

## Climatic Change and Agriculture in India: Issues and Challenges.

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**ABSTRACT:**India is a large country with a diverse climate. Diverse seasons mean diverse crops and farming systems. There is a high dependency of agriculture on the monsoon rains and a close link exists between climate and water resources. Two-thirds of the area are rain dependent. We are also going to see increased climatic extremes such as heat and cold waves, which are likely to increase production variability. The potential impacts on Indian agriculture is the productivity of most cereals would decrease due to increase in temperature and CO<sub>2</sub>, and decrease in water availability. There will be a projected loss of 10-40% in crop production by 2100 if no adaptation measures are taken. A one degree Celsius increment in temperature may decrease yields of real nourishment edits by 3-7%. The importance of understanding the ongoing impact of climate change on agriculture is often underestimated. An early and equitable international agreement on climate change is beneficial to less- developed countries, but the question of how much delay by developing countries they can tolerate on this issue is of critical strategic interest to them. Domestic policy considerations require that climate change be factored into development activities that are influenced by the climate and weather. In the meantime, logical assessments of the quickness of the effect of environmental change and the degree of atmospheric defenselessness are fundamental to the detailing of national arranging positions at global environmental change transactions. In this manner the ebb and flow paper features the agronomic and financial viewpoints and negative effect of environmental change on Indian horticulture and its profitability and spotlights on projects to upgrade flexibility of Indian agribusiness to climatic inconstancy. The test will be to check whether the innovative work and monetary feasibility stay aware of the pace of climate change and empower sustenance security.

**KEYWORDS:**Earth, Climate change, Environmental Change, Indianagriculture, climate policy, adaptation, vulnerability

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### I INTRODUCTION:

The most important aspect of Earth's climate is changing as a consequence of human activity on the planet. The average temperature of the Earth is rising, slowly but steadily, as a consequence of the emission of greenhouse gases (GHGs) and their increasing concentration in the atmosphere. Of the greenhouse gases that contribute to global warming, carbon dioxide is by far the most significant. A consequence of the carbon cycle is that the net amount of carbon dioxide (CO<sub>2</sub>) in the atmosphere is not equivalent to the total CO<sub>2</sub> that has been emitted into the atmosphere and the net stock (after absorption by the carbon cycle) are relevant to study the impact of climate change. The study of global warming is riddled with uncertainties. The best predictions that can be made about temperature rise due to greenhouse gas emission are probabilistic in nature. The rise in temperature due to emission of greenhouse gases into the atmosphere has a profound effect on the Earth's climate system as a whole, and this in turn has important consequences for the geosphere and biosphere.

### II OBJECTIVES:

- To analyze the climatic changes due to global warming.
- To study the actual and potential effects of climate change on developing countries.
- To examine the impact of climate change on agriculture.

### III CLIMATIC CHANGE DUE TO GLOBAL WARMING:

The authoritative source for information regarding such effects remains the periodic assessment reports of the Intergovernmental Panel on Climate Change (IPCC), the latest being prepared and issued in 2012. According to AR4, the most significant climatic changes that could result from global warming are due to daily and seasonal temperature patterns could change with increases in both maximum and minimum temperatures.

Even rainfall patterns could, subject to significant changes, with subtropical regions of the world likely to receive significantly lower rainfall and the northern latitudes experiencing increased rainfall. Rising temperature will lead to increased frequency of extreme weather events like heat waves, extremely heavy rainfall and intense storms and cyclones. Following the increase in global temperatures, the melting of polar icecaps will contribute to a rise in sea levels, although there are uncertainties regarding the extent of the rise. Rising sea levels will pose a threat of submergence of coastal communities and many island nations. Global warming will lead to changes in the oceans. Due to increased CO<sub>2</sub> concentration in the ocean will acidify, resulting in adverse consequences for marine flora and fauna.

The magnitude of these effects depends on the actual extent of temperature increases, which in turn depends on the quantum of greenhouse gases that are released into the atmosphere. The expectations made by atmospheric science for particular districts are not so much exactness but rather more unverifiable. Prediction on the regional scale require reliable meteorological and other time-series data to calibrate climate models, data that may not always be accurate or available, especially in less developed countries.

