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IMPACT OF CLIMATE CHANGE ON AGRICULTURE:INDIAN PERSPECTIVE

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Abstract:-*Climate is one of the main determinants of agricultural production. Throughout the world there is a significant concern about the effects of climate change and its variability on agricultural production. India is most threatened by climate change among countries with experts warning that rising temperatures will lead to more floods, heat waves, storms, rising sea levels and unpredictable farm yields. As Indian economy is purely based on agriculture, the vulnerability of Indian agriculture to climate change is well acknowledged. More over climate change will affect the rain-fed (non-irrigated) agriculture, practiced mostly by small and marginal farmers who will suffer the most. As most of the rain-fed lands are in arid and semi-arid zones where annual rainfall is meager and prolonged dry spells are quite usual even during the monsoon season, crop cultivation becomes highly risky. If the quantum of rainfall in these areas drops further or its pattern undergoes any distinct, albeit unforeseeable, change in the coming years, which seems quite likely in view of climate change, crop productivity may dwindle further, adding to the woes of rain-fed farmers and impact India's food security. With this idea the paper will focus on the impact of climate change on Indian agriculture.*

Keywords: *Climate Change, Agriculture, Rural Areas, Carbon emission, Rural Farmers*

INTRODUCTION

Climate is the long term pattern of weather conditions for a given area. Climate change refers to a statistically significant variation in either the mean state of the climate or its variability, persisting for an extended period. Climate change is not only global environmental problem, but it is also an issue of great concern to a developing country like India. India is home to extraordinary variety of climatic regions, ranging from tropical in the south to temperate and alpine in the Himalayan north, where elevated regions receive sustained winter snowfall. The nation's climate is strongly influenced by the Himalayas and the Thar Desert. Four major climatic groupings predominate into which fall seven climatic zones which are defined on the basis of temperature and precipitation. As stated by the Intergovernmental Panel on Climate Change (IPCC), climate change is "Unequivocal". The IPCC projected a global average temperature rise of 4.2°C under the Business-As Usual emissions scenario towards the end of the 21st century, while new studies project a warming of more than 6°C under the current Business-As Usual emissions scenario over the same period.

Climate change affects the balance of natural eco-systems (i.e. forests, river basins, sea level) and socio-economic systems (i.e. agriculture, fisheries, irrigation and power projects). The lacks of resources, technology and finances in developing countries such as India have limited capacity to develop and adopt strategies to reduce their vulnerability in climate change. It is widely accepted that the poorest are disproportionately vulnerable to climate change and the least able to adapt. Agriculture plays a key role in overall economic and social well being of India. Though the share of agriculture in both Gross Domestic Product and employment has declined over time, the pace of decline in its share in employment has been much slower than that of GDP. The research on the impact of climate change and vulnerability on agriculture is in high priority in India agenda as the changes in temperature and precipitation in monsoon.

Indian Agriculture: Scenario, Impacts and Vulnerability Assessment

Indian Scenario

The food grain production in India has increased spectacularly due to the Green Revolution from 50 Mt in 1951 to 212 Mt in 2002 and the mean cereal productivity has increased from 500 kg per ha to almost 1800 kg per ha. The share of agricultural products in exports is also substantial with 15% of export earnings. Agricultural growth also has a direct impact on poverty eradication and is an important factor in employment generation. The wheat accounts for one-third of the total food grain production, while rice forms 43% of the total and is cultivated in 43 million hectares, which is about 30% of the net cultivated area.

Impact

Agriculture is extremely vulnerable to climate change. Indian agriculture faces the dual challenge of feeding a billion people in a changing climatic and economic scenario. Even it is the main source of livelihood for almost 60% of the country's total population. The impacts of climate change on agriculture will be severely felt in India. It has been projected that under the scenario of a 2.5°C to 4.9°C temperature rise, rice yields will drop by 32%-40% and wheat yields by 41%-52%. This would cause GDP to fall by 1.8%-3.4%. Agricultural productivity is sensitive in two broad classes of climate-induced effects (a) direct effects from changes in temperature, precipitation, or carbon dioxide concentrations and (b) indirect effects through changes in soil moisture and the distribution and frequency of infestation by pests and diseases. The impact assessment can be assessed with the three major factors i.e. Environmental, Biophysical and Socio-economic factors.

Vulnerability

Vulnerability is the degree to which a system is susceptible to or unable to cope with adverse effects of climate change including variability and extremes. Other definition, vulnerability is a function of the character, magnitude and rate of climate change and the degree to which a system is exposed, along with its sensitivity and adaptive capacity. The vulnerability of agricultural production to climate change depends not only on the physiological response of the affected plant but also on the ability of the affected socio-economic systems of production to cope with changes in yield as well as with changes in the frequency of droughts or floods. The effect of climate change depends not only on the magnitude of climate stimuli or their effects but also on the sensitivity and capacity of the affected system to cope with or adapt to such stress are illustrates by the assessment framework of impact and vulnerability assessment expansion of weather insurance mechanisms and agricultural practices.

The mission focuses on four areas that are relevant for the endeavours of India's agricultural sector to adapt to climate change:

- Dry land agriculture
- Risk management
- Access to information
- Use of technology

The other policy is National Agriculture Policy, 2000 aims to attain over the next two decades a growth rate in excess of 4% per annum in the agriculture sector. The policy explicitly recognizes that agricultural growth should cater to domestic markets and maximize benefits from exports of agricultural products in the face of the challenges arising from economic liberalization and globalization Adaptation Strategies . Adaptation is needed to prepare communities, regions, countries and societies for the consequences of climate change. Adjustment in human and natural systems in response to natural and non-natural climate stimuli or their impacts that moderate harm or exploit beneficial opportunities. Adaptation in the agriculture sector addresses is to reduce the farmer's vulnerability and improve their adaptive capacity.

Sustainable Development towards the Climate Resilient Pathways Sustainable development within the context of climate change calls for new approaches to development that takes into account complex interactions between climate and society. Climate-resilient pathways recognize that impacts are certain because climate change can no longer be avoided. A variety of complex issues in assessing climate-resilient pathways in a variety of regions at a variety of scales: sustainable development as the ultimate aim, mitigation as the way to keep climate change impacts moderate rather than extreme and adaptation as a response strategy to cope with impacts that cannot be avoided. The president of USA Barrack Obama visit to India in 2015, he stressed that they will continue to help India deal with the impacts of climate change because India should not bear that burden alone.

Pathways for sustainable development become more climate resilient by risk management and vulnerability reduction strategies that include (a) Mitigation reducing the net rate of growth of Green House Gas

emissions and stabilizing or reducing their concentrations in the atmosphere and (b) Adaptation- improving capacities to cope with climate changes without disruptions of systems that we value. The linkage of adaptation and mitigation seems to be very clear in agricultural sector. Agriculture plays a dual role in climate change. It is a sector that will be severely affected by a changing climate and it also significant contributor to global GHG emissions. The agriculture sector directly combines 14% of total GHG emissions.

Suggestions

In this context, institutions and policies are important at multiple scales. Study suggests the following interventions to reduce adverse impacts of climate change:

- ❖ Improvement in forecasting & early warning systems
- ❖ Establishing hazard & vulnerability mapping
- ❖ Augmenting public awareness
- ❖ Creating community-based forest management and afforestation projects
- ❖ Improvement in irrigation

Conclusion

It is estimated that India needs 320 MT of food grains by the year 2025. For a country like India, sustainable agricultural development is essential not only to meet the food demands, but also for poverty reduction through economic growth by creating employment opportunities in non-agricultural rural sectors.

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