



Climate Change and It's Impact on Diversification of Agriculture

Sadasiba Tripathy

H.O.D Economics, Bhairab Degree Mahavidyalaya, Borigumma, 764056

Email:sadasibaphd@gmail.com

Abstract

This paper aims to analyse the nature and impact of climate change in agriculture. A structured questionnaire cum interview schedule has been developed. Data has been collected from 60 households by simple random sampling method I found there is a negative impact of the climate change on the agricultural production in the study area.

Key words- *climate change, Irrigation, Tribal households, sensitivity of agriculture*

Introduction

India is an agro-based economy. Impact of climate change on agriculture will be one of the major deciding factors influencing the future food security of mankind on the earth. Rising global temperature is not only causing climate change but also contributing to the irregular rainfall patterns. Uneven rainfall patterns, increased temperature, elevated CO₂ content in the atmosphere are important climatic parameters which affects the crop production. Agriculture is not only sensitive to climate change but also one of the major drivers for climate change. Understanding the weather changes over a period of time and adjusting the management practices towards achieving better harvest are challenges to the growth of agricultural sector as a whole. The climate sensitivity of agriculture is uncertain, as there is regional variation in rainfall, temperature, crops and cropping systems, soils and management practices. The inter-annual variations in temperature and precipitation were much higher than the predicted changes in temperature and precipitation. The crop losses may increase if the predicted climate change increases the climate variability. Small changes in temperature and rainfall have significant effects on the quality of fruits, vegetables, etc. Chatidiput economy is adversely being, influenced very frequently due to extreme events such as heavy rainfall, cold and, forest fires, etc. Here in this village the farmers are in a mood to produce vegetable production but since last 2 years they get a crop failure due heavy and unproductive rainy days. Climate change is one of the most important global environmental challenges

we are facing at present times. Climate Change is affecting food production, natural ecosystems, freshwater supply, health, etc. Agriculture production depends heavily on Climate. Throughout the world there is significant concern about the effects of climate change on agricultural production. Researchers and administrators are much concerned with the potential damages of climate change that may arise in future on agriculture productions. Impact of Climate Change on agriculture will affect domestic and international policies, trading patterns, use of resources and food security. The Climate change over time and time is attributed directly or indirectly to human activity that alters the composition of the global atmosphere (IPCC, 2007). Since climatic factors serve as direct inputs to agriculture, any change in climatic factors is bound to have a significant impact on crop yields and production. Climate change scenarios include higher temperatures, changes in precipitation, and higher atmospheric CO₂ concentrations. The greenhouse effect is a natural process that plays a major part in shaping the earth's climate. It produces the relatively warm and hospitable environment near the earth's surface where humans and other life-forms have been able to develop and prosper. However, the increased level of greenhouse gases (GHGs) which includes carbon dioxide (CO₂), water vapor (H₂O), methane (CH₄), nitrous oxide (N₂O), hydro fluorocarbons (HFCs), per fluorocarbons (PFCs), and sulfur hexafluoride (SF₆), etc. has contributed to an overall increase of the earth's temperature which is driving earth towards global warming. The average global surface temperature has increased by 0.74°C since the late 19th Century and is expected to



increase by 1.4°C To 5.8°C by 2100 AD with significant regional variations (IPCC, 2007). The atmospheric CO₂ gas has increased from 280 ppm (parts per million) To 395 ppm (parts per million) , CH₄ Methane gas has increased from 715 ppb (parts per billion) to 1882 ppb and N₂O concentration has increased from 227 ppb To 323 ppb (parts per billion) in previous years. The Global Warming Potential (GWP) of these gases i.e., CO₂, CH₄ and N₂O are 125 and 310 respectively. Projected scenario of global warming indicates that the global average surface temperature could rise by 1.4°C to 5.8°C by 2100. The projected rate of warming is unprecedented during last 10,000 years.

Objectives

- (i) To know the nature and impact of climate change in agriculture in the study area.
- (ii) To suggest some measures to improve in the agricultural production in the changing climate.

Methodology

The study is based on both primary and secondary data. A structured questionnaire cum interview schedule has been developed. Data has been collected from 60 households by simple random sampling method. The heads of the households were interviewed to deduce the inferences.

