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Climate Smart Agriculture (CSA): An Approach in Mitigating the Impacts of Climate Change on Agriculture

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SUMMARY

India is becoming increasingly concerned about climate change in order to guarantee food and nutrition security for its expanding population. There is an urgent need to increase agricultural production substantially by a staggering 60% by 2050 to meet the escalating global demand for food.Although the effects of climate change are felt worldwide, nations like India are particularly vulnerable because of their large agricultural population.It affects agriculture in a number of ways, including as changing growing seasons, scarcity of water, extreme temperatures, increased spread of pests and diseases, lower crop yields, etc. To mitigate this Climate-smart agriculture (CSA) is an approach to farming that seeks to address the challenges of climate change while ensuring sustainable food production. By adopting various components of the CSA, it aims to build resilience in agricultural systems, enhance food security, and contribute to sustainable development in the face of climate change. It's an evolving field that requires collaboration among farmers, researchers, policymakers, and other stakeholders to address the complex challenges posed by a changing climate.

INTRODUCTION

The most important two issues facing by the humanity in the 21st century are climate change and food insecurity.Climate change has far-reaching and multifaceted effects on the environment, ecosystems, human societies, and economies. These impacts are already being observed and are projected to intensify in the coming decades. Some key effects of climate change includes rising in temperature (i.e., heat waves), Changing Precipitation Patterns (i.e., drought and floods), Rise in Sea Level (i.e., coastal erosion and saltwater intrusion), Extreme Weather Events (i.e.,Hurricanes, Cyclones, Typhoons and wildfires), Melting Ice and Glaciers (i.e., Arctic and Antarctic Ice Melt, Glacier Retreat),Ocean Acidification (impact on marine lives), Biodiversity Loss (i.e., Habitat Disruptionand Species Extinction), Agricultural Impacts(i.e., change in growing season, Pests and Diseases), Social and Economic Disruptions (i.e., Displacementand Economic Losses) (Anonymous, 2011). Agriculture stands as the dominant sector of the Indian economy, playing a pivotal role in its overall economic landscape. Contributing approximately 20.19 percent to the Gross Domestic Product (GDP), this sector holds critical significance (Balakrishna et al., 2021).Addressing the multifaceted challenges posed by climate change demands a holistic strategy that encompasses both adaptation and mitigation efforts. Striking this balance is essential to ensure the resilience of agricultural systems while simultaneously curbing further environmental degradation. Moreover, there is an urgent need to increase agricultural production substantially by a staggering 60% by 2050 to meet the escalating global demand for food.

The Indian Council of Agricultural Research (ICAR) launched the National Innovations in Climate Resilient Agriculture (NICRA) network project in February 2011 with the goal of strengthening Indian agriculture's resistance to climate change and climate vulnerability through capacity building, sponsored/competitive grants, technology demonstration, and strategic research. Krishi Vigyan Kendras (KVK) are essential to the growth of agriculture in our nation. The findings of Savita and Lalita (2017) indicated that the Krishi Vigyan Kendra had a favourable impact on farmers' adoption of a variety of agricultural production technology. Through KVK, numerous initiatives are carried out to advance agricultural and rural development. Vardhan et al. (2022) revealed that farmers of adopted villages have more awareness regarding climate resilient technologies when compared with non adopted village. In order to enhance resilience of Indian agriculture to climate change and climate vulnerability, strategic research and technology demonstration given by NICRA should be followed. Ganesh and Rahman (2018) with NICRA technologies impact 90 per cent migration was reduced and farmers' income increased up to 66.66 per cent. Vardhan et al. (2022a) concluded that climate resilient technologies adopted village respondents were having better Socio- economic status than the non-adopted villages.Climate change has an adverse effect on the agricultural system and food production,

hastening the processes of environmental deterioration in already damaged areas. So with the help of KVKs there is a need of bringing a mitigating technology to reduce the impact of climate change on agriculture. This has made it even more important to adopt the idea of Climate Smart Agriculture (CSA) in order to lessen the detrimental effects of climate change on agricultural systems while dealing with climatic fluctuations.

What is Climate Smart Agriculture (CSA):

Climate-smart agriculture (CSA) is an approach to farming that seeks to address the challenges of climate change while ensuring sustainable food production. It involves integrating climate change adaptation and mitigation strategies into agricultural practices. The goal is to make agriculture more resilient to the impacts of climate change, reduce greenhouse gas emissions, and contribute to food security

The key important components of climate-smart agriculture:

Adaptation:

Crop Diversification: Planting a variety of crops can help farmers adapt to changing climate conditions.
Resistant Varieties: Using crop varieties that are more resistant to pests, diseases, and extreme weather events.

Mitigation:

Conservation Agriculture: Practices such as minimal tillage, cover cropping, and crop rotation can help sequester carbon in the soil and reduce emissions.
Agroforestry: Integrating trees into agricultural landscapes can sequester carbon, provide shade, and enhance biodiversity.

Water Management:

Efficient Irrigation: Using water more efficiently through techniques such as drip irrigation or rainwater harvesting.
Water Conservation: Implementing practices that conserve water, especially in areas prone to drought.

Livestock Management:

Improved Grazing Practices: Implementing rotational grazing and better land management to reduce the environmental impact of livestock.
Methane Reduction: Exploring ways to reduce methane emissions from livestock through improved feeding practices.

Technology and Innovation:

Precision Agriculture: Using technology like sensors, GPS, and data analytics to optimize farm management and resource use.
Climate-Resilient Crop Varieties: Developing and promoting the use of crop varieties that can withstand climate stress.

Capacity Building and Education:

Training Farmers: Providing farmers with knowledge and skills to implement climate-smart practices.
Access to Information: Ensuring farmers have access to weather forecasts, market information, and other relevant data.

Policy and Institutions:

Supportive Policies: Governments can play a crucial role by implementing policies that incentivize climate-smart practices.
Financial Support: Providing financial incentives and support to farmers adopting climate-smart agriculture.

Community Engagement:

Participatory Approaches: Involving local communities in decision-making processes and adapting strategies to local contexts.

CONCLUSION

By combining these elements, climate-smart agriculture aims to build resilience in agricultural systems, enhance food security, and contribute to sustainable development in the face of climate change. It's an evolving field that requires collaboration among farmers, researchers, policymakers, and other stakeholders to address the complex challenges posed by a changing climate.

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