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AN ANALYSIS OF CLIMATE-SMART AGRICULTURE AND ITS MANAGEMENT

Dr. Ashok Kumar*

*SOA,
Sanskriti University, Mathura, Uttar Pradesh, INDIA
Email id: dean.soa@sanskriti.edu.in

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ABSTRACT

The need for the feed is growing in tandem with the population growth. Agriculture has a critical part in supplying food to people all over the globe. Agricultural industries are the most well-known sectors, and they also contribute to a country's economic growth. The agricultural sector is facing a significant problem as a result of global climate change. Changeable weather patterns, shorter growing seasons, drought, severe temperatures, and increased exposure to pests and crop diseases are causing significant difficulties for farmers all over the globe. Farmers will be able to adapt and prepare for the effects of climate change by using climate-smart practices. The main goal of climate-smart agriculture is to increase agricultural output while also making farms more adaptable to climatic changes and lowering greenhouse gas emissions from agricultural products. As a result of the lack of information regarding climate-smart agricultural methods, as well as a lack of resources, socio-economic constraints at the farm level, and so on, climate-smart agriculture techniques face certain difficulties. To overcome all of these obstacles, government authorities, institutions, and key stakeholders should support climate-smart agriculture by offering different educational programs, financial assistance, and instruments. Farmers should be supplied with equipment that allows them to detect climate changes in real time and choose the best crop based on this information. It may be used to transmit messages to farmers in the future after sensing the quantity of water needed for crop growth.

KEYWORDS: *Agriculture, Climate, Farmers, Land, Management, Productivity.*

1. INTRODUCTION

Agriculture is the world's biggest industry in terms of land use, and it is the sole source of human food, occupying about 40% of all available land. It plays a critical role in the country's economic development. Crop food products provide for approximately 78 percent of the world's average per capita energy needs, while other food sources such as milk, eggs, and meat account for another 20%. As a result, the expanding population's food demand is the primary necessity, which can only be met by increasing agricultural production(1). Natural and agricultural components make up ecological development elements. The success or failure of many companies has been determined by the health of its plant organizations. The scientific community has declared unequivocally that global temperatures will increase as a consequence of climate change, which will have a direct detrimental impact on agricultural output. As a result, climate-smart agriculture is gaining popularity around the world as a way to improve and secure the agricultural sector.

Climate-smart farming practice is a term that refers to a collection of actions that have been used in the past in the fields of ecology, environmental protection, climate change, and farming practice. On the other hand, the link between farming and climate variation is underappreciated, particularly given the sector's dual behavior (i.e., farming methods contribute significantly to global anthropogenic GHG (greenhouse gas) release while also being vulnerable to climate variation jerks and pressures). Climate change has a dramatic impact on farmers' livelihoods. Random climate patterns, shorter rising times, scarcities, hazardous temperatures, and increased vulnerability to pest and crop disease pose significant difficulties for the world's small farmers, particularly in tropically populated areas where there is a greater reliance on typical resources. Climate-smart agriculture practices may help planters adapt and prepare for the effects so that they can preserve and perhaps regain their livelihoods(2).

1.1 Objective of Climate-Smart Agriculture practices:

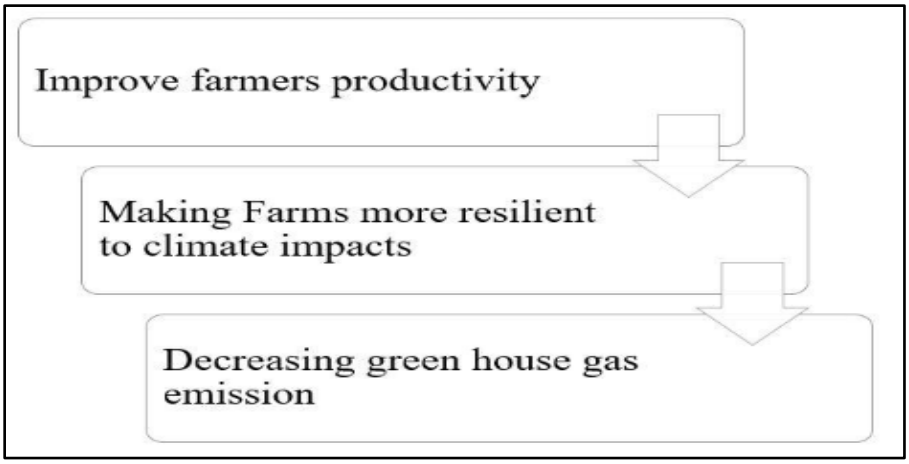

Figure 1: Representation of several objectives of Climate-Smart Agriculture practices.

