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Technologies Involved in Mitigating the Impacts of Climate Change on Agriculture

Subhajit Chakraborty
Research Scholar, Department of Agricultural Extension, Uttar Banga Krishi Viswavidyalaya, Pundibari, Coochbehar, West Bengal

SUMMARY

Climate change is a major threat to society and agriculture, with a 21% reduction in global agricultural output. It has various impacts on agriculture including altered growing seasons, water scarcity, extreme weather events, pest and disease spread, reduced crop yields, etc. To address this issue, agricultural practices must prioritize sustainability and embrace innovative technologies. Precision agriculture, climate-resilient crop varieties, sustainable irrigation, agroforestry, and other practices can help mitigate the impacts of climate change on agriculture. Technology, such as data-driven systems and artificial intelligence, can provide valuable information for decision-making. Embracing these advancements can enhance productivity, resilience, and reduce the environmental impact of agriculture, ultimately meeting the rising global food demand while ensuring long-term sustainability.

INTRODUCTION

Climate change is the most threatening phenomena and addressing it is the biggest challenge for civilized society now-a-days (Iswoyo *et al*., 2018). The growing global population, coupled with shifting food preferences, is placing increasing pressure on food production systems. However, this demand is challenged by the fact that climate change has already taken a toll on global agricultural productivity, as reported by Nature Climate Change, with a 21% reduction in output (Arya, 2022). Some of the key impacts of climate change on agriculture include Altered Growing Seasons, Water Scarcity, Extreme Weather Events, Pest and Disease Spread, Reduced Crop Yields, Food Quality and Safety, Livestock Health, Soil Erosion, Loss of Biodiversity, Economic Impact, Adaptation and Resilience and Migration and Conflict (Anonymous, 2011). Agriculture has indeed evolved into a highly competitive field in today's world. To thrive in this environment, modern agricultural practices must embrace innovation, sustainability, traditional wisdom, and the latest advancements in science and technology. Farmers are expected to blend these elements to remain competitive and faster inclusive growth. In this context, Krishi Vigyan Kendra (KVKs) play a crucial role in the agricultural development of our country. KVKs are designed to act as local resource centres that facilitate the expansion of government initiatives into rural areas. Vardhan et al, (2022) conclude from his research that, there is a very high level impact of KVKs on adoption of climate resilient technology depicted from the adoption level of climate resilient technologies on community level as well as individual level. Apart from the mandates, KVKs are also doing tremendous job towards dissemination of climate resilient technology through National Innovations on Climate Resilient Agriculture (NICRA) project (Vardhan et al., 2021). This highlights the urgent need for agricultural practices to adapt and evolve. To address this critical issue, it is imperative that agricultural practices prioritize sustainability and environmental conservation. One promising avenue for achieving this is through the adoption of innovative technologies. According to Anseera and Alex (2019) regarding changed climatic conditions, there is every need to adapt or to go for mitigation measures to tune with climate change.

Several technologies and practices can help mitigate and adapt to the impacts of climate change on agriculture:

1. **Precision Agriculture**: Precision farming technologies, such as GPS-guided tractors, drones, and sensors, enable farmers to optimize resource use. This includes precise application of water, fertilizers, and pesticides, reducing waste and environmental impact.
2. **Climate-Resilient Crop Varieties**: Developing and adopting crop varieties that are more resilient to extreme weather conditions, pests, and diseases can enhance agricultural resilience. These varieties can be bred or genetically modified to tolerate drought, flooding, or heat stress.
3. **Sustainable Irrigation**: Improved irrigation techniques like drip and sprinkler systems reduce water wastage and energy consumption. Smart irrigation systems, which use data and weather forecasts, can optimize water use further.

4. **Agroforestry**: Integrating trees and woody plants into farming systems can enhance biodiversity, improve soil health, and sequester carbon. Agroforestry can also provide shade and windbreaks for crops, reducing heat and wind damage.
5. **No-Till Farming**: No-till and reduced tillage practices help preserve soil structure, reduce erosion, and sequester carbon in the soil. This can improve soil health and resilience to climate change.
6. **Cover Crops**: Planting cover crops during fallow periods can protect soil from erosion, improve nutrient cycling, and increase carbon sequestration. They also help retain soil moisture and reduce weed pressure.
7. **Climate-Smart Livestock Management**: Implementing practices like rotational grazing, improved feed efficiency, and methane-reducing additives can lower emissions from livestock agriculture.
8. **Vertical Farming and Controlled Environment Agriculture**: These methods can enable year-round production in controlled conditions, reducing vulnerability to weather-related disruptions and conserving resources.
9. **Renewable Energy in Agriculture:** Using renewable energy sources, such as solar panels or wind turbines, can reduce emissions associated with farming operations and energy costs.
10. **Data and AI:** Data-driven technologies and artificial intelligence can provide real-time information on weather, soil conditions, and crop health, helping farmers make informed decisions and optimize resource use.
11. **Sustainable Aquaculture**: Implementing sustainable practices in fish and seafood farming can reduce the environmental impact of aquaculture.
12. **Crop and Soil Monitoring**: Remote sensing and satellite technology can be used to monitor crop health and soil conditions, helping farmers make data-driven decisions.
13. **Water Management**: Efficient water management through technologies like rainwater harvesting, groundwater recharge, and water recycling can mitigate the impact of water scarcity on agriculture.
14. **Organic Farming and Regenerative Agriculture**: These practices focus on building healthy soils and reducing chemical inputs, which can enhance resilience to climate change.
15. **Carbon Farming**: Techniques like reforestation, afforestation, and re-vegetation can sequester carbon and offset emissions.

CONCLUSION

By embracing these technological advancements, farmers can not only enhance their productivity and resilience in the face of climate change but also contribute to reducing the environmental footprint of agriculture. This forward-looking approach aligns with the imperative to meet the rising global food demand while safeguarding the long-term sustainability of our agricultural systems.

REFERENCES

Anonymous, (2011). Climate change, water and food security. Food and Agriculture Organization.pp:1-4.

Anseera, T.P. and Alex, J.P. (2019). Awareness and Adoption of Climate Resilient Technologies by Farmers of Palakkad and Wayanad District of Kerala State. *Indian Research Journal of Extension Education*, **19**(1):7-12.

Arya, S. (2022). How technology can help combat climate change in agriculture. https://www.getapp.ca/blog/3317/technology-combat-climate-change-in-agriculture.

Iswoyo, H., Stoeber, S., Kaimuddin, Yassi, A., Dermawan, R and Ramba, T. (2018). Empowering upland farmers to become more resilient towards climate change experiences from Toraja, Indonesia. IOP Conference Series: Earth and Environmental Science, p. 1-11.

Peddi Naga Harsha Vardhan, Prabhat Kumar Pal and Deepa Roy (2021). Influence of Krishi Vigyan Kendras and Socio-Economic Characteristics towards Adoption of Climate-Resilient Technologies. *International Journal of Environment and Climate Change*, **11**(12): 38-43.

Peddi Naga Harsha Vardhan, Prabhat Kumar Pal, Deepa Roy and Sabita Mondal (2022). Study on Biophysical Impact by Adoption of Climate Resilient Technologies in Agriculture. *Biological Forum – An International Journal*, **14**(1): 1179-1183.