CLIMATE SMART AGRICULTURE, FOOD SECURITY AND SUSTAINABLE DEVELOPMENT

GLOBAL ISSUES & LOCAL PERSPECTIVES volume One

Edited by

Eteyen Nyong

Ijeoma Vincent-Akpu

Bassey Ekpo

Muhammad Hussaini

Udensi Ekea Udensi

Mansur Bindawa

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[1,2,3] Department of Agricultural Extension, University of Agriculture and Environmental Sciences, Umuagwo

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[1]National Cereals Research Institute, P.M.B 8, Bida, Nigeria, ORCID: 0000-0002-9345-1112
[2]Department of Agronomy, Bayero University Kano, P.M.B 3011, Kano State, Nigeria
ORCID: 0000-0003-0639-009X
[3]Department of Crop Science, University of Calabar, Cross River State, Nigeria, ORCID: 0000-0002-8513-7457; seabarahm.agr@buk.edu.ng +2348024695219

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Department of Agricultural Extension and Management Technology
Email: hopembube@gmail.com & baridanu.mbube@fecorlart.edu.ng

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[1]Department of Geography, Federal College of Education, Odugbo, Benue State
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[3]Department of Agriculture, Federal College of Education, Odugbo, Benue State
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*,[a]Igbojionu, D.O., [b]Igbojionu, J.N.

[a]Department of Agricultural & Bo-environmental Engineering Technology,
Federal College of Land Resources Technology, Owerri, Imo State
[b]Department of Soil Science &Technology,
Federal College of Land Resources Technology, Owerri, Imo State, Nigeria
**a Corresponding author email:igbojionudonatus@gmail.com*

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Department Of Forestry, Wildlife And Environmental Management, Olusegun Agagu University Of Science And Technology, Okitipupa, Ondo State, Nigeria

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*Eric, E.E., ** Ejizu, A.N. and *Akpan, U.F.

*Forestry Research Institutes of Nigeria, Ibadan, Swamp Forest Research Station Onne, Rivers State, Nigeria.

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*[1]Department of Horticultural Technology, Federal College of Horticulture Dadin-kowa Gombe State Nigeria, *Corresponding author: jkapsiya.hort@fchdk.edu.ng*

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[2]*Department of Biology, Federal College of Education (Technical), Akoka, Lagos, Nigeria.*
*vfakinjogunla.faq@buk.edu.ng

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[1]Department of Geography, Federal College of Education, Odugbo, Benue State

[2]Department of Agricultural Science, Federal College of Education, Odugbo, Benue State

Email: elishaikpe@fceodugbo.edu.ng

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College of Agriculture and Animal Science

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[1]Shittu, E.A*., [2]Bassey, M.S, and [1]Buhari, F.Z

[1]Department of Agronomy, Bayero University Kano, P.M.B 3011, Kano State, Nigeria
ORCID: 0000-0003-0639-009X
[2]National Cereals Research Institute, P.M.B 8, Bida, Nigeria ORCID: 0000-0002-9345-1112
*Corresponding Author email: seabarahm.agr@buk.edu.ng

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Eteyen Nyong and G. E. Okon

Department of Agricultural Economics, Akwa Ibom State University, Nigeria

eenyong16@gmail.com

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 Agriculture, Food Security and Sustainable Development** 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 agriculture (CSA) food security, Sustainable Development 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 agriculture, food security, and sustainable development necessary in policy making process that will stimulate increase in food production and environmental sustainability.

Climate Smart Agriculture, Food Security and Sustainable Development: *Global Issues & Local Perspectives* is organized in three parts. Part One deals with The Concept of **Climate Smart Agriculture**, Part Two is concerned with The Concept of **Food Security And** and Part Three deals with the Concept of **Sustainable Development**

Eteyen Nyong; October 2025

Chapter Eleven
Climate Smart Agriculture, Food Security and Sustainable Development: Homegarden Agroforestry Perspective

[*]Eric, E.E., [**] Ejizu, A.N. and [*]Akpan, U.F.

[*]Forestry Research Institutes of Nigeria, Ibadan, Swamp Forest Research Station Onne, Rivers State, Nigeria.

[**]Forestry Research Institutes of Nigeria, Ibadan, Federal College of Forestry, Ishiaghi, Ebonyi State, Nigeria.

