

**CLIMATE SMART AGRIBUSINESS FINANCING (CSAF) FORESTRY AND  
WASTE MANAGEMENT**  
*GLOBAL ISSUES & LOCAL PERSPECTIVES*

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## **Preface**

This book adopts an exegetical approach as well as a pedagogic model, making it attractive agriculture and environmental economics teachers, professional practitioners and scholars. It is eschews pedantry and lays bars the issues in such clarity that conduces to learning. The book elaborates on contemporaneous **Climate Smart Agribusiness Financing (CSAF) Forestry and Waste Management** issues of global significance and at the same time, is mindful of local or national perspectives making it appealing both to international and national interests. The book explores the ways in which **Climate Smart Agribusiness Financing (CSAF) Forestry and Waste Management** issues are and should be presented to increase the public's stock of knowledge, increase awareness about burning issues and empower the scholars and public to engage in the participatory dialogue **Climate Smart Agribusiness Financing (CSAF) Forestry and Waste Management** necessary in policy making process that will stimulate increase in food production and environmental sustainability. **Climate Smart Agribusiness Financing (CSAF) Forestry and Waste Management : Global Issues & Local Perspectives** is organized in two parts. Part One deals with The Concept of **Climate Smart Agribusiness Financing (CSAF)**, Part Two is concerned with The Concept of **Forestry and Waste Management**

**Eteyen Nyong; August 2026**

## **Chapter One**

### **Sources and Constraints to Agroforestry Financing in Nigeria**

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#### **1.0 Concept of Agroforestry**

Agroforestry is a sustainable land management system that intentionally integrates trees and shrubs with crops/or livestock, combining agriculture and forestry technologies for environmental, economic and social benefits. According to Amonum et al. (2009), agroforestry is a distinct land-use system which may include combination of agricultural, forestry, horticultural and animal husbandry subsystems and practices. It integrate trees with crops/or animals with the main objective of reducing risk and increasing total productivity. This practice improves biodiversity, soil health, and water management, and finally, improves farmers' income. Agroforestry seeks positive interactions between its components, aiming to achieve a more ecologically diverse and socially productive output from the land than is possible through conventional agriculture. Agroforestry is a practical and low-cost means of implementing many forms of integrated land management (that seeks to reduce human impacts on land), and

it contributes to a green economy by promoting long-term, sustainable, and renewable forest management, especially for small-scale producers.

Agroforestry can be seen as any land-use technique involving planting of trees or deliberate retention of trees by farmers within the farm or homestead for a variety of purposes which include wood, fodder, fruits, medicine, shade, soil improvement, water conservation, etc. (Adedire, n. d). According to Leakey (1996), agroforestry is a dynamic, ecologically-based natural resource management system that, through the integration of trees on farms and in agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land-users at all levels.

## **2.0 Agroforestry Practices/Techniques**

Agroforestry practices help farmers to understand how different systems work to enhance agricultural productivity and environmental health. Agroforestry systems or practices combine woody plants and agricultural crops on the same area. This combination offers numerous ecosystem services such as improved soil fertility, water storage, and erosion control. At the same time, woody plants remove carbon dioxide (CO<sub>2</sub>) from the atmosphere, making it one of the most important carbon sinks in agriculture (Thomas, 2023).

Agroforestry practices are classified into different systems based on their structure and usage. Each system utilizes the interaction between agricultural and forestry components to the advantage of the ecosystem and the agricultural yield. Some of these practices are found below.

- **Silvopastoral System:** this system integrate trees with pastures and livestock. The system is designed to optimize the use of land resources. By integrating trees into grazing areas, farmers can improve forage production and provide shade and shelter for animals, thereby enhancing their welfare and increase in meat or milk production (Gabriel, 2024). Some benefits of this practice are;
  - a. Increased biodiversity,
  - b. Improved soil fertility through organic matter leaf litter,
  - c. Soil erosion control,
  - d. Beautification of landscapes,

