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Review Paper

Impacts of Climate Change on Food Security in India: A Review

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ARTICLE DETAILS

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ABSTRACT

Climate change affects directly and indirectly in many aspects of food security. Agricultural production systems and livestock should undergo a transformation, mainly in developing countries, to adapt to climate change, contribute to mitigation without compromising food security and nutritional status of their populations and achieve the sustainable development of farming. For carrying out this transformation, funding is needed. The current one is insufficient. Apart from the contribution obtained by development aid programs, agricultural systems should be considered in the allocation of funds for the fight against climate change.

1. Introduction

Food security refers to the availability, accessibility, and affordability of food for all individuals in a society. Climate change, on the other hand, refers to the long-term changes in weather patterns and temperatures caused by human activities such as burning fossil fuels and deforestation. The impact of climate change on food security is significant as it affects agricultural productivity, food availability, and access to food.

Climate change affects food production by altering weather patterns, such as changes in rainfall and temperature, leading to crop failure and reduced yields. It also increases the occurrence of extreme weather events such as floods, droughts, and hurricanes, which can destroy crops and infrastructure. Climate change also affects the quality and nutritional value of food, as rising temperatures can reduce nutrient content. Food security is also affected by climate change through its impact on global trade and food prices. As climate change affects food production in different regions, it leads to changes in global food supply and demand. This can result in price fluctuations that affect the affordability of food, particularly for vulnerable populations.

To address the challenges of food security and climate change, there is a need for sustainable agricultural practices that are resilient to climate change. This includes the use of climate-smart agriculture techniques such as conservation agriculture, agro-forestry, and crop diversification. Additionally, there is a need for policies that support small-scale farmers and promote equitable access to resources such as land, water, and technology. By addressing food security and climate change together, we can ensure a sustainable future for all.

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2. Concept of Food Security

In 1983, FAO analysis focused on food accessibility, primarily to a definition based on the equilibrium between the demand and supply side of food security. In 1986, the highly influential World Bank report on Poverty and Hunger (World Bank, 1986) focused on temporal dynamics of food insecurity. This was complemented by Sen's Theory of Famine which highlighted the consequence of personal rights on food access i.e. production, labor, trade and transfer based resources. The widely accepted World Food Summit (1996) definition reinforces the multi-dimensional concept food security and includes food access, availability, food use and stability. Currently over 40 countries have the right to food enshrined in their constitution and FAO estimates that the right to food could be judicial in some 54 countries. The concept of Food security is centered on two sub-concepts; food availability and food title. The former refers to supply of food available at various levels i.e. local, national or international. The latter refers to the capability of an individual or household to obtain food. The main prerequisites or dimensions of food security are as follows:

Food availability: The physical availability of food refers to adequate quantities of food, supplied through native production or imports. It refers to the „supply side" of food security.
Food Accessibility: It refers to access by individual to adequate resources (entitlements) for acquiring appropriate food for a nutritious and balance diet.
Food Utilization/use: Utilization in general understood as the way the body makes the most of various nutrients in the food through balance diet, clean water, hygiene, sanitation and healthcare.
Stability: To be food secure, an individual, household or population must have access to adequate food at all times.

3. Impacts of Climate Change

The concern for ensuring food security under climate change led to developing a relationship between food, and the environment and climate change, which gained prominence since the Rio Declaration in 1992, where food production is Chapter 14 of Agenda 21, to the Paris Agreement of 2015, includes the need for food security. This growing prominence of food is reflected in recent IPCC reports, including its Fifth Assessment Report and the Special Report on global warming of 1.5 °C. Food security is projected to be impacted negatively due to rapid population growth in developing countries, coupled with global climate change, and the recent economic down turn. There are expected to be 9.8 billion people by 2050, and climate uncertainties are already showing signs of crop production decline. The capacity of the earth's resources to meet the growing food demand already stands challenged. Global agriculture is faced with the pressure of feeding the increasing number of mouths, constrained by climate change, land availability and degradation, loss of biodiversity and food insecurity .The food system encompasses all the activities and actors in the production, transport, manufacturing, retailing, consumption and waste of food and their impacts on nutrition, health and well-being, and the environment.

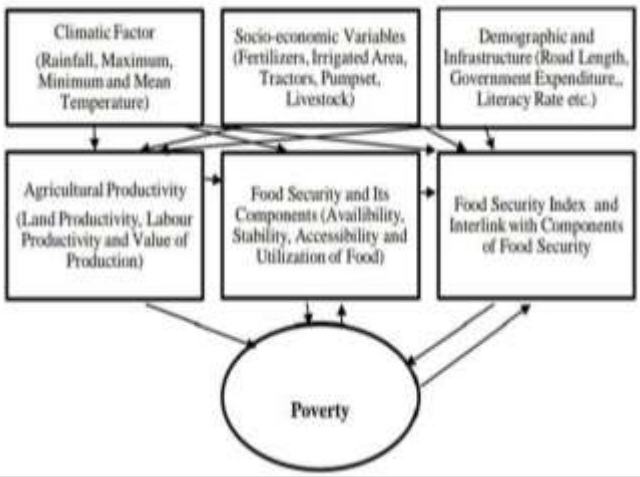


Figure 1. Interlinkage between climatic and non-climatic variables on agriculture, food security and poverty

