**Topic: Women’s Contribution To Climate Smart Agriculture Practices**

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***Abstract:*** *Climate-smart agriculture (CSA) integrates sustainable practices to address food security and climate change challenges, emphasizing productivity, resilience, and reduced greenhouse gas emissions. Women play a pivotal role in implementing CSA, particularly in developing countries, where they comprise over 50% of the agricultural workforce. Regarless of their contributions, women face barriers such as limited access to resources like land, credit, and farm machinery, which affect their ability to adopt CSA practices effectively.Though women do not get recognized for their participation in agriculture activities, they contribute in various CSA activities. This current chapter discusses the contribution of women in different Climate Smart Agriculture practices and their importance though literature reviews.*

***Keywords:*** *Climate Smart Agriculture (CSA), sustainable practices, climate change, women, contribution.*

**Introduction:**

Climate-smart agriculture (CSA) is an integrated approach to managing landscapes-cropland, livestock, forests and fisheries--that address the interlinked challenges of food security and climate change. CSA is a set of agricultural practices and technologies which simultaneously boost productivity, enhance resilience and reduce GHG emissions. Although it is built on existing agricultural knowledge, technologies, and sustainability principles, CSA is distinct in several ways.

Today, the global agrifood system emits [one-third](https://www.carbonbrief.org/food-systems-responsible-for-one-third-of-human-caused-emissions/) of all emissions. Global food demand is estimated to [increase](https://www.nature.com/articles/s43016-021-00322-9) to feed a projected global population of [9.7 billion people](https://www.un.org/en/global-issues/population) by 2050. Traditionally, the increase in food production has been linked to agricultural expansion, and unsustainable use of land and resources. This creates a vicious circle, leading to an increase in emissions (World Bank, 2024). Without a pronounced transformation of agriculture, it is recurrently argued, humanity will quite simply struggle to put enough food on the plates of a projected nine billion people by 2050. To respond to this projected Malthusian crisis, international institutions from the World Bank to the Food and Agriculture Organisation (FAO) have lauded a global transition to “Climate-smart Agriculture” (CSA). The latter comprises a unified governance framework designed to diffuse agricultural methods and technologies that not only increase the productivity of a given crop but also build resilience to climate change and reduce greenhouse gas emissions. It is this ‘triple-win’ approach – the incorporation of intensification, adaptation and mitigation goals into a single rubric – that defines CSA (Taylor,2018).

About 70 per cent of the total working population of women is extensively involved in agricultural activities. Mainly rural women are engaged in agricultural activities as paid laborers or as cultivator doing labor on their own farm or engage in supervision of certain activities of agriculture and animal husbandry and also participation in post harvest operations.In agriculture, women are involved in sowing, transplanting, weeding, irrigation, fertilizer application, plant protection, harvesting, winnowing, grading, cleaning and storing of farm produce Nature and extent of their involvement differ with the variations in agro-production systems (Kumar, 2013).

**Climate Smart Agriculture Practices: Women’s Contribution/Participation**

 Women’s contribution to smart agriculture is an essential for achieving food security and sustainability. Women’s access to farm resources positively contributes to the implementation of CSA. Moreover, women contribute more than 50% of the agricultural labor force in developing countries, but women farmers are comparatively disadvantaged compared to male farmers in controlling productive resources (land, animals, credit, and farm machinery). Women farmers’ limited access and control over physical and human capital affect their livelihood and capacity to adopt different CSA practices at the farm level (Shahbaz *et al*, 2022). Nessa (2024) in her study stated that the scope of women empowerment through CSA method as they often contribute a substantial portion in workforce but their contributions are unrecognized in the society.

1. **Integrated Farming System**

Integrated farming system (IFS) is a valuable approach to addressing the problems of sustainable economic growth for farming communities in the country. In Indian context, farming is a family occupation and farm women are associates to their husbands performing various activities in farm and home level. Women have precious contribution in Integrated Farming System along with their household chores. They are mostly involved in crop production activities, livestock management, horticulture, pisciculture, mushroom cultivation, compost making, post-harvest processing, value addition and marketing of the produce (Nayak and Kapoor, 2019). In crop production, they handle tasks like land preparation, sowing, weeding, harvesting, and storage. Livestock activities involve feeding, milking, animal care, and preparing value-added products like butter and ghee. In horticulture, women engage in growing fruits, vegetables, and mushrooms, alongside making products like pickles and jams. Fisheries see women's involvement in fish drying, shrimp processing, and ornamental fish rearing. Post-harvest management includes food processing, storage, and marketing, often supporting micro-enterprises. Women also contribute to sustainable farming by preparing organic manure and vermicompost, recycling farm waste, and utilizing dried plant materials as firewood substitutes, ensuring environmental and economic sustainability.

