



## Change in climate, fluctuating challenges: A study on farmers experiences in Puri district of Odisha

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### ARTICLE INFO

**Keywords:** Climate change, Agriculture, Livelihood vulnerability, Adaptation strategies

### ABSTRACT

This study assesses the impacts of climate change on agriculture and rural livelihoods in the Puri district of Odisha, India. Based on responses from 33 randomly selected farmers in Astaranga and Kakatpur blocks, the findings reveal that irregular rainfall, rising temperatures, and frequent extreme weather events have significantly affected crop yield and livestock productivity. Yield loss (30.30%) and crop disease (18.18%) were identified as the major agricultural challenges, while 75.76% of livestock owners reported disease and mortality as key constraints. Vulnerable groups, including farm families, women, and rural laborers, face greater livelihood insecurity due to declining agricultural income. The study suggests promoting climate-resilient practices such as rainwater harvesting, afforestation, crop diversification, and organic farming. Strengthening institutional support, early warning systems, and capacity-building programs for farmers are essential to enhance adaptive capacity and ensure sustainable rural livelihoods.

### INTRODUCTION

Odisha, an agricultural state on India's eastern coast, is defined by its unique geography, deeply embedded cultural traditions and a climate that alternates between abundance and challenges. It shares boundaries with West Bengal, Jharkhand, Chhattisgarh and Andhra Pradesh. The state covers approximately 155,707 square kilometers and has a 450-kilometer coastline. Its topography consists of hills, flood plains, coastal plains, plateaus and forests; roughly one-third of the state is covered by forests, which are home to a variety of wildlife. Odisha is suitable for agriculture because it is traversed by important rivers like the Mahanadi, Brahmani,

Baitarani and Subarnarekha. The largest river, the Mahanadi, spans 42% of the state. Another well-known feature of Odisha is Chilika Lake, one of the largest brackish water lagoons in the world that is significant for local livelihoods and the environment. Rice, not only a staple food but also a representation of wealth, spirituality and social identity, is integral to Odisha culture. Rice is so important in rural Odisha that it is frequently cited as second only to oxygen. In a similar vein, the ceremonial planting of rice seeds on Akshaya Tritiya invites divine blessings for a bountiful harvest season. The end of the sowing season is marked by Raja Sankranti in mid-June and celebrations such as Nuakhai are thought to represent the harvest of lowland and upland rice, respectively. Rice is considered the staple food, even in

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tribal and non-landowning communities, and its absence is frequently linked to deprivation and poverty. The southern Odisha Jeypore tract is acknowledged as a secondary center of origin for paddy cultivation, underscoring the area's historical importance in the domestication and diversification of this essential crop. Therefore, rice cultivation, economic sustenance and spiritual fulfillment are the threads that make up Odisha's cultural heritage. The southwest monsoon is the primary source of the 150 cm of annual rainfall that Odisha receives due to its tropical monsoon climate. The wettest month, July, frequently results in flooding. Paddy farming, which is highly dependent on stable weather, is impacted by the frequent cyclones that hit coastal areas. Odisha has seen enormous losses climatic changes in recent decades, with cyclones, floods and droughts occurring more frequently and with greater intensity. The state's largely agrarian populace in faces persistent problems as a result of these fluctuations. Farmers' resilience and inventiveness are put to the test as they must adjust to fluctuating rainfall patterns, erratic monsoons, and the constant threat of natural disasters.

The climate of the district is defined by mild winters, hot, muggy summers and copious monsoon rains from June to October. Compared to inland regions, the Bay of Bengal's sea breezes help to moderate the extreme heat, making summers more tolerable. Puri is extensively vulnerable to natural disasters such as tropical cyclones, floods, heat waves, and extreme precipitation, all of which cause significant damage to life and property. Climate change is creating more problems for Puri's agriculture, such as decreasing June rainfall and increasing temperatures that have an adverse effect on crop yields and water availability. Extreme and turbulent weather phenomena are increasing in frequently, deserts become hotter and drier, and agricultural land has become less productive. Changes in the climate will make the water crisis worse, with rural Indian women suffering the most (Yadav and Lal, 2018). Post-harvest management save food from spoilage and create employment opportunities (Gupta et al. 2024). Unpredictable weather patterns pose a further threat to the district's primarily rainfed agriculture, making disaster resilience and adaptation essential to the local economy and general well-being.

