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Climate Change Impact on Soil Fertility

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Introduction

The dependency of agriculture on climate is indicated by the fact that cultivation is mostly rainfed area of the total cropped area is dependent on uncertainties of monsoon. Climate change can impact directly food security through food system stability. Agriculture is considered both a contributor to climate change and a victim as well. Agriculture is a contributor because it emits a significant amount of greenhouse gases, and a victim because climate change has considerable impacts on agricultural production. The fourth assessment report of the Intergovernmental Panel on Climate Change (IPCC) made it clear that the global average temperature has increased by 0.74 °C over the last 100 years and the projected increase is about 1.8 to 4.0 °C by 2100. Climate change and agriculture are interrelated processes and global warming is projected to have significant impacts on agriculture by influencing through direct and indirect effects on crops, soils, livestock, and pests. Apart from the probable decline in food production, the nutritional quality of food may also be reduced raising concern for nutritional security. Alarmed by the possible impact of the global climate change on the quality of life of human being efforts are being made to develop strategies to mitigate its negative impacts.

Climate Change Impacts on Soils

Climate change is a global phenomenon and occurring continuously since the earth came into existence. Climate change has become a major scientific and political issue during the last decade. There are well-marked cold and hot cycles in the history of the earth's climate, however, these changes have been observed relatively rapid in the last 150-200 years around the world.

Soil seems to be more important for modern human societies than ever before to meet the global demands for food and fiber for the increasing population from limited soil resources. Climate change is threatening food security globally. Countries like India are more vulnerable in view of the tropical

climate and poor coping capacity of the small and marginal farmers. Climate change is projected to have significant impacts on agriculture through direct and indirect effects on crops, soils, livestock, and pests. Though climate change is a slow process involving relatively small changes in temperature and precipitation over a long period of time, nevertheless these slow changes in climate influence the various soil processes, particularly those related to soil fertility. The effects of climate change on soils are expected mainly through alteration in soil moisture conditions and an increase in soil temperature and CO2 levels as a result of climate change. Global climate change is projected to have variable effects on soil processes and properties important for restoring soil fertility and productivity. The major effect of climate change is expected through elevation in CO2 and an increase in temperature.

Soil Fertility and Productivity

The drivers of climate change such as moisture, temperature, and CO_2 are expected to have variable effects on various soil processes and properties having relevance to soil fertility and productivity. However, these effects of the climate change factors cannot be viewed separately, being one factor influencing the other and the resultant effect would be complex. Further, all these effects will be highly region-specific, depending on the magnitude of the climate change, soil properties, and climatic conditions. India is bestowed with 9 of the 12 soil orders that exist in the world and 15 agro-climatic zones, with diverse seasons, crops, and farming systems. Since climate change is a reality, it will have direct and indirect impacts on soil development processes and properties related to crop production influencing the livelihoods of millions of people in the country. The impact of climate change factors, specifically temperature, CO_2, and rainfall on various soil properties is being discussed below to understand the relationship between climate change variables and various soil properties in order to evolve appropriate mitigation strategies.