

# **Economic Impact of Climate Change on Agricultural Sector of Odisha State**

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Date of Submission: 08-09-2022

Date of Acceptance: 25-09-2022

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## **I. Introduction**

Agriculture is crucial for ensuring food, nutrition and livelihood securities for India. Indian agriculture had made a significant progress in the past, but currently it is facing many challenges. Stagnating net sown area, plateauing yield levels, deterioration of soil quality, reduction in per capita land availability and the adverse effect of climate change are the major challenges for Indian agriculture. On the other hand, the increased rate of population is pressurizing the agricultural sector for enhance food production. The task is very challenging because about 60% of the net cultivated area is rainfed and exposed to biotic and abiotic stresses arising from climate variability and climate change. More than 80% of Indian farmers are marginal and small with poor coping capacity. Furthermore, the Indian farmers are heterogeneous and unorganised. Climate change and variability are likely to aggravate the problem of future food security by putting pressure on agricultural, affecting its sustainability.

India has a diverse range of habitats, ranging from wet and dry tropical environments in the south to alpine temperate environments in the north. For the WWF, India is home to 15 of the world's 200 global eco-regions, including four biodiversity hotspots. In spite of its small size, India is home to more than 8 percent of the world's known species, including 45,000 plant and 91,000 animal types. Due to the fact that it is so dependant on rainfall, it is difficult to maintain a constant growth pattern or revenue stream throughout the year. In spite of this, it is responsible for 18% of India's GDP (GoI, 2020).

According to the Germanwatch Climate Risk Index 2018, Indian farmers are particularly vulnerable to climate hazards, which resulted in the loss of 2,119 lives and nearly \$21 billion in property in 2016. (Eckstein et al., 2017).

The study examines the regional level of economic impact on climate change on agricultural sector of Odisha state situated at east costal part of India on the bay of Bengal covering two costal districts Balasore and Jagatsinghpur. 70% of Odisha's population depending on Agriculture. In Odisha's agricultural system depend on climatic condition and here most of the people living in rural area with single income family. Due to climate change Odisha had seen so many worst cyclone since 1999, which has a huge impact on agriculture. Climatic variable act as direct input in agricultural production along with other input such as land, water, fertiliser, pesticides etc. however the effects of climatic variables became more pronounced on agriculture region, where it is backward or premature with less scope for technological adoption and transmission.

Climate change has become a major worry for the lives and livelihoods of small and marginal farmers because of its potential and extensive consequences. Millions of small and marginal farmers have been affected. Extreme weather catastrophes, such as cyclones and super cyclones, have wreaked havoc on a large portion of the population. Both the National Action Plan and the State Action Plan on Climate Change were developed by India and Odisha, respectively, and both include sustainable agriculture and forestry as core missions. After a decade of dedicated efforts, climate change continues to have a negative impact on the agricultural reliant population, according to several studies. According to this issue statement, the changing environment has a negative impact on the livelihoods of marginal and small farmers, regardless of established coping strategies, development plans, and programmes.

## **II. Statement of the Problem**

Examine the problem in adverse effects of climate change, falls heavily on climate sensitive agricultural sector. Agriculture holds a predominant position in the state economy. This contributes 26% of GSDP (Gross State Domestic Product) with almost 60% of agricultural land under rainfed and water dependant rice as it's main crop. Agriculture is particularly vulnerable to the vagarich of climate change. According to disaster management plan for Odisha in the year of 2013- 2021, around 15.45 lacs hectares of cropped areas were extensively damaged by floods. Around 35000 people had lost their lives due to cyclone and

flood . In the districts of Jagatsinghpur and Balasore, after cyclone like Yaas, Amphan and Phani damaged most of the houses, trees and cropped areas the most.

Findings of the problem statement are as follow:

- Due to climate change, rise in sea level which indirectly impact on soil fertility.
- Increasing floods, droughts and adverse weather events , which are higher risk to agricultural production and food security in the state.
- Increase in temperature from 2-4 degree Celsius in last decade cause scarcity of water storages, which leads to agricultural losses in rabi crops.
- Huge changes in seasonal calendar in Odisha leads to maximum of summer season, mild winter season, low- mid level of rain fall in monsoon, where Odisha's agriculture parten mostly depending on monsoon. Which results in low crop production.
- Odisha faces minimum of 2 cyclones per year and 1 super cyclone in alternative year since 1999, which is mostly affecting costal districts of jagatsinghpur and Balasore the most. Mostly this happens in between Sept- Dec month, which is the time of collection.

### **III. Literature Review**

The literature review is based on different search engines , journal, books and articles with related to climate change impact on agricultural sector. Also includes various reports from Odisha state govt.( Economic Survey of 2019-20) and data relating to disaster management of odisha to analyse agro-climatic condition in the state.

Human interference with natural resources has significantly changed the environment and its ecosystem in last few decades. Dreadful climate change effects like floods, cyclone, droughts, heat waves, unseasonal rain fall patterns . This events are severely affected the farm productivity and food and nutritional security simultaneously affecting growth and development of the nation. (Narendra Singh Tomar).

Countries together in sentilization of global climate change issue and it's impacts particularly on agriculture. (ICAR). The UNFCCC is a "RIO Convention" came into existence in 1944, designed to prevent all hazardous activities of human, which interfere the global climate proactive role in institutionalising the climate adaption process in agricultural sector and evaluate vulnerability of Indian Agriculture to global climate change analysis of the adaption and nitigation strategies.( 2004 ICAR) Assessment of risk vulnerability of agricultural system to different climate change scenarios at local, regional and at national levels, including but not limited to pests and diseases. (2015 at SBSTA-42 Bonn, Germany). A mission was mounted to interrogate water resource management.(IWRM).

