



Depletion of natural resources, ill effects of global climate change and sustainable management by new techniques

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India accounts for only about 2.4 % of the world's geographical area and 4 % of its water resources, but has to support about 17 % of the world's human population and 15 % of the livestock. Agriculture is an important sector of the Indian economy, accounting for 14% of the nation's GDP, about 11% of its exports, about half of the population still relies on agriculture as its principal source of income and it is a source of raw material for a large number of industries. Recent IPCC report and a few other global studies indicate a probability of 10-40% loss in crop production in India with increases in temperature by 2080-2100.

Climate Change refers to statistical variations in properties of the climate system such as changes in global temperatures, precipitation, etc., due to natural or human drivers over a long period of time. Climate change could drastically alter the distribution and quality of natural resources thereby adversely affecting livelihood security of people. Observations of Intergovernmental Panel on Climate Change (IPCC) indicate that adverse impact of climate change due to rising temperatures and extreme weather events on food production system could impact agricultural growth. Several areas have been identified as risk prone due to impact of climate change like coastal areas, Indo-Gangetic plains and the drought and flood prone regions of the country.

The global atmospheric concentration of carbon dioxide, a greenhouse gas (GHG) largely responsible for global warming, has increased from a pre-industrial value of about 280 ppm to 387 ppm. Nitrous oxide (N₂O) is the largest source of GHG emissions from agriculture, accounting for 38 percent of the global total. N₂O is produced naturally in soils through the processes of nitrification and denitrification. Under a "business as usual" scenario, these emissions are expected to increase by 47 percent from 1990 to 2020. In 1990, the OECD and China accounted for approximately 50 percent of all N₂O emissions from agricultural soils. The ozone level reduced from 300 Dobson units to 90 Dobson units by 2010.

The mean earth temperature has changed by 0.82°C during 1880–2013. For the Indian region, the IPCC projected 0.5 to 1.2°C rise in temperature by 2020, 0.88 to 3.16°C by 2050 and 1.56 to 5.44°C by 2080, depending on the future development scenario. It is projected that by the end of the 21st century, rainfall over India will increase by 10-12% and the mean annual temperature by 3-5°C. Temperature drives crop growth, duration; influences milk production in animals and spawning in fish; also radiation influences the photosynthetic productivity. Increased risk of spread and proliferation of soil borne diseases as a result of more intense rainfall events (coupled with warmer temperatures). These environmental changes are likely to increase the pressure on Indian agriculture, in addition to the ongoing stresses of yield stagnation, land-use, competition for land, water and other resources and globalization. It is estimated that by 2020, food grain requirement would be almost 30-50% more than the current demand.

Wet & dry spells causes significant impact on standing crops, suitability and adaptability of current cultivars would change. The 6.59 million tonnes (about 5.02 per cent) decline in *kharif* production has been on account of late onset of monsoon. Irrigation requirements in arid and semiarid regions are estimated to increase by 10% for every 10°C rise in temperature.

For proper management of natural resources and to ensure sustainable agriculture growth in the country, there is need for a land use policy which should be integrated with all developmental programmes for the holistic development of rural areas, natural resource management and eco-restoration. Considering the need to respond to the challenges arising out of possible global, regional and local impacts of climate change, the Government of India has launched a National Action Plan on Climate Change (NAPCC) along with 8 National Missions addressing climate change science, adaptation and mitigation aspects. The proposed national mission will focus on four areas for adapting to climate change dryland agriculture, risk management, access to information and use of biotechnology.

The Mission would devise strategies to make Indian agriculture more resilient to climate change. It would identify and develop new varieties of crops and especially thermal resistant crops capable of withstanding extremes of weather long dry spells, flooding, and variable moisture availability. Development of suitable agronomic adaptation measures for reducing the adverse-climate related production losses. Development of crop simulation models for horticultural crops for enabling regional impact, adaptation and vulnerability analysis. Identification and refinement of indigenous technological knowledge to meet the challenges of weather related aberrations. Development of eco-friendly and efficient water and fertilizer use systems. Weather based pest management strategies. Development of pre and post harvest produce storage systems which can meet the challenges of climate related risks. Recycling/usage of Agri./Horticultural biomass should be emphasized.

"In the backdrop of dwindling natural biodiversity with changing global climatic scenario, it is assumed that all genetic resources are potentially valuable and to be conserved for posterity. Present value of the existing resources cannot be assessed because of future developing technologies."

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