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Research Paper

Perception, Perceived Impacts and Constraints about Adoption of Climate Resilient Technologies in the Eastern Plain Zone of Uttar Pradesh

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ABSTRACT

Climate change affects crop production adversely. The study focused on the perception, perceived impacts and constraints on the climate change and adoption of climate resilient technologies in the eastern plain zone of Uttar Pradesh. 240 rice-wheat cropping pattern following farm households were interviewed using the structured schedule. Data were analyzed with descriptive statistics and Garrett's ranking technique. Results showed that farmers were aware of climate change and there were know the impact due to climate change. Lack of knowledge and training, lack of inputs availability and lack of credit availability were major constraints to adopt the climate resilient technologies.

Highlights

- Farmers were aware of climate change.
- Farmers were perceived that climate change affecting the crop production.
- Lack of knowledge of climate resilient technologies, lack of inputs, lack of economical and general constraints were major barrier to the adoption of climate resilient technologies.

Keywords: Climate resilient technologies, Perception, Perceived impacts, Constraints

India is a large emerging economy with diverse geography, biodiversity, and natural resources. However, as a result of growing urbanization, industrialization, and economic growth, natural resources and the environment are already under stress. Indian agriculture contributes about 17% Gross Value Added (GVA) still 55% of population dependent on agriculture. The climatic factor is one of the important factors for crop production (Devegowda *et al.* 2019). Erratic rainfall and temperature fluctuation affect crop production adversely. Due to climate change crop yields will decline by 4.5-9% in the short run and by a whopping 25% in the long run in the absence of adaptation by farmers (Guiteras, 2009).

Indian agriculture is highly vulnerable to climate change facing different level of degradation water erosion (32.8 mha), wind erosion (10.8 mha), desertification (8.5 mha), water logging (8.5 mha) (Naresh *et al.* 2017). Rainfed rice yields in India are expected to decrease marginally (2.5 percent) in 2050 and 2080, whereas irrigated rice yields are expected to increase by 7% in 2050 and 10% in 2080. Wheat yields are expected to drop by 6 to 25% by 2100, while maize yields will drop by 18 to 23%. Chickpeas are anticipated to gain from future climates as their production rises (23-54%) (Rao 2019). Cereal productivity is projected to decrease

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by 10-40% by 2100 and greater loss is expected in Rabi. There is already evidence of negative impacts on the yield of wheat and paddy in parts of India due to increased temperature, increasing water stress and reduction in the number of rainy days (Mahato, 2014). Significant decreasing trend in the total quantum of annual rainfall noticed over the years (Arvind Kumar *et al.* 2018).

Uttar Pradesh, India's fifth largest state and it is most populous, it is the leading state in terms of agriculture production in the country; its comparative advantage in agriculture production stems from a strong agriculture base with the most fertile landmasses and a well-connected river network and enables it to play a significant role in the country's food and nutrition security. Climate sensitivity to agriculture is very high in the state, and the recent changes observed in climate may be an obstacle (O'Brien *et al.* 2004). Uttar Pradesh noticed increase in minimum temperature within the range of 0.06 to 0.44°C among all the climatic zones (Bhatt *et al.* 2019). Uttar Pradesh receives 90% rainfall during southwest monsoon. Western, Bundelkhand and Central zones noticed significant decrease in the rainfall over the years (Deo *et al.* 2016). Whereas Eastern Uttar Pradesh observed floods during monsoon and cause huge loss to the crop production (Khatoon, 1988; Usama, 2015).

RESEARCH METHODOLOGY

The present study was conducted in the eastern plain zone of Uttar Pradesh. Data collected as a purpose sampling from the flood affected blocks of Varanasi and Chandauli. The sample size of 240 was randomly collected from rice-wheat cropping farm households using a structured schedule. The collected data subjected to descriptive statistics such as frequency and mean derived from the Likert's scale, 4 = Strongly agree, 3 = agree, 2= disagree and 1 = strongly disagree.

