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Effect of Climate Change on Agriculture

*Charchit Bansal**Punjab Agricultural University, Ludhiana**bansalcharhit@gmail.com*

Introduction:

The climate being the primary and foremost factor determining agricultural production, has potential effects on crop production due to global climate change. In regard to long-term climatic changes, scientific studies are concerned and focused on both the physical and economic effects of climate change on overall crop production. Physical factors concentrate on the changes in crop and livestock yields whereas, on the other hand, economic factors implies to the impacts of climate change on the potential change in the yields and prices. The studies are being conducted to assess the role of humans in adapting and responding to climate change and the possible impacts on agricultural systems and the changes in crop production and its prices.

Cause of Climate Change:

Climate change is due to the release of Greenhouse gases in the atmosphere which gets accumulated in it and gets trapped into the outer atmosphere of the Earth. It results in the ultimate increase in the temperature of Earth due to the Greenhouse effect as it blocks the escaping Infrared rays trying to pass through the sheet of atmosphere after striking back from the Earth's surface. This is known as Global Warming. This process leads to plausible changes in the parameters related to the global climate, viz. Temperature, sea level, precipitation, etc. The results of this affect almost each and every part and cycle on Earth. Agriculture is one sector among them, which is important because it not only gets affected by global climate change but also contributes well to it by releasing Greenhouse gases.

Effect on Agriculture:

Agricultural practices release increasing concentrations of Greenhouse Gases viz, Carbon dioxide (CO₂), Methane (CH₄), and Nitrous oxide (N₂O) which are important gases that are causing global warming. The main sources of gas release are nitrogenous fertilizers, stubble burning, soil management, etc. CO₂ is released when natural vegetation is cleared and land is put under agriculture, a large number of plants and soil organic matter is lost. Moreover, it is also released by the burning of crop residues practiced in many countries. CH₄ is released into the atmosphere on a large scale from the paddy fields. The main reason behind the release is the anaerobic decomposition of the organic matter in submerged or flooded paddy fields. The release of NO₂ is due to the application of nitrogenous fertilizers in the fields which in turn leaches down or gets mixed with the flowing water. The action of denitrifying bacteria on the flux of Nitrogen is responsible for the release of nitrous oxide from the fields.

The credible effects of climate change on agriculture vary differently around the globe from crop to crop, which include increases in temperatures, reducing the availability of water for irrigation, and changes in rainfall patterns. Moreover, an increase in CO₂ levels alters the climate having important effects on agriculture worldwide, more specifically in the tropic regions. These changes in the climate impact agriculture adversely due to the changes in climate and weather events which also changes the behavioral and developmental patterns of some pests and diseases. To cope with this change in the climate, crops undergo certain changes and shifts in the response to climate change. The crops of higher altitudes suffer less as compared to the crops of lower altitudes due to the prevailing differences in the temperatures. The crops act differently to these changes, rice crop for instance, is affected less than wheat and maize crops which show a decline in yields even with an increase of 2-4°C. Livestock also shows a negative effect of increasing global climates. Weight gain is much less in warmer climates and it leads to yield losses and reduced dairy operations. It adversely affects milk production because of the reduced forage production and increased temperatures.

The adaptations and adjustments to climate change do not occur without an increase in costs. Farm-level adoptions, changes in technology, and new researches imply an increase in costs.

There may be certain barriers also that can limit the adoption of new technologies. Moreover, not all financial and technical assistance is available everywhere which also limits the adaptations to the circumstances. Genetics can play a major role in tackling the problem as plant breeding programs can lead to high-yielding varieties, varieties resistant to various abiotic and biotic stresses, etc. This can improve the condition of the world food supply even in the scenario of climate change. These improved crop varieties are the result of intensive crop breeding programs which require immense research and development, driven by increased investments.

Conclusion:

Ultimately, there will be both categories, one which will be getting benefitted and the other suffering from climate change. Although these changes would not impact large changes suddenly in the coming years, the impacts on the low-altitude crops could amount to high percentage changes in their production. There can be significant losses in these areas. Most studies suggest that the temperature increase beyond the levels which doubles the amounts of CO₂. This highlights the need to estimate the extent of warming that could result from atmospheric CO₂ accumulation.

References

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