Figure 1 represents several objectives of Climate-Smart Agriculture practices. Climate-smart agriculture (CSA) practices have three main goals: increasing agricultural productivity to increase income and food security for farmers, making farms more resilient to climate impacts by increasing adaptive capability at various levels, such as farmland to country, and reducing greenhouse gas emissions(3).

1.2 Three pillars of Climate-Smart Agriculture:

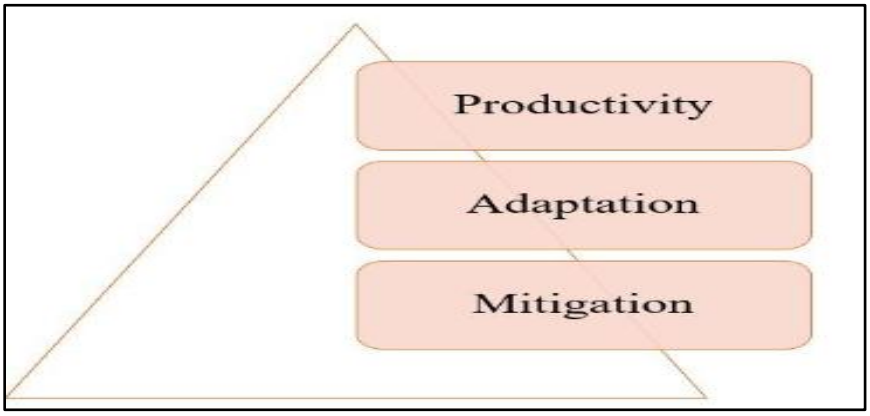

Figure 2: Representation of Three Different Pillars Associated With Climate-Smart Agriculture.

CSA, by definition, must have a lot more to offer than just assisting in the achievement of local sustainable development goals. A number of issues, however, hindered the execution and efficacy of the CSA strategy. The CSA's three pillars work at different scales in terms of geo-economics, geography, and institutions. CSA is seen differently by different parties according on their political beliefs, and it is influenced by a range of funding provisions, decision-making procedures, and business and trade barriers. The proportional importance of the CSA pillars changes depending on native descriptions. The agriculture sector's wide range of mitigation and adaptation methods at different levels reflects the present CSA split(4).

1.2.1 Productivity:

The goal of CSA is to improve agricultural and farm revenues in a sustainable way that does not harm crops, animals, or fish. As a result, food quality and safety will improve. An important idea for improving productivity is sustainable intensification.

1.2.2 Adaptation:

The CSA aims to reduce farmers' exposure to short-term hazards and improve their flexibility by improving their capacity to adapt to shocks and longer-term pressures and flourish. The preservation of ecological services supplied to farmers and others receives particular emphasis. These facilities are required to maintain production while also adapting to changes in the climate.

1.2.3 Mitigation:

CSA strives to reduce or eliminate greenhouse gas (GHG) emissions whenever and wherever feasible. This implies that for every calorie or kilogram consumed, we decrease emissions from food, fiber and gasoline. That is, to prevent agricultural deforestation, we manage soil and trees in ways that maximize their ability to serve as carbon sinks and absorb carbon dioxide from the atmosphere.

