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Study of the Impact of Climate Change on Indian Agriculture

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Abstract

Global climate change is a change in long-term weather patterns that characterizes regions of the world. The term weather refers to short-term (daily) changes in temperature, wind, and precipitation in a region. Climate change can affect agriculture in many ways, such as crop yield and quality in terms of production capacity growth rate, photosynthesis and evapotranspiration rates, etc. In areas where the temperature is already close to the physiological maximum for crops, the effect of rising temperatures immediately impacts yields. The negative impact of climate change on agriculture due to atmospheric changes is serious, and it is predicted to have a major impact on food production, thus threatening food security. Therefore, specific agricultural measures are needed to combat this. Climate change has emerged as one of the most critical challenges affecting agricultural sustainability and food security in India. Variations in temperature, rainfall patterns, and the increasing frequency of extreme weather events such as droughts, floods, heat waves, and cyclones have significantly influenced crop productivity, soil health, water availability, livestock, fisheries, and pest dynamics. This study examines the multifaceted impacts of climate change on Indian agriculture using secondary data sourced from published literature, research reports, and academic journals. The analysis highlights how rising temperatures reduce crop growth duration, alter photosynthesis and evapotranspiration rates, and increase vulnerability to pests and diseases.

Keywords*: Indian Agriculture, Indian Climate, Indian Crops, Food Security, Climate Adaptation*

Introduction

Currently, the problem of climate change is plaguing the entire world. Due to changing climate, agriculture is becoming increasingly difficult. In addition, catastrophic weather events such as... Unseasonal rains, strong winds, hailstorms, cloudy weather, cold and heat waves, floods, and droughts are occurring frequently. Because of this, agriculture is becoming increasingly unprofitable day by day. Due to such changing weather, crops are being affected by pests and diseases, resulting in immense damage. Besides crops, livestock and sericulture are also being adversely affected. It is extremely important to investigate the effects of climate change on agriculture and its adverse consequences on agricultural management.

Research Objectives

1. To study the agricultural impacts of climate change.
2. To study the impact of changing climate on Indian agriculture.

Research Methodology

The presented research paper is based on secondary sources. Reference books, quarterly journals have been used to collect information.

Topic Description

It is natural that climate change will affect agriculture. It has a direct effect on production, while it has an indirect effect on the farming community. Alternatively, it creates a food problem. Due to the increase in temperature, the snow melts and the agricultural area in the river area goes under water and the agricultural area decreases. Due to the increasing population, the land under agriculture is coming under settlement. Due to this, the agricultural area is decreasing. And the problem of food grains arises. Food grains and fruit crops are affected. If the temperature increases. Then it has an adverse effect on wheat, rice and fruit crops. The size of the fruits and fruit crops becomes small and the production decreases. Also, humid climate causes the emergence of pests and diseases. The intensity of light on the surface of the plant. Factors such as humidity, temperature do not show a uniform effect on the growth of plants. For example, in Kharif, the growth of tur and castor crops increased and the number of pulses and pods decreased. In some places, the chlorophyll in the leaves of Rabi and Jowar leaves turns red and yellow, due to which the yield of Jowar decreases. Due to the increase in the rate of flower drop and fruit drop due to fruit crops, fruits and flowers are not available for export.

Therefore, foreign exchange is not earned. Due to the humid weather, the reproductive capacity of insects increases. Therefore, more insecticides have to be used. Due to excessive use, crops do not respond to insecticides. As a result, costs increase. And crop yield decreases. Flood conditions arise due to climate change. Flood conditions cause great losses to Indian agriculture - fertile soil and crops are washed away. In Bihar, 73% of the area is prone to flooding, so it has to face continuous flood crises. Due to the flood of the Koshi river, Bihar faces flood every yearThe agricultural sector suffers damage, and the fertility of the soil is depleted. A similar situation has arisen in the state of Kerala. Climate change leads to the creation of drought-affected areas. This results in a decrease in agricultural production. The per capita availability of food grains decreases, and malnutrition increases.