## Research Methodology

This research was carried out in the Astaranga and Kakatapur blocks of Puri district. These two blocks, as well as the district, were purposefully chosen from among eleven blocks and thirty districts. Three-gram panchayats were selected from each of the two blocks and three villages were selected at random from each panchayat. Random sampling was used to choose farmers. For this study, 33 respondents participated from the selected villages. Research schedules was used to gather the data. Classification, coding, analysis

and tabulation were all part of the methodical processing. For analysis, statistical tools such as frequency and percentage were used for interpretation and reference of results.

## RESULT

This study explores the way farmers view climate change as a significant factor affecting their way of life through in-depth field research. The results demonstrate that declining agricultural dependability, which is linked to climate change, not only negatively impacts family well-being but also intensifies disputes over scarce resources in rural areas.

### Effect of climate change in Agriculture

Table-1 Effect of climate change in Agriculture

Statement of response	Frequency	Percentage
Disease & pest infestation	06	18.18
Unwillingness for farming	03	09.09
Yield loss	11	30.30
Natural calamities (cyclone, flood)	02	06.61
Not receiving fair prices for their crops	01	03.03
Crops are not being sown & harvest at right time	09	27.27
Water scarcity	01	03.03
Expenses outweigh earnings	01	03.03
Total	33	100.00

The findings of table 1 indicate that yield loss (30.30%) is the most significant impact of climate change on agriculture in the study area. Irregular rainfall, temperature fluctuations, and increased frequency of extreme weather events such as cyclones and floods have severely affected crop productivity. Farmers reported that delayed or untimely rainfall often leads to poor germination, pest infestation, and reduced yields. The second most reported issue was the inability to sow and harvest crops at the right time (27.27%), emphasizing the uncertainty in crop calendars due to unpredictable weather. Disease and pest infestations (18.18%) have also increased, as climatic variations favour the spread of new pathogens and insect species.

A smaller proportion of respondents (9.09%) expressed unwillingness to continue farming, reflecting growing frustration with declining profitability. Natural calamities such as cyclones and floods (6.61%), water scarcity (3.03%), and expenses exceeding earnings (3.03%) further exacerbate farmers' vulnerabilities. Additionally, only 3.03% of farmers

mentioned not receiving fair prices for their produce, suggesting that market instability compounds the economic stress induced by climate change.

## Effect of climate change in Livestock

Table-2 Effect of climate change in Livestock

Statement of response	Frequency	Percentage
Disease & death	25	75.76
Lack of pasture & animal husbandry	03	09.91
Unwillingness to engage in animal husbandry	04	12.12
Decline livestock resources	01	03.03
Total	33	100.00

The study reveals that disease and death of livestock (75.76%) constitute the most significant impact of climate change on animal husbandry in the Puri district. Rising temperatures, erratic rainfall, and frequent cyclones have created stressful conditions for animals, leading to increased disease incidence and mortality. A smaller but notable proportion of respondents (12.12%) expressed unwillingness to continue animal husbandry, citing increased risks and financial losses due to climate variability. Lack of pasture and animal husbandry challenges (9.91%) were also reported, reflecting the degradation of grazing lands and declining fodder production. Only 3.03% of respondents mentioned a decline in livestock resources, yet this indicates a gradual erosion of livelihood assets over time.

## Impact of climate change in vulnerable people/ group

Table-3 Impact of climate change in vulnerable people/ group

Statement of response	Frequency	Percentage
Farm families	11	33.33
Farmers, Labors	09	27.27
Poor's	03	09.09
Women, Livestock	04	12.12
Oldies	02	06.06
Child	03	09.09
Patient	01	03.03
Total	33	100.00

Table 3 depicts that the impact of climate change on various vulnerable groups in the Puri district. The results revealed that farm families (33.33%) are the most affected group,

as they are directly dependent on agriculture for their livelihood. Irregular rainfall, increased temperature, and recurrent cyclones have disrupted farming cycles, leading to reduced productivity and food insecurity. Farmers and laborers (27.27%) were also severely impacted, facing unstable employment opportunities and declining income due to crop failure and unpredictable weather patterns.

