



Perception of Farmers about Impact of Climate Change on Agriculture in Uttarakhand, India

Pratibha Pandey^{a++*}, Deepa Vinay^{a#} and Seema Kwatra^{a#}

^a Department of RMCS, College of Community Science, GB Pant University of Agriculture and Technology, Pantnagar-263145, Uttarakhand, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The development process is being threatened by climate change, which is also negatively affecting the Indian economy in a number of areas, most notably the agriculture sector. Planting, transplanting, weeding, thinning, harvesting, processing, selling, winnowing, storing, kitchen gardening, and other methods are some of the crop production techniques that farmers use. Unpredictable, and chaotic climate change is threatening agricultural productivity and the stability of rural communities' livelihoods. Farmers that are aware of these disruptive variables may be able to lessen the detrimental effects of climate change on agriculture. This study aimed to evaluate farmers' perceptions regarding the impacts of climate change on agriculture within the Almora district of Uttarakhand, India. The study was carried out in the Almora district of Uttarakhand state.

⁺⁺ PhD Scholar;

[#] Professor;

^{*}Corresponding author: E-mail: pratihema2803@gmail.com;

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Purposive sampling technique and Random sampling was used to select the study area and samples. Total sample size was 120. Data on perception of farmers about impact of climate change reveals that 63 percent of respondents reported a decrease in overall food production. Results on change in availability of water for irrigation revealed that there was no change as reported by 43.33 percent of respondents in Almora district. Availability of drinking water decreased in Almora (54 %). The frequency of forest fire was reported to be increased as reported by respondents (65 %). When we talk about crop diversity and climate change, it was found that crop diversity decreases as reported by majority of respondents (82%) in Almora showing that crop rotation and other practices were not followed properly. The wild animal attack to the crop was increased in present time and causes serious damage to the crop. To effectively address these difficulties, policy measures and guidelines can be designed with more insight if location-specific farmers' perceptions and adaptive behaviors are understood.

Keywords: Climate change; perception; crop diversity; crop rotation; adaptive behaviour.

1. INTRODUCTION

Climate change represents a formidable threat to agricultural advancement in India. A major danger to development, climate change is hurting several sectors of the Indian economy, especially the agriculture industry. India is especially susceptible to the effects of climate change, which might harm its agricultural output, food and water security, human well-being, and cow numbers. Among the many tasks that farmers perform include planting, transplanting, weeding, thinning, harvesting, processing, selling, winnowing, storing, taking care of animals, and kitchen gardening. Unpredictable, and unpredictable climate change is threatening agricultural output and the stability of rural communities' livelihoods. Farmers may lessen the detrimental effects of climate change on agriculture by being aware of these disruptive elements. Thus, a deeper understanding of the perspectives and adaptation practices of farmers in particular locations might help establish appropriate policy measures and guidelines to effectively handle these difficulties.

The process of taking in information and stimuli from one's environment and turning them into psychological responsiveness is known as perception.

For farmers, the concept of climate change is extremely complicated because it has few bounds, while people's perceptions vary depending on their past and current circumstances. The traits of the individual, their experiences, and the information they are given, and the cultural and geographic setting in which they live all impact and affect perception.

Jamshidi *et al.* (2019) observed that we must look into farmers' awareness, attitudes, and perceptions of climate change, climatic risks, and the elements that contribute to susceptibility in order to determine how vulnerable they are to it.

It has long been acknowledged that implementing adaptation measures requires a perception of climatic changes. Farmers are more inclined to support policy actions to address climate change if they recognize its negative implications (Alam *et al.*, 2017).

Farmers' livelihoods, food security, and agriculture are all under risk from climate change. Changes in temperature, rainfall amount, and dispersion are common indicators of climate change. Most farmers believe that summers are getting hotter, which is consistent with rising temperatures. In addition, many farmers believe that snowfall has decreased recently in comparison to a few decades before. A survey carried out in Uttarakhand revealed similar views regarding rising temperatures and falling snowfall (Anonymous, 2011).