1.3 Areas for the Implementation of Climate-Smart Agriculture:

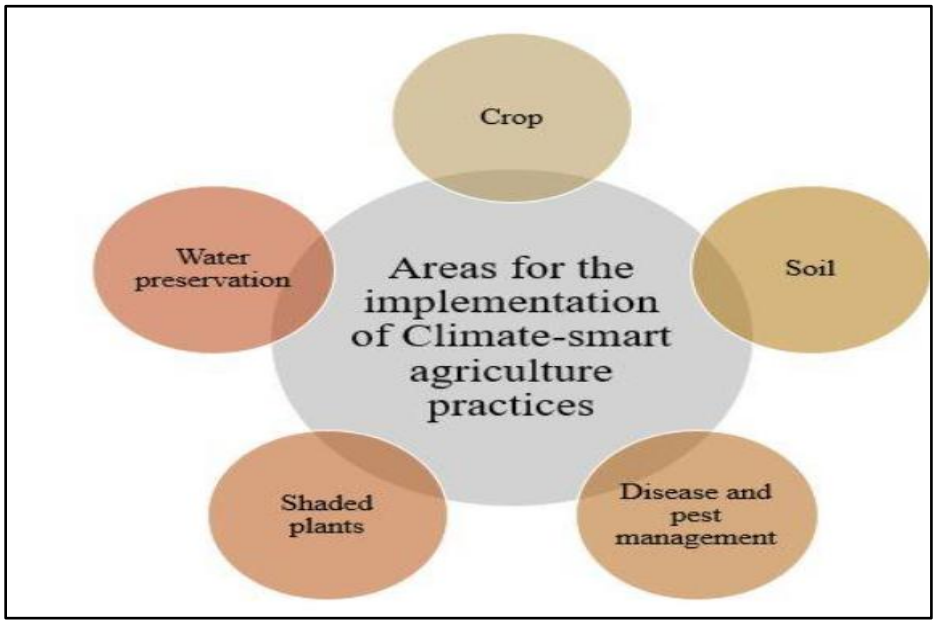

Figure 3: Representation of Areas for the Implementation of Climate-Smart Agriculture.

Figure 3 depicts all of the key areas where climate-smart agriculture may be applied, including soil, crop, disease, and pest management, water conservation, and shaded plants.

- *Crop Management:* Once climate effects and risks have been evaluated, climate smart solutions tailored to a particular countryside, rural population, or even individual acreage may be estimated. In the case of the cocoa plant, collecting and fermenting need a unique technique that is dependent on the climate. In the event of significant rainfall or severe moisture conditions, simple sun dryers constructed of wooden structures and plastic pieces may be utilized to dehydrate beans(5).
- *Soil Management:* Heavy rains may rinse productive top-layered soil, particularly on sloping terrain. Establishing pulverized protection helps to keep top soil in place during heavy rains and is beneficial for drought-prone regions because it helps the soil retain moisture. All actions that improve the quality and structure of the soil increase efficiency, which is a major goal of climate wise farming. In many cases, healthy soil acts as a carbon sink, storing carbon dioxide and keeping it out of the atmosphere, thereby aiding in the fight against climate change.
- *Management of pests and diseases:* Pests and illnesses brought on by global warming have the potential to severely reduce production and perhaps wipe out whole farms. Climate smart farming gives farmers the knowledge they need to apply the right quantity of pesticide at the right time of year to combat new pests. Buying pest-resistant plantlets is also a good idea. Farmers are recommended to use hand weeding as needed in any climate when it comes to weeds, concentrating on dangerous weeds while separating the mushy weeds to replenish soil and prevent nutrient-rich top layered soil from dissolving(6).
- *Shaded Plants:* Regardless of the climatic risk, planting shade trees helps a farm or community: the right number of plants, of the right class, and with the right amount of coverage may help to protect farmland from harsh wind, rain, and sun. Climate-smart trainings help in identifying the best tree class to plant, the best amount of vegetation to plant, and a full shade-tree classification—which may include the use of trees as wind-barriers and living borders, as well as providing shade for harvests that benefit from it. Planting different types of trees that offer protection to their leaves at different periods of the year, especially in warmer and drier climates or areas with more rain, is important to maintaining a continuous canopy, especially in warmer and drier climates or regions with more rain(7).
- *Water Conservation:* Agriculture consumes 70% of the world's available water supply.According to current understanding, if the planet continues to warm, water scarcities, which have been a concern in many places, will become a more serious danger. Climate change may potentially deplete a nearly limitless supply of water. Flooding was caused by a combination of prolonged dry spells that weakened the pulverized soil, followed by severe rains. To network excess water and protect crops from illnesses caused by moisture, drainage systems and trenches may be built. Climate smart agriculture is synonymous with sustainability; it integrates many sustainable methods to address the climate's unique challenges in a given agricultural community. To begin, the risk linked with climate is measured since a field that suffers ongoing water scarcities would need different strategies than one that experiences periodic floods. Using a variety of methods and taking into consideration local ecosystems and crops, we can determine the risk associated with climate change and vulnerability throughout the country. It makes climate smart agriculture "smart"

by allowing farmers to discover the right combination to meet their farmland's climate challenges—as well as provide flexibility for future impacts(8).

1.4 Problems And Its Solution For The Execution Of Climate Smart Agriculture Practice:

The fundamental methods of climate-smart agriculture are often similar to those of integrated agricultural management. Most mitigation and adaptation methods and practices are similar or more similar in that they assist to improve living behavior, water quality and quantity, and biodiversity advantages. As a result, adopting a climate-smart strategy will aid in the addition of new resources and understandings to integrated agricultural management(9).Figure 4 represents several challenges associated during the implementation of climate smart farming.

