

Impact of climate change on Agriculture in India

Arvind Kumar*

Abstract-Climate change is the biggest challenges facing the world today. Climate change is the change that can be attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. However, scientists often use the term for any change in the climate, whether arising naturally or from human causes. In particular, the Intergovernmental Panel on Climate Change (IPCC) defines climate change as a change in the state of the climate that can be identified by changes in the mean and or the variability of its properties, and that persists for an extended period, typically decades or longer.

Climate change is likely to lead to sum irreversible impact on biodiversity. By contrast, the term climate describes the overall long-term characteristics of the weather experienced at a place. The ecosystems, agriculture, livelihoods and settlements of a region are very dependent on its climate. The climate, therefore, can be thought of as a long-term summary of weather conditions, taking account of the average conditions as well as the variability of these conditions. The fluctuations that occur from year to year and the statistics of extreme conditions such as severe storms or unusually hot seasons are part of the climatic variability.

Agriculture is highly sensitive to Climate variability and weather extreme. The Earth's climate has varied considerably in the past, as shown by the geological evidence of ice ages and sea level changes, and by the records of human history over many hundreds of years. The causes of past changes are not always clear but are generally known to be related to changes in ocean currents, solar activity, volcanic eruptions and other natural factors. The difference now is that global temperatures have risen unusually rapidly over the last few decades.

*Research Scholar, P.G. Dept. of Economics, L.N.M.U., Darbhanga (Bihar)

Keywords: - Climate Change, Agriculture, Ecosystem, Livelihoods.

Introduction-Climate change and agriculture are interrelated process, both of which take place on a global scale. Global warming is projected to have significant impact on condition affecting agriculture, including temperature; carbon dioxide, glaciari runoff and the interaction of these elements. Climate change and variability are concerns of human being. The recurrent droughts and floods threaten seriously the livelihood of billions of people who depend on land for most of their needs. The global economy is adversely being influenced very frequently due to extreme events such as droughts and floods, cold and heat waves, forest fires, landslips etc. The natural calamities like earthquakes, tsunamis and volcanic eruptions, though not related to weather disasters, may change chemical composition of the atmosphere. It will, in turn, lead to weather related disasters. Increase in aerosols due to emission of greenhouse gases such as Carbon Dioxide due to burning of fossil fuels, chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) etc., Ozone depletion and UV-B filtered radiation, eruption of volcanoes, the "human hand" in deforestation in the form of forest fires and loss of wet lands are causal factors for weather extremes. Climate change have destructive effect on Indian agriculture. The loss of forest cover, which normally intercepts rainfall and allows it to be absorbed by the soil, causes precipitation to reach across the land eroding top soil and causes floods and droughts. Paradoxically, lack of trees also exacerbates drought in dry years by making the soil dry more quickly. Among the greenhouse gases, CO₂ is the predominant gas leading to global warming as it traps long wave radiation and emits it back to the earth surface. The global warming is nothing but heating of surface atmosphere due to emission of greenhouse gases, thereby increasing global atmospheric temperature over a long period of time. Such changes in surface air temperature and consequent adverse impact on rainfall over a long period of time are known as climate change. If these parameters show year-to-year variations or cyclic trends, it is known as climate variability.¹

Climate change is the biggest challenges facing the world today. Climate change is the change that can be attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. However, scientists often use the term for any change in the

climate, whether arising naturally or from human causes. In particular, the Intergovernmental Panel on Climate Change (IPCC) defines climate change as a change in the state of the climate that can be identified by changes in the mean and or the variability of its properties and that persists for an extended period, typically decades or longer.²

Climate change is likely to lead to sum irreversible impact on biodiversity. By contrast, the term climate describes the overall long-term characteristics of the weather experienced at a place. The ecosystems, agriculture, livelihoods and settlements of a region are very dependent on its climate. The climate, therefore, can be thought of as a long-term summary of weather conditions, taking account of the average conditions as well as the variability of these conditions. The fluctuations that occur from year to year, and the statistics of extreme conditions such as severe storms or unusually hot seasons are part of the climatic variability.

Agriculture is highly sensitive to Climate variability and weather extreme. The Earth's climate has varied considerably in the past, as shown by the geological evidence of ice ages and sea level changes, and by the records of human history over many hundreds of years. The causes of past changes are not always clear but are generally known to be related to changes in ocean currents, solar activity, volcanic eruptions and other natural factors. The difference now is that global temperatures have risen unusually rapidly over the last few decades.

There is strong evidence of increase in average global air and ocean temperatures, widespread melting of snow and ice, and rising of average global sea levels. The IPCC Fourth Assessment Report concludes that the global warming is unequivocal. Atmosphere and ocean temperatures are higher than they have been at any other time during at least the past five centuries, and probably for more than a millennium. Scientists have long known that the atmosphere's greenhouse gases act as a blanket, which traps incoming solar energy and keeps the Earth's surface warmer than it otherwise would be, and that an increase in atmospheric greenhouse gases would lead to additional warming.³

Climate change will have an impact on the predictability and variability in the availability of water. The year 1998 was the warmest and declared as the weather-related disaster year. It caused hurricane havoc in Central America and floods in China, India and Bangladesh. Canada and New England suffered heavily due to ice storm in January while Turkey, Argentina and Paraguay suffered with floods in June 1998.