As per Ofuoku, (2011) method of Lickert's scale was done by asking some question to the households, based on the response of the households ratings were assigned. To determine the cut of mean score ratings were summed up (4 + 3 + 2 + 1 = 10) and divided by the number of ratings (4), mean score (cut off mean score) 2.5 was obtained. Each statement, frequency (*f*) of each rating obtained such as " occurrence of flood" frequencies were strongly agree (f = 178); agree (f = 52); disagree (f = 21) and strongly disagree (f = 19) and multiplied by the respective rating 178 × 4 = 712, 52 × 3 = 156, 21 × 2 = 42 and 19 × 1 = 19. Then, 712 + 156 + 42 + 19 = 929. The sum was divided by the total frequency thus, 929/240= 3.871 were the mean score which was greater than the cut-off mean score of 2.50. Rankings were assigned based on the highest to lowest mean score.

The constraints faced by the farmers to adopt climate resilient technologies were ranked by using Garrett's ranking technique. As per this method, respondents were asked constraints that they were faced in the adoption of climate resilient technologies. Depending upon the extent of constraints faced by them rankings were assigned separately to each constraint. Likewise, ranks were assigned to a different frequency of various factors/parameters. The results of such rankings were converted into score values by using the following formula;

$$\text{Percent position} = \frac{100 * \left(\ _{ij} \quad 0.5 \right)}{}$$

Where R_{ij} = Rank given for the i^{th} factor by the j^{th} respondent.

N_j = Number of factors ranked by the j^{th} respondent.

The percent position of each rank converted into scores by using Garret and Woodworth (1969) table. Number of each rank were calculated and multiplied by converted Garret ranking table total score for the each constraints calculated. Total score converted into percent by dividing total respondents, obtained respondent percent score ranked as per highest percent (Vijayasarathy & Ashok, 2015; Kumar & Sidana, 2018; Majumder *et al.* 2020).

RESULTS AND DISCUSSION

Perception of the farmers on climate change

Table 1 showed that farmers facing the flood during *Kharif* season due to overflow of rivers and canals which causes crop loss. Occurrence of the flood was the major problem followed by an increase in day temperature, erratic distribution of rainfall, increase in night temperature, weather extremes have become common, the occurrence of drought, early withdrawal of monsoon, late withdrawal of monsoon and pest outbreak were ranked according to the mean score of the perception faced by the farmers. Similar results were found in high rainfall areas (Banerjee, 2015; Ansari, Joshi, & Raghuvanshi, 2018) and contrary results were found in the low rainfall area like the Bundelkhand region of Uttar Pradesh (Singh, 2020).

Table 1: Perception of farmers on climate change in selected districts

Sl. No.	Perceptions	Score	Mean	Rank
1	Erratic distribution of rainfall	831	3.463	3
2	Early withdrawal of monsoon	608	2.533	8
3	Late withdrawal of monsoon	606	2.525	9
4	Increase in day time temperature	883	3.679	2
5	Increase in night time temperature	829	3.454	4
6	Weather extremes have become common	708	2.950	5
7	Occurrence of the drought	615	2.563	6
8	Decline in water table	610	2.542	7
9	Occurrence of the flood	929	3.871	1
10	Pest outbreak	602	2.508	10

Perceived impacts of farmers on climate change

Table 2 shows the perceived impacts on crop production by farmers. Uncertainty of yields, reduction in net income, reduction in crop yields, increase in the intensity of floods, yield reduction due to increase in temperature, the intensity of more crop failure in usar soil, reduction in the cropped area and reduction in the agricultural employment were ranked according to their highest mean score respectively. Platt *et al.* (2021) study in Uttarkhand showed similar results.

Table 2: Perceived impacts of farmers on climate change in selected districts

Sl No.	Perceived impacts	Score	Mean	Rank
1	Reduction in cropped area	614	2.558	7
2	Reduction in crop yields	817	3.404	3
3	Uncertainty in yields	861	3.588	1
4	Reduction in net income	835	3.479	2
5	Reduction in agricultural employment	602	2.508	8
6	Increase in intensity of flood	773	3.221	4
7	Yield reduction due to increase in temperature	739	3.079	5
8	Intensity of more crop failure in usar soil	702	2.925	6

Constraints in adoption of climate resilient technologies

To identify the constraints in the adoption of climate resilient technologies at a farm level, Garrett ranking was done and results were presented in Table 3. The