- e. Improved carbon sequestration (carbon sink)—absorption of carbon dioxide from the atmosphere.
- **Agrisilvicultural System:** this is characterized by the combination of trees with crops. This methodology can enhance productivity by creating a more resilient farming environment. Trees provide windbreaks, reducing crop damage and water evaporation. Trees can also offer opportunities for alternative income through fruits, nuts or timber production.
- **Agrosilvopastoral System:** this system combines trees, crops and livestock on the same piece of land. This approach maximizes productivity through diversified outcomes and enhances ecosystem sustainability. Some of the advantages of this practice are;
  - a. The space use is highly optimized,
  - b. Enhance nutrient recycling through organic matter decomposition (ie. it maintains soil fertility),
  - c. Greater genetic diversity,
  - d. Increased resilience against environmental changes.
- **Alley Cropping:** this is a common agroforestry practice that involves planting rows of trees with crops grown in the alleys between them. This practice allows farmers to benefit from both the crops and the trees, thereby optimizing the use of available space and resources. Alley farming significantly reduce soil erosion. Selecting sustainable tree species that do not compete heavily with crops for sunlight and nutrients are vital for alley cropping.
- **Forest Farming:** this is also known as “*multistory cropping*” that involves cultivating high-value crops under the protection of a forest canopy. This method allows farmers to manage a forest for both timber and non-timber products. The practice helps to optimize land use and biodiversity conservation. Some products of forest farming include medicinal herbs, mushrooms, snails, berries and nuts, shade-grown coffee or tea, among others.
- **Windbreaks and Shelterbelts:** this consists of planting rows of trees or shrubs to reduce the force of the wind across agricultural fields. This practice protects crops and livestock,

prevent soil erosion and improve microclimates within farming sites. It is vital to know wind direction before planting the trees or shrubs. Some benefits of this practice include;

- a. Reduced wind speed, thereby minimizing crop damage,
- b. Reduction of soil moisture loss via evaporation,
- c. Improved crop yields through microclimate enhancement,
- d. Providing a habitat for beneficial wildlife.

- **Home Garden:** tropical home gardens consist of an assemblage of plants which may include trees, shrubs, vines and herbaceous plants growing in or adjacent to a homestead or home compound (Amonum et al., 2009).
- **Apisilviculture:** this involves a carefully chosen woody species grown for their nectar-producing flowers and pollen valued by bees. This can boost wax and honey production. Many farmers have gone into apiculture (bee farming) of recent for huge revenue generation.
- **Aquaforestry:** here, trees are planted around fish ponds to provide fodder for herbivorous fish. It is a practice that link trees with aquaculture.

### **3.0 Agroforestry Financing**

Agroforestry financing involves specialized loans, grants and sustainability-linked incentives designed to overcome high upfront costs and long-term returns of combining trees with crops or livestock. To embark on agroforestry practice farmers need fund to acquire land, clear the land, and purchase plant seeds or seedlings, and to pay labourers. All these attract a lot of money, hence sources of fund to pay for the above mentioned inputs and services is therefore apt. Some of the sources of funds that farmers can explore are itemized below.

1. *Government Grants:* in some countries, government give financial grants/aids to farmers that practice agroforestry and sustainable farming. Government grants play vital roles in promoting agroforestry and sustainable farming practices ([fundsforngos.org](http://fundsforngos.org)). Many countries have established programmes aimed at supporting farmers who adopt environmentally friendly practices such as agroforestry. For instance, in the United States, the Natural Resources Conservation Service (NRCS) offers various grants through its Environmental Quality Incentives Programme (EQIP). This programme provides financial assistance to farmers that embark on conservation practices like agroforestry. Aside

financial assistance, government often come with technical assistance and resources that can help farmers successfully implement agroforestry practices.

2. *Private Foundation Grants:* this is another significant source of funding for agroforestry and sustainable farming initiatives. Many philanthropic organizations see the relevance of sustainable agriculture in addressing global challenges such as climate change and food insecurity. These grants often focus on innovative approaches that can empower local communities and enhance their resilience to environmental changes. Most importantly, private foundations seek to support projects that demonstrate measurable impacts on both the environment and local economies. Private organization like the Catholic Relief Services among others provide grants and support for initiatives that promote agroforestry and sustainable land management practices in Nigeria.
3. *International Funding:* International funding opportunities are available for those that engage in agroforestry and sustainable farming practices. Organizations like Food and Agriculture Organization (FAO) of the United Nations, provide grants and technical assistance to communities that implement sustainable agricultural practices. The FAO's initiatives often focus on enhancing food security while promoting environmental sustainability through agroforestry systems. Other organizations include International Development Banks (IDBs) like the World Bank (WB) offers funding for large scale agroforestry projects in developing countries like Nigeria. The World Bank Forest Investment Programme for instance supports countries in implementing sustainable forest management practices which include agroforestry components.
4. *Corporate Sponsorship and Investment:* Corporate sponsorship and investment for agroforestry and sustainable farming is another avenue for funding agroforestry and sustainable farming initiatives. Many corporations are promoting and willing to invest in projects that align with their corporate social responsibility (CSR) goals. Companies involved in agriculture, food production, or environmental conservation often seek partnership with NGOs to support agroforestry initiatives.
5. *Crowdfunding and Community Support:* of recent, crowdfunding has emerged as a powerful tool for financing agroforestry and sustainable farming projects. Platforms like *Kickstarter*, and *Gofundme* allow individuals and organizations to raise funds directly from the community. This approach not only raise financial support but also foster a sense of

‘ownership’ among community members who invested in the success of local agricultural initiatives.