In contrast, huge crop losses were noticed in Maharashtra (India) due to un-seasonal and poor distribution of rainfall during 1997-98.

Climate change will affect the health, Growth and productivity of crops. The year 2003 was the year of heat and cold waves across the world. The European Union (EU) suffered to a large extent due to heat wave that occurred in summer 2003. In India Uttar Pradesh, Bihar, West Bengal, Orissa and Andhra Pradesh are the States that experienced summer heat waves. When the EU suffered heat wave during the summer in 2003, India experienced severe cold wave from December 2002 to January 2003. Some parts of Jammu, Punjab, Haryana, Himachal Pradesh, Bihar, Uttar Pradesh and the North Eastern States experienced unprecedented cold wave. The crop yield loss varied between 10 and 100% in the case of horticultural crops and seasonal crops. The fruit size and quality were also adversely affected in horticultural crops. However, temperate fruits like apple, perch, plum and cherry gave higher yield due to extreme chilling. The damage was more in low-lying areas where cold air settled and remained for a longer time on the ground.⁴

Climate change has been a cause of serious concern if the agricultural sector has to grow in the context of overall economy. High temperature in March 2014 adversely affected crops like wheat, apple, mustard, rapeseed, linseed, potato, vegetables, pea and tea across the State of Himachal Pradesh in India. The yield loss was estimated between 20% and 60% depending upon the crop. Wheat and potato harvest was advanced by 15-20 days and the flowering of apple was early by 15 days. The optimum temperature for fruit blossom and fruit set is 24°C in the case of apple while it experienced above 26°C for 17 days. The entire region recorded between 2.1 and 7.9°C higher maximum temperature against the normal across the State of Himachal Pradesh in March 2014. A decline of 39% in annual cocoa yield was noticed in 2004 when compared to that of 2013 due to rise in maximum temperature of the order of 1 to 3°C from 14th January to 16th March in Central part of Kerala, India. Such trend was noticed whenever summer temperature shot up by 2 to 3°C when compared to that of normal maximum temperature of 33 to 36.5°C.

Climate changes have also affect the mean sea level significantly. The Mean Sea Level (MSL) rise is likely to be slightly less than one mm/year along the Indian coast. Sea level rise may lead to disappearance of low-lying areas of coastal belt in addition to changes in ocean

biodiversity. It threatens health of corals and polar bear population. Greater number of high surges and increased occurrences of cyclones in post-monsoon period, along with increased maximum wind speed, are also expected. This phenomenon of sea level rise threatens the area of land available for farming.

Climate change is easily the biggest challenges before policy planners today. As per the United Nations Report of FAO, India stands to lose 125 million tonnes equivalent to 18% of its rainfed cereal production from climate change by 2015. China's rainfed cereal production potential of 360 million tonnes is expected to increase by 15% during the same period. It would also cause a worldwide drop in cereal crops, leaving 400 million more people at risk of hunger, and leaving three billion people at risk of flooding and without access to fresh water supplies. The crop production losses due to climate change may also drastically increase the number of undernourished people, severely hindering progress in combating poverty and food security. The severest impact is likely to be in sub-Saharan African countries, which are least able to adapt to climate change or to compensate for it through increase in food imports. In 2004 and 2005, twenty four (24) sub-Saharan African countries faced food emergencies, caused by a lethal combination of locusts and drought. In addition, adverse hot and dry weather in United States and drought conditions in parts of the EU lowered cereal output during 2005 when compared to that of 2004. The simulation models indicate that the global warming leads to reduction in rice and wheat production in northern India.⁵

Conclusion-From the present article it has been found that the occurrence of floods and droughts, heat and cold waves are common across the world due to climate change. Their adverse impact on livelihood of farmers is tremendous. It is more so in India as our economy is more dependent on Agriculture. Interestingly, weather extremes of opposite in nature like cold, heat waves, floods and droughts are noticed within the same year over the same region or in different regions and likely to increase in ensuing decades. The human and crop losses are likely to be heavy. The whole climate change is associated with increasing greenhouse gases and human induced aerosols and the imbalance between them may lead to uncertainty even in year-to-year monsoon behaviour over India. Therefore, there should be a determined effort from developed and developing countries to make industrialization

environment friendly by reducing greenhouse gases pumping into the atmosphere. Overall performance of the Indian agriculture growth and production has shown the significant change in the last three decades.

References:-

1. Asis Kumar (2008), "Climate Change and its effects on Human Health", ICFAI Books, Tripura.pp.50-65.
2. K.R. Gupta and J.R. Gupta (2008). "Indian Economy", Atlantic Publishers, New Delhi.pp.33-48.
3. S.P. Gupta, (2002). "Statistical Methods", Sultan Chand & Sons, New Delhi.pp.60-68.
4. Dipak Sarkar (2012). "Soil and Plant Nutrient loss During the Recent Floods in North Kamatakii: Implications and Ameliorative Measures", Current Science, 99(10), November 25, pp: 1333 - 1340.
5. Neil Padukone, (2010). "Climate Chang: in India: Forgotten Threats, Forgotten Opportunities", Economic and Political Weekly, XLV (22), May 29, pp: 47 - 54.

