

IMPACT OF CLIMATE CHANGE IN AGRICULTURE SECTOR IN INDIA AND ACTION PLANS

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Abstract Climate change is now a reality. Agriculture in India is likely to suffer losses due to heat, erratic weather and decreased availability of irrigation. Adaptation strategies can help minimize the impact. But that will come at a cost although not still accurately measurable and is likely to be high. This also requires new policy support, research and investment. However, cost of inaction will be still higher. Carbon dioxide level is now about 400 ppm which is likely to increase to about 450 to 600 ppm during 2050 and by 2100 it is likely to go up anything above 500 ppm to 1000 ppm if current situation is allowed to continue. This paper attempts to analyse the impact of climate change on Indian agriculture in terms of decreased productivity to be seen in relation to increase in population. And to counter that impact what are the measures being initiated.

Keywords:
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Introduction

India is an agrarian country. 50% of the population still depends on agriculture and average farm holding is 1 to 2.5 acres with very low farm yield and over 50% of the country's workforce still engaged in agriculture. About 17% of the country's GDP is contributed by Agriculture. India is also a vast country with 1.3 billion population and have different agro climatic regions. If in some part it is drought, in some other part it could be flood. The weather is thus unpredictable and it has significant effect on agriculture productivity and farm output. Climate Change is a natural phenomenon. Climatic conditions, however, worsening due to human activities. Rapid urbanisation, industrialisation, pollution, and over exploitation of natural resources etc. resulting into drastic changes in climatic conditions and with the change in climatic conditions and increase in global warming, the frequency and quantity of rainfall has become erratic. And as a result agricultural produce has also become variable.

Increase in temperature would also increase requirement of fertilizers for same production target and the result will be higher emissions. Besides, increase in sea and river water temperatures are likely to affect fish breeding, migration and harvests of fish. Coral reefs start declining from 2030. With increase in temperature there will be increase in water, shelter and energy requirement for livestock which will also have implications on milk production. India currently is the world' largest producer of milk and also largest in terms of cattle population. Various sectors contributing to climate change in India are energy use 61 %, Agriculture 28%, industrial processes 8%, wastes 2% and change in land use to the extent of 1%. Climate change is posing a great threat to agriculture and food security. Water is the most critical agricultural input in India, as 55% of the total cultivated areas do not have irrigation facilities. And in India we experience drought almost every year which further aggravates the problem. Currently we are able to secure food supplies under these varying conditions and we have comfortable buffer stock of food grains. However, all climate models predict that extreme conditions like drought, heavy rainfall and storms in agricultural production areas can be expected due to climate change resulting into potential crop failure. In India, this would pose a new problem as our ecological and socio-economic system already under pressure due to rising population. In India, average food consumption at present is 550 g per capita per day, whereas in China and USA are 980 and 2850 g, respectively (IPCC 2001). Wheat

yields are predicted to fall by 5-10% with every increase of 1°C and overall crop yields could decrease up to 30% in South Asia by the mid-21st century (IPCC 2007). India could experience a 40% decline in agricultural productivity by the 2080s (Goyal, R.K, 2004). Rise in temperatures will affect wheat growing regions, placing hundreds of millions of people at the brink of chronic hunger (Hummington TG, 2003). In India, the growing population is a major concern, and there is a need to understand the availability of water in terms of increase in population growth. A decline has been projected in mean per capita annual freshwater availability and growth of population from 1951 to 2050 (Eckhardt K and Ulbrich U, 2003). The rising population will increase the demand for water leading to faster withdrawal of water and this in turn would reduce the recharging time of the water tables.

Impact of Climate Change on Crop Productivity in India

Rainfall in India has a direct relationship with the monsoons which originate from the Indian Ocean and Arabian Sea. Climate change has a direct impact on crop evapotranspiration (ET). In arid regions of north India like Rajasthan and Madhya Pradesh an increase of 15% in total ET demand has been projected. A marginal increase in ET demand due to global warming and climate change will have much larger impact on India's fragile water resources (Allen D.M. et al, 2004) this will result into change in soil moisture, ground water recharge In arid regions of northern states the impact of climate change will result into an increase of and frequency of flood and drought and finally ground water level as well as water cycle (Xu J. et al 2007). In addition, rise in sea level will increase the risk of permanent or seasonal saline intrusion into ground water and rivers which will have an impact on quality of water and its potential use of domestic, agricultural and industrial uses as well as threatening the aquatic life. Climate change will thus have number of effects on agriculture (Gautam H.R and Sharma H.L 2012).

Higher temperatures and changing precipitation patterns will also severely affect the production patterns of different crops. Increased carbon dioxide content will also impact agricultural productivity and all these changes will increase the vulnerability of the landless farm workers and the poor. There were several studies conducted in recent times show that coming years will disproportionately affect agriculture in the planets lower latitudes where most of the world's poor live and in that context

agriculture needs to be better managed for the natural resources like land, water and other resources to be more resilient.

Countermeasure by Government

India has a National Action Plan on Climate Change which was unveiled in 2008. There are eight national missions that would form the core of the national plan. These include national missions for solar energy, enhanced energy efficiency, sustainable habitat, conserving water, sustaining the Himalayan ecosystem, a “Green India”, sustainable agriculture and strategic knowledge platform for climate change. In addition there are some innovative responses by water utilities to address these risks arising out of climate change resulted in pushing the frontiers in a number of areas. This includes desalination, re-use and storm water harvesting and aquifer recharge. It would be worthwhile to give high priority to "more crops per drop" approach, rainwater harvesting, aquifer recharge, revival of water bodies and conservation technologies. In the last decade, the Central Government has tried to address the issue through several initiatives such as subsidies for micro-irrigation (which optimizes water usage for agriculture), drip irrigation, national watershed development project for rain fed areas and artificial recharge to ground water through dug wells in hard rock areas and rural water supply enhancement programmed through the catchment area approach.

In 2007, Union Ministry of Water Resources of the country initiated a Farmer Participatory Action Research Programmed in over 2000 villages all over the country to assess the impact of water saving technologies on agriculture production. It has been found that yield and income can be increased by 50 to 100 per cent in most of the crops by using water saving technologies. Additional yield of 1 ton per hectare can be realized through supplemental irrigation. Our agriculture is more prone to monsoon rains as we are growing high water requiring crops like rice and sugarcane. We should increase area under low water requiring but high value crops like pulses and oilseeds to counter the erratic monsoons.

Conclusion

Global climate change is not a new phenomenon. Several studies have predicted the disastrous consequences that mankind will face in varied degrees by world population. While developed countries have the record of over exploiting the natural resources but the impact on developing and under-developed as well as poor countries will be significant in spite of the fact that they are less polluters. A collective action plan to neutralise the impact of the climate change needs to be undertaken. India is self-sufficient in terms food production and supply. With successful Green revolution India has very comfortable position in terms of food stock. Even during pandemic, India had over 80 million MT of buffer stock of grains to be distributed free to poor section of the society and agricultural logistics service and supply chain functions were kept in operation to avoid any crisis situation. However, India is not insulated from the impact of climate change. The effect of climate change poses many threats; one of the important consequences is bringing about changes in the quality and quantity water resources and crop productivity. It can be concluded that the Indian region is highly sensitive to climate change. Agriculture sector is the most prone sector as it will have a direct bearing on the lives of 1.3 billion people. India has set a target of halving greenhouse gas emissions by 2050. There is an urgent need for coordinated efforts to strengthen the research to assess the impact of climate change on agriculture, forests, animal husbandry, aquatic life and other living beings.

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