



PARLIAMENT LIBRARY AND REFERENCE, RESEARCH,
DOCUMENTATION AND INFORMATION SERVICE
(LARRDIS)

REFERENCE DIVISION

REFERENCE NOTE

No.02/ RN/Ref/January/2022

January 2022

Climate Smart Agriculture: A Key to Sustainability

At a Glance

- Climate Change: Introduction
- Impact of Climate Change on Agriculture
- Need of Climate Smart Agriculture(CSA)
- Climate Smart Agriculture: Characteristics
- Government Initiatives to adopt Climate Smart Agriculture
- Impact of Government Programmes and Policies

Feedback : refdiv-lss@sansad.nic.in

Concerned Desk Officer :23035499

Prepared by Smt. Vandana Chauhan, Deputy Director and Shri Satyavijay Ram, Additional Director (4589) of Lok Sabha Secretariat and under the supervision of Shri Naushad Alam, Director (4760) and Shri Prasenjit Singh, Additional Secretary (23034433).

The Reference Note is for personal use of the Members in the discharge of their Parliamentary duties, and is not for publication.

Introduction

A growing global population and changing diets are driving up the demand for food. Nearly 690 million or 8.9 percent of the global population are hungry. The food security challenge will only become more difficult, as the world will need to produce about 70 percent more food by 2050 to feed an estimated 9 billion people. The environmental impacts of satisfying this increased food demand will be further aggravated by climate change¹. The problem also works in reverse. Agriculture is a major part of the climate problem. It currently generates 19–29% of total greenhouse gas (GHG) emissions. Around one-third of total production in the world is wasted, which in and of itself embodies a large carbon footprint.

Impact of Climate Change on Agriculture

- ❖ Economic losses from natural disasters are rising globally, and agriculture sector is highly vulnerable to these disasters. According to the United Nations Office for Disaster Risk Reduction (UNISDR) (2018), disaster-hit countries experienced direct economic losses to the tune of US\$ 2908 billion during 1998–2017. Of the total losses, 77 percent were due to climate related disasters. Climate change impacts are more pronounced on agriculture sector in the recent past.
- ❖ In India, the countrywide decline in major crop yields due to climate change effects between 2010 and 2039 could be as high as Nine percent, worsening further with time. The loss can be up to 35 percent for rice, 20 percent for wheat, 50 percent for sorghum, 13 percent for barley and 60 percent for maize depending on the location and future climatic scenario.

¹ *International Panel on Climate Change defines climate change as a change in the state of the climate that can be identified by changes in the mean and variability of the properties that persist for an extended period, typically decades or longer. Seasonal change profoundly affects the balance of life in ecosystems and essential human activities including agriculture and irrigation.*

Indian Scenario

- ❖ Indian agriculture being a gamble of monsoons, crop yields continue to be climate sensitive and the fluctuations in temperature and rainfall pattern adversely affect crops productivity, thus threatening food security in India.
- ❖ In India, climate change has triggered increase in temperatures by 0.6 °C to 25.1 °C between 1901 and 2018, caused shifts in monsoon patterns
- ❖ Productivity of most crops is likely to decrease 10-40% by 2100 due to increases in temperature, rainfall variability, and decreases in irrigation water.
- ❖ The major impacts of climate change will be on rain fed or un-irrigated crops, which are cultivated in nearly 60% of cropland. A temperature rise by 0.5 degree C in winter temperature is projected to reduce rain fed wheat yield by 0.45 tons per hectare in India.
- ❖ Government of India's economic survey (2018) estimated that the annual loss of US\$ 9-10 billion was due to the adverse effects of climate change.

Need of Climate Smart Agriculture

- ❖ Climate change accelerates degradation processes in already-degraded environments and has negative impact on food production and food system. In India, the countrywide decline in major crop yields due to climate change effects between 2010 and 2039 could be as high as Nine percent. This has heightened the need to embrace the notion of Climate Smart Agriculture (CSA) in the face of climatic vagaries to reduce the negative impacts of climate change on agricultural systems. A transformation of the agricultural sector, including crop and livestock production, fisheries and forestry, is urgently needed to respond to climate change and sustainably increase agricultural productivity and incomes. Climate-smart agriculture is rooted in sustainable agriculture and rural development objectives which, if reached, would contribute to achieving the Millennium Development Goals (MDGs) of reducing hunger and improved environmental management.

“Climate smart agriculture is an approach that helps guide actions to transform agri-food systems towards green and climate resilient practices.” Food and Agriculture Organization, Hague, 2010

What is Climate Smart Agriculture

A range of agricultural practices that transform agricultural systems to support food security in the face of climate change has been collectively known by the name ‘climate-smart agriculture’ (CSA). A CSA approach tries to integrate climate change into planning and implementation of sustainable agricultural practices. It also aims to increase the resilience of agriculture to climate variability through better adaptation to climate change and reduce agriculture’s contribution to global warming.