Food system is supported by the biosphere along with all other manifestations of human activities. As a consequence of changes in the average weather conditions, it is projected that wet regions will become wetter and dry regions dryer. In response to this variability, the climate change and food security (CCFS) framework were developed to analyze how climate change affects food security outcomes for the four components of food security – food availability, food accessibility, food utilization, and food system stability – in various direct and indirect ways. Climate change and natural disasters such as droughts, landslides, and floods greatly affect food security. Climate change variables influence biophysical factors, such as plant and animal growth, water cycles, biodiversity, and nutrient cycling and the ways in which these are managed through agricultural practices and land use for food production. However, climate variables also have an impact on physical/ human capital – such as roads, storage and marketing infrastructure, houses, productive assets, electricity grids and human health– which indirectly changes the economic and socio-political factors that govern food access and utilization and can threaten the stability of food systems. All these impacts manifest themselves in the ways in which food system activities are carried out. The framework developed by CCFS, illustrates how adaptive adjustments to food system activities will be needed all along the food chain to cope with the impacts of climate change.

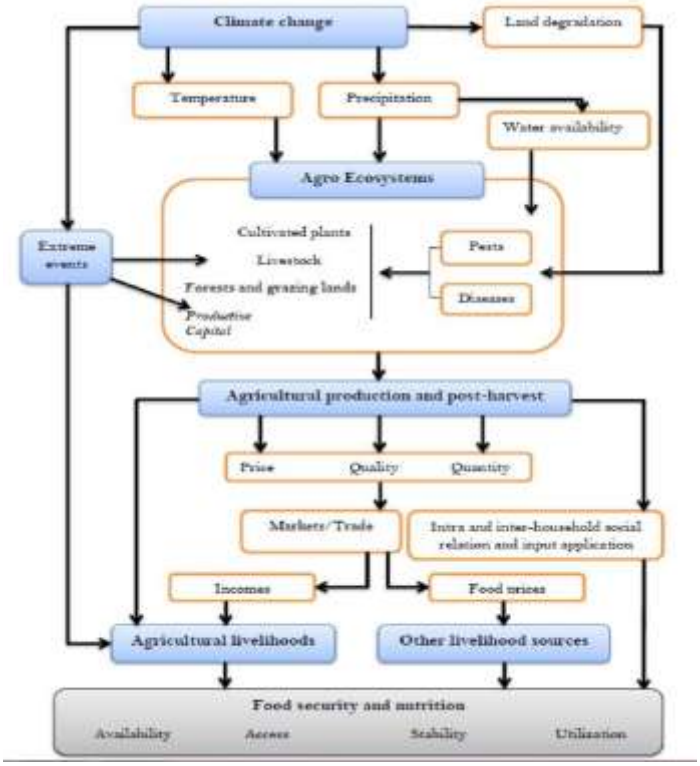
The climate change variables considered under the framework are:

- The CO_2 fertilization effect of increased greenhouse gas concentrations in the atmosphere;
- Increasing mean, maximum and minimum temperatures;
- Gradual changes in precipitation: increase in the frequency, duration and intensity of dry spells droughts; changes in the timing, duration, intensity, and geographic location of rain and snowfall;
- Increase in the frequency and intensity of storms and floods;
- Greater seasonal weather variability and changes in the start/end of growing seasons

As direct evidence, more frequent and more intense extreme weather events (droughts, heat, and cold waves, heavy storms, floods), rising sea levels, and irregularities in seasonal rainfall patterns (including flooding) are already having immediate impacts on not only food production, but also food distribution infrastructure, the incidence of food emergencies, livelihood assets and human health in both rural and urban areas. The indirect impacts are expected to emanate from gradual changes in mean temperatures and rainfall. These will pose vital challenges to the suitability of land for different types of crops and pasture; the health and productivity of forests; the distribution, productivity, and community composition of marine resources; the incidence and vectors of different types of pests and diseases; the biodiversity and ecosystem quality water for crop, livestock and inland fish production. The loss of arable land to increased aridity (and associated salinity), ground water depletion, and sea-level rise. Uncontrolled internal and external migration, resource-based conflicts, and civil unrest triggered by climate change area potential threats to future food systems. The threat of climate change stands to jeopardize the livelihoods attached to the land; it is anticipated to drive more than 100 million people into extreme poverty by 2030.

