RESEARCH NOTE

# Effect of Climate Change on Agriculture and Allied Activities in Jharkhand: An Inference from Farmer Perception

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## ABSTRACT

*Understanding effect of climate change on agricultural and allied activities provides deeper insights essential for evolving policy ecosystem ensuring sustainable agricultural development. Present study conducted to provide the vital information from Jharkhand, India. About 86 percent of respondents agreed that cultivation became costlier day by day primarily due to growing trend of insect infestation and pathogen infection beside mounting expenses on irrigation under changed climatic conditions. In parallel, other floral and faunal components of ecosystem adversely affected that highlighted expanding evidences of climate change in lesser studied areas like Jharkhand.*

***Key words**: Jharkhand; Climate change; Farmer perception; Flora; Fauna;*

Climate change is no more a distant problem. We have been experiencing changes in climatic variables, such as temperature, rainfall, droughts etc (*Lobell et al., 2012; Auffhammer et al., 2011*) and have almost failed to reach a global consensus on the mitigation of greenhouse gas (GHG) emissions (*Sharma, 2015*). Amidst all these odds developing countries like India continue to face challenge of striking balance between growth and sustainable development. In the quest for survival, efforts to get adopted in the changing climate become the central strategy in the hand of policy makers. Agriculture being the most vulnerable sector against climate-relatedshocks exposes millions of small and marginal resource poor farmers to the greatest threat of civilisation. In this backdrop understanding effect of climate change on agricultural and allied activitiesprovides deeper insights essential to frame policy ecosystem for sustainable agricultural development (*Simane et al.2016*). Present study conducted to provide the vital information from Jharkhand, India.

## METHODOLOGY

The study was carried out in Jharkhand state during the years 2017-18 and 2018-19. Ranchi district was selected for present study. The district is located at 23°222 N85°202 E / 23.36°N85.33°E. Three blocks of Ranchi district selected randomly for the selection of villages. From each selected block, 2 villages (Total 2×3 = 6) were selected randomly for the selection of respondents.From each selected village, 40 farmers were selected through stratified sampling among population with more than 40 years age. In this way, a total of 240 farmers (Total 6×40 = 240) were considered as respondent for the present study. To ascertain the impact of long term climate change on variousevents, respondents were asked for their general perceptions on climate change impacts using 10 statements regarding agricultural incidences as well as 8 statements regarding other incidences; whether they have expressed their agreement or disagreement on impacts of climate change. Responses were recorded on 3-point continuum scale viz. agree, can't decide and disagree by assigning scores 3, 2 & 1, respectively. Further, the overall impact of long term climate change was determined and respondents were categorized as low (up to 22 Score), medium (23 - 44 Score) and high (more than 44 Score).

Out of total obtainable score from both the categories (agriculture and allied activities), actual score obtained by each respondent was considered for analysis of data.

## RESULTS AND DISCUSSION

*Impact of long term climate change on agriculture :* Majority of the respondents (86.25%) agreed that due to climate change, cultivation became costlier day by day. The phenomena may be attributed to growing trend of insect infestation and pathogen infection beside mounting expenses on irrigation (Table 1). Moreover, 82.92, 82.08 and 79.59 per cent of them said that cropping pattern has changed, use of traditional crop varieties decreased and climate change has reduced traditional irrigation sources like well, respectively. It might be due to fluctuations in rain onset, heat stress, longer dry seasons, uncertain rainfall and changing patterns of rainfall. 71.67 per cent agreed that population of rodent like rat has increased in recent past years due to climatic conditions have been supportive to its growth and 67.91 per cent of the farmers said that new species of seasonal weeds seen in recent years due to climate change. The result reinforced findings of *Bhushalet al. (2009)*.

