



Full Length Research

Climate Change and Its Impact on Agriculture with Special Reference to Production System in India

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Abstract: Agriculture production is directly dependent on climate change and weather. Climate change can bring positive and negative effects on Indian agriculture, India's agriculture is more dependent on monsoon from the ancient periods. Any change in monsoon trend drastically affects agriculture. Even the increasing temperature is affecting the Indian agriculture. The term "weather" refers to the short-term (daily) changes in temperature, wind, and/or rainfall of a region. In the long run, the climatic change could affect agriculture in several ways such as quantity and quality of crops in terms of productivity, growth rates, photosynthesis and transpiration rates, wetness accessibility etc. Climate change is likely to directly impact food production across the globe. Increase in the mean seasonal temperature can reduce the duration of many crops and hence reduce the yield. In areas where temperatures are already close to the physiological maxima for crops, warming will impact produces more immediately. Motorists of climate change through alterations in atmospheric arrangement can also influence food production directly by its impacts on plant physiology. The consequences of agriculture's contribution to climate change, and of climate change's negative impact on agriculture, are severe which is projected to have a great impact on food production and may threaten the food security and hence, need special agricultural measures to struggle with. In the Indo-Gangetic Plain, these pre monsoon changes will primarily affect the wheat crop (>0.5oC increase in time slice 2010-2039). In the states of Jharkhand, Odisha and Chhattisgarh alone, rice production losses during severe deficiencies (about one year in five) average about 40% of total production, with an estimated value of \$800 million. The consequence of climate change poses many threats; one of the important significances is bringing about changes in the quality and quantity water resources and agriculture productivity This study focus on study about the climate change how affecting the agriculture production in India different regions.

Keywords: Climate Change: Impact: Agriculture Production: Temperature

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1.0 Introduction of the Study

Climate change has a thoughtful influence on the accessibility of several resources on the earth particularly H₂O (Water), which withstands life on this earth. Changes in the environment, biodiversity and natural resources are unfavorably distressing human strength and quality of life (Merritts et al., 1998). During the 21st century, India is predictable to knowledge warming above universal level. India will also initiate to understanding more periodic difference in temperature with more warming in the winter than summer seasons. Permanency of heat waves through India has comprehensive in modern years with warmer night-time temperatures and hotter days, and this trend is probable to continue. The average temperature variation is anticipated to be 2.33°C-4.78°C with a replication in CO₂ focusses. These heat waves will lead to improved unpredictability in summer monsoon rainfall, which will consequence in radical special effects on the cultivation and agriculture sector in India. Hoffmann (2011) argued that climate replicas forecast a steady rise in carbon dioxide (CO₂) attentiveness and temperature across the globe. These models, however, are not very exact in envisaging upcoming variations in local weather circumstances. Local weather circumstances such as rain, temperature, sunlight and wind, in mixture with locally adapted plant variability, harvesting schemes, and soil conditions can make the most of food production as long as plant diseases can be controlled (Chatterjee, 1998).

2.0 Review of Literature

2.1 Importance of Agriculture

First, and primary, agriculture problems in India for deep motives, not minimum because the agriculturalist clutches a superior domicile in Indian sentiments and concentrations. The first salvo of Satyagraha was enthusiastic by Mahatma Gandhi on behalf of agriculturalists, the indigo agrarians oppressed by colonial imperative. Not disparate in premature, Jeffersonian America (Hofstadter, 1955; Hoffmann, 2011), past and literature have funded to the agriculturalist obtaining mythological prestige in Indian wisdom: acquitted, unblemished, hard-working, in accord with environment; and nevertheless deprived, helpless, and the target, first of the imposing controllers and then of indigenous landholders and distributors. Bollywood (and Kollywood and Tollywood) has also played a key role in creating and strengthening the tradition of the Indian agrarian.

Significance of Farming in India is understood by everybody when Mr. Lal Bahadur Shastri, another Prime Minister of India had assumed the motto of 'Jai Jwan Jai Kisan'. India is the nation of agriculturalists and plantations (Kumar & Parikh, 1998). Utmost of the societies of India have embraced Farming for their profession. There are numerous estates of land which are used only for agriculture of different crops like tomato, potato, rice, wheat, sugarcane, apples etc. That is why Agriculture is noble to take as an occupation. Some of the people is nearby who do not reflect agriculture a presumed occupation. This is actually a reprehensible intelligent. You can live without further possessions like mobile, etc but not without food. Consequently, this is the arena where you also are occupied for the existing of civilization.