Table 3: Constraints faced by farmers in the adoption of climate resilient

Sl. No.	Constraints	% Score	Rank
	Economic constraints		
(a)	High cost of climate resilient varieties/hybrids	59.25	5
(b)	Lack of credit availability to adopt climate resilient technologies	62.00	4
(c)	Lack of own capital availability	44.63	9
(d)	High rate of non-institutional credit	28.12	15
(e)	Lack of collateral security and complex procedure to obtain credit	38.67	13
	Input constraints		
(a)	Lack of supply climate resilient varieties/hybrids	58.04	6
(b)	Lack of location specific climate resilient variety/hybrids	38.74	12
(c)	Small and marginal landholding	66.94	2
	Guidance and training constraints		
(a)	Lack of knowledge on climate resilient varieties seeds	70.93	1
(b)	Inability to attend demonstrations & training programmes	64.00	3
	General Constraints		
(a)	Climate resilient varieties/hybrids susceptible to pest and diseases	36.10	14
(b)	Climate resilient varieties/hybrids are low yielding	45.75	7
(c)	Lack of availability of market for adopted varieties/hybrids	41.10	11
(d)	Lack of time available for soil reclamation	43.38	10
(e)	Lack of weather updates	45.10	8

ranking was done for constraints faced by sample farmers in respective study areas. The constraints were subdivided into economic constraints, input constraints, guidance and training constraints and general constraints.

Lack of knowledge on climate resilient varieties, small and medium holding, lack of training and demonstration to climate resilient technologies were major hurdles among all constraints. Credit availability, high cost of climate resilient varieties or hybrids, lack of own capital were major financial constraints. Small and marginal land holding, lack of supply climate resilient varieties or hybrids and lack of location specific climate resilient variety or hybrids were input constraints ranked respectively. Guidance and training has significant role in the adoption of any new technology, here result indicated lack of knowledge on climate resilient varieties seeds and inability to attend demonstrations and training programmes. General constraints such as climate resilient varieties or hybrids are low yielding, lack of weather updates, lack of time available for soil reclamation, lack of availability of market for adopted varieties or hybrids, climate resilient varieties or hybrids susceptible to pest and diseases.

Farmers noticed were unaware about climate change, unable to attend training and demonstration programmes, lack of credit availability to adopt improved technology were major constraints for farmers. Similar results found in Jasna *et al.* (2017) Nanjappan, (2018) Manjunath *et al.* (2019) Majumder *et al.* (2020), Chouksey *et al.* (2021).

CONCLUSION

Farmers' perception of climate change was in line with the findings of other researchers of rice-wheat cropping system in the world. Farmers recognized increase and erratic distribution of rainfall which affect the crop production. Frequent flood was the major problem during monsoon season due to heavy rainfall. Increase in the temperature during *rabi* season caused yield loss mainly by heat stress, crop loss frequently common in usar soil. Farmers were lack of knowledge regarding climate change due inaccessibility to training programme. Small and medium holding, lack of credit availability and inputs to farmers were major constraints in adopt climate technologies.

Government policies should enable farmers to have access to extension services adequately as a lack of knowledge, input and credit have been indicated as the major barrier to the adaptation of climate resilient technology.

REFERENCES

Ansari, M.A., Joshi, S. and Raghuvanshi, R. 2018. Understanding farmers perceptions about climate change: a study in a North Indian State. *Adv. Agri. Env. Sci. (Open Acces)*, **1**(2): 85–89.

Kumar, A., Tripathi, P., Gupta, A., Singh, K.K., Singh, P.K., Singh, R. and Tripathi, A. 2018. Rainfall variability analysis of Uttar Pradesh for crop planning and management. *Mausam*, **69**(1): 141–146.

Banerjee, R.R. 2015. Farmers' perception of climate change, impact and adaptation strategies: a case study of four villages in the semi-arid regions of India. *Natural Hazards*, **75**(3): 2829–2845.

Bhatt, D., Sonkar, G. and Mall, R.K. 2019. Impact of Climate Variability on the Rice Yield in Uttar Pradesh: an Agro-Climatic Zone Based Study. *Env. Proce.*, **6**(1): 135–153.

