices of farmers between 10 years before and the present practices. For this work, we have selected the Bankura district of West Bengal purposively. In West Bengal, some districts like Bankura, Purulia, Medinipur, West Bardhaman,

Medinipur have mostly dry weather. The farmers of these districts are mostly dependent on monsoon rainfall and irrigations are not easily available. So, here the effect of climate change can be seen more clearly. And as it is student research, it gets less time to complete the survey and report. So, becoming Bankura native place of the researcher, it has been chosen for time-saving. From the 22 blocks of the district, 2 blocks are chosen randomly -

the Onda block and Chhatna block. From these 2 blocks, 2 villages are chosen randomly - Seulpahari village from Chhatna block and Bathan Tara village from Onda block. From these 2 villages, 35 farmers are selected randomly from each village. Now their opinions about cultivation practices they had followed 10-15years back and which are following now. For the work, we have used Frequency and Percentage as statistical tools.

**RESULTS AND DISCUSSION**

**Table 1 : Changes in cultivation parameters over time**

Cultivation practices	Category	10-15 years back		Now		Remarks
		Frequency	Percentage	Frequency	Percentage	
<b>Source of seed</b>	Local shop	25	35.71	42	<b>60</b>	Farmers mostly rely on local shops for collecting seed
	From govt.	2	2.86	2	2.86	
	Govt. shop	6	8.57	8	11.43	
	Own	37	<b>52.86</b>	18	25.71	
<b>Storage of seed</b>	Fully stored	30	<b>42.86</b>	25	<b>35.71</b>	Storing of seed is decreasing over time because all new varieties are hybrid rice and for good growth
	Partially stored	7	10	5	7.14	
<b>Method of Ploughing</b>	Bullock	70	<b>100</b>	4	5.71	Almost all of the Respondents have changed their ploughing method from bullock to tractor.
	Tractor	0	0	66	<b>94.28</b>	
<b>Seed Treatment</b>	Done	4	5.71	10	14.29	A slight increase has seen in 10-15years.
	Not done	66	<b>94.28</b>	60	<b>85.71</b>	
<b>Soil Testing</b>	Done	0	0	4	5.71	Due to lack of awareness and low extension participation farmers are not intended for soil testing.
	Not done	70	<b>100</b>	66	<b>94.28</b>	
<b>Crop Diversification</b>	Done	20	28.57	30	42.86	Due to the loss in mono-cropping farmers are intending for crop diversification
	Not done	50	<b>71.43</b>	40	<b>57.14</b>	
<b>Mixed Cropping</b>	Done	0	0	0	0	No change has been noticed here
	Not done	70	<b>100</b>	70	<b>100</b>	

*Contd....*

Cultivation practices	Category	10-15 years back		Now		Remarks
		Frequency	Percentage	Frequency	Percentage	
<b>Number of labour requirement</b>	More than 10	20		28.57	70	<b>100</b> Due to more amount of weeds, disease, and pests, farmers need more number of labours for weeding, pesticide application.
	Less than or equivalent 10	50		<b>71.43</b>	0	
<b>No. of irrigation given</b>	More	0		0	70	<b>100</b> Due to the decreased amount of rainfall, more number of irrigations are needed now.
	Less	70	<b>100</b>	0	0	
<b>Cost of Cultivation</b>	More	0		0	70	<b>100</b> 10-15 years back Cost of cultivation was less than present as less number of weeding and application of chemical substances
	Less	70	<b>100</b>	0	0	
<b>Yield</b>	More	0	0	70	<b>100</b>	Present varieties cultivated by respondents are High Yielding hybrid varieties. So that presently, the yield is more (4-7q/bigha) than old traditional varieties (2-4q/bigha)
	Less	70	<b>100</b>	0	0	
<b>Application of Organic Manure</b>	Provide	70	<b>100</b>	34	48.57	Organic manure application has reduced as most farmers are intended to inorganic fertilizer application for higher yield.
	Not provide	0	0	36	<b>51.43</b>	
<b>Inorganic Fertilizer Application</b>	Provide	18	25.71	70	<b>100</b>	Presently, all farmers intended for inorganic fertilizer application.
	Not provide	52	<b>74.29</b>	0	0	
<b>Application of different chemicals</b>	Provide	10	14.29	70	<b>100</b>	Due to more number of weed, pest and disease farmers need number of chemical application than 10-15 years before.
	Not provide	60	<b>85.71</b>	0	0	