Kiran (2018) conducted a study on "long term trends and variations in rainfall under present climatic scenarios at Pantnagar" found an increasing trend of rainfall over the period of time during rainy season but the number of rainy days observed a declining trend for this season.

According to meteorological statistics, the majority of Indian farmers have noticed an increase in temperature as well as irregular and less frequent rainfall. It appears that Indian farmers have implemented a variety of adaptation strategies, the majority of which are systemic and incremental. Farmers are also increasingly adopting transformational

adjustments, which include significant changes in agricultural systems, occupational patterns, resource and labor allocations, and land usage. Adoption of adaptation strategies is often influenced by factors such as household income, farm size, gender, resource endowment, and lack of access to necessary credit and knowledge at the appropriate moment.

Since 85% of farmers in India lack financial resiliency, climate change and the sufferings it brings are a big issue (Singh *et al.*, 2019).

Furthermore, it is said that farmers' debt load is made worse by climate stressors, and some of them take their own lives as a result (Carleton, 2017).

2. METHODOLOGY

The aim of present study is to ascertain the perception of farmers about impact of climate change on agriculture in Uttarakhand. The methods and procedures developed for conducting the study are presented as follow:

2.1 Universe of the Study

The present study was conducted in Uttarakhand. Uttarakhand state is organised into two divisions – Kumaon and Garhwal- and 13 districts. viz., Almora, Bageshwar, Nainital, Udham Singh Nagar, Uttarkashi, Deharadun, Rudraprayag, Pithoragarh, Pauri, Tehri, Champawat, Haridwar and Chamoli.

2.2 Locale of the Study

Mid hill region of Kumaun division in Uttarakhand was selected for the study.

2.3 Sampling Procedure

Almora district was selected purposively for the study. Takula and Dwarahat block were randomly selected from Almora district. Two villages were selected randomly from each of the selected block. Thus, a total of four villages were included in the study sample. Total 120 farm women were selected from four villages using random sampling, in which thirty farm women were selected from each village.

2.4 Data Collection Tools and Techniques

Descriptive data was collected for the selected samples through survey method. In this study, an

interview schedule, having statements, regarding perceptions of the respondents about climate change impacts on agriculture, health etc. faced by the farmer were asked. Appropriate statistics such as frequency, percentage, etc. were used to analyse the data.

3. RESULTS AND DISCUSSION

3.1 Agriculture Production

Data on perception of farmers about impact of climate change reveals that nearly 52 percent of respondents reported a decrease in overall food production.

The obstacles to agricultural livelihood, such as inadequate output, animal encroachment, lack of water for irrigation, and dependence on conventional farming methods, were clarified by Dey *et al.* (2020).

Rana *et al.* (2019) observed that poor irrigation infrastructure and tiny, dispersed land holdings are the state's largest agricultural challenges. Low agricultural production in comparison to the national average is the result of challenging topography, adverse weather conditions for some crops, and a lack of technology and inputs. Growing vegetables is one of the key facets of Uttarakhand's agricultural industry. It offers the much-needed chance for agricultural diversification.

Results showed that majority of farmers were dependent on agriculture for food. Food sufficiency across the year was for 8-12 months as reported by only 6 percent of respondents. Decreased food production reduces the food sufficiency across the year.

Results on change in availability of water for irrigation revealed that there was no change as reported by 43.33 percent of respondents in Almora district. Agriculture in the district is mainly dependent on rainfed irrigation. Diminished water availability is affecting food production in the area.

Chhimwal *et al.* (2019) observed that because of its steep slopes, the hill region is constantly prone to soil erosion, which further reduces its fertility. State farmers primarily use two types of agricultural practices: irrigating and rain-feeding.