Impacts of Climate Change

Climate change has is a hindrance in the growth rate of the state's economy. The impacts of climate change are reduced yield rate, poor human health, erratic rainfall, hampers to biodiversity and change in vegetation. Storms, floods, heat-waves, lightening events, vector diseases and droughts have been occurred and makes disastrous to the economy. (Mishra and Jena, 2015). Odisha is experiencing distinctive changes in the climate pattern. Atmospheric temperature is going up in the state making the summer seasons almost unbearable. Low pressure is becoming a regular phenomenon causing an unpredictable rain pattern across the state. Frequent floods and droughts since 1998 crushed the economic strength of coastal Odisha. It's not only natural disasters, but the rise in sea level and the Bay of Bengal expanding towards the coastal landscape taking many villages, farm lands into it have become

more a problem of the villagers who live along the coastline and derive most of their livelihood from the sea. Once proud to have a little over 480 km long coastline, people of Odisha are now seeing it as a danger. Starting from the northern coasts of Odisha to the southern coasts, many villages have been the victim of the wrath of the ocean. The villages most affected by the climate change are the coastal villages in the district of Kendrapara. The cluster of seven villages called Satabhaya is the burning example. The 1930 land records show an area of 320 sq. km. for the Satabhaya cluster near the port town of Paradip in Odisha. The 2000 land records indicate that this area has been reduced to 155 sq. km. with five of the seven villages being swallowed by the sea. It has been considered that climate change impacts can be measured as an economic cost (Smith et al., 2001). Smith et al. argue that climate change can increase income inequalities between and within countries. They further state that a small increase in global mean temperature would result in net negative market sector impacts in many developing countries and net positive market sector impacts in many developed countries. Besides such market oriented impacts, the Climate change can also result in pronounced non-market impacts such as health impacts in developing countries. The economic impact of climate change in Odisha is observed in each sector of the state be it agriculture, food, fisheries and animal resources, forests, water resources, health, industry, or mining; everywhere the effect is quite noteworthy.

Profile of the Study Area

Chatidiput Population - Koraput, Orissa

Chatidiput is a village located in Jeypore Block of Koraput district in Odisha with total 283 families residing. The Chatidiput village has population of 1300 of which 650 are males while 660 are females as per Population Census 2011. In Chatidiput village population of children with age 0-6 is 228 which make up 17.29 % of total population of village. Average Sex Ratio of Chatidiput village is 1008 which is higher than Odisha state average of 979. Child Sex Ratio for the Chatidiput as per census is 900, lower than Odisha average of 941. Chatidiput village has lower literacy rate compared to Odisha. In 2011, literacy rate of Chatidiput village was 35.29



% compared to 72.87 % of Odisha. In Chatidiput Male literacy stands at 49.35 % while female literacy rate was 21.66 %. As per constitution of

India and Panchyati Raj Act, Chatidiput village is administrated by Sarpanch who is elected representative of village.

Table-01 Demographic features of Chatidiput

Particulars	Total	Male	Female
Total no. of houses	283	--	--
Population	1,300	640	670
Child(0-6)	228	120	108
Schedule Caste	400	205	195
Schedule Tribe	513	242	271
Literacy	35.29%	49.35%	21.66%
Total workers	580	331	249

Table-02 Agricultural workforce

Category	Cultivators	Agricultural labour	Marginal labour
Male	117	73	142
Female	77	107	69
Total	194	180	211

In chatidiput village, most of the villagers are from Schedule Caste (SC) & Schedule Tribe (ST). Schedule Tribe (ST) constitutes 38.89 % while Schedule Caste (SC) was 30.33 % of total population in Chatidiput village. In chatidiput village out of total population, 580 were engaged in

work activities. 85.13 % of workers describe their work as Main Work while 14.87 % were involved in Marginal activity providing livelihood for less than 6 months. Of 580 workers engaged in Main Work, 194 were cultivators while 180 was Agricultural labourer.