6. *Research and Development Grants:* research and development (R&D) grants are vital for advancing knowledge in agroforestry and sustainable farming practices. These grants support innovative research projects that explore new techniques, technologies, or methodologies that can enhance agroforestry systems’ effectiveness. For instance, organizations such as the National Institute of Food and Agriculture (NIFA) in the United States provide R&D grants to improve agricultural sustainability (fundsforngos.org). In Nigeria, universities and other research institutions like IITA, NRCRI, etc. collaborate with NGOs to carryout studies that assess the impacts of agroforestry on biodiversity, soil health, or climate resilience.
7. *Loans from Village Savings and Loans Association or Cooperatives:* smallholder farmers may not have the initiatives to access fund from some of these formal sources of fund listed above due to factors such as illiteracy and lack of awareness. But they can easily access funds from their cooperatives or village savings and loans associations (VSLAs) which they are members to fund their agroforestry practices. One of the approaches in trying to improve the living standard of the rural poor is that which focused on the financial sector through rural pro-poor financial services such as the VSLAs (Shehu, 2025). The VSLA is one of the methodologies designed to help rural people to mobilize resources and have access to finance to invest in their economic activities such as agroforestry and sustainable farming. According to Karlan et al. (2010), VSLAs have for the past decades proven to be one of the remarkable tools, platforms, modes, or drivers of economies worldwide, which have positively impacting the living standards of the rural dwellers, especially in developing countries. VSLAs or cooperatives are strong sources of fund for rural farmers that need fund to startup agroforestry and sustainable farming.

#### **4.0 Constraints to Accessing Funds for Agroforestry Practices**

Accessing funds for agroforestry and sustainable farming is hindered by a combination of high initial costs, long return-on investment timelines, and systemic barriers in financial and land tenure systems. The smallholder farmers face more of these challenges due to their small nature of land holdings, lack of awareness and most importantly, their low literacy levels. Some of these constraints are summarized below.

- i. High initial costs of seedlings, planting and management at the early stage when there is no immediate return.
- ii. Long investment, as trees take several years to mature, hence delaying revenue for farmers.
- iii. Limited sources of credit for farmers to explore, and farmers may not have the necessary prerequisites to access funds from some of these formal financial institutions.
- iv. Limited access to markets and high competition can lower their profitability.
- v. Land tenure system which hinders long-term ownership make farmers unwilling to plant trees.
- vi. Restrictive and complex government regulations on tree harvesting and selling discourage farmers from embarking on agroforestry practices.
- vii. Smallholder farmers have small landholdings which may not allow them contemplate going into agroforestry system.
- viii. Limited knowledge on high-quality tree species and their management techniques.
- ix. Poor access to extension services impede specialized training and information on agroforestry practices.
- x. High labour needs and cost for planting and maintaining trees is another serious factor constraining agroforestry practices by farmers in Nigeria.

## **5.0 Concept of Sustainable Farming**

Hawken (1994) described sustainability as the maintenance of the economic state of the environment regardless of the external pressure by people. Sustainable farming includes an enduring agricultural production system that ensures or fosters a friendly environmental and ecological ecosystem. Sustainable farming systems are established to exploit the full potentials of existing soil nutrients, soil organisms, and energy flow and water cycles (Chikaire and Abdulwahab, 2020).

Sustainable farming is the farming system that is close to nature; it minimizes waste, giving less damage to the environment, and yet profitable. Succinctly put, sustainable farming is the integrated system of plant and animal production practices that satisfies human food needs while enhancing environmental quality, by utilizing non-renewable resources efficiently, and ensuring long-term economic viability of farmers. It focuses on soil health, water conservation, and reducing chemical inputs to create resilient agricultural ecosystems. The goal of

sustainable agriculture is cultivating crops and livestock as well as reducing environmental impacts. Sustainable farming maintains the stability of the ecosystem and soil health, hence differentiating it from ‘*industrialized agricultural practices*’ which is heavily dependent on synthetic fertilizers, pesticides and other agrochemicals. Sustainable agriculture is an agricultural model that focus on the long-term conservation of natural resources and the promotion of environmentally-friendly practices. Its objective is to meet the food need of the present without compromising the ability of future generations to meet their own needs. The approach incorporates innovative methods such as crop rotation, agroforestry and the judicious use of water and energy resources. Sustainable agriculture is anchored on three fundamental pillars that guide farming practices.