Table 1. Perception of farmers about impact of climate change N=120

Sr. No	Perception of farmers on climate change impact	%
1	Overall food production	
	Increased	25.83
	No change	21.67
2	Source of food	
	Decreased	52.5
	Agricultural	43.33
3	Food sufficiency across the year	
	Forest	20.83
	Others	35.83
4	Food sufficiency across the year	
	0-4 month	32.5
	4-8 month	61.67
5	Change in availability of water for irrigation	
	8-12 month	5.83
	Increased	15
6	Water for drinking	
	No change	43.33
	Decreased	41.67
7	Natural source of water	
	Increased	13.33
	No change	32.5
8	Frequency of forest fire	
	Decreased	54.17
	Increased	65
9	Human health	
	No change	29.17
	Decreased	5.83
10	Community Assets (Primary, Middle school, Panchayat Ghar, Bank, Roads, PHC, Post office and others)	
	Increase in waterborne diseases	28.33
	No change	42.5
11	Crop Diversity	
	Increase in waterborne diseases	29.17
	No impact	25
12	Livestock Diversity	
	Yes but only up to 4 asset categories affected	13.33
	Yes- 5 and above number of asset categories affected	61.67
13	Social conflicts (water related)	
	Decreased	81.67
	No change	13.33
14	Wild life attack	
	Increased	5
	Decreased	69.17
15	Social conflicts (water related)	
	No change	12.5
	Increased	18.33
16	Wild life attack	
	Increased	41.67
	No change	50.83
17	Wild life attack	
	Decreased	7.5
	Increased	89.17
18	Wild life attack	
	No change	10
	Decreased	0.83

3.2 Climate Change Impact on Health

Availability of drinking water decreased in Almora (54%). As far as the incidence of water borne diseases and human health concern, results showed that there was no change in the

outbreak of disease as reported by nearly 42 percent respondents whereas about 29 percent of the respondent of the Almora reported an increase in incidences of water borne diseases.

3.3 Climate Change and Crop Diversification

The frequency of forest fire was reported to be increased as reported by respondents (65%). When we talk about crop diversity and climate change, it was found that crop diversity decreases as reported by majority of respondents (82%) in Almora showing that crop rotation and other practices were not followed properly. A decrease in livestock diversity was also observed. Chandra *et al.*, (2020) highlighted that the conventional crop rotation strategy enhances soil health, boosts crop output, and makes effective use of rainfall. In the event that a certain crop fails, this method also serves as insurance for small-scale farmers. Under such circumstances, the farmers' financial loss is offset by other crops that grow in an intermixed fashion. This ancient technique is seriously threatened by cash crop monoculture and village population outmigration.

Raghuvanshi *et al.* (2020) in a study indicated that the majority of respondents (64%) were moderately vulnerable to climate change. Furthermore, over 50% of respondents had a very positive attitude toward climate change, and 71.4% showed a medium level of awareness about it. Furthermore, over 90% were aware of adaptation strategies such as changing planting times, switching from farming to non-farming occupations, adopting drought/frost tolerance practices, and diversifying crops and kinds.

Results also indicated that there were no change in social conflicts related to water (50%). The wild animal attack to the crop was increased in present time and causes serious damage to the crop. Wild animal attack is the underlying factor contributing to the decreased food production.

Farmers' views on climate change have a significant impact on how they comprehend and manage risks and uncertainties brought on by the phenomenon, as well as how they implement certain strategies to lessen its negative effects on agriculture (Ansari *et al.*, 2018).

4. CONCLUSION

Climate change is endangering the process of growth and has a severe impact on the Indian

economy in many areas, particularly the agricultural sector. The negative impacts of climate change on agriculture might be mitigated by farmers who are aware of these disruptive factors.

Farmers in Almora district perceive decreased food production due to climate change. The district's agriculture relies heavily on rainfed irrigation, and the scarcity of water is significantly impacting its food production. Forest fire frequency has increased, and 82% reported reduced crop diversity due to improper crop rotation. Wild animal attacks are increasing, causing serious crop damage. Wild animal attack is the underlying factor contributing to the decreased food production. To effectively address these difficulties, policy measures and guidelines can be designed with more insight if location-specific farmers' perceptions and adaptive behaviors are understood. It has long been known that understanding climate changes is necessary to put adaptation strategies into action. Establishing suitable policy measures and guidelines to successfully manage these challenges may be made easier with a deeper awareness of the viewpoints and adaptation strategies of farmers in specific areas.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