A study by Paul *et al* (2015) in Tripura found that in livestock enterprise, majority of the activities were performed by the female in plain and in hilly. In poultry and fishery enterprise also there were important contribution were coming from male and female. Again a study was conducted in some villages of Karnataka and a similar results were found.Women involved in fisheries had complete responsibility of drying, salting, processing, marketing and management of cash in coastal villages of Maharashtra (DRWA, 2011). It is evident that women are an integral part of Indian agriculture.

1. **Organic Farming**

 "Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity (FAO/WHO Codex Alimentarius Commission, 1999). Organic farming is not only a sustainable agricultural practice but also a significant strategy in mitigating climate change. The potential of organic farming to reduce greenhouse gas emissions, enhance carbon sequestration, and promote biodiversity makes it a vital component in the global effort to combat climate change. All over the world, women are playing a crucial role in the organic food chain. On the farm, women are very important for saving seeds, maintaining biodiversity, production of traditional crops and livestock, which in turn provides healthy and safe food, and saves the culinary culture, they take leading roles in ecotourism and didactic farm activities (Verma and Panwar, 2019). However, Ozsayin and Korkmaz, (2021) in their study in Turkey found that women mostly participated in activities such as organic material collection, irrigation, compost making and seed growing and concluded that participation level of rural women in organic farming activities is not satisfactory. Nishi *et al.* (2021) also conducted a study in Bangladesh and found that women mostly participated in activities like collection of composting material, collection of organic product from own residence, decomposing of compost, irrigation etc. Similarly, in this study it is also stated that participation of women in organic farming is still not satisfactory and necessary steps concerning extension approach as well as adequate support should be provided to increase the participation by ensuring barrier free participation of rural women in organic farming.

1. **Agroforestry *(Goncalves et al, 2021)***

 Women play a vital role in management, education, and income generation within indigenous communities, particularly in agroforestry systems. They contribute significantly to family food security, income, and improving local micro-climates. Women’s involvement empowers them and benefits their families, yet gender disparities persist. Men typically oversee tree cultivation, while women manage subsistence crops. Women, despite being the majority workforce in agriculture (e.g., in Africa), are often excluded from public policies, perpetuating poverty and inequality. In Colombia, men dominate decisions about crop species, while women handle domestic work, food preparation, and product sales. Gender equality in agroforestry could improve community well-being.

Many women face barriers to land ownership, as systems often prioritize men.Globally, decision-making in farming is still male-dominated, but women are gradually gaining influence. In northern Vietnam, women show strong preferences for agroforestry methods, contributing to food production and cultural resilience.

1. **Crop Production and Management**

 Rural women work from dawn to dusk to support their families through participation in crop production (Abbasi and Jafri, 2013). Several studies found that women had played a vital role in the crop production. They take part in preparing the arable land for sowing, managing and harvesting of food and cash crops. They also participate in weeding, manuring, harvesting, threshing, seed selection or sorting, storage, processing, marketing agricultural produce and cutting of fodder for domestic animals. females’ contribution in reproductive, productive and community work is significantly higher than that of males (Ogato et al, 2009).

1. **Soil and Water Management**

Improving agricultural land and water management is critical to global food security, due to rapid population growth and climate change. Measuring and monitoring the use of soil and water resources in agricultural food production is important - approximately 70 percent of global freshwater is used by the agricultural sector, yet much of that water gets wasted because of poor water management practices (ITEA,2024). Soil is an animated top layer of the earth's crust composed of various materials such as minerals, organic matter, soil water, and soil air. Soils differ in thickness, structure, texture and their genetic processes. This resource is responsible for the production of crops. Water resources are potentially useful natural resources of water. 97% of the water on the earth is saline water and only 3% is fresh water. Just over two-thirds of the glaciers and polar ice caps are frozen. The use of water includes agriculture, industry, home, recreation and environmental activities. A farm woman is one of the important or key users of natural resources such as soil and water (Singh and Sareen, 2021).Women emerge as pivotal contributors to this conservation effort due to their traditional engagement with daily activities intimately connected to natural resources, fostering a reduction in waste and excessive consumption. Despite their significant role, governmental attention towards encouraging women’s involvement in natural resource conservation remains disproportionately minimal (Khandelwal et al, 2024). A farm woman does most of the agricultural operations with a man or sometimes more than a man (Singh and Sareen, 2021). Studies show that women play a crucial role in soil and water conservation (SWC), with regional and contextual differences. A study in Rajasthan highlighted that women in irrigated areas were highly involved in soil conservation and land management, while those in rainfed areas had limited roles in water management due to insufficient training, except for handling drip and sprinkler systems. In Gujarat, women contributed more to soil conservation than water conservation, with maximum participation during the execution stage and minimal involvement in planning. Sherka (2023) found that women's engagement in diverse SWC practices, including agroforestry, crop rotation, and contour plowing, noting that factors such as education, land size, household composition, and extension contact significantly influenced their participation.

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