



Impact of Climate Change

* Bijendr Pradhan ** Jitendra K Verma

* Asst. Prof. Department of Social Work, JVBU-Ladnun(Raj.)

** Research Scholar, Department of Social Work, JVBU- Ladnun (Raj.)

ABSTRACT

This paper reviews evidences on the climate change challenge; and assesses the impact of climate in India. This paper also estimates the impact of climate change on Indian agriculture. Agriculture is the backbone of Indian economy. Directly or indirectly 55% of the country's population depends on the climate sensitive sector agriculture. The agricultural sector is a driving force in the gas emissions and land use effects that causes climate change. In addition being a significant user of land and consumer of fossil fuel, agriculture contributes directly to greenhouse gas emissions through practices such as rice production and the raising of livestock (FAO, 2007). According to the Intergovernmental Panel on Climate Change (IPCC), the three main causes of the increase in greenhouse gases observed over the past 250 years have been fossil fuels, land use, and agriculture (IPCC 2001).

Keywords :

Introduction:

As per UNDP's Human Development Report (HDR), 2007/2008, "Climate Change is the defining human development issue of our generation". This problem is not one which a single nation or community is facing in isolation. Rather, the issue is global in nature which is a consequence of the fact that the atmosphere is common to the entire mankind. Moreover, the problem needs to be viewed in the context of growth and development in the developing countries and how the presently poor in different parts of the world will be able to break the shackles of deprivation and have adequate access to health, nutrition, education and other basic services needed for their well-being.

Climate-related disasters have brought widespread misery and huge economic losses to India, adversely affecting public health, food security, agriculture, water resources and biodiversity. The situation is likely to worsen if human beings continue to pump 'greenhouse gases' (GHGs) like carbon dioxide into the atmosphere.

These gases trap heat from the sun and thus lead to 'global warming'. As the Earth's temperature rises, a series of reactions take place – for instance, sea levels rise and inundate land, weather patterns change and have an impact on agricultural productivity, precious fresh water evaporates faster, disease carrying vectors increase, thus leading to epidemics.

The United Nations Framework Convention on Climate Change (UNFCCC) agreed to in 1992 and the 1997 Kyoto Protocol, the two international agreements to deal with global warming, have not yet succeeded in reducing GHG emissions. Rich countries, where per capita emissions of carbon dioxide are much higher due to higher usage of fossil fuel, are unwilling to compromise their lifestyles by reducing fossil fuel consumption. The US, in particular, is responsible for a quarter of the world's total emissions of carbon dioxide, but has refused to cooperate in a global agreement to reduce these emissions. Meanwhile, subsidies on fossil fuel around the world prevent sustainable energy technologies such as solar power from becoming competitive.

The world today faces two challenges if we are to deal effec-

tively with the biggest challenge faced by humankind. The first is to reduce carbon dioxide emissions drastically by moving to renewable technologies as soon as possible. The second is to prepare to deal with the impacts of climate change that are already inevitable due to existing levels of greenhouse gases in the atmosphere, and cannot be avoided even if the world stops emitting carbon dioxide immediately.

Agriculture

The arrival and performance of the monsoon is no insignificant matter in India every year, and is avidly tracked by the national media. This is because most of the states in the country are largely dependent on rainfall for irrigation. Any change in rainfall patterns poses a serious threat to agriculture, and therefore to the country's economy and food security.

Agriculture is the backbone of Indian economy. The share of agricultural products in exports is also substantial, with agriculture accounting for 15% of export earnings. Agricultural growth also has a direct impact on poverty eradication, and is an important factor in employment generation. The agricultural sector is a driving force in the gas emissions and land use effects that causes climate change. In addition being a significant user of land and consumer of fossil fuel, agriculture contributes directly to greenhouse gas emissions through practices such as rice production and the raising of livestock (FAO, 2007). According to the Intergovernmental Panel on Climate Change (IPCC), the three main causes of the increase in greenhouse gases observed over the past 250 years have been fossil fuels, land use, and agriculture (IPCC 2001).

India is one of the densely populated countries of the world. India has only acquired 2.4% of the land area of the world with an arable land of 11.2% but bound to feed 17.5% of the world population. This is a great challenge for our country which is supposed to become more severe with the threat of climate change. This may be the reason why we share 22.3% of world agriculture. Though we have 17.5% share in world population but our share in total active population is only 14.8 per cent. This shows that we are not only densely populated but also have high dependency rates. Agriculture sector is term as the most sensitive sector to the climate changes

because the climate of a region/country determines the nature and characteristics vegetation and crops. Indian climate is very much suitable for the cultivation of most of the crops in different parts of our country because of large scale variation in the climate across the region. But Indian soil is most suited for the cultivation of food grains particularly wheat and rice. The production of wheat is done in the Rabi season when the rain fall is limited. Because of this reason the production of wheat found mainly in those regions where there is availability of assured irrigation (mainly Punjab, Haryana and Western Uttar Pradesh) which helps in proper implementation of Green Revolution and became very much limited to the Northern part of the countries. Since wheat production is heavily dependent upon assured irrigation therefore a change in temperature is expected to affect the production of wheat.

