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Climate-Smart Agriculture : Need of the Hour

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Abstract

To address present food security and climate change issues, agricultural sector must become climate-smart. Agriculture which includes forests and fisheries, is critical for food security, rural income, and other necessary items including energy, fiber and feed. Working at the landscape level with an ecosystem approach, including forests, fisheries, crops, and livestock systems, is critical for responding to and mitigating the effects of climate change. Farmers, fishermen, and forest-dependent people will need institutional and financial support to make shift to climate-smart agriculture. Agriculture is one of the most vulnerable sectors to climate change effects, it also accounts for 14 percent of global greenhouse gas emissions. Furthermore, agriculture is a major contributor to deforestation and land degradation, which account for another 17% of emissions. Management and governance strategies based on ecosystem concepts will be required for sustainable use of natural resources. Climate-smart agriculture is based on sustainable agricultural and rural development goals, if met will help to achieve the Millennium Development Goals (MDGs) of hunger reduction and better environmental management. Policies at the regional, national, and international level must be evaluated to better reflect the need for consistent and comprehensive approaches to agricultural development, climate change and food security protection. The main goal of developing nations should be to achieve the four elements of food security (availability and access to food, food with nutrition, and food supply stability). Climate financing is required to ensure that investments are sufficient to enable the transition to climate-smart agriculture. Climate-smart agriculture tools and information must be improved and shared at a greater extent.

Key words : Climate smart agriculture, Greenhouse gas emissions, MDG, Food security.

Farming and food systems are affected by climate change, which introduces unpredictability and susceptibility concerns for farmers and as well as the policymakers. (Vermeulen *et al*., 2013).

There is no doubt that the effects of climate change pose big problems for food security around the world. This is expected to get worse and worse in the coming years due to factors like growing population, economic growth, rapid urbanization, and the recurrence of natural disasters like high temperatures, drought, severe frosts and intensive rainfall among others. It is anticipated that by the year 2050, the living circumstances of around 9 billion people throughout the globe would deteriorate, with hunger and poverty taking the lead and making it far more challenging to keep bread on the table. (World Bank, 2015; FAO, 2013). As a repercussion of this, a number of international organizations, including the World Bank and the Food and Agricultural Organization (FAO), are collaborating with one another to develop agricultural systems that will improve and stimulate the production of food on all scales, from the international to the local. Therefore, a global movement toward climate-smart agriculture (CSA) has been hailed by a variety of organizations, including stakeholders such as scientists and policymakers, as well as investments, and across corporate, governmental, and civil society sectors. (Lipper *et al*., 2014; Taylor *et al*., 2018)

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Although the concept of CSA may be found in a variety of scientific and technical publications, different definitions have been provided by a variety of groups, including agricultural researchers, research organizations, and organizations that focus on climate change. Increased adoption of a 'climate-smart agriculture' (CSA) strategy is recommended as a way to ensure sustainable agricultural productivity (FAO, 2010). CSA is built on three primary pillars, which are: boosting agricultural output and incomes in a sustainable manner; adapting to and creating resilience to climate change; and decreasing and/or eliminating greenhouse gas emissions relative to traditional approaches (FAO, 2013). According to the description of the CSA, one of its primary goals is to provide assistance to initiatives that advance food and nutrition security, which will enable the incorporation of necessary adaptation and mitigation strategies. (Lipper *et al.*, 2014). It makes possible the evaluation of various techniques and technology in terms of the results they produce, in particular with regard to the accomplishment of national development and food security goals in the context of a changing climate. Therefore, the objective of this paper is to review on the role that climate-smart agriculture and its methods play in the production of a sustainable ecosystem.

Features of Climate Smart Agriculture: Building resiliency and adapting to climate change as well as decreasing greenhouse gas emissions in comparison to a "business as usual" or "baseline scenario" is one of the primary tenets of the Climate Smart Agriculture (CSA) concept. Another important aspect of the CSA idea is that it seeks to increase food security in a manner that is not only sustainable but also increases productivity and incomes. In its definition of climate-smart agriculture, the Food and Agriculture Organization of the United Nations (FAO) describes it as consisting of three pillars:

(1) Raising agricultural output and earnings in a way that is both sustainable and beneficial to food security;

(2) Adjusting to the effects of climate change and increasing our resistance to them (adaptation); and

(3) Mitigating the effects of climate change by lowering and/or eliminating emissions of greenhouse gases wherever possible.

CSA has been designed to reach millions of rural homes, and the goals for this outreach are both ambitious and unambiguous (FAO, 2018). Drought resistant crops, integrated soil nutrient management, watershed management methods, greater integration of livestock on smallholder mixed crop-livestock farms and land rehabilitation in pastureland have all been recognized as possible contributors to these three pillars. (Vanlauwe *et al.*, 2010; Campbell *et al.*, 2014; FAO, 2018; Rosenstock *et al.*, 2019). However, there are also unresolved problems regarding the priority of measures in certain contexts or the best way to monitor progress toward these objectives over time, the latter of which is especially problematic given the lack of solid baselines against which interventions may be measured. (Van Wijk, 2014).