Chouksey, R., Singh, K.C., Singh, C. and Birle, Y. 2021. Adaptation of Farmers Regarding Climate Resilient Technologies in Rewa Block of Rewa District in Madhya Pradesh. *Indian J. Ext. Edu.*, **57**(1): 26–31.

Deo, K., Tripathi, P., Gupta, A. and Singh, K.K. 2016. Trends of Rainfall in Different Sectors of Uttar Pradesh Under Present Scenario of Climate Change. *Vayu Mandal*, **42**(1): 12–20.

Devegowda, S.R., Kushwaha, S., Kumari, K. and Pavan, M.K. 2019. The Impact of Climate Change on Indian Agriculture. Vol. 16, p. 41–55. *In:* Naresh, R. K.(eds) Research Trends in Agricultural Sciences. CRC Press, New Delhi, India.

Guiteras, R. 2009. The Impact of Climate Change on Indian Agriculture. Manuscript. 53 p. Department of Economics, University of Maryland, College Park, Maryland.

Jasna, V.K., Burman, R.R., Padaria, R.N., Sharma, J.P., Varghese, E., Chakrabarti, B. and Dixit, S. 2017. Impact of climate resilient technologies in rainfed agro-ecosystem. *Indian J. Agri. Sci.*, **87**(6): 816–824.

Khatoon, R. 1988. Floods in Uttar Pradesh a Geographical Perspective. Thesis MSc (Geography). Aligarh Muslim University, Department of Geography, Aligarh.

Kumar, S. and Sidana, B.K. 2018. Farmers' perceptions and adaptation strategies to climate change in Punjab agriculture. *Article in Indian J. Agri. Sci.*, **88**(10): 93–101.

Mahato, A. 2014. Climate Change and its Impact on Agriculture. *Int. J. Sci. Res. Pub.*, **4**(4): 1–6.

Majumder, D., Roy, R., Bhowmik, P., Rudra, B.C., Mondal, A., Das, B. and Sultana, S. 2020. Impact and Perceived

Constraints in Adoption of Climate Resilient Technologies in Flood Prone Areas of West Bengal, India. *Int. J. Cur. Microb. Appl. Sci.,* **9**(4): 797–806.

Manjunath, K.V., Shivaramu, K. and Suresh, D.K. 2018. Adoption of Climate Resilient Technologies by Paddy Growers. *Asian J. Agric. Ext., Eco. Soc.*, **28**(3): 1-9.

Nanjappan, B. 2018. Adoption of Climate Resilient Agricultural Technologies by Farmers. *J. Agric. Ext. Mgt.*, **11**(1): 65–72.

Naresh, R., Gupta, R., Minhas, P., Rathore, R., Dwivedi, A., Purushottam, V.K. and Singh, O. 2017. Climate change and challenges of water and food security for smallholder farmers of Uttar Pradesh and mitigation through carbon sequestration in agricultural lands: An overview. *Int. J. Chem. Stu.,* **5**(2): 221–236.

O'Brien, K., Leichenko, R., Kelkar, U., Venema, H., Aandahl, G., Tompkins, H. and West, J. 2004. Mapping vulnerability to multiple stressors: Climate change and globalization in India. *Global Env. Change,* **14**(4): 303–313.

Ofuoku, A.U. 2011. Rural Farmers' Perception of Climate Change in Central Agricultural Zone of Delta State, Nigeria. *Indonesian J. Agric. Sci.,* **12**(2): 69.

Platt, R.V., Ogra, M., Kisak, N., Manral, U. and Badola, R. 2021. Climate change perceptions, data, and adaptation in the Garhwal Himalayas of India. *Climate and Dev.,* **13**(2): 95–106.

Singh, S. 2020. Farmers' perception of climate change and adaptation decisions: A micro-level evidence from Bundelkhand Region, India. *Ecological Indicators,* **116**(106475): 1–13.

Usama, M. 2015. *Management of Floods in Flood Prone Regions of Eastern Uttar Pradesh*. **2**(11): 148–152.

Vijayasarathy, K. and Ashok, K.R. 2015. Climate Adaptation in Agriculture through Technological Option: Determinants and Impact on Efficiency of Production. *Agric. Eco. Res. Rev.,* **28**(1): 103–116.