**Source of seed :** About 10-15years back most of the farmers (52.86%) stored their seeds and used to sow that in next year, now farmers emphasize mostly on buying seeds from local shops.

**Storage of seed :** At present, tendencies for storing seeds become less, they buy improved hybrid seeds from local shops every year as it gives more yield.

**Method of Ploughing :** Ploughing method has totally changed from bullock to tractor.

**Seed Treatment :** There are no significant changes that have seen in 10-15years in the case of seed treatment.

**Soil Testing :** Farmers are not intended for soil testing due to a lack of awareness.

**Crop Diversification :** From doing mono-cropping with rice to diversification in crop production like cabbage, cauliflower, potato etc. there's increasing number has been seen among farmers.

**Mixed Cropping :** Farmers don't have proper knowledge so that they aren't doing mixed cropping.

**Number of labour requirement :** While 10-15years before hardly 10-12 labours/bigha were hired by farmers but now farmers are hiring average 20labours/bigha due

to drastically increasing weed, pest, disease infestation.

**No. of Irrigations given :** Present hybrid varieties require more amount of water.

**Cost of Cultivation :** Now Cultivation cost has increased much than 10-15years before due to extra labor charge, more chemical fertilizer, pesticide application, more number of providing irrigation.

**Yield :** As being high yielding hybrid varieties, recent rice varieties give comparatively more yield.

**Profit :** Due to high yield farmers' profits have increased by selling the products.

**Organic Manures Application :** Tendency for providing organic manure on the field among farmers has decreased to almost half.

**Inorganic Fertilizer Application :** Tendency for inorganic fertilizer application has increased from 25.71% to 100%.

We have selected some coping strategies and taken response from farmers. Among these, the best response has got from stopping the burning of crop residues as none of them burns their residues. After that, most farm-

**Table 2 : The coping strategies of farmers due to climate change (N=70):**

Sl. No.	Coping strategies	Discussion	Frequency	Percentage	Remarks
1.	Reducing Chemical Fertilizer	Followed	7	10	It is necessary for saving soil fertility, flora and fauna biodiversity
		Not Followed	63	<b>90</b>	
2.	Changing the Planting Date	Followed	50	<b>71.43</b>	Due to the shift of monsoon rainfall planting date has to change.
		Not Followed	20	28.57	
3.	Cultivating short duration crop variety	Followed	60	<b>85.71</b>	Due to short time monsoon rainfall, cultivating of short duration variety is profitable.
		Not Followed	10	14.28	
4.	By changing the cropping pattern	Followed	40	<b>57.14</b>	Mono-cropping unfertile the land and increases the chance of more disease-pest infestation.
		Not Followed	30	42.86	
5.	Stopping burning of crop residues	Followed	70	<b>100</b>	Burning of crop residues emits a huge amount of greenhouse gases which contributes to climate change. Burning residues also adversely affect land and biodiversity.
		Not Followed	0	0	

ers are intending for cultivating short duration crop varieties followed by changing of planting date due to delay in monsoon. Then they are going to changing the planting date. Still got less awareness among farmers for reducing chemical fertilizer application on the field.

From the study significant changes have been observed in case of seed storing, seed buying, no. of irrigations provided, amount of different chemical fertilizers, pesticides used. Where farmers hardly provided 2 irrigations as rainfall was timely and the amount of rainfall was adequate but now average 4 irrigations are required as rainfall pattern becomes little off-bit and the monsoon rainfall has also been delayed.

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