Women and livestock-dependent groups (12.12%) experienced additional challenges, as women often bear the burden of collecting water, fuel, and managing household resources under worsening climatic conditions. The poor and children (9.09% each) are particularly vulnerable to malnutrition and limited access to education and healthcare when household incomes drop. Elderly persons (6.06%) face health risks from heat stress and reduced mobility during disasters, while patients (3.03%) suffer from inadequate medical support during extreme weather events.

## Impact of climate change in vulnerable places

Table-4 Impact of climate change in vulnerable places

Statement of response	Frequency	Percentage
Across nearly all sites	09	27.27
Predominantly rural areas	04	12.12
Coastal areas	08	24.24
Urban & rural regions	10	30.30
Low land areas	04	12.12
Total	33	100.00

Data of table 4 indicates that the effects of climate change are widely felt in many vulnerable areas. The most commonly reported affected regions are urban and rural areas combined, which account for 30.30% of cases. Impact across nearly all sites is almost as common, occurring in 27.27% of cases. Coastal regions are also heavily affected, accounting for 24.24% of cases. Significant coastal erosion, saltwater intrusion and land loss have resulted from rising sea levels and temperatures. Marine biodiversity is at risk due to these changes. Comparatively, 12.12% of cases are found in low-land areas and primarily rural areas. In general, climate change is noticeable in a variety of susceptible environments, with coastal and urban/rural regions particularly susceptible to its consequences.

## Institutions and people that farmers consult to address climate change and

## how much effective is their interventions

Table-5 Institutions and people that farmers consult to address climate change and how much effective is their interventions

Responses	Frequency	Percentage
Highly experienced farmers	01	03.03
Block Agriculture Office	15	45.45
NGOs	03	09.09
VAW	05	15.15
Veterans	02	06.06
Total	33	100.00

The results from above indicate that the Block Agriculture Office (45.45%) is the primary institution consulted by farmers to address issues related to climate change. This reflects the trust placed in government agricultural extension systems for technical advice, subsidies, and information on adaptive farming practices. Village Agricultural Workers (VAWs) (15.15%) play a significant role at the grassroots level, assisting farmers in field-level problem-solving and awareness creation regarding climate-resilient practices. Non-Governmental Organizations (NGOs) (9.09%) contribute to awareness programs and training initiatives, though their outreach remains limited. A small proportion of farmers reported consulting veterans (6.06%) and highly experienced farmers (3.03%), suggesting that informal knowledge sharing, though valuable, is less institutionalized.

## Strategies for addressing climate change

Table-6 Strategies for addressing climate change

Statement of response	Frequency	Percentage
Afforestation	08	24.24
Improvement irrigation, drinking water facilities	04	12.12
Rain water harvesting	04	12.12
Organic farming	03	09.09
Precision agriculture & Animal Husbandry	01	03.03
Bridging the extension & communication gap	01	03.03
Total	33	100.00

The findings from the table 6 reveal that afforestation (24.24%) is perceived as the most important approach to address climate change. This reflects the farmers' understanding of the role of trees in mitigating carbon emissions, improving soil fertility, and regulating the microclimate. Improvement

in irrigation and drinking water facilities (12.12%) and rainwater harvesting (12.12%) were also recognized as crucial measures, indicating that water scarcity and irregular rainfall are major climate-related challenges affecting agricultural productivity and rural livelihoods. Adoption of organic farming (9.09%) signifies growing concern for sustainable and soil-friendly agricultural practices that minimize chemical inputs and enhance resilience. However, only a small proportion of respondents acknowledged precision agriculture and animal husbandry (3.03%) and bridging the extension and communication gap (3.03%) as necessary interventions. This suggests limited awareness about technological and institutional innovations that could significantly improve climate adaptation capacity.

