JUST AGRICULTURE
multidisciplinary e-Newsletter

Climate Smart Agriculture

Deblina Roy[1*]
[1]Ph.D. Research Scholar, Department of Agronomy, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal-741252

ARTICLE ID: 58

Introduction

Climate Smart Agriculture (CSA) is an integrated approach for landscape management that helps to adapt farming or agricultural methods, livestock and crops to the current anthropogenic climate change and, where possible, address it by reducing greenhouse gas emissions, while taking into account the growth of the world's population to ensure food security. So, the focus is not only on sustainable agriculture, but also on increasing agricultural productivity. In other words, climate smart agriculture (CSA) is an approach that helps to guide the actions needed for transformation and reorient agricultural systems to effectively support development and ensure food security in a changing climate (FAO, 2010).

Objectives of CSA

CSA aims to achieve three main goals. CSA invites you to look at these three goals together at different scales - from farm to landscape, from local to global - and over short and long-time horizons, with taking into account national and local specificities and priorities.

1. **Sustainably Increasing Agricultural Productivity and Incomes:** About 75% of the world's poor live in rural areas and agriculture is their main source of income. Experience has shown that agricultural growth is very effective in reducing poverty and increasing food security in developing countries. Increasing productivity as well as reducing costs through more efficient use of resources are important ways to achieve agricultural growth. The yield gap", which shows the difference between the output farmers get on the farm and the technically feasible maximum yield, is quite significant for smallholder farmers in developing countries.(FAO, The State of Food and Agriculture. 2014). In a similar way, livestock productivity is often much lower than it could be. Reduce these gaps by improving the productivity of agro-ecosystems and increasing the efficiency of soil, water, fertilizers, animal feed and other agricultural inputs to bring higher returns for agricultural producers, to reduce poverty

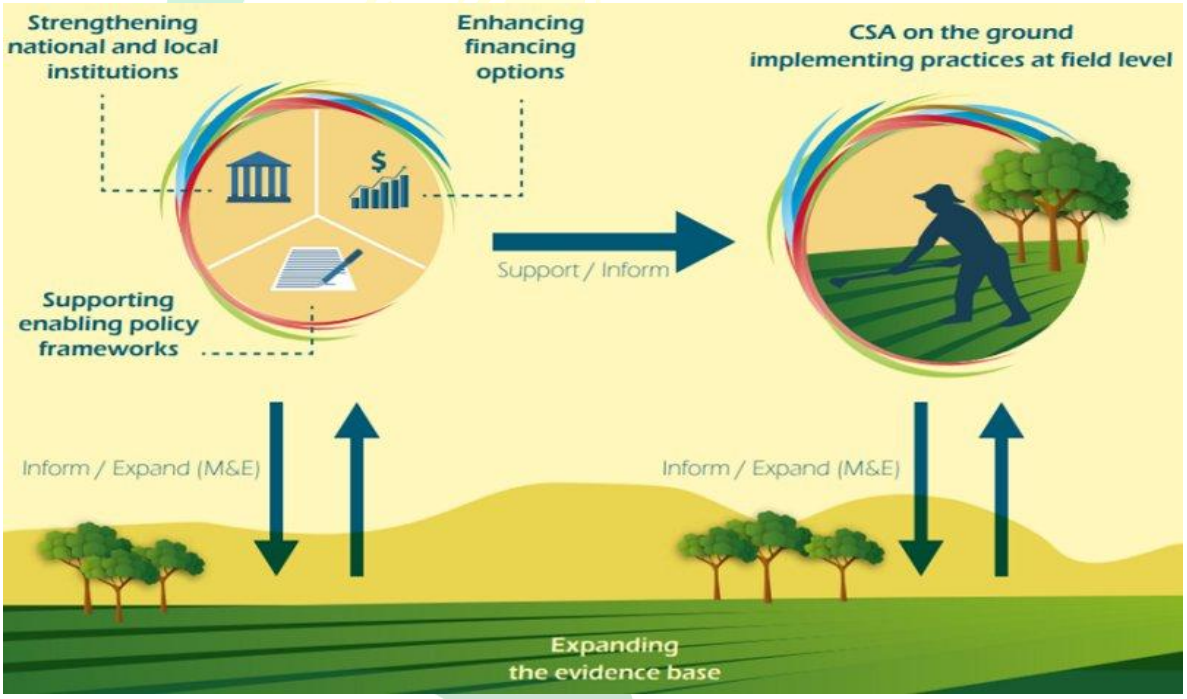
JUST AGRICULTURE
multidisciplinary e-Newsletter

and increase food supply and access. These measures can often lead to reductions in greenhouse gas emissions compared with previous trends.