#### **IV REAL AND POTENTIAL IMPACTS OF ENVIRONMENTAL CHANGE ON CREATING NATIONS:**

Between 1906 and 2005, world average temperature increased by 0.7 degree Celsius, with larger increases in northern latitudes and larger increases over land than over the oceans. Even the sea levels have increased consistently with the expansion temperature on oceans, icecaps and polar ice sheets. The incidence of cold days and nights has decreased, while there has been an increase in the number of hot days and nights. Heat waves and extreme rainfall events have also become more frequent. One of the important factors that affect the climate-sensitivity of the biosphere is the pace at which climate change take place. Global warming and consequent variations in climate may proceed at a faster rate than the rate at which ecological system adapts to such changes. Similarly, changes in the behavior of marine life offer further evidence. Shifts in the ranges and abundance of some algae and fish are clearly associated with rising water temperatures and other related changes including in salinity and oxygen content.

It is clear from the scientific evidence that there is an urgent need to limit the total quantity of greenhouse gases, especially CO<sub>2</sub> that will be released into the atmosphere in the future. Given the past levels of emissions of CO<sub>2</sub>, human society has to learn to live within a strict carbon budget, sharply reducing its dependence on fossil fuels in all forms. For developing countries this constitutes a major challenge, since in the near future they will continue to primarily be dependent on the use of fossil fuels to meet their development needs, particularly for improved access to energy, further industrialization and infrastructure building. In order to create this essential carbon space for developing countries, developed nations must reduce their CO<sub>2</sub> emissions sharply. The current tendency is towards global warming beyond the acceptable limit of 2°C. The world succeeds in limiting the maximum temperature increase to 2°C, such temperature rise itself will result in a number of serious consequences. Prominent among these is the impact of climate change on agriculture.

There is abundant evidence that climate change will disproportionately affect less- developed countries. One of the primary climatic reasons is that agricultural production in low latitudes, which account for a majority of less-developed countries, is more likely to be affected by rising temperatures, since ecosystems are already at the limits of thermal stress tolerance in many cases. Similarly, water stress arising from climate change is likely to be higher in many locations in lower latitudes. This also places greater stress on agriculture in less – developed countries. But given the great variations in socio – economic conditions across regions with similar climatic conditions, it is evident that climatic conditions alone do not determine or characterize the greater vulnerability of developing country agriculture to climate change.

#### **V THE IMPACT OF CLIMATE CHANGE ON AGRICULTURE:**

Before we analyze the impacts, there are 3 aspects of the relationship between climate change and agriculture. Firstly, climate change has a direct bearing on the biology of plant growth. Furthermore, any appraisal of the effect of environmental change on horticulture must consider the association between the direct natural impacts of environmental change from one viewpoint and different parts of the biosphere and geosphere, for example, soil conditions, seed, water, manure, pesticide Advancements, and plant entomology et cetera. Thirdly, we must consider the impact of climate change on society and the economy, and the ability of existing social and economic institutions, particularly in rural areas, to deal with the challenges posed by global warming. The climate change affects the agriculture in soil processes, crop, grasslands and livestock etc.

**SOIL Procedures:** The potential for soils to help farming and circulation of land utilize will be impacted by changes in soil water to adjust:

- ✓ Increase in soil, water deficits, i.e. dry soils ends up drier, thusly expanded requirement for the water system
- ✓ It enhances soil workability in wetter districts and reduce poaching and disintegration hazard.

**CROPS:** The effect of increased temperature and CO<sub>2</sub> levels on crops will be broadly neutral:

- ❖ The range of current crops will move northward
- ❖ New trim assortments may should be chosen
- ❖ Horticultural crops are more helpless to changing conditions than arable products
- ❖ Fields vegetables will be especially influenced by temperature changes.
- ❖ Water shortages will straightforwardly influence leafy food creation

### VI GRASSLANDS AND LIVESTOCK

- There is probably not going to be a critical change in appropriateness of animals.
- Pigs and poultry could be presented to higher occurrences of warmth push, along these lines impacting efficiency.
- Increase in infection transmission in quicker development rates of pathogens in the earth and more proficient and rich vectors, (for example, bugs)
- Consequences for food quality and storage.

### VII ANTICIPATED IMPACTS OF ENVIRONMENTAL CHANGE ON AGRIBUSINESS THROUGHOUT THE FOLLOWING 50 YEARS

CLIMATIC ELEMENT	EXPECTED CHANGES BY 2050'S	CONFIDENCE IN PREDICTION	EFFECT ON HORTICULTURE
CO <sub>2</sub>	Increase from 360ppm to 450-600 ppm( 2005 levels now at 379 ppm)	Very high	Good for crops: expanded photosyn theory , lessened water utilize
Ocean Level Rise	Rise by 10-15 cm expanded in south and balance in north by regular subsistence	Very high	Loss of land, beach front disintegration, flooding, salinization of groundwater
Temperature	Rise by 1-2°C. Winter warms more than summers. Expanded recurrence of warmth waves	High	Faster, shorter, prior developing seasons, goes moving north and to expand evapotranspiration
Precipitation	Seasonal changes by ±10%	Low	Impacts on dry spell hazard 'soil workability, water logging water system supply, transpiration
Storminess	Increased wind speeds, particularly in north. More serious precipitation events	Very low	Lodging, soil disintegration, decreased invasion of precipitation
Variability	Increases crosswise over most climatic factors, forecasts uncertain	Very low	Changing danger of harming occasions which impact products and the timing of homestead tasks