Climate Smart Agriculture: Characteristics

- ❖ Contrary to conventional agricultural development, CSA systematically integrates climate change into the planning and development of sustainable agricultural systems.
- ❖ CSA’s three primary pillars are interrelated concerns-increased productivity, enhanced resilience and reduced emissions. However, the resultant trade-offs often cannot maximize the pillars simultaneously, only optimize them.
- ❖ CSA maintains ecosystem services: Ecosystems provide the agricultural sector with a number of unpaid services –clean natural water, materials, food, sunlight etc. CSA attempts to ensure the sustainability of these services, preventing their degradation.
- ❖ CSA is not a rigid set of particular practices, technologies or methodologies- it is only a concept amenable to adaptation. It has multiple entry points, ranging from the development of technologies and practices to the elaboration of

climate change models and scenarios, information technology, insurance schemes, value chains and the strengthening of institutional and political enabling environments.

Key Government Initiatives on CSA

National Innovation on Climate Resilient Agriculture (NICRA)

National Innovations in Climate Resilient Agriculture (NICRA) is a network project of the Indian Council of Agricultural Research (ICAR) launched in February, 2011 with an outlay of Rs.350 crores. The project aims to enhance the resilience of Indian agriculture, covering crops, livestock and fisheries to climatic variability and climate change through development and application of improved production and risk management technologies.

National Mission on Sustainable Agriculture (NMSA)

The Government is implementing the National Action Plan on Climate Change (NAPCC) which provides the overarching framework for climate actions, through national missions in specific areas. The National Mission for Sustainable Agriculture (NMSA), one of the Missions under NAPCC, includes programmatic interventions like Soil Health Card, Paramparagat Krishi Vikas Yojana, Mission Organic Value Chain Development for Northeastern Region, Rainfed Area Development, National Bamboo Mission and Sub-mission on Agro-Forestry. The NMSA works through adoption of sustainable development pathway by progressively shifting to environment friendly technologies, adoption of energy efficient equipments, conservation of natural resources, integrated farming, etc. Besides, the NMSA aims at promoting location specific improved agronomic practices through soil health management, enhanced water use efficiency, judicious use of chemicals, crop diversification.

The National Adaptation Fund for Climate Change (NAFCC)

The National Adaptation Fund for Climate Change (NAFCC) was established to meet the cost of adaptation to climate change for the State and Union Territories of India that are particularly vulnerable to the adverse effects of climate change. This Scheme was implemented during 2015-16 mainly for supporting concrete adaptation activities dealing with mitigating the adverse effects of global climate change in various sectors including agriculture. Under the NAFCC, various projects have been sanctioned in different states i.e., Punjab, Himachal Pradesh, Odisha, Manipur, Tamil Nadu, Kerala, Mizoram, Chhattisgarh, J&K, Meghalaya, Telangana, Andhra Pradesh etc.

Climate Smart Village: Climate-smart village (CSV) is an institutional approach to test, implement, modify and promote CSA at the local level and to enhance farmers' abilities to adapt to climate change. The CSV adopts a portfolio of interventions to tackle the climate challenges of the agriculture sector that cover the full spectrum of farm activities. Various Consultative Group on International Agricultural Research (CGIAR) centers and national research organisations are putting their concerted efforts into the CSVs in India. CSVs were piloted in two states of India: Karnal district of Haryana state and Vaishali district of Bihar state which later spread into districts of Punjab, Andhra Pradesh and Karnataka.

Pradhan Mantri Krishi Sinchayee Yojna (PMSKY): This Scheme was planned and formulated to give more priority on water conservation and its management in agriculture with the vision to extend the area under irrigation from 1 July 2015. The main motto of this Scheme is 'Har Khet Ko Paani' to improve water use efficiency. 'More crop per drop' scheme provide end-to-end solutions in water on source creation, distribution channels and its management.

Pradhan Mantri Fasal Bima Yojna (PMFBY): The Pradhan Mantri Fasal Bima Yojana (PMFBY) introduced in the country from Kharif 2016 season is voluntary for States/UTs as well as for farmers. States/UTs can participate in the scheme keeping in view their risk perception and financial considerations etc. From inception of the scheme till 2020-21 cumulatively 2,938.7 lakh farmer applications for a sum insured of Rs. 10,49,342 crore have been enrolled under the scheme.

Soil Health Card Scheme: This Scheme was launched in February, 2015 to issue soil health cards (SHC) to the farmers providing detailed information on test-based soil nutrient status of their own land along with recommended dose of fertilizers for improving productivity through judicious use of inputs. The Government of India targeted to issue 10.48 crores of SHCs since inception of the Scheme.

National Water Mission (NWM): A Mission was mounted to ensure Integrated Water Resource Management (IWRM) for conserving the water sources and minimizing its wastage, and also to optimize Water Use Efficiency (WUE) by 20 per cent including agriculture sector.

Paramparagat Krishi Vikas Yojna (PKVY): It is an extended component of Soil Health Management (SHM) launched in 2015 under NMSA with the objective of supporting and promoting organic farming through adoption of organic village by cluster approach, which in turn result in improvement of soil health.

