

Chapter 2

Impact of Climate Change on Agriculture and Food Security

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ABSTRACT

Many studies have demonstrated the sensitivities of crop yield to a changing climate, a major challenge for the agricultural research community is to relate these findings to the wider societal concern with food security. Apart from few exceptions, the likely impacts of climate change on agricultural sector in the future are not understood in any great depth. There are many concerns as to how changes in temperature, rainfall and atmospheric Carbon Dioxide concentrations will interact in relation to agricultural productivity. The present article is an attempt to distil about the likely effects of climate change on food security and nutrition in coming decades. The consequences of climate change on various important aspects of agriculture are discussed and summarized. The article also discusses the analysis on the possible mitigation measures and adaptations for agriculture production in the future climate change scenarios.

INTRODUCTION

Climate is the status of the climate system, comprises the atmosphere, the hydrosphere, the cryosphere, the surface lithosphere and the biosphere. These elements all determine the state and dynamics of the Earth's climate. It is a measure of the average pattern of variation in climatic parameters like precipitation, temperature, humidity, wind, atmospheric pressure, atmospheric particle count, and other meteorological variables in a given region over long periods of time. These climatic parameters are changing due to global warming. According to UNEP (2015) the climate change has long-since ceased to be a scientific curiosity and is no longer just one of many environmental and regulatory concerns. In addition, the CO₂ concentrations and other greenhouse gases such as Methane, Nitrous Oxides, Chlorofluorocarbons and chlorofluorocarbon substitutes will continue to rise (Hartwell et al. 1996). The American Meteorological Society (AMS, 2015) explained climate change may be due to natural external forcing, such as changes in solar emission or slow changes in the earth's orbital elements; natural internal processes of the climate system; or anthropogenic forcing.

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Many evidences are showing the world's climate is changing, and the changes will have an enormous impact on people, ecosystems, and energy use. According to the latest report of the Intergovernmental Panel on Climate Change (IPCC), average global temperature is likely to rise by another 2 to 8.6 degrees F by 2100. Further, Grif (2013) reported, climate change may have some serious impacts for farmers. It turns out that as the climate shifts, more and more crop pests are spreading and study has shown that these pests are moving at a rate of nearly two miles per year toward the North and South Poles. The findings could have major implications for food security in the future. The shifting weather pattern has threatened food production and food security on the globe. At the end of this century, different locations will experience different levels of increases in temperature, with the greatest impact toward the North Pole and the least increase toward the South Pole and in the tropics.

It is well known fact that agriculture production is dependent on set of climatic conditions. Each crop requires a particular climate for its growth, development and completion of its life cycle. This is one of the reason that farmers can cultivate a specific crop in a particular region which is having suitable climatic condition to that crop. The climatic resources which cannot be manipulated by the human beings are the deciding factor for successful cultivation of any crop. The one of these resources includes availability of the water for the crop. The availability of water for irrigation and the source of the water both are climate dependent factors. Both shortage and excess of water will interfere the agriculture production. The latest reports (FAO, 2013) of statistics of utilization of world land says that thirty percent of the earth's land is used for crops and pastures and seventy percent of all abstracted freshwater is directed towards irrigation to produce the food that people and livestock need for a stable food supply. This large-scale utilization of land and water resources is increasingly threatening environments. Furthermore, farming is important because it provides the livelihood of hundreds of millions of people.

Agriculture system in many countries are particularly vulnerable for several reasons such as climate already too hot and often too dry; water supply is limited and variable; low and degraded soil quality and lack of adaptive capacity because of relatively poor regions and low levels of technology and research and development.

Keeping in the view the challenges for agriculture and global food security due to changing climate, the article focuses on the impact of climate change on agriculture, knowledge on the relationship between climate change and food security and how agriculture is able to adapt to such climate change. The paper also explores about the important issues like what will be the impending impact of such change and what mechanisms can be implemented to mitigate the resulting impact? Climate change is expected to affect human livelihood, up to different extents, at different regions on the globe. Each part of agriculture production system may react differently in different climatic situations. The paper also focuses on the consequences of climate change on different aspects of agriculture such as crop production, livestock, fishery production, biodiversity, pests and diseases, Carbon fertilization, irrigation, food accessibility and utilization. Furthermore, it discusses the mitigation measures for the climatic change situations. Each aspect of agriculture has to adopt to climate change situations for sustained agricultural production has also been discussed. In order to meet the elevated flow of agricultural production further research and extension activity need to be focused keeping in mind the changing climatic situations. Hence, towards end discuss about the latest trends in the agriculture research for changing climatic situations. However, the impact on agriculture and its ability for adaption may vary with different parts of world.

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