Climate change is already being felt in Rwanda’s rural farming communities, where erratic weather patterns are disrupting agricultural production. Droughts, floods, severe storms, and disease outbreaks are increasingly shaping how farmers work the land.

According to the Ministry of Agriculture and Animal Resources, long-term shifts in temperature and rainfall patterns are contributing to lower crop yields, reduced incomes, and worsening land degradation.

Much of Rwanda’s farming takes place on hillsides, which make up the bulk of the country’s arable land. These areas are now heavily affected by soil erosion, with an estimated 1.4 million tons of fertile topsoil lost every year.

At the same time, heavy rains and flooding continue to wash away soils, kill livestock, destroy crops, and damage rural infrastructure, including roads, bridges, markets, and homes.

For farmers on the ground, these changes are no longer abstract.

Jean Marie Twagirayezu, a farmer from Murama Sector in Kayonza District, says last season he planted maize and beans expecting timely rains, but they arrived much later than usual.

“The weather conditions have changed. The harvest has reduced. It is very hot, the rains are unreliable, and the situation is not good,” he says.

National planning projections also highlight the pressure ahead. The National Land-Use and Development Master Plan 2020–2050 estimates that Rwanda will need about 102,973 square kilometres of productive land to feed a projected population of 22 million.

In Ndego Sector, Eastern Province, farmer Sylvain Nyirangirimana recalls more predictable seasons in the past, when rainfall followed familiar cycles and forests were still common in the area. He says many of those forests have now disappeared, cut down for charcoal production and firewood.

“The weather is more difficult to predict now than before. As farmers, we depend entirely on agriculture. We need a steady balance of sun, warmth, and rain to produce food reliably,” he explains.

Against this backdrop of climate uncertainty, smallholder farmers in Rwanda's Eastern Province are increasingly turning to climate-smart agriculture. By shifting to more resilient crops and improved farming practices that boost both income and nutrition, they are slowly adapting to a changing climate and trying to stay one step ahead of its impact.

According to John Murenzi, an agriculture expert working with Rwanda Development Organization(RDO) in eastern province, CSA practices bring important adaptation and productivity benefits to farmers.

"The CSA concept reflects an ambition to improve the integration of agriculture development and climate responsiveness. It aims to achieve food security and broader development goals under a changing climate and increasing food demand." He notes.

According to him, the concept is built on three key pillars, that is investing in land husbandry, water harvesting, and hillside irrigation to increase resilience to climate change, reduce water erosion and soil loss, halt land degradation, and increase land productivity" He explains.

In eastern province, a farmer like Desire Umugabocyane practicing agroforestry is earning a decent livelihood after diving into climate smart agriculture.

The 52 year old father, who supports a family of five in Murama sector in Kayonza district, attributes this to the CSA training he received five years ago.

Around his two hectare of land, Umugabocyane has planted a lot of Calliandra, acacia and calothyrsus flowering plants as a soil conservation hatch to prevent soil erosion.

Apart from the protecting soil surface, Umugabocyane who practices zero grazing observes that plants benefit him as a fodder to feed his cow and seven goats.

"We feed fodder legume for animals in return; the cow gives us milk that we feed the children particularly to fight acute malnutrition. The other benefit is that, we use the manure from the cow by returning it to the soil to help the soil to retain moisture, if we get little rain; the underground stays moisturized, and also attracts

worms that help water flow through the soil which helps to stabilize production.” He explains.

Umugabocyane’s wife also says, the over 160 trees act as windbreaker and rain catcher, act as shades and also provide nitrites to the roots as well as leaves, and are a source of firewood for the kitchen.”

“Our main source of income as a family is bananas, maize, beans, cow peas, cassava, sweet potato, macadamia, followed by milk and vegetables, we sell the firewood and timber for more income. Our expenses are school fees, hospital bills plus farm inputs” She adds.

According to the Food and Agricultural Organization (FAO), agriculture, soil erosion and deforestation together contribute to a third of total greenhouse emission.

Murenzi further explains that slashes, burn as wells ploughing, strongly reduces soil water holding capacity hence reducing nitrites. A field covered with weeds and undisturbed soil structure keeps the moisture which stand forces of soil erosion.

“All that the plant needs in the soil must stay in the soil for the plants to absorb them, if the soil is not covered, it loses some much water through evaporation. Health soil contains moisture and small microorganism that contribute nitrates to the soil” He explains

He explains that without top cover, the soil heats up, moisture evaporates, many of the microorganisms die and soil loses fertility. The impact of rain on soil causes further damage and erosion, but mulching stops sunshine from entering, moderates temperature of soil organisms, and protects soil surface from rain.

Jean Baptist Ndikumana, a farmer in eastern province who practices crop diversification says that Improvement of soil fertility on his three hectares of land has enabled his yield increases by 3 times for soybeans, cowpeas and maize, 4 times for beans, and 5 times for Irish potatoes.

The 49 year-old, incorporates his garden with crotalaria juncea because it supports each other with cereal plants on the other hand, it protects his crops from a tough pest.

“When planting maize seeds, I tend to leave all the surroundings covering the soil round. We don’t plant in bare and loose soils, I plant seeds in soils covered with crops and plant residues” he notes. I leave the trash on the ground to gradually decompose to give the soils the required nitrates,” he says.

Besides maize growing, the 36 year old from Nyamirama sector, Kayonza district has a poultry farm and a vegetable garden. He owns 270 chickens. He says around 4-5 trays of eggs on a daily basis.

“I sell each tray of at Rwf 3,800 to Rwf 4,000 (about US$3.6 to US$3.8) on a good day. We also consume some of the eggs, children take some at school. We grow carrots, cabbage, tomatoes, onions, broccoli, green pepper and eggplants in a vegetable garden” adds Ndikumana.

After being trained through the Participatory Integrated Climate Services for Agriculture (PICSA) approach five years ago, Jean Claude Muvunyi from Rwinkwavu sector says that he now owns an agroforestry farm, where at least a fruit tree can yield him about Rwf 6,000 to 8,000 in four months.

He has learned how to earn money from tree planting and belongs to a village savings group meeting. He welcomes the idea because it helped increase his small income.

“Apart from earning income from selling mature trees, the trees also help in fighting erosion, purify the air we breathe, filter the water we drink, prevent erosion, and help address climate change by absorbing planet-warming carbon.” he added.

So far, 2600 farmers from Kayonza, Burera,Ngororero and Nyanza Districts have been trained, given tree seedsto plant tree practices and to gather climate information, analyze and decide the right time for cropping.

The incomes earned by these rural households are spent on healthcare insurance, children school fees and other basic necessities.

Alice Keza, head of social affairs in the Murundi sector, says that they’re observing a change in standards of life in these households.

“Most of these households, especially women farmers, belong to a community small saving group, as a result, they’re earning significant benefits in order to fight poverty.” she explained adding that in their sector alone, more than 100 are

benefiting from the scheme.

However, Keza warns that other rural farmers may need to be aware of CSA practices, and to learn how to implement them on their farms.

She thinks that, It is difficult for farmers, especially in rural communities, to transition to CSA, even if they are interested, some of the CSA pretices require significant investments in new technology or infrastructure.

Other challenges are related to policy and regulatory barriers that make it difficult for them to implement climate smart agriculture practices. For instance, the use of specific technologies or practices, or there may be a lack of support from government agencies regarding funding or technical assistance.

“We may need help finding markets for their climate smart agriculture products, mainly if there is limited demand for them. It is difficult for farmers to recoup their investments in climate smart agriculture practices and make the transition economically viable..” Ndikumana adds.