Biotech-KISAN: It is a scientist-farmer partnership scheme launched in 2017 for agriculture innovation with an objective to connect science laboratories with the farmers to find out innovative solutions and technologies to be applied at farm level. Under this scheme, so far 146 Biotech-KISAN Hubs have been established covering all 15 agro-climatic zones and 110 aspirational districts in the country. The scheme has benefitted over two lakhs farmers so far by increasing their agriculture output and income. Over 200 entrepreneurships have also been developed in rural areas.

Neem Coated Urea: It is a form of urea fertilizer coated with neem extracted material, which acts as a slow releaser of nitrogen reducing the pest and disease infestation ultimately minimizing the usage of chemicals in farming by achieving the overall increase in crop yield.

Sub-mission on Agro-forestry: This Mission was launched during 2016-17 with the objective of planting trees on farm bunds. Agro-forestry has the potential to bring sustainability in agriculture and also achieving the optimum productivity by mitigating the impact of climate change.

National Livestock Mission: This Mission was initiated by the Ministry of Agriculture and Farmers' Welfare and got commenced from 2014-15 focusing mainly on livestock development through sustainable approach ultimately protecting the natural environment, ensuring bio-security, conserving animal bio-diversity and farmers' livelihood.

Impacts of National Programmes and Policies

- ❖ Under NICRA, climate resilient technologies have been developed for various crops under State of the art climate change research facilities established at several institutes across the country. District level risk assessment of Indian agriculture to climate change (572 rural districts) have been prepared. ICAR along with NARS has developed District Agriculture Contingency Plans for 650 districts in India and is being updated regularly. Climate-resilient villages have been developed, one in each of 151 climatically vulnerable districts under the NICRA Project and location-specific technologies have been demonstrated in these districts.
- ❖ “More crop per Drop” is a strong message in overall water utilization strategy in Indian agriculture. The Prime Minister Krishi Sinchayee Yojana (PMSKY) besides MGNREGA have contributed immensely for water resources conservation and ground water recharge and utilization in the country. PMSKY contains within itself a Micro Irrigation Fund with a focus on protective irrigation and water use efficiency interventions in a climatic conscious manner. Both field crops and

horticulture subsectors positively impacted with improved water use efficiency related programmes and policies.

- ❖ The fertilizer policies in India have grown positively by enhancing crop production and productivity. The additional food grain production of 13.66 Mt using fertilizers avoided the conversion of 11.48 million hectares of forest land to cropland, thereby, reducing 2013 Mt of GHGs emissions. Neem coated urea has also reduced fertilizer input cost, improved nutrient use efficiency and reduced GHGs from fertilizer nutrient sources.
- ❖ There has been a sincere effort to promote Zero Budget Natural farming (ZBNF) across India. It offers a commercially viable and environment friendly alternative and offer better climatic adaptation compared to conventional agriculture .
- ❖ Area under agro-forestry is on upward trend towards more carbon fixation and reduced GHGs. Inclusion of pricing policy would contribute to stability of livelihoods of agro-forestry farmers of India besides environmental services.
- ❖ During 2017-18, the record milk production was registered at 176.3mt in comparison with 132.4 mt during 2012-13. Several livestock related policies contributed to animal health, vaccination, fodder availability, artificial insemination besides marketing and promotion agripreneurship ecosystems in India.

References:

1. <https://www.worldbank.org/en/topic/climate-smart-agriculture>
2. *Climate Change and Indian Agriculture: Impacts, Coping Strategies, Programmes and Policy*, ICAR, 2019, pp-16-21
file:///C:/Users/Hp/Desktop/climate%20smart%20agriculture%20%20key%20to%20sustainability/ICAR-NAARM-Policy-on-Climate-Change-and-Agriculture_compressed.pdf
3. *Prioritizing Climate Smart Agriculture*, Kurukshetra, January 2022, p 45-47
4. *Climate smart farming in India A pathway to poverty alleviation, food security, and climate adaptation and mitigation.*
<https://www.edf.org/sites/default/files/documents/Climate-smart-agriculture-India-EDF-report.pdf>
5. *Agricultural sustainability under emerging climatic variability: the role of climate-smart agriculture and relevant policies in India*, *International Journal of Innovation and Sustainable Development*, 2020, p 4,7
https://www.researchgate.net/profile/Jeetendra-Aryal/publication/332695235_Agricultural_sustainability_under_emerging_climatic_variability_The_role_of_climatesmart_agriculture_and_relevant_policies_in_India/links/5ccc636e458515712e901f1e/Agricultural-sustainability-under-emerging-climatic-variability-The-role-of-climate-smart-agriculture-and-relevant-policies-in-India.pdf
6. <http://www.nicra-icar.in/nicrarevised/index.php/project-details>
7. *Pib release, Ministry of Science & Technology, dated 19/6/21*
<https://pib.gov.in/PressReleasePage.aspx?PRID=1728507>