2.2 Situation of Climate Change in India

The warming may be extra noticeable in the northern portions of India. The extravagances in thoroughgoing and smallest temperatures are predictable to growth under varying temperature, few places are anticipated to become extra rain though certain might remain desiccated (Pandey, 2007). Leaving Punjab and Rajasthan in the North West and Tamil Nadu in the South, which show an insignificant diminution on a regular a 20 % increase in all India seasonal monsoon rainwater over all states are anticipated. Quantity of rainy times may come downcast (e.g. MP) but the passion is estimated to growth at most of the parts of India (e.g. North East). Gross per capita water obtainability in India will deterioration from 1820 m³/ yr in 2001 to as low as 1140 m³/ yr in 2050 (IPCC 2007). Corals in Indian Marine will be soon unprotected to summer temperatures that will surpass the current inceptions practical over the last 20 years.

Once a year bleaching of corals will develop nearly an inevitability from 2050. Currently the districts of Jagatsinghpur and Kendrapara in Odisha; Nellore and Nagapattinam in Tamilnadu; and Junagadh and Porabandar districts in Gujarat are the most susceptible to effects of enlarged concentration and occurrence of hurricanes in India (NATCOM, 2004). The past explanations on the cruel sea level beside the Indian coast show a long-term (100 year) rising trend of about 1.0 mm/year. Yet, the recent data recommends an increasing tendency of 2.5 mm/year in ocean level laterally Indian shoreline (Hoffmann, 2011).

The marine surface temperature contiguous India is probable to earnest active through nearby 1.5–2.0°C by the intermediate of this period and by approximately 2.5–3.5°C by the completion of the century. A 1 meter sea-level rise is anticipated to relocate nearly 7.1 million people in India and nearby 5764 sq. km of land area will be lost, along with 4200 km of roads (NATCOM, 2004). Over 50% of India's forests are probable to involvement modification in forest types, undesirably impacting accompanying biodiversity, regional climate subtleties as well as maintenances based on forest products. Even in a comparatively tiny distance of almost 50 years, most of the forest biomass in India appears to be extremely defenseless to the estimated change in climate. Moreover, it is expected that by 2085, 77% and 68% of the forested networks in India are expected to practice change in forest types.

2.3 The India Meteorological Department (IMD) Designates four Climatological Seasons in India:

Sinha & Swaminathan (1991) reported that in India classified different zones such as North Zone, East Zone, West Zone South Zone Central Zone and North East Zone. Each zones classified different climatological seasons (Ahmad et al., 2012). These are first, winter, occurring from December to March. The year's coldest months are December and January, when temperatures average around 10–15 °C (50–59 °F) in the northwest; temperatures rise as one proceeds towards the equator, peaking around 20–25 °C (68–77 °F) in mainland India's southeast.

Secondly, summer or pre-monsoon season, lasting from April to June (April to July in northwestern India). In western and southern regions, the hottest month is April; for northern regions of India, May is the hottest month. Temperatures average around 32–40 °C (90–104 °F) in most of the interior.

Thirdly, Monsoon or rainy season, lasting from July to September. The season is dominated by the humid southwest summer monsoon, which slowly sweeps across the country beginning in late May or early June. Monsoon rains begin to recede from North India at the beginning of October. South India typically receives more rainfall.

Lastly, Post-monsoon or autumn season, lasting from October to November. In the northwest of India, October and November are usually cloudless. Tamil Nadu receives most of its annual precipitation in the northeast monsoon season.

The Himalayan states, being more temperate, experience an additional season, spring, which coincides with the first weeks of summer in southern India. Sinha & Swaminathan (1991) stressed that traditionally, North Indians note six seasons or Ritu, each about two months long. These are the spring season (Sanskrit: *vasanta*), summer, monsoon season, autumn, winter, and preverbal season. These are based on the astronomical division of the twelve months into six parts. The ancient Hindu calendar also reflects these seasons in its arrangement of months.

Chattopadhyay (2000) posited that India grows almost each and every crop. Can you think why? If we consider the varieties of crop grown from Kashmir to Kanyakumari and western coast of Gujarat to extreme north eastern states of Arunachal Pradesh, there would be hundreds of crops. We group all these crops into four broad types. Let us discuss the main crops under each type in detail.