*Corresponding author: estydavies@gmail.com

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Introduction

In recent decades, homegardens have primarily served to meet the basic needs of small families, especially in rural settings. In many counties, homegardens provide multiple goods and are composed of various plant growth habits – trees, shrubs and herbaceous plants growing in or adjacent to homesteads (Mattsson *et al*., 2015). Homegarden agro-forestry is an important ecosystem in the conservation of useful plant and animal species since they contain very large numbers of species which are often absent or disappearing from other production systems as well as provision of a wide range of ecological benefits and services and a valuable set of products for the rural poor (Amberber *et al*. 2014). Globally, biodiversity conservation in homegardens is currently on the increase.

Definition of homegarden

Homegarden has been viewed and described by different researchers. Kebebew (2018) stated that, homegarden areas represent land-use systems involving deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial agricultural crops and invariably livestock. Ofosu-Bamfo *et al*. (2023) pointed out that plant diversity and ethnobotanical importance of home gardens in Ghana's middle belt; system of farming, resolute cultivation and management of multipurpose trees and shrubs are followed in close relationship with annual, biennial and perennial crops with or without animal husbandry within the compounds of individual houses. Among all agro-systems, homegarden is identified and recognized to be the least comprehended and commands the least attention. Homegarden is

viewed as the home having a common boundary or edge and very adjacent lands that is habitable by the family household for their living and submitted that this land space aids subsistence farming especially for the rural poor dwellers.

Homegarden is a dwelling with its land and buildings, occupied by the owner or any dwelling with its land and buildings where a family makes its home. Homesteading is a lifestyle of self-sufficiency characterized by subsistence agriculture, home reservation of food, and may or may not also involve the small-scale production of textiles and clothing, for household use or sale (Rita, 2017). In addition, Ukaegbu (2014) pointed out that all agroforestry practices should possess three major attributes which include: productivity, sustainability and adaptability. Akhter *et al.* (2014) upheld that, a wide range of plant resources found in the homestead forests and the rural economy depends on productivity of the natural resources which is intimately linked with the biodiversity in the ecosystem.

Homegardens are the multi-storied vegetation of shrubs, bamboos, palms, and trees that produce materials for a multitude of purposes including fuel, shelter, structural materials, fruits, fodder and medicines, hence are the *in-situ* conservation sites of wide range of plant biodiversity. Similarly, Borokini (2013) pointed out that the maintenance of viable and self-sustainable populations of wild species in their natural state represents the ultimate goal, but habitat destruction is inevitable and endangered species need to be preserved before they become extinct.

Species Components in Homegardens

Homegarden plants includes trees, shrubs, herbs, climbers, palms and grasses, cultivated and maintained by household members, offering shade, ornamental value, and diverse[products (Udofia, 2012); Another important function is that they have considerable ornamental values and provide shade to people and animals. Aworinde *et al*. (2013) stated that, homestead areas symbolise land-use systems involving purposeful management of multipurpose trees and shrubs in a symbiotic relationship with annual and perennial agricultural crops and invariably livestock within the compounds of individual houses. Hence, the focal points of biodiversity conservation. In general, *ex situ* conservation, which literally means, "off-site conservation is applied as an additional measure to supplement *in situ* conservation. Biological diversity conservation *ex situ* is therefore complementary to *in situ* conservation and can act as an "insurance policy" against threatened species in their natural habitats. It cannot be overemphasized therefore that ethno-botanical survey of homestead agro-forestry are extremely heterogeneous because of several functions it exhibits.

Homegarden are diverse enormously with various forms such as backyard, kitchen, and farmyard, compound, mixed or homestead gardens known as one of the oldest production systems with proof of their intrinsic economic and nutritional merits Uzokwe, *et al*. (2016). Species diversity in tropical homestead forests is reported to be very high due to species having different life forms, height and canopy structure (Dimelu and Odo, 2013). In line with this report Obasi *et al*. (2015) pointed out that, the distribution of species creates a multi-storey structure. Olajide (2003), noted that homestead agro-forestry in Nigeria is naturally endowed with

collections of relatively uniform composition of different plant forms including trees, shrubs, herbs and other non-wood resources. Also, ecological systems differ based on their species composition, their contribution to household subsistence, economic and environmental benefits differ as well (Birhan and Abebe 2019), these plants components are arranged in a randomly and intimate mixed patterns in homestead gardens.

