Climate Change and Food Security

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Abstract

The year 2010 was the warmest year in India, followed by 2009 and the very first decade of this century recorded as the warmest since eight out of 10 years were identified as the warm years. Increase in mean annual surface air temperature across India was 0.54 °C during the last 110 years while the rate of increase was high in post monsoon and winter seasons. In the case of annual maximum and minimum surface air temperatures, it revolves around 0.8 °C and 0.2 °C, respectively. However, decline in rainfall was noticed during the monsoon season in many parts of the country since last 50–60 years. Reports indicate that rice and wheat production is likely to decline due to global warming and climate change. The national economy is mostly agrarian based and depends on onset of monsoon and its distribution. Interestingly, weather extremes of opposite in nature like cold and heat waves and floods and droughts are noticed within the same year over the same region or in different regions across the Country. Reports indicate that they are likely to increase in ensuing decades and food insecurity is likely world-over. Therefore, there should be a determined effort from developed and developing countries to make industrialisation environment-friendly by reducing greenhouse gases pumping into the atmosphere.

Keywords: Climate change, food security, global warming

1. Introduction

The year 2010 was the warmest year in India, followed by 2009 and the very first decade of this century recorded as the warmest since eight out of 10 years were identified as the warm years. Increase in mean annual surface air temperature across India was 0.54 °C during the last 110 years while the rate of increase was high in post monsoon and winter seasons. In the case of annual maximum and minimum surface air temperatures, it revolves around 0.8 °C and 0.2 °C, respectively. Rate of increase in temperature was high across the West Coast, North East and the Western Himalayas of India when compared to other zones within the Country. The climate projections indicate that increase in temperature is likely to be around 2–3 °C by 2100 A.D. and trends in rainfall vary across the Country. However, decline in rainfall was noticed during the monsoon season in many parts of the country since last 50–60 years. Reports indicate that rice and wheat production is likely to decline due to global warming and climate change.

2. National Economy and Agriculture Situation

The national economy is mostly agrarian based and depends on onset of monsoon and its distribution. The year 2002 was a classical example to show how Indian food grains production depends on rainfall of July and it was declared as the all-India drought, as the rainfall deficiency was 19% against the long period average of the country and 29% of area was affected due to drought. The All-India drought is defined as the drought year when the rainfall deficiency for the Country as a whole is more than 10% of normal and more than 20% of the Country's area is affected by drought conditions. The *kharif* food grains production was adversely affected by a whopping fall of 19.1% due to all-India drought during monsoon 2002. Rice production in India was adversely affected in 2009 due to erratic monsoon behaviour and ended with 22% rainfall deficiency, which was the second highest rainfall deficit year after 1972 in which the rainfall deficiency was 24%. As a whole, the Indian food grains production was less by 16% due to deficit monsoon rainfall of 2009. There was a deficit of 8% monsoon rainfall in 2012 too. In 2014, the deficit of monsoon rainfall was 12% and some regions of the country in south experienced unusually deficit monsoon rainfall. The crop season was shifted in several regions due to deficit rainfall in June and July in 2014. In contrast, heavy floods were noticed in Orissa, Jammu & Kashmir and several

other regions of the Country in 2014. Another important aspect of monsoon in India is that whether the monsoon is normal, excess or deficit as noticed in 2012, 2013 and 2014, one region or other experiences floods or droughts and food grains production is adversely affected thereby food insecurity, leading to escalation in food price. All these weather aberrations reveal that the occurrence of droughts and floods during southwest monsoon across the Country adversely affect the Indian food grains production during *kharif* to a greater extent.

3. Impact of Climate on Agriculture

However, the impact of drought during *kharif* season is much more on food grains when compared to that of the incidence of floods. The unprecedented cyclone 'Hudhud' in the second week of October, 2014 devastated the three northern districts of Andhra Pradesh and heavy crop loss was noticed in food and fruit crops. During *rabi*, it is the turn of occurrence of cold and heat waves, which adversely affect field and fruit crops' production across the northern parts of the country. In animal agriculture, the poultry and dairy farming are adversely affected due to cold and heat waves. The classical examples were the cold wave in 2002−03 and 2005-06 and the heat wave in 2003−04. The poultry farming was adversely affected due to heat wave in May 2003 across the State of Andhra Pradesh. The milk production is likely to be adversely affected if the THI is more than 80. Such discomfort zones based on THI are noticed across the West and East Coasts of India due to high temperature and humidity conditions on which THI depends. Therefore, suitable housing and other management techniques are essential to minimize the adverse impact of THI in poultry and dairy farming.

4. Factors Affecting Food Security in India

Food Security in India is influenced not only by climate change or climate variability but also depends on several other components viz., Farmers' income security, public distribution System, WTO related issues in view of public stockholding and trade facilitation, need of more and more foodgrains to meet the requirement of ever increasing human population, greenhouse gas emissions from agriculture and animal agriculture and socio-economic factors. In the context of global warming and climate change, it is reported that the food grain production will fall by 10% by the year 2050 A.D. The weather related disasters viz., droughts, floods, heat and cold waves and cyclones adversely affected the world's food grain production to a considerable extent since last one-and-a-half decades as seen in the case of our country. The global climate projection models also indicate that the frequency of such weather related disasters is likely to increase in ensuing decades. Therefore, the global economy is likely to be under threat in global warming and climate change scenario due to decline in foodgrains and thereby escalation in food price. It is also observed that the atmospheric heat load is likely to influence the quality of produce in field and fruit crops. In view of the above, the small farm holders' farming and family farming gain momentum to maintain food and nutritional security. It reveals that the occurrence of floods and droughts and heat and cold waves are common across the world. The adverse impact of weather calamities on world economy is tremendous in the form of food insecurity and increase in food prices. It is more so in India as our economy is more dependent on Agriculture. Interestingly, weather extremes of opposite in nature like cold and heat waves and floods and droughts are noticed within the same year over the same region or in different regions across the Country. Reports indicate that they are likely to increase in ensuing decades and food insecurity is likely world-over.

5. Mitigation Strategies

Therefore, there should be a determined effort from developed and developing countries to make industrialisation environment-friendly by reducing greenhouse gases pumping into the atmosphere. Awareness programmes on climate change and its effects on various sectors viz., food security, health, infrastructure, water, forestry, land and ocean biodiversity and sea level and the role played by human interventions in climate change need to be taken up on priority. In the process, lifestyles of people should also be changed so as not to harm earth-atmosphere continuum by pumping greenhouse gases and CFCs into the atmosphere. Finally, we have to foresee the weather extreme events and prepare ahead to combat them so that the losses can be minimised. Therefore, strategies on mitigation and adaptation against weather extremes are to be chalked out on war-footing. Similarly attempts are to be made to forewarn local weather systems and weather extremes so as to minimise the human and crop losses. In addition, weather insurance package to the farmers against weather related disasters should be made compulsory and operational in an event of their occurrence. It will help to maintain their livelihood in an event of weather extremes those who depend solely on the income of Agriculture including Animal Agriculture. It is the phenomenon even world over and thus there should be a mechanism to sustain food security against climate variability or climate change.

6. Conclusion

It can be concluded thatattempts are to be made to forewarn local weather systems and weather extremes so as to minimise the human and crop losses. In addition, weather insurance package to the farmers against weather related disasters should be made compulsory and operational in an event of their occurrence. It will help to maintain their livelihood in an event of weather extremes those who depend solely on the income of Agriculture including Animal Agriculture. It is the phenomenon even world over and thus there should be a mechanism to sustain food security against climate variability or climate change.