2. **Adapting and Building Resilience to Climate Change-** According to the fifth assessment report recently published by the Intergovernmental Panel on Climate Change (IPCC), the impact of climate change on agricultural and food production already evident in many parts of the world, with negative impacts more frequent than positive ones. Over medium and long term, the average and seasonal maximum temperatures are projected to increase continuously leading to higher average rainfall, but these effects are not evenly distributed, with overall wet regions and seasons becoming wetter and arid regions and seasons becoming drier. There has been an increase in the frequency and intensity of extreme events, such as droughts, heavy rains, resulting floods and maximum temperature. This increased exposure to climate risks, seen in many parts of the world, poses a significant threat to the potential to improve food security and reduce poverty among populations with low-in come dependent on agriculture. These negative effects of climate change can be minimized and even avoided, but this requires the development and implementation of effective adaptation strategies. Given the site-specific impacts of climate change, as well as the wide variations in agro-ecosystems and livestock and fisheries systems, the most effective adaptation strategies will vary even across countries. A range of potential adaptation measures have been identified and can provide a good starting point for developing effective adaptation strategies for a particular site. This includes improving the resilience of agro-ecosystems by increasing ecosystem services through the use of agro-ecological principles and landscape approaches.
3. **Reducing and/or Removing Greenhouse Gas Emissions, Where Possible:-** Agriculture, including land use change, is a major source of greenhouse gas emissions, responsible for about a quarter of all anthropogenic GHG emissions. Agriculture contributes to emissions primarily through the management of crops and livestock, as well as through its role as a major driver of deforestation and peatland degradation. Non-CO_2 emissions from agriculture expected to increase due to projected agricultural growth following business as conventional growth strategies. There are several ways to reduce greenhouse gas emissions from agriculture. Reduce

JUST AGRICULTURE
multidisciplinary e-Newsletter

emission intensity (e.g.,equivalent CO_2/unit products) through sustainable intensification is a key strategy for agricultural mitigation. This process involves implementation of new practices that improve the efficiency of inputs used so that the increase in agricultural output is greater than the increase in emissions.Another important way to reduce emissions is to increase carbon sequestration in agriculture. Plants and soil have the ability to remove CO_2 from atmosphere and store it in their biomass - this is the process of sequestering carbon. Increased tree cover in crop and livestock systems (e.g., through agroforestry) and reducedsoil disturbance (e.g., reduced tillage) are two ways to sequester carbon in agricultural systems. However, this form of emission reduction may not be long-term, if trees are cut down or the land is ploughed, stored CO_2 will be released.



Components of Climate Smart Agriculture

CSA is not a set of practices that can be universally applied, but rather an approach that includes various elements integrated into the local context. CSA is about both on-farm and off-farm actions and integration of technologies, policies, institutions and investments. Various elements that can be incorporated into climate-smart farming approaches include:

JUST AGRICULTURE
multidisciplinary e-Newsletter

1. **Management of Farms, Crops, Livestock, Aquaculture and Capture Fisheries: -** Climate smart agriculture depends heavily on the biophysical and socioeconomic context. Crop options include changing varieties or species, changing crops schedule and managing nutrients such as micronutrients, mulch, or organic fertilizers. Breeding or livestock options include improving pasture and feed quality, modifying herd management, and specific responses to heat stress. In fisheries, variation of location, quota and species are all involved, while in aquaculture, combinations of species and temperature management are climate-smart options. Comprehensive agricultural management solutions include production of diversification, integrated crop-livestock systems, agro forestry, rehabilitation of organic soil, limiting soil erosion, use of energy efficiently, use of biomass fuel, integrated pest management, and improved irrigation and water resource management.
2. **Landscape or Ecosystem Management: -** The CSA also encourages examining agricultural systems within the larger landscape and ecosystem context, to better understand the links between agricultural production and ecosystem services within and beyond agricultural systems. The role of water resource management and land use change in food security, adaptation and mitigation of the impacts of landscapes is an important factor. Regulation of ecosystem services such as hydrology or biodiversity, including in soils, can create production, adaptation and mitigation co-benefits. Multi-purpose forest management can generate benefits in terms of food security, development, adaptation to climate change (microclimate), water management, soil protection, agro-biodiversity protection. (pollinators) and contribute to carbon storage and reduction of greenhouse gas emissions.
3. **Services for Farmers and Land Managers: -** Increasing the adaptability of farmers, ranchers, fisheries and forestry requires an expansion of a wide range of services. These include climate information services, such as forecasting or early warning systems, consulting services linking climate information to agricultural decisions, and financial services such as credit and insurance. Social protection as well as new index-based weather insurance products that can increase the ability of smallholders to invest in agriculture despite increasing climate change.