## DISCUSSION

The climatic fluctuating phenomenon like irregular rainfall and rising temperatures causes yield loss 30.30%. It was believed that these modifications would reduce agricultural output (Batungwanayo et al. 2023). There is 18.18 proportion of disease and pest infestation were occurred due to climate change. The majority of farmers believed that climate change was to blame for the rise in weed and pest infestations (65%), as well as the appearance of new weeds (30%) and pests (26.7%) (Mandal et al., 2020). The majority of farmer 75.76% identified disease and death as the most significant impact of climate change on livestock, indicating widespread concern about animal health and survival. The morphological and anatomical features of buffaloes make them well-suited to hot and humid climates however; the heat stress has detrimental effect on the reproduction of buffaloes (Kaur and Arora 1982; Tailor and Nagda 2005). A minor proportion 12.12% expressed unwillingness to engage in animal husbandry, indicating that people are becoming less inclined to continue livelihoods based on livestock as a result of the increasing difficulties. Moreover, the economic pressures faced by farmers are consistent with studies showing that dependence on supplementation clearly increases costs for livestock producers (Schulze et al. 2016). This climate alternation is making more difficulties for the women with livestock 12.12% and agrarian farm families 33.33%. Women particularly are responsible for household chores climate change makes things like getting fuel and water much more difficult because of heatwaves and droughts. Poverty and gender inequality make women more susceptible to climate change (Yadav and Lal 2018). About 24.24% coastal area, 12.12% low land area and rural regions are significantly vulnerable to this climatic alternation. As a result of resource scarcity and degraded ecosystems, coastal communities particularly farmers and fishermen face growing livelihood insecurity (Zikra and Lukijanto, 2015). Around 45.45% of farmers frequently consult the Block Agriculture Office for addressing the

climate change and it's followed by VAWs, NGOs, Veterans and highly experienced farmers. The Intergovernmental Panel on Climate Change's recommendations highlight the need for coordinated action between government agencies, extension networks, and farming communities, as well as institutional strengthening and community participation, in order to successfully adapt to climate change. In this regard, the Block Agriculture Office's dominance in the current study implies that institutional efforts continue to be the cornerstone. Although the comparatively low representation of NGOs and experienced farmers suggests that more integration for bottom-up methods with current top-down tactics is required. Increasing cooperation between these groups could improve interventions' overall efficacy by ensuring that local knowledge and scientific understanding cooperate to reduce it (Stinger et al., 2022). In the context to address the climate modification the farming community embrace to improvement irrigation, drinking water along with rain water harvesting facilities with 12.12%. Similarly, the region-specific land use methods i.e. sustainable intensification, such as improved crop diversification, irrigation and agroecological technique to increase output without sacrificing environmental sustainability (Taillander et al., 2023). African cities the local resources and technologies is a common component of community resilience. Fog-water harvesting, recreation along arid riverbeds, and modifications to irrigation schedules (Kareem et al., 2020).

## CONCLUSION

The Puri district of Odisha's agricultural and socioeconomic fabric is seriously threatened by climate transformation. This research inferences highlighted about the crop yields, livestock health and rural livelihoods in general are being negatively impacted by rising temperatures, unpredictable rainfall and an increase in the frequency of extreme weather events like floods and cyclones. Unpredictable weather, as per the farmers, increases the risk of disease and pest infestations, interferes with the cycles of planting and harvesting and sinks agricultural productivity. Climate stressors have a similar impact on livestock management, with disease and mortality rates sharply increasing. These changes disproportionately affect vulnerable groups, such as farm families, laborers, women, children and the oldies, who frequently face increased resource scarcity and livelihood insecurity, particularly in rural and coastal areas. The urgent need for stronger adaptation strategies is highlighted by the current institutional interventions' limited effectiveness. Rainwater harvesting, organic farming, afforestation and awareness campaigns stand out as important suggestions for enhancing resilience. In a nutshell adopting sustainable

agricultural practices and involving the community are all important ways to prioritize climate change adaptation. Ensuring the sustainability of Puri's agriculture-based economy and protecting the welfare of its people require increasing institutional support and empowering the local community. Coordinated efforts at all levels will be necessary to address these issues in order to reduce risks and foster long-term resilience.

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