Poverty, inequality, and food in security are among the key challenges of our time; yet improving food availability is not enough to eliminate poverty and hunger as envisaged under SDG 2 of sustainable development goals. The notion of food security evolved close to half a century ago and has been gradually enlarged. Initially, it focused mainly on the availability of food and on food production, then it was expanded to include explicitly the accessibility to food (physical, economic, and socio-cultural), its utilization, and lastly to encompass the stability of these dimensions.

The task of defining the concept of food security evolved from the World Food Summit in 1996, which says “food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”



4. Food Security Solutions

There are several solutions that can help address the issue of food security in the face of climate change. These include:

1. Diversifying Crop Production: Farmers can diversify their crop production to include crops that are more resilient to changing weather patterns, such as millet. This can help ensure a more stable food supply.

2. Promoting Sustainable Agriculture: Governments can promote sustainable agriculture practices that help reduce greenhouse gas emissions and improve soil health. This can help increase crop yields and improve food security.

3. Investing in Research and Development: Governments can invest in research and development related to climate-resilient crops and sustainable agricultural practices. This can help farmers adapt to changing weather patterns and improve food security.

4. Strengthening Food Supply Chains: Governments can strengthen food supply chains to ensure that food is available year-round, even in the face of extreme weather events. This can include investing in storage and preservation technologies for crops such as millet.

5. Government laws and initiatives related to food security: National Food Security Mission

It is a Centrally Sponsored Scheme launched in 2007.It aims to increase production of rice, wheat, pulses, coarse cereals and commercial crops, through area expansion and productivity enhancement. It works toward restoring soil fertility and productivity at the individual farm level and enhancing farm level economy. It further aims to augment the availability of vegetable oils and to reduce the import of edible oil.

5.1 Rashtriya Krishi Vikas Yojana (RKVY)

It was initiated in 2007, and allowed states to choose their own agriculture and allied sector development activities as per the district/state agriculture plan. It was converted into a Centrally Sponsored Scheme in 2014-15 also with 100% central assistance. Rashtriya Krishi Vikas Yojana (RKVY) has been named as Rashtriya Krishi Vikas Yojana- Remunerative Approaches for Agriculture and Allied Sector Rejuvenation (RKVY-RAFTAAR) for three years from 2017-18to 2019-20.Objectives: Making farming a remunerative economic activity through strengthening the farmer's effort, risk mitigation and promoting agri-business entrepreneurship. Major focus is on pre & post-harvest infrastructure, besides promoting agriculture

entrepreneurship and innovations. Integrated Schemes on Oilseeds, Pulses, Palm oil and Maize (ISOPOM)

5.2 Pradhan Mantri Fasal Bima Yojana

1. E-marketplace: The government has created an electronic national agriculture market (eNAM) to connect all regulated wholesale produce markets through a pan-India trading portal.
2. Massive irrigation and soil and water harvesting programme to increase the country's gross irrigated area from 90 million hectares to 103 million hectares by 2017.
3. The government has also taken significant steps to combat under- and malnutrition over the past two decades, through

✓ The introduction of mid-day meals at schools. It is a Centrally-Sponsored Scheme which covers all school children studying in Classes I-VIII of Government, Government-Aided Schools.

✓ Anganwadi systems to provide rations to pregnant and lactating mothers,

✓ Subsidized grain for those living below the poverty line through a public distribution system.

✓ Food fortification

5.2 The National Food Security Act (NFSA), 2013

1. Legally entitles upto 75% of the rural population and 50% of the urban population to receive subsidized food grains under the Targeted Public Distribution System.
2. The eldest woman of the household of age 18years or above is mandated to be the head of the household for the purpose of issuing of ration cards under the Act.

6. Conclusion

There are people in the world so hungry, that God cannot appear to them except in the form of bread."

–Mahatma Gandhi

The health of a country's agri-food systems determines the health of its people. Demands on the global food systems are growing exponentially. Over the next 20 years, they will need to feed 10 billion people and at the same time, protect natural resources and ecosystems for future generations. The findings from the first round of the Fifth National Family Health Survey suggest that nutrition-related indicators have worsened in most States. Covid-19 has led us off- track even further.However, there is hope. With 10 years to go to end hunger, poverty and inequality, food systems under pin all 17 of the UN Sustainable Development Goals for 2030. By leveraging the links between how we produce, buy, sell and eat food, it is possible to support healthier, more prosperous and fulfilling lives. Feeding a population of 9 billion people by2050 without increasing greenhouse gas emissions is one of the world's great challenges. Climate change has, and will increasingly have in the near future, direct and indirect effects on food security in developing countries; and such countries are the most vulnerable to its consequences. This creates a vicious circle, as a malnourished population is less resistant to the effects of climate change, such as the spread of diseases. To achieve food security at a time of climate change, the agricultural sector in developing countries needs to undergo a profound transformation. This process must consider the synergy between adaptation capacity and the mitigation opportunities offered by sustainable agriculture or climate-smart agriculture», which take into account traditional practices, biodiversity and the fundamental role of rural women in developing countries.

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