Status of the village in 2014-15:

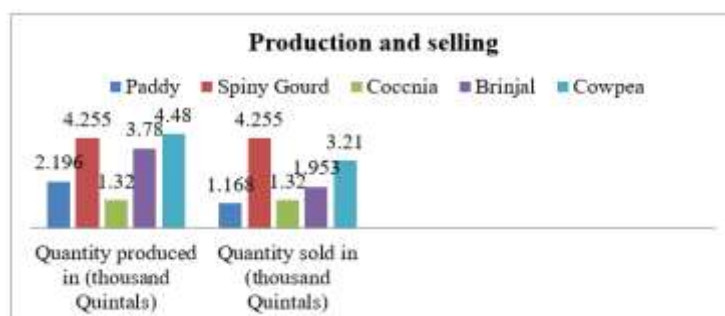
Table – 03: production pattern of the village in 2014-15

Name of The crop	Area under Cultivation (in acres)	Quantity Produced (in quintals)	Quantity consumed (in quintals)	Quantity Sold(in quintals)	Income (In rupees)
Paddy	120	2195	1,028	1,168	15,18,400
Spiny gourd	32	4,256	-----	4,255	63,82,500
Coccinia	22	1,321	-----	1,320	13,20,000
Brinjal	18	3,779	1,827	1,953	9,53,000
Cowpea	28	4,480	1,270	3,210	48,52,000
Total	220 acres				1,50,25,900

(Source: Compiled from primary data)

In 2014 the farmers were producing paddy and all other vegetables as shown in the table above. It is explained in the figure below:

Figure-01 (Production and selling of Agricultural output)



In the above figure we can see the agricultural output and it's selling in thousand quintals. But due to the

uneven rainfall in the district the production of the vegetable is affected a lot. The figure below shows the district rainfall data in recent years:

Figure-02: Rainfall data of koraput district in recent years:



It can be observed from the above figure that in 2010 the average rainfall was around 620mm and in 2011 it was quite nearer to that but in between 2012 to 2016 there were less rain fall which rose to around

350mm during 2017 and further rose to 590mm in 2018. Stagnation of water at the root of the plants affected the agricultural output especially the production of vegetables in the study area.

Status of the village in 2018-19:

Table-04: production pattern of the village in 2018-19

Name of The crop	Area under Cultivation (in acres)	Quantity Produced (in quintals)	Quantity consumed (in quintals)	Quantity sold (in quintals)	Income (In rupees)
1	2	3	4	5	6
Paddy	1,90	3,840	1,582	2,258	32,87,000
Non-paddy	----	----	----	----	----

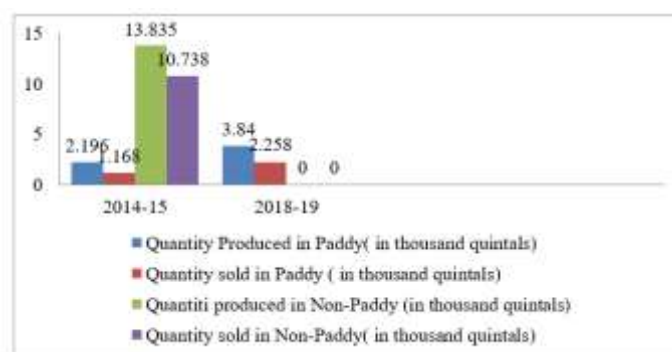
(Source: Compiled from primary data)

In 2018-19 the farmers were producing paddy because due to the uneven rainfall in the district as

shown in the table above. Here is a figure which shows the comparative idea of two time periods in 2014-15 and 2018-19.

Figure-03 A comparative idea between 2014-15 and 2018-19

(Impact of climatic change in 2018-19 on agricultural Production)





From the above figure it can be experienced that in 2014-15 the farmers could able to produce the paddy and non-paddy output in their fields but in 2018-19 they are only producing the paddy which adversely affects their standard of living and also the availability of vegetables in the region.

Findings of the Article

- Yes there is a negative impact of the climate change on the agricultural production.
- The farmers are changing their cropping pattern due to the uneven rain fall in 2018-19.
- But there is a positive impact on the production of paddy in the study area.
- Due to the frequent change in climate of the district the farmers also practicing the diversification in agriculture.

Suggestions to overcome:

1. HYV Seeds should be developed in scientific ways and supplied to the farmers as per testing of the soil and climate change.
2. Storage facilities should be provided to the farmers for the better preservation of the product and to get the actual price.
3. The farmers should continue to practice the same method of diversification of agriculture without hesitating the uneven rainfall.
4. The farmers should be provided the crop insurance in the concern areas.

5. Training, awareness and techniques should be provided to the farmers for the diversified crop production by predicting the climate change.

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