Food Security

Food security is directly or indirectly related to climate change. Any alteration in climatic parameters such as temperature and humidity which govern crops growth will have a direct impact on the quality of food produced. Indirect linkages pertain to catastrophic event such as floods and droughts which are projected to multiply as a consequences of climate change leading to huge crop loss and leaving large patches of arable land unfit for cultivation, and hence threatening for food security (Chaudhry Anita, Aggarwal P.K, 2007). Further, Climate change and food security are also related because climate change can directly affect a country's ability to feed its people. However, research shows climate change will not equally affect all countries, and will likely have the biggest impact in equatorial regions such as sub-Saharan Africa. This means that countries already struggling with food security are likely to struggle still harder in the future. The Food and Agriculture Organization (FAO) warns that an increase in average global temperature of just 2 to 4°C above pre-industrial levels could reduce crop yields by 15- 35% in Africa and western Asia, and by 25-35% in the Middle East. Despite fast economic growth and piling food stocks in the government godowns, India is home to the largest number of hungry and deprived people in the world – to be precise 360 million undernourished and 300 million poor people. Sustaining supply of food itself is emerging as a critical issue. Growth in food grain production is slow, rather decreasing over the last few decades. During 1996-2008 it increased by just 1.2% per annum: from 199 to 230 million tons, as against an annual rate of growth of 3.5% achieved during the 1980s (UNDP, 2009). On top of it, the poor lack purchasing power. This led to artificial surplus in food grains stock and enabled government to export an average of about seven million tones food grains annually during 2002-08. The net food grains availability has declined from 510 grams per day per capita in 1991 to 443 grams per day per capita in 2007 (UNDP, 2009). It affects the poor the most as they have little access to the more expensive fruits, vegetables, poultry, and meat products. They need food but don't have purchasing power. This situation is more pronounced in central and eastern India. The Indian Agricultural Research Institute (IARI) examined the vulnerability of agricultural production to climate change, with the objective of determining differences in climate change impacts on agriculture by region and by crops. The projected climate change under various scenarios is likely to have implications on food production, water supply, biodiversity and livelihoods. Estimations predict that the area under food grain, for instance fell from 126.18 mha to 122.23 mha during the period from 1975-76 to 2008-09, the production registered an increase from 121.03 Mt. to 234.47 Mt. during that period. The study also indicates that there is a large scale fluctuation in the area under the cultivation in the Kharif season. The area under cultivation in the Kharif season has increased from 78.21 million hectare in 1966-67 to maximum of 84.14 million hectare in 1983-84 with some minor fluctuations. But after that with the fluctuation in rain fall and changes in the temperature pattern there has been a continuous fall in the area under cultivation.

Future Impact of Climate Change

Human Development Report (HDR) 2007/08 states that "Ma-

hatma Gandhi once reflected on how many planets might be needed if India were to follow Britain's pattern of industrialization. We are unable to answer that question. However, we estimate in this Report that if all of the world's people generated greenhouse gases at the same rate as some developed countries, we would need nine planets. While the world's poor walk the Earth with a light carbon footprint they are bearing the brunt of unsustainable management of our ecological interdependence". According to the IPCC, the enhanced GHG effect will result in additional warming of the Earth's surface. The Fourth Assessment Report of IPCC has projected a serious picture of the earth's future. The Report states that global warming may have a devastating impact on the climate of the earth. It is very likely that climate change can slow down the pace of progress towards sustainable development either directly through increased exposure to adverse impact or indirectly through erosion of the capacity to adapt. It also states that climate change related exposures are likely to affect the health status of millions of people, particularly those with low adaptive capacity, through increases in malnutrition and consequent disorders, with implications for child growth and development; and increased deaths, disease and injury due to heat waves, floods, storms, fires and droughts. India is also not immune from the impact of global warming and climate change. Any sharp rise in sea level could have a considerable impact on India. The United Nations Environment Programme included India among the 27 countries that are most vulnerable to a sea level rise. The mega cities of Mumbai and Chennai with large and growing populations and huge investments in infrastructure are located on the coast. Low-level areas, such as those in Orissa and West Bengal, could be vulnerable to inundation. Simulations with climate models as well as observational data have indicated that droughts and spells of excessive rain like the deluge that struck Mumbai in 2005 are likely to become more frequent in India with the warming of the world. Glaciers in the Himalayas feed important rivers such as the Ganga, the Indus and the Brahmaputra that provide water for millions of people as well as for irrigation and industry. The accelerated melting which these glaciers are experiencing as a result of the earth's warming will have a profound effect on future water availability. The Gangotri glacier, one of the largest in the Himalayas, has been melting since long and more rapidly in recent decades. As the glaciers melt, they become more fragmented and the smaller glaciers are more sensitive to global warming.

Conclusion

No doubt agriculture plays a key role in overall economic and social well being in India because still more than fifty% population is engaged in the agriculture sector. So the number of factors such as global warming, rapidly rising levels of carbon dioxide and other GHGs in the atmosphere, area under the food grain production has direct effects on agricultural systems in the country. Estimations predict that the area under food grain, for instance fell from 126.18 mha to 122.23 mha during the period from 1975-76 to 2008-09, the production registered an increase from 121.03 Mt. to 234.47 Mt. during that period. The food grain production looked quite impressive in 2008-09, which is more than thrice the production of 74.23 million tons in the year 1966-67. However the country faces major challenges to increase its food production to the tune of 300 million tones by 2020 in order to feed its ever-growing population, which is likely to reach 1.30 billion by the year 2020. To meet the demand for food from this increased population, the country's farmers need to produce more food grains by 2020. The fluctuation in the production as well as productivity is also realized along with the fluctuation in the area under cultivation. This tells the truth that though with the availability of assured irrigation facilities the vulnerability of Rabi crops to the climate change has reduced but still the climate change has its impact on the Agriculture.

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