Source. Climate and agriculture, MAFF (2000)

### VIII INDIA'S AGRICULTURE:

From antiquated circumstances India's horticulture has been subject to rainstorm. Any adjustment in storm drifts radically influences farming. Indeed, even the expanding temperature is influencing Indian horticulture. In the Indo-Gangetic plain, these pre-monsoon changes will primarily affect the wheat crop (>0.50c increase in time slice 2010-2039; IPCC 2007). In the conditions of Jharkhand, Odisha and Chhattisgarh alone, rice generation misfortunes amid serious dry season's normal around 40% of aggregate creation, with an expected estimation of \$800 million. The increase in CO<sub>2</sub> to 550 ppm increases yields of rice, wheat, legumes and oilseeds by 10 to 20%. A one degree Celsius increase in temperature may reduce yields of wheat, soya beans, mustards, groundnuts and potatoes by 3 to 7 %. There would be higher losses at higher temperatures. Productivity of most crops decreases only marginally by 2020 but by 10 to 40% by 2100 due to increases in temperature, rainfall variability, and decrease in irrigation water. The major impacts of climate change will be on rain fed or UN –irrigated crops, which are cultivated on nearly 60% of cropland. Possibly there might be some improvement in yields of chickpeas, Rabi maize, sorghum and millets and coconut on the west coast and less loss in potatoes, mustard and vegetables in northwestern India due to reduced frost damage. Expanded dry spells and surges are probably going to build generation variability. Recent ponders done at the Indian Agrarian Exploration Organization show the likelihood of lost in the vicinity of 4 and 5 million tons in wheat creation later on with each ascent of one degree temperature all through the development time frame. In Rajasthan, a 2 degree ascent in temperature was evaluated to diminish the creation of pearl millet by 10 to 15 %. Farming will be influenced in the beach front locales of Gujarat and Maharashtra, as ripe regions are powerless against immersion and salinization.

### IX FOOD SECURITY:

Sustenance security is both straightforward and by implication connected with environmental change. Any modification in the climatic parameters, for example, temperature and dampness which oversee edit development will directly affect the amount of sustenance delivered. Aberrant linkage relates to cataclysmic occasions, for example, surges and the dry season, which are anticipated to duplicate as an outcome of

environmental change, prompting enormous yield misfortune and leaving huge patches of arable land unfit for development which henceforth debilitates nourishment security. The net impact of food security will depend on the exposure to global environmental changes. On a worldwide level, progressively unusual climate examples will prompt a fall in farming creation and higher nourishment costs, prompting sustenance instability. It could be an indicator for assessing vulnerability to extreme events and slow –onset changes. This effect of a dangerous atmospheric deviation has noteworthy results for agrarian generation and exchange of creating nations and in addition an expanded danger of craving. Preparatory appraisals for the period up to 2080 propose a decay of exactly 15 to 30 % of agrarian profitability in the most atmosphere – change - uncovered creating nation areas – Africa and South Asia. Rice and wheat have an imperative offer at all out nourishment grain creation in India. Any adjustment in rice and wheat yields may significantly affect sustenance, security of the nation. What’s more, this when Indian horticulture is now in emergency, and over the most recent twenty years 300,000 ranchers have executed themselves.

#### **X CONCLUSION:**

"An unnatural weather change" has now begun demonstrating its effects around the world. Atmosphere is the essential determinant of horticultural profitability which specifically impacts nourishment generation crosswise over the globe. The farming division is the most delicate segment to atmosphere changes in light of the fact that the atmosphere of a nation decides the nature and attributes of vegetation and products. The nourishment creation framework is amazingly delicate to atmosphere changes like changes in temperature and precipitation, which may prompt flare-ups of nuisances and infections subsequently lessening harvest eventually influencing the sustenance security of the nation. The net effect of nourishment, security will rely upon the presentation to worldwide ecological change and it require watchful administration of assets like soil, water and biodiversity. Thus the impact of climate change on agriculture and food production, India will need to act on the global, regional, national and local level.

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