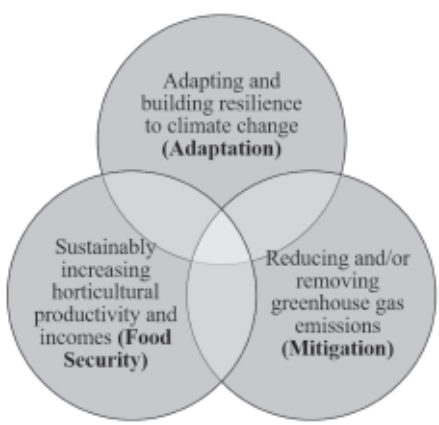

Fig. 1. Features of CSA (Adopted from FAO, 2010)

Ways to achieve Climate Smart Horticulture : A lot needs to be done in order to achieve the goal the Climate Smart Horticulture. It is very necessary to combine agricultural, fisheries, forestry, and livestock systems in order to effectively adapt to the effects of climate change and contribute to its mitigation. This may be accomplished by working at the landscape level using an ecosystems approach. At every level, there is a need for cross-sectorial approaches and policies that are consistent across the agricultural, food security, and climate change spheres. For farmers, fishermen, and other forest-dependent peoples to successfully make the shift to climate-smart agriculture, they will require help from both institutions and the financial sector. Some climate-smart practices are currently in existence and have the potential to be scaled up; however, in order to achieve this goal, significant expenditures will be required in the construction of a knowledge base and the development of technology. Climate-smart agricultural investments must be linked to both public and private funding sources, as well as integrated into long-term development plans. (FAO, 2010).

Implementation of Climate Smart Horticulture : Climate-smart solutions need a significant amount of prior knowledge and are very location-dependent. However, putting this strategy into practice can be difficult, in part because there is a shortage of resources and knowledge. It is crucial to have a solid grasp of what these barriers are and how they have an impact on the implementation of CSA practices. It will take a significant amount of work to build up the necessary knowledge and capabilities in order to make CSA a reality. Doberman and Nelson (2013) proposed the following methods as a potential solution to this problem. They suggested putting these proposals into action.

1) **Diagnosis :** Knowing the situation in which an effort or intervention will be carried out and how it fits in with global agro-ecological knowledge.
2) **Contextualized principles :** By finding the right economic, social, and environmental principles that fit the needs of farmers.
3) **Getting it right locally :** By giving local communities the tools they need to improve the performance of the farming system based on agro ecological principles and local preferences.
4)
5) **Scaling and support :** by making the effort or intervention bigger (in terms of how many people are involved and how big the area is) and by putting in place the necessary value chains, services, support systems, and business models that can run on their own.
6) **Evidence :** By keeping track of how things are going and writing them down, and by learning how to improve the local and global knowledge base, we can influence policies that will help us keep going.

Four-step bottom-up processes to make agriculture climate-smart (CSA implementation) is also given by (Knaepen *et al*., 2015) (Fig 2).

Climate Smart Agriculture and Sustainable Agriculture : The lack of clear

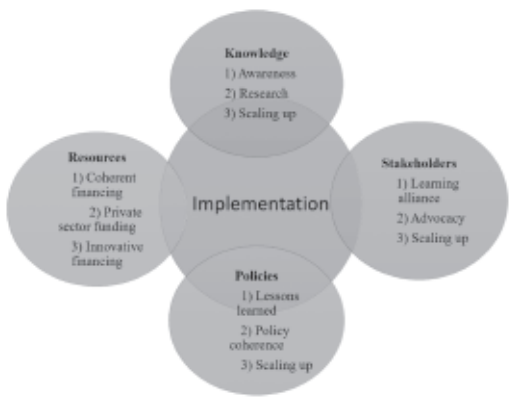

Fig. 2. Implementation of Climate Smart Agriculture (Knaepen *et al*.)

principles that can be used to define a CSA practice has been a major point of criticism for Climate Smart Agriculture (CSA). As a result, there are concerns that the concept and branding could be used to advance forms of agricultural development that are not sustainable or desirable. This discussion was fueled by the incorrect impression that CSA was fundamentally a proposal for a new form of agricultural practice, giving rise to issues directly tied to continuing and heated debates regarding technology for sustainable agriculture. CSA is not meant to give a new set of sustainability principles; rather, it is a way of incorporating the particulars of adaptation and mitigation into policies, programmes, and investments that support sustainable agricultural growth. Therefore, the methods and practices associated with CSAs have to be in accordance with the principles that drive sustainable agricultural and food systems. (Mesfin, 2020).

Conclusion

It is projected that the global population would reach 9 billion people by the year 2050, which will also need most likely doubling the existing food production in order to fulfil the demand. The problem of climate change is a significant obstacle that must be overcome in whatever way that this rise is intended to be accomplished. Consequently, interventions are necessary in order to feed the fast expanding population of the world, particularly in emerging nations. In light of this, the need for adaptation and mitigation measures is now higher than ever in order to satisfy the requirements for food in the face of a climate that is constantly shifting. In this regard, the climate-smart agriculture (CSA) strategy provides a workable and long-term solution for the accomplishment of optimal crop output of a high quality with minimal adverse impacts on the environment. CSA refers to" agricultural that sustainably raises production, develops resilience, decreases or eliminates GHGs wherever practicable, and enhances attainment of food security national and development goals". Therefore, it is the need of the hour to adopt Climate Smart Horticulture for the development of sustainable ecosystems.

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