Odisha was one of the first state in India to prepare a comprehensive and truly consultive state action plan in inventing diverse stakeholders.( SPACC 2013-14) Odisha has both a sea side and hinter land effect, when it comes to intraday and seasonal variation in temperature (Odisha climate change action plan (2018-23). Climate change related investment for agriculture was 556.28 crore. (Economic survey of dosiha 2011-12) and was 631.44 crore in the year 2013-14.

Odisha's geographic location on the east coast of India and it's climatic condition have meant that the state has historically been, highly prone to climate change and multiple hazards, mainly cyclones, droughts and floods. Its fluctuating weather conditions suggest that Odisha is stumbling under climatic chaos. Most of the observed warming over the last fifty years likely to have been due to increase in green house gas concentration (IPCC 2013).

Climate change has the greatest impact on agriculture since it is the least structured industry, according to Hansen et al (2012). A key factor in the effectiveness of climate change adaptation and mitigation efforts was the involvement of local residents. There is some evidence that human activity has contributed to climate change, based on the impression of recent local climatic fluctuations.

Small-scale farmers in India face a wide range of concerns, but climate change is one of the most pressing. This will disproportionately affect people living in vulnerable ecosystems, such as rural India, where livestock losses are already at an all-time high.

Etwire et al (2013) found that small farmers were particularly hard hit by climate change. Households were even more susceptible due to the dry season, where the average time to reach a water source was long, increasing the time burden of household duties and impacting women and girls' ability to care for their families and attend school.

For climate change-affected coastal farming, Gopalakrishnan (2019) addressed all pertinent concerns. In order to achieve long-term agricultural sustainability along the coast, researchers found that narrowing the gap between farmer aspirations and available adaption alternatives is critical.

#### **IV. Objectives of the Study**

The study's goals are as follows:

- Estimation of the costs of Indian agriculture's adaptation to climate change
- Climate change influences on agricultural production and sustainable development are to be studied.
- Odisha farmers' perceptions of climate change and the elements that influence their perceptions are to be analysed.
- For the purpose of examining the impact of climate change on the livelihood of Odia farmers
- To look at how households and communities in Odisha are dealing with difficulties brought on by climate change.
- Finding the new adoptions of climate smart agriculture practices, which helps soil disturbances, green house gas emissions and preserve soil nutrients.
- Smart appliances used at the time of cyclone in odisha for disaster management and food crop protection.
- Crop diversification plans and implementation by govt of Odisha.
- Research programmes or initiatives for agro climatic action.

#### **V. Significance of the Study**

There may be political importance in the research of contextual adjustment and climate change coping mechanisms. It's possible that both the government and other development organisations, such as financing agencies, may build a platform for responsible convergent development. Adaptation and mitigation of climate change will also be supported by evidence-based policy and public awareness. Policymakers will be able to use the findings of this study to help craft new agricultural and climate change policies.

Farmers and the community would benefit from facilitating agency-specific climate change mitigation and adaptation programmes. As a result, it is envisaged that the community would have a greater ability to mitigate and adapt to climate change concerns as a result of the anticipated convergence of many agencies, including NGOs. The agricultural community will develop its own leadership as a result of this process.

#### **VI. Research Methodology**

##### **Data collection:**

Primary and secondary data will be used in this investigation. The questionnaire survey will be used to gather the bulk of the main data. For secondary data, sources such as past research and journal papers will be consulted as well as material from books, periodicals and the internet. Also included in this category are Textbooks; Journals; Magazines; News Papers; Government Gazettes; and Government Reports. –

##### **Study area:**

The study will focus on two distinct agroclimatic regions: one in Odisha's coastal Balasore district and the other in the state's interior Jagatsinghpur district.

##### **Sampling plan and sample size:**

The research locations and farm households in the study region were selected using a multi-stage sampling procedure and Purposive sampling to know about how cyclone hits these two districts. Correlation coefficient found negative relation between agriculture and climate change in Odisha. Also regression analysis shows the relationship between two or more variables of interest like land, water resource, rainfall, weather condition, agricultural instruments. dependent variables are land, water, agricultural instrument and rain fall is independent variable.

Initially, Odisha state in India would be chosen as the overall research region for this project.

Remembered for the second round of determination were two regions (Coastal and inside). It will be determined by the level of little and peripheral ranchers in each locale, as surveyed by the National Initiative on Climate Resilient Agriculture of Indian Council of Agriculture Research (ICAR), Government of India.

After consulting with: two rainfed blocks from each district

- 1- The rev-department,
- 2- Non-profit organisations

In the sixth and final stage, a questionnaire will be distributed to all the small and marginal farmers in the selected communities. As a result, a total of 200 people from Jagatsinghpur district and 100 people from Balasore district are scheduled to participate in the survey.

##### **Data Analysis Plan:**

Self-administered questionnaires are used to collect the information. Descriptive and multivariate statistical methods will be used to examine the data. Information will be examined utilizing SPSS programming,

which can play out an assortment of factual tests, including recurrence conveyance investigation and expressive insights like mean, standard deviation and unwavering quality examination, among others.

### **VII. Expected Outcome of the Study**

The farmers in the study setting will communicate their perspectives on how to reduce the consequences of climate change on their lives and livelihoods through a suitable engagement strategy with various institutions, such as the home, community, NGO, and government.

Climate change economics and perceptions will be examined in new ways by this study. In addition, the community has participated in concentrated group talks to map out the characteristics of climate change that are most important to local lives. For a climate change vulnerability research, this is a more scientific approach than just choosing random climate change characteristics.

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