Table 1: Four Broad Categories of Crops

S. No	Types of Crops	Meaning	Major Crops
1.	Food grains	Crops that are used for human consumption	Rice, Wheat, Maize, Millets, Pulses and Oil seeds
2.	Commercial Crops	Crops which are grown for sale either in raw form or in semi-processed form	Cotton, Jute, Sugarcane, Tobacco and Oilseeds
3.	Plantation Crops	Crops which are grown on Plantations covering large estates	Tea, Coffee, Coconut and Rubber
4.	Horticulture	Sections of agriculture in which Fruits and Vegetables are grown	Fruits and Vegetables

3.0 Impact of Climate Change on India’s Agriculture Productivity

Climate change is enacting a toll on India’s agronomic production and agriculturalists’ profits, 2018 Economic Investigation has established. The survey showed by foremost economic mentor Arvind Subramanian and his group has initiated that the effect of temperature and rainfall on agriculture is fingered throughout exciting fluctuations—when temperatures are ample developed, rainfall meaningfully inferior, and the number of “thirsty times” better than usual. According to the Economic Survey well-known that such impact is other contrary in unirrigated lands related with watered zones. “Extreme surprises have extremely conflicting effects among unirrigated and irrigated areas (and consequently between crops that are dependent on rainfall), almost double as high in the former related with the latter,” the survey noted (Ahmad et al., 2012).

Besides assumed the statistic that nearby 52% (73.2 million hectares zone of a total 141.4 million hectares remaining spread zone) of India’s total land under agriculture is still unirrigated and rain-fed, the sector is watching at bothered times ahead (IPCC 1996).

3.1 Crashes in Protection against Climate Change

For example deficiencies, hailstorms and floods converted more frequent and less expectable, agriculturalists and the government administration is feeling the full force of climate change (Adams et al., 1998). Most agriculturalists in India are not enclosed by protection and thus do not receive liberation for harvest damage. Yet on an average these disbursements be around about Rs 24,000 crore per year among 2014–15 and 2016–17, according to a report published recently in the Live Mint. The total economic damage to agronomy could be many times higher—the Economic Survey found that India experiences losses of about Rs 62,000 crore to extreme weather shocks (Adams et al., 1998). Climate change is inevitable, but the necessity on the climate can be reduced by emerging India’s irrigation schemes quickly.

3.2 Decrease in Agriculture Productivity:

The decrease in Agriculture productivity of foremost crops will be peripheral in the subsequent scarce centuries but it could decrease to as much as 10-40% by 2100 unless agricultural familiarizes to climate change-induced changes in weather (Adams et al., 1998).

Foremost crops such as wheat, rice, oilseeds, pulses, fruits and vegetables will see reduced yields over the years. It will force agriculturalists to either acclimate to encounters of climate change or face the hazard of receiving inferior (Aggarwal & Kalra, 1994). It could opportunity India into a foremost trader of oilseeds, pulses and even milk. Adaptation to climate change will need unlike cropping decorations and appropriate contributions to reimburse yield instabilities.

3.2.1 Food Security: Liability of Indian agronomy due to notions accompanying with climate change and small variation capacity of mainstream of Indian farmers attitudes danger to food security of the country. By 2030, India may need 70 million tonnes more of food grains than the predictable making production in 2016-17. The claim for food is also going to growth due to an increasing population, growing urbanization and increasing income. To meet growing demand, India may be contingent on importation if it does not performance on time to growth production and productivity of major food crops, pulses, oilseeds and milk by adapting to climate change.

3.2.2 Projected food demand: The ICAR-National Institute of Agricultural Economics and Policy Research has projected food demand of 345 million tonnes (MT) by 2030- almost 30% higher than in 2011. The projected demands for fruits, vegetables, milk, animal products (meat, eggs and fish), sugar and edible oil, by 2030 is estimated to be 2-3 times more than that in 2011.

3.3.3 Economic Losses: According to the economic survey estimations, India presently suffers fatalities of about \$9-10 billion annually due to extreme weather events. Of these, nearly 80% losses remain uninsured (Saseendran et al., 1999) . The significant of losses are going to intensification considerably in upcoming if one earning into account the impact of climate change on farm productivity.

3.3.4 Improve in Harvests: Though there is possibility of reduction in harvests of certain crops in outdated disseminated areas due to climate change but it may escalation elsewhere due to change in weather pattern. Though most harvests will see reduced production, but climate change may also help improve harvests of soybean, chickpea, groundnut, coconut (western coast) and potato (in Punjab, Haryana and western Uttar Pradesh)

4.0 The Role of Government to Improve the Harvests

Agriculture accounts for 16% of gross domestic product and 49% of employment in India, making it crucial in the overall economy (Aggarwal & Kalra, 1994). Shortages of water and land, deterioration in soil quality, climate change-induced temperature increases and rainfall variability, these are some of the main issues with agriculture leading to farmers' distress. The impact of climate change is already visible and in medium term, agriculture income may fall by 25% because climate change will hit the crop yields. Poor agricultural performance can lead to inflation, farmer distress and unrest, and larger political and social disaffection – all of which can hold back the economy. The farmers are suffering because of erratic monsoons, unseasonal showers, volatile prices, which sometimes dip below support prices. At times, agriculture faces problem of plenty while at other times, there is much less harvest (Saseendran et al., 1999). Lower yields because of high temperature and low rainfall due to climate change will add to farmers' distress.