- Alam, G.M., Alam, K., Mushtaq, S., (2017). Climate change perceptions and local adaptation strategies of hazard-prone rural households in Bangladesh. *Clim. Risk Manag.* 17, 52–63. doi:10.1016/j.crm.2017.06.006 .
- Anonymous. (2011). Documentation of Climate Change Perceptions and Adaptation Practices in Uttarakhand, Northern India. By Beej Bachao Andolan Save Seed Campaign. Available at <http://>

- /www.panap.net/sites/default/files/06CCP
hase1BBA.
- Ansari, MA, Joshi, S, Raghuvanshi R. (2018) Understanding farmers perceptions about climate change: a study in a North Indian State. *Advances in Agriculture and Environmental Science*.1(2): 85-89.
- Carleton, T.A., (2017). Crop-damaging temperatures increase suicide rates in India. *Proc.Natl. Acad. Sci.* 114 (33), 8746–8751.
- Chandra, S., Chandra, D., PandeyR., Khajuria A.K., Kumar V., Bhatt P. (2020)Sari System: A Traditional Cropping Pattern of the Uttarakhand Himalaya. *Microbiological Advancements for Higher Altitude Agro-Ecosystems & Sustainability, Rhizosphere Biology*, https://doi.org/10.1007/978-981-15-1902-4_3
- Chhimwal, M., Pandey, R.K., Srivastava R.K. (2019) Status of agriculture and horticulture farming in the hill state of India- Uttarakhand. *Journal of Pharmacognosy and Phytochemistry* 8(4): 1626-1631.
- Dey, P.S., Chettiar M.S., Devanand P., Arunajaya C. K., Sowmya C., Frey L.M., Cornet S.(2020). Assessment of Sustainable Agriculture Practices in Uttarakhand, India. *IEEE 8th R10 Humanitarian Technology Conference (R10-HTC) | 978-1-7281-1110-0/20/\$31.00 ©2020 IEEE | DOI: 10.1109/R10-HTC49770.2020.9357012.*
- Jamshidi, O., Ali, A., Khalil, K., Hossein, A. and Jürgen, S. (2019). Vulnerability to climate change of smallholder farmers in the Hamadan province, Iran, *Climate Risk Management*, 23, 146-159.
- Kiran, R. (2018) Long Term Trends and Variations in Rainfall under Present Climatic Scenarios at Pantnagar. *Vayu Mandal*.44:54-60.
- Neha, Ansari M A. (2021).Farmers' Perception on Climate Change: A Study in Tarai Region of Uttarakhand. *Asian Journal of Agricultural Extension, Economics & Sociology* .39(11): 581-591.
- Raghuvanshi, R. and Ansari, M.A. (2020). Farmers' Vulnerability to Climate Change: A Study in North Himalayan Region of Uttarakhand, India. *Indian Journal of Extension Education* 56(4): 1-8.
- Rana, K., Kameswari, V.L.V., Chaudhary S., Kumar D. (2019). Livelihood opportunities through agriculture and allied field in the mid-hills of Uttarakhand. *Journal of Pharmacognosy and Phytochemistry*, SP5: 81-86.
- Rao C A Rama, Raju B M K, Rao A V M S, Rao K V, Rao V U M, Ramachandran K., Nagasri K, Dupdal R., Samuel J., Shankar K R, Rao M S and Maheswari M.(2018).Climate Change In Uttarakhand: Projections, Vulnerability And Farmers' Perceptions. *Journal Of Agrometeorology* 20 (Special Issue-I) : 37-41 .
- Singh, C., Rio, C.R.D., Soundarajan, V., Nath, Nath., Shivananjani, V., 2019. Assessing India's mounting climate losses to Financial Institutions, <http://www.indiaenvironmentportal.org.in>
- Van den Ban, AW, Hawkins, HS. *Agricultural Extension. (2nd Edition)*, Blackwell Science, UK;2000.
- Van der Linden, Hawkins, S.(2015) The social-psychological determinants of climate change risk perceptions: Towards a comprehensive model. *Journal of Environmental Psychology*,41: 112-124.

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