Effects of Climate Change on Indian Agriculture:

1. **Crops**:

An increase in ambient carbon dioxide is beneficial because it increases photosynthesis in crops. Crops with a photosynthetic mechanism, especially wheat and rice, are likely to see increased yields despite reduced transpiration, particularly in major cereal crops like wheat. Reduced crop growth period, increased respiration, and reduced rainfall and irrigation water supply due to increased atmospheric temperature.

Increased frequency and duration of extreme weather events such as floods, droughts, cyclones, and heat waves, which adversely affect agricultural productivity. Increased water demand of crops during the rainy season and changes in rainfall patterns during the monsoon season lead to reduced yields in rain-fed areas. Agricultural biodiversity is threatened by rainfall uncertainty and increased temperatures, rising sea levels, and the increased frequency and intensity of droughts, cyclones, and floods.

2. **Water:**

Increased temperatures and higher evaporation rates increase the need for irrigation. This can lead to a decrease in groundwater levels in some areas. The melting of Himalayan glaciers may increase water availability in the Ganges, Brahmaputra, and their tributaries in the short term. However, in the long term, water availability will decrease significantly. A substantial increase in water flow is expected during the wet season.

3. **Soil:**

Under concentrated conditions, the ratio in crop residues is higher, which can reduce their decomposition and nutrient supply. Increased gaseous evaporation and denitrification. Changes in rainfall amount.

4. **Livestock:**

Climate change has had a significant impact on livestock feed production and nutrition. Increased temperatures lead to enhanced lignification of plant tissues and reduced digestibility. Increased water scarcity also reduces food and fodder production.

5. **Fisheries:**

Rising sea and river water temperatures are affecting fish breeding, migration, and marine fish. Higher sea surface temperatures are likely to increase coral bleaching.

6. **Pests and Diseases:**

The expansion of the geographical range of pests and pathogens, changes in the growth rate of disease-causing pests and insect populations, changes in the relative abundance and effectiveness of biocontrol agents, changes in the interactions between pathogenic pests/insects and their host environment, and reduced immunity in varieties with temperature-sensitive genes lead to the emergence of new disease and pest problems and an increased risk of invasion by migratory diseases and pests.

Challenges to agriculture from climate change:

1. Changing rainfall patterns, changes in streamflow, and increased water demand for crops.
2. Deterioration of water quality due to seawater intrusion, overexploitation of aquatic resources, and salinization of deep soil
3. Unpredictable changes in pests and diseases in India. Minor pests are likely to become major pests with changing climate.

Conclusion:

1. Hanging climate conditions are likely to jeopardize the country's food security.
2. Social life in extremely hot, extremely cold, and unpredictable regions is at different levels.
3. Climate change is impacting human health and leading

Solutions:

The livelihood of people in India is based on agricultural production. Especially in rural areas, people depend on agriculture for their sustenance. To protect this subsistence agriculture, climate literacy and other measures are important.

1. Reducing greenhouse gas emissions: The use of chemical fertilizers in agriculture increases greenhouse gas emissions. Agriculture is a major source of nitrous oxide. When chemical components like ammonia and urea are used in agriculture, they produce toxic gases in the atmosphere, resulting in a rise in temperature. As a solution, organic farming is appropriate. Organic farming helps maintain soil quality and balances organic compounds. Organic farming helps control methane emissions and diseases like cancer.
2. Coordination between agricultural research centers and meteorological observatories: In the future, farmers should receive forecasts from meteorological observatories about the expected conditions in agriculture and climate. It is also necessary to identify crops that can thrive with less rainfall. Therefore, farmers will be able to predict which crops to cultivate in which climate, and it is also necessary to find crops that thrive with less rainfall and to find solutions for

flood control. It is essential to increase the use of solar energy and other renewable energy sources. The use of materials like plastic is harmful.

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Conflicts of interest
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