- a. **Economic sustainability:** this concerns profits. The aim is to ensure fair and stable incomes, while promoting the long-term economic viability of farming activities.
- b. **Environmental protection:** this include activities that are aimed at reducing agriculture’s environmental footprint, conserving biodiversity, protecting soil, water and air quality, and optimizing use of pesticides and fertilizers.
- c. **Social protection:** this aim to improve living conditions of farmers, farm workers and rural communities. It also focus on fair working conditions, high safety standards and access to healthy and nutritious food.

## **6.0 Techniques and Benefits of Sustainable Agricultural Farming**

Many farming methodologies support sustainable farming practices (Schap and Cunningham, 2026). Some of these practices include;

- a. **Crop rotation:** this involves planting of different crops in sequence to improve soil health, break pest cycles and reduce overdependence on synthetic fertilizers and pesticides. This system assist in replenishing vital nutrients that are either used-up by harvested plants or lost to drainage or soil erosion. It also combats pests and weeds naturally, and prevents long-term soil degradation.
- b. **Intercropping:** this is the practice of growing two or more crop species simultaneously on the same piece of land to maximize land use, increase biodiversity, and enhance yield. This system lowers disease spread, hence reducing the need for herbicides.

- c. *Conservation tillage*: this is the reduction or avoidance of tillage to minimize soil disturbance and soil erosion. The practice improves water retention capacity and facilitate carbon sequestration (carbon sink).
- d. *Integrated pest management (IPM)*: this involves the combination of biological (natural predators), physical and chemical tools to manage pests with minimal environmental impacts.
- e. *Agroforestry and cover crops*: integrating trees and shrubs into farms or landscapes to stabilize soil and protect crops, while cover crops like legumes prevent soil erosion and facilitate nitrogen fixation into the soil. The practice also helps sequester carbon, thereby mitigating climate change.
- f. *Water management*: this system employs efficient irrigation practices like drip irrigation to minimize waste of water. Drip irrigation and rainwater harvesting contributes to more efficient use of water.
- g. *Growing of nitrogen-fixing plants*; like legumes (beans, peas, clover, soybeans, etc.) to decrease fertilizer needs. Nitrogen-fixing bacteria are vital microorganisms that convert inert atmospheric nitrogen gas into usable compounds like ammonia.
- h. *Soilless farming (hydroponics)*: this practice involves the use of certain techniques to grow food crops without soil; this allows all year round space-efficient urban-focused production. Specifically, soilless farming or hydroponic is a sustainable method of growing plants without soil by supplying nutrients directly through water. This enables year-round crop production, as it reduces water usage and protects crops from pests, this makes the practice ideal for urban or space-constrained areas. The practice uses substrates like coco peat or coconut coir (the coarse fibre from the outer husk of coconut), perlite (a natural heat-expanded volcanic lightweight stones used for gardening) or water commonly found in greenhouse setups. Plant nutrients are mixed into water reservoir, along with high levels of oxygen efficiently to the plant roots.

### **Benefits of Sustainable Farming**

According to Schap and Cunningham (2026), there are various health and environmental benefits of sustainable farming, some of these are;

- a. The use of non-synthetic fertilizers which decrease human exposure to toxic chemicals,

- b. Sustainable agriculture aids environmental conservation by reducing energy consumption by up to 30%,
- c. Sustainable agriculture allows soil to remain healthy by preventing soil erosion. The practice preached against over-exploitation of soil and promoting practices such as crop rotation, and composting.
- d. The practice aids in water conservation due to better management of water resources,
- e. It improves biodiversity by avoiding intensive monoculture and adopting biodiversity-friendly practices and sustainable agriculture. Biodiversity conservation plays crucial role in regulating agricultural ecosystems. It supports the presence of pollinating insects, and natural pest control assistants.
- f. It limits air and water pollution, as the level of agrochemical usage is greatly reduced.
- g. It promotes carbon sequestration in the soil. This is a long-term storage of carbon in plants, soil or geologic formations, and the ocean. The concentration of this gas in the atmosphere can drive climate change-related problems, the capturing, storage and reuse of this gas is therefore crucial for human and plant ecology.

## **7.0 Conclusion**

Agroforestry and sustainable agricultural practices which involves integrating trees with food crops and livestock in an environmentally-friendly way is acknowledged as the surest way to manage available resources for current and future use. Several of this agroforestry practices were adopted by farmers, despite the financial constraints faced. This therefore calls for adequate funding of agroforestry and sustainable farm practices by government, NGOs or other actors in the agricultural sector.

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