JUST AGRICULTURE
multidisciplinary e-Newsletter

4. **Changes in the Wider Food System:-** Agricultural production is not the sole focus of adaptation and mitigation measures to support food security and livelihoods. Throughout the value chain, innovations in harvesting, storage, transportation, primary and secondary processing, retail and consumption activities are essential elements of an enabling and incentivizing environment needed for CSA

Actions Required for Implementation of Climate Smart Agriculture

CSA approaches include four major types of actions, which are as follows:

1. Expand the evidence base and assessment tools to identify agricultural growth strategies for food security that incorporate necessary adaptation measures and potential mitigation.
2. Develop a policy framework and consensus to support large-scale implementation.
3. Strengthen national and local institutions to enable farmers to manage climate risks and adopt context-appropriate agricultural methods, technologies and systems.
4. Improving financing options to support implementation, linking climate and agricultural finance.

Methods for Assessment of Climate Smart Agriculture

The Food and Agriculture Organization of the United Nations has identified a number of tools for countries and individuals to assess, monitor and evaluate integral parts of CSA planning and implementation by FAO.

JUST AGRICULTURE
multidisciplinary e-Newsletter

1. **Modelling System for Agricultural Impacts of Climate Change (MOSAICC)**: This model system helps the countries to make an interdisciplinary assessment of the impacts of climate change on agriculture through simulations.
2. **Global Livestock Environmental Assessment Model (GLEAM):** This simulates the interaction of activities and processes related to animal production (milk and meat production) and the environment. The model is designed to assess several types of environmental impacts, such as greenhouse gas emissions, nutrient and water use, land use and land degradation, and interactions with biodiversity.
3. **Sustainability Assessment of Food and Agriculture (SAFA) System:** The SAFA guidelines provide a holistic and overarching framework for assessing sustainability in the agriculture and food sectors, including crop and livestock production, forestry and fisheries. Monitoring and evaluation activities establish baselines, define indicators, measure progress, and evaluate the successes and failures of CSA interventions.
4. **Economics and Policy Innovations for Climate Smart Agriculture (EPIC**):The programme works with governments, universities, research centres and other institutional partners in support of their transition to CSA through the use of economic and policy analysis. It does this by identifying and harmonizing climate smart agricultural policies, analysis of impacts, effects, costs and benefits as well as incentives and barriers to the adoption of climate smart agricultural practices.
5. **Ex-Ante Carbon Balance Tool (EX-ACT):** This rating system was developed by FAO. During the project development phase, it provides prior estimates of the impact of agricultural and forestry development projects, programmes and policies on carbon balance.
6. **Climate Risk Management (CRM):** This integrated approach addresses vulnerabilities to short-term climate change and long-term climate change within the framework of sustainable development. A key element of FAO's CRM is to provide weather and climate information products to farmers, fishers and ranchers for risk assessment to enhance opportunities at the local level.
7. **Monitoring and Assessment of Greenhouse Gas Emissions and Mitigation Potential in Agriculture (MAGHG) Project:** This project is part of the MICCA

JUST AGRICULTURE
multidisciplinary e-Newsletter

program. Under this project, member countries are assisted in collecting and reporting data on GHG emissions in the Agriculture, Forestry and Other Land Uses (AFOLU) sector for reporting requirements related to the UNFCCC.

Conclusion

The Climate smart agriculture is the saviour of the world. Various smart incentives such as organic farming and zero budget natural farming should be taken into consideration. Renewable energy can also be the better solution for climate smart farming. Integrated farming system model can also be the right choice for climate smart agriculture. Precision agriculture and its new applications can also be a game changer for Climate smart agriculture.