**Table 1. Perception of respondents about impact of long term climate change on agriculture**

| Statement | A(%) | UD(%) | D(%) |
|---|---|---|---|
| Area under kharif crop has decreased | 48.33 | 17.92 | 33.75 |
| Use of traditional crop varieties decreased | 82.08 | 12.50 | 5.42 |
| Changes occurred in flowering and fruiting time of crops | 48.33 | 32.50 | 19.17 |
| Cropping pattern has changed | 82.92 | 15.83 | 1.25 |
| Population of rodent like rat has increased | 71.67 | 22.50 | 5.83 |
| | 67.09 | 29.16 | 3.75 |
| Emergence of new crop weed species | 67.91 | 27.50 | 4.59 |
| Cost of cultivation increased | 86.25 | 12.08 | 1.67 |
| Traditional irrigation sources like well has reduced | 79.59 | 14.16 | 6.25 |
| Ground level water has decreased | 63.75 | 29.16 | 7.09 |

*Impact of long term climate change on ecology and allied activities:* Most of the respondents (86.30%) agreed that over the past 30 year migration of birds and animals has increased due to climate change, while, 82.92 per cent believed that climate change has increased omnivorous birds like crow but decreased fruit eating birds like parrot and woodpecker. Further frequency of amphibian animals like snail and frog decreased (82.51%). Similarly, frequency of spider has also declined over year in the region due to climate change (80.42%). Significant number of respondents (72.92%) believed that drudgery of farm labour in general and farm women labourer in particular increased many fold due to rise in temperature and reduced humidity. A total of 71.67 per cent respondents agreed that drinking water availability decreased due to climate change. Though drinking water has decreased in summer due to changing pattern of rainfall resulting more runoff, local people said that they were facing more drought periods resulting decrease in ground water level. It was also perceived by a substantial percentage of respondents that the change in climate has resulted in scarcity of fodder in the area (68.75%), increased human health problems particularly mosquito borne diseases and respiratory diseases (67.97%). These results are in conformity with *Owusu-Sekyere et al. (2011).*

**Table 2. Perception of respondents about impact of long term climate change on ecology and allied activities**

| Statement | A(%) | UD(%) | D(%) |
|---|---|---|---|
| Migration of birds and animals has increased | 86.30 | 4.12 | 9.58 |
| Omnivorous birds like crow increased but herbivorous birds like parrot decreased | 82.92 | 9.58 | 7.50 |
| Frequency of amphibian animals like snail and frog decreased | 82.51 | 7.08 | 10.41 |
| Frequency of spider decreased | 80.42 | 1.67 | 17.91 |
| Drudgery of farm labour in general and farm women labourer in particular increased many fold | 72.92 | 1.67 | 25.41 |
| Drinking water availability decreased | 71.67 | 0.00 | 28.33 |
| scarcity of fodder | 68.75 | 18.33 | 12.92 |
| Vector born and pollution related human health problems increased | 67.97 | 10.70 | 21.33 |

Overall impact of long term climate change was determined by summed up the scores of farmers' perception on impact of long term climate change on agriculture and allied activities (Table 3). Roughly 34 per cent of the respondents perceived that climate change has high level of overall impact of climate change on ecology and human life, while, 36.67 and 29.17 per cent of the respondents reported medium to

low level of overall impact of climate change on ecology and human life.

**Table 3. Perception of respondents about overall long term climate change impact on human health and ecology**

| Long term impact | No. | % |
|---|---|---|
| High (More than 44 score) | 82 | 34.17 |
| Medium (23-44 score) | 88 | 36.67 |
| Low (Up to 22 score) | 70 | 29.17 |

## CONCLUSION

Findings of the present study revealed that farmer in Ranchi district of Jharkhand perceived significant change in agriculture and allied activities and primarily attributed the changes to shift in climate over 30 years in the region.

Deep impression of climate change even traced beyond the boundary of agricultural ecology and reported to changed dynamics of floral as well faunal composition in the region. The finding reinforced climate change as a transboundary civilizational challenge capable to transforming every component of ecology where man is only a part. Thus the study highlighted growing evidences of climate change in lesser studied areas like Jharkhand where food security of common man is more vulnerable due to chronic poverty and subsistence farming.

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