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# Impact of Climate Change on Agriculture

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# Impact of Climate Change on Agriculture

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**Abstract:**

India, one of the largest and most populous countries now days are facing up to the increasing threat of climate change. Agriculture is the main occupation in the country employing over 65% of the people and impact of climate change is seen agri product. Further, climate change also affects human health. Climate change is an important factor of agricultural productivity. The fundamental of role of agricultural in human welfare, concern has been expressed by many organization and others regarding the potential effects of climate change and agricultural over the past decade.

**Keywords:** Climate change, Agriculture, Productivity, Occupation

**Review on Impacts of Climate change on Agriculture**

Climate change impacts on agriculture are being witnessed all over the world, but countries like India are more vulnerable in view of the high population depending on agriculture and excessive pressure on natural resources. The warming trend in Indi over the past 100 years was observed to be 0.51° C with accelerated warming of 0.21°C per every 10 years since 1970. The projected impacts are likely to further aggravate yield fluctuations of many of many crops with impact on food security and prices. Cereal productivity is projected to decrease by 10-40% by 2100 and greater loss is expected in rabi. There are already evidences of negative impacts on yield of wheat and paddy in parts of India due to increased temperature, increasing water stress and reduction in number of rainy days. Modeling studies project a significant decrease in cereal production by the end of this country. Climate change impacts are likely to vary in different parts of the country. Parts of western Rajasthan, southern Gujarat, Madhya Pradesh, Maharashtra, Northern Karnataka, Northern Andhra Pradesh, and Southern Bihar are likely to be more vulnerable in terms of extreme events. For ever one degree increase in temperature yields of wheat, soybean, mustard, groundnut and potato are expected to decline by 3-7%. Similarly, rice yields may decline by 6 % for every one degree increase in temperature. Water requirement of crops is also likely to go up with projected warming and extreme events are likely to increase. Hence, there is a need to address the whole issue of climate change and its impacts of India agriculture totality so as to cope with it trough adaption and mitigation.

The impact of climate change on agriculture may accentuate at regional level creating more vulnerability in food security rather than global as a whole. The potential impact will be shifts time and length of growing seasons, which may necessitates adjustment of cropping system itself. Warmer environment coupled with erratic rainfall distribution, results in higher rate of evaporation and depletion of soil moisture. Hence for sustaining the crop productivity efforts should be made to enhance the water and nutrient efficiencies intense extreme events like heat and cold waves, droughts and floods may become norm of the day for farming community. Such phenomena will impact agriculture considerably through their direct and indirect efforts on crops, livestock, and incidences of pest disease-weeds, increasing deterioration of soil health and thereby threatening the food security like never before.

The output of the studies so far carried out by Agarwal (2009) have indicated that a marginal 1°C increase in atmospheric temperature along with increase in $CO_2$ concentration would cause very minimal reduction in wheat production of India if simple adaptation strategies like adjustment of

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panting date and varieties are adopted uniformly. But in absence of an adaptive mechanism, the yield loss in wheat can loss of wheat can go up to 6 million tones. A further rise by 5°C may cause loss of wheat production up to 27.5 million tones. Similarly, rice yields may decline by 6 % for every one degree increase in temperature.

In addition too direct effects on crops, climate change is likely to impact natural resources like soil and water. Increased rainfall intensity in some regions would cause more sill erosion leading to land degradation. Water requirement of crops is also likely to go up with projected warming. Extreme events like floods, cyclones, heat wave and cold wave are likely to increase.

The availability of viable pollen, sufficient numbers of germinating pollen grains and successful growth of pollen tube to the ovule are of fundamental importance in grain formation. The Network study on wheat and rice suggested that high temperature around flowering reduced fertility f pollen germination on stigma. These effects are more pronounced in Basmati rice as well as Durum wheat cultivars A positive finding of the study was that the Aestivum wheat cultivars are more or less tolerant to such adverse effects. But differential impact of increasing temperature is observed with respect to grain quality of wheat where it is found that Aestivum wheat cultivars are more prone to reduced grain quality due to increasing temperature during the fruit setting stage than Durum cultivars. Field experiments using advanced ' Temperature gradient tunnels ' with different dates of sowing too study impact of rising temperature on growth and development of different crops revealed that an increase of temperature from 1 to 4°C reduced the grain yield of rice (0-49%), potato (5-40%), green gram (13-30%), and soybean (13-36%), yield by an increase in temperature up to 3°C, but was reduced by 13% with further 1°C rise in temperature.

The impact of rising temperature and $CO_2$ are also likely to change insect-pest dynamics. Dilution of critical nutrients in crop foliage may result in increased herbivory of insects. For example, Tobacco caterpillar consumed 39% more castor foliage under elevated $CO_2$ conditions than ambient environment. The advancement of reading season of major Indian carps as early as March has been reported from West Bengal which is extended from 110 to 120 days due to increase in environmental temperature, which stimulates the endocrine glands of fish and helps in the maturation of the gonads. This brings about a possibility breed these fishes twice a year at an interval of 30 to 60 dyes. Besides, the nutrient loss from soil through high rate of mineralization and $CO_2$ emissions from soil could be accelerated as a result of increase in temperature. Low carbon soils of mainly dry land areas of India are likely to emit more $CO_2$ compared to high or medium carbon temperate region soil. Simulation of water balance using Global and Regional Climate Models revealed likely increase in annual as well as seasonal stream-flows of many Indian river basins pointing to the need for adoption of more effective runoff and soil loss control measure to sustain crop production across the country.

**Conclusion:**

Even though climate change in India is now a reality, a more certain assessment of the impacts and vulnerabilities of rainfed agriculture sector and a comprehensive understanding of adaptation options across the full range of warming scenarios and regions would go a long way in preparing the nation for climate change. According to the latest scientific assessment, the earth's climate system has demonstrably changed on both global and regional scales since the preindustrial era.

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