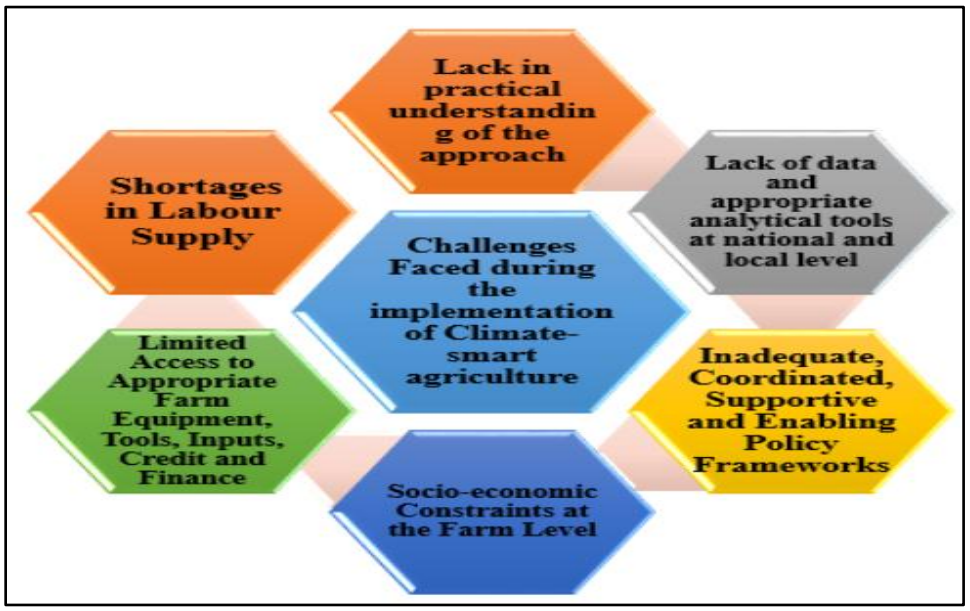

Figure 4: Challenges Associated During the Implementation of Climate Smart Farming.

2. LITERATURE REVIEW

According to Alvin Chandra et al. the link between climate change and agriculture has evolved into four main cross-functional programs: research, economics, management, and policy. Scientists are focusing their efforts on crop origins, farming methods, farmland management strategies, and how agricultural practices may complement the three pillars of climate-smart agriculture (CSA), which are mitigation, food safety, and adaptation. These CSA pillars perform different geo-economics, official, and three-dimensional tasks. It is also suggested that the issue of scales be addressed, as well as taking into account differences in CSA descriptions by promoting broad community participation. Priorities for cross-disciplinary research will aid in bridging the gap between science and policy. The global scientific research agenda requires a reintroduction of funding to smallholder "on-farmland" and "off-farmland" authenticity. This entails reconsidering the CSA debate's political and institutional elements, which may be achieved in part via cross-disciplinary research that enhance the communal, administrative, and financial scale of study(4).

Sara J Scherr et al. showed that the many goals of climate-smart farming, such as adjustment and mitigation goals, as well as improvements in living, efficiency, or other bionetwork facilities, would often need an integrated landscape strategy. On-farm and climate-smart methods, variety

in agricultural systems as well as landscape use, and farmland usage connections management to achieve interactions between multiple objectives are all characteristics of a climate-smart environment. The implementation of climate-smart landscapes includes multiple stakeholder forecasting procedures, supporting supremacy organizations that include a term of resources, coordinated financial contrivances that enable the subsidy of inventiveness with several interconnected goals, and surveillance and estimation methods that justify for a range of landscape effects. Climate-smart landscape projects in the Sahel, Madagascar, Australia, and elsewhere demonstrate how different settings are already being created. Although these situations demonstrate a degree of success, lessons may be learnt from them for people who are still in the early phases of their careers. If properly implemented, the results may assist to update future stakeholder capacity investments and institutional development in all of its aspects, resulting in climate-smart landscapes(8).