The government's lofty objectives of addressing agricultural stress and doubling farmer's income need radical follow-up action, including decisive efforts to bring science and technology to farmers, replacing untargeted subsidies (power and fertilizer) by direct income support, and dramatically extending irrigation but via efficient drip and sprinkler technologies. We note that Government had launched Direct Benefit Transfer for Fertilizer subsidy on pilot basis in October, 2016. Under this scheme, the entire subsidy on various fertilizer grades was released to the fertilizer companies on the basis of actual sales done by the retailers to beneficiary farmers.

The Government is implementing a number of schemes to help the farmers in increasing their productivity by reducing cost of cultivation, achieving higher yield per unit and by realizing remunerative prices. ... The balanced use of fertiliser will also enhance productivity and ensure higher returns to the farmers.

5.0 Conclusion of the Study

Climate change, the outcome of the “Global Warming” has now started presentation its effects universal. Climate is the major cause of agricultural productivity which directly impact on food production across the world. Agriculture sector is the greatest penetrating sector to the climate changes because the climate of a region/country determines the nature and characteristics of undergrowth and crops. Increase in the mean periodic temperature can reduce the period of many crops and henceforth decrease final harvest. Food production systems are tremendously complex to climate changes like changes in temperature and rainfall, which may lead to occurrences of nuisances and illnesses thus dropping harvest eventually disturbing the food security of the country. The net impact of food security will depend on the experience to global environmental change and the capacity to manage with and recuperate from global environmental change. Coping with the impact of climate change on agriculture will require careful management of resources like soil, water and biodiversity. To survive with the impact of climate change on agriculture and production, India will need to act at the global, regional, national and local levels.

6.0 References of the Study

- Adams, R. M., Hurd, B. H., Lenhart, S. & Leary, N. (1998). Effects of Global Climate Change on Agriculture: *An Interpretative Review Climate Research Clim Res*, 11(1): 20- 31.
- Ahmad, J., Alam, D. & Hassen, S. (2012). Impact of Climate Change on Agriculture & Food Security in India: 131-136.
- Aggarwal, P. K. & Kalra, N. (1994). Analyzing the Limitations Set by Climatic Factors, Genotype, and Water and Nitrogen Availability on Productivity of Wheat. II. Climatically Potential Yields and Optimal Management Strategies. *Field Crops Res.*, 38: 93-103.
- Chatterjee, A. (1998). *Simulating the Impact of Increase in Carbon Dioxide and Temperature on Growth and Yield of Maize and Sorghum. M.Sc. Thesis, Division of Environmental Sciences.* Indian Agricultural Research Institute, New Delhi.
- Chattopadhyay, R. (2000). *Simulating the Impact of Climatic Variability and Climate Change on the Productivity of Sugarcane. Ph.D. Thesis, Division of Environmental Sciences.* Indian Agricultural Research Institute, New Delhi.
- IPCC (1996). *Climate Change 1995: Impacts, Adaptations and Mitigation of Climate Change: Scientific-Technical Analysis. Report of the Working Group II of the Intergovernmental Panel on Climate Change.* Cambridge University Press, London and New York.
- Kumar, K. & Parikh, J. (1998). *Climate Change Impacts on Indian Agriculture: The Ricardian Approach, in Measuring the Impact of Climate Change on Indian Agriculture, Edited by a Dinar, R Mendelsohn, Everson, J Parikh, A Sanghi, K Kumar, J Mckinsey and S Lonergan, Washington, DC: The World Bank World Bank Technical Paper No 402.*
- Sinha, S. K. & Swaminathan, M. S. (1991). *Deforestation, Climate Change and Sustainable Nutrition Security: A Case Study of India.* Climatic Change, 19: 201-209.
- Saseendran, S. A., Singh, K. K., Rathore, L.S., Singh, S.V. & Sinha, S. K. (1999). *Effects of Climate Change on Rice Production in the Tropical Humid Climate of Kerala, India.* Climate Change, 12:1-20.
- Hoffmann, U. (2011). *Assuring Food Security in Developing Countries under the Challenges of Climate Change: Key Trade and Development Issues of a Fundamental Transformation of Agriculture.* United Nation Conference on Trade and Environment: 3-5.