According to Campbell et al. SI (Sustainable Intensification) and CSA are two linked concepts. The major distinction in the CSA is the emphasis on climate change adaptation and mitigation outcomes. SI requires both adaptation and mitigation. Invariably, all CSA patients are SI cases. In order to enhance food safety and accelerate financial growth in developing nations, a climate justice perspective necessitates measures to assist poor farmers who are most impacted by climate change but are less affected by it. Regular activities to improve food safety and assist agriculturists have significant mitigating benefits, as well as advanced start-up costs (e.g. additional labour prices). Identification of behaviors' that promote the adoption of smart-climate alternatives is a major issue. Agricultural policy is inextricably linked to rural financial aid in many countries. Low-income nations are increasingly able to steer output in more productive and sustainable directions. Enquiry associates and growth associates have a major role to play in identifying and encouraging environment-smart actions that improve country side publics, expand small-holder living conditions and jobs, and avoid adverse community and ethnic influences such as compulsory relocation and terrestrial tenancy harms. Many poor nations may see a significant increase in agricultural financing, and the CSA and SI goals will need to be set against this complex political backdrop(10).

3. DISCUSSION

Global agriculture has been much more productive during the past several decades. Improvements in manufacturing techniques, as well as harvest and cow breeding tactics, result in a significant boost in food output while only increasing agricultural area by 10%. Climate change, on the other hand, is expected to exacerbate farming's existing difficulties. Food safety and climatic fluctuation are intimately linked in the agricultural industry, and there are substantial possibilities to convert the area into climate smart techniques that resolve equitably. Climate change puts the stability and long-term viability of manufacturing under risk. Climate change is expected to further reduce production and raise unpredictable demand. Agricultural production systems must evolve toward higher output and, more crucially, reduced production erraticness in the face of climate change and other agriculture and socio-economic challenges in order to preserve and improve food safety.

In order to maintain performance and profitability, production systems must become more resistant to disruptions, or adept at executing effectively in the face of disruptions. Changes in natural resource management (e.g., water, genetic resources, soil minerals, and cropland) as well as improved productivity in the processing of these resources and inputs are required for more efficient and resilient agriculture. Transitioning to such systems will offer significant mitigation advantages by increasing carbon sinks and reducing discharge per unit of agricultural item for

consumption. CSA practices are described as a variety of on-farm activities such as agroforestry, land use, forestry, agronomy, livestock, rustic and feeding, soil and water management, and bio-energy. Climate smart farming is defined by three main structures, according to an assessment of climate variation subtleties associated with agriculture: climate smart application at the arena and ranch level; variety of farmland usage through land that offers flexibility; and controlling of farmland usage connectionsonl and scapes to achieve communal, commercial, and environment al influences.

Multiple stakeholder forecasting, helpful site governance and supply tenure, and spatially based sites are all required to incorporate climate smart farming backgrounds with the following characteristics (i.e. for successful promotion and maintenance over time, in the face of complex financial, communal, environmental, and weather situations): One of the major obstacles to the development of sustainable agriculture is the significant dependence of agricultural systems on rainfall. Due to repeated droughts and the unpredictability of rainfall, farmers are especially susceptible to climate-related risks. As a consequence, climate information services (CIS) are considered as one-of-a-kind strategies for reducing weather-related hazards. Agriculturalists are informed about rain delivery configurations, concentration and regularity, wind tempests, and severe actions since CIS is accessible from any ethnic knowledge techniques or meteorological data.

4. CONCLUSION

Agriculture is the world's biggest business in terms of agricultural usage, and it is the sole source of human food, occupying about 40% of all accessible land. It is critical for the country's economic development. According to the scientific community, climate change would cause global temperatures to rise, which will have a direct detrimental effect on agricultural growth. As a consequence, climate-smart agriculture is becoming more popular across the globe as a way of enhancing and safeguarding the agricultural industry. CSA is for Community Supported Agriculture, and it refers to a set of practices that have been used in the fields of ecological environmental science, preservation, climate change, and farming in the past. The three main goals of climate-smart agriculture are as follows: a) Increasing agricultural productivity to increase farmland productivity and food security; b) Making farms more resilient to climate impacts by increasing cumulative adaptive capability at various stages, such as farmland to country; and c) Reducing greenhouse gas emissions associated with agriculture.

Productivity, adaptation, and mitigation are the three pillars that are interconnected for attaining the Climate Smart Agriculture objectives. Crop management, soil management, pest and disease control, and other key areas where climate-smart agriculture may be applied are listed below. Challenges encountered during the implementation of climate smart farming include a lack of applied knowledge of this approach, a lack of information and appropriate diagnostic instruments, and a labour scarcity, among others. To address these issues, climate-smart agriculture is being widely and at all scales implemented in a nation with advanced technical ability, and it is being supported by institutions, several stakeholders, and the government in order to reduce all of the major challenges associated with climate-smart agriculture, as agriculture plays a key role in economic development. It may also be used to identify and alert farmers, allowing them to supply water for agricultural development.

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