Homestead garden is a traditional land-use system which is extensively practiced throughout the world found in most ecological regions of the tropics and subtropics which usually exhibit high species diversity, structure and composition (Jegora *et al*., 2019). Also, Eric *et al*. (2019a) reported that about 87 different plant species were inventoried in homegardens of Oruk Anam, LGA, Akwa Ibom State, Nigeria, with densities of each plant ranging from two to twenty-seven individuals ha^{-1} and classified into six life-forms (herbs, climbers, shrubs, palms, bamboos and trees) and representing 50 different plant families which were found to be of socio-economic, medicinal and environmental valuable to the homegarden owners. The study further explains that the number of species, although a little higher than the 81 plant species enumerated by Udofia (2007) could be due to increasing awareness that homegardens are more dependent ecosystems for the conservation of valuable socio-economic species due to their proximity to living homes.

Furthermore, useful plant species have been reported by Regassa (2016) who identified vegetable plant species, fruit plant species, spices plant species, root and tubers plant species, cereals, pulses and oil seeds plant species, stimulant plant species, fragrant plant species, ornamental plant species, firewood plant species, animal feed plant species and medicinal plant species. However, Kebebew (2018) observed that, homestead gardens are varying greatly in species richness, structural complexity and size.

Contributions of homegrdens to sustainable management

Environmental benefits

Green spaces within residential areas (homestead) provide important contributions to the residential landscapes and yards to overall environmental sustainability (Kebebew, 2018). Consistently, Arowosoge (2015) pointed out that the uses of forest resources are enormous as seen in energy supply, provision of food, provision of infrastructural facilities, herbs, and environmental protection and in contributing to employment creation and about 1.65 million households in Nigeria derived their livelihood from forest related activities while about 86 % of rural households depend on the forest for biomass as source of energy. Similarly, homestead agro-forestry is a diversity-enhancing land-use system, especially in the context of interspecies diversity, as it brings together crops, shrubs, trees and in some cases, livestock on the same piece of land (Mekonen *et al.* 2015). According to Ramesh *et al*. (2020), the traditional society practicing homestead gardens and sacred groves help in bio-diversity conservation by slowing the conversion of natural habitat to agricultural lands.

Source of income generation

Agroforestry can increase farm income and turn it less dependent of price fluctuations, while diminishing deforestation Rahman *et al*. (2017). Homegarden production is also an important source of supplementary income for poor rural and urban households around the world. In line with this, the rural communities have, for long, relied on indigenous trees for food, medicine and income (Buyinza *et al*., 2015; Bori *et al*., 2018). The sale of homestead forest resources is one of the major ways in which homegardeners interacts with the people (buyers) through the generation of economic, social and cultural activities. Subitha *et al*. (2016) upheld that gardens are important sources of income in many countries around the world and they maintain crop and agroforestry genetic resources, which may not be found in more extensive agro-ecosystems however, the major functions of homestead gardens especially in rural areas are subsistence production and income generation. Earning income from the sale of homegarden production is not a new trend; research has shown that hsomegarden can increase household income. For instance, Eric *et al*. (2019b) revealed that the mean returns to homegarden farmers' labour and management (RLM) was at profit level. According to Habtewold and Fakadu (2020) access to sufficient income throughout the year with diverse products in their households were the main factors that motivated them to use agroforestry homegarden technologies. Their findings showed that, on the average, home garden contributed over 34 % of household annual income.

Food Security

Food consumption has been a subject of research all over the world and is especially meaningful in developing countries where food expenditures account for a relatively large share of household income Obot and Umoh (2019). This implies that the per capita growth of production of major foods has not been sufficient to satisfy the demands of an increasing population. This has resulted in a big gap between supply and demand for food Obot *et al*. (2019). Von Braun and Tedesse (2012) reported that there have been riots in Burkina Faso, Cameroun, Egypt, Indonesia, Cote d'Ivoire, Mauritania, Mozambique, Senegal, Haiti, Yemen and Zimbabwe. To corroborate this report, (Annonymous 2018) reported a protest on price spike of farm products especially food commodities in Sudan. This is the result of food availability, accessibility and affordability.

With rapid population increase, urbanization and land use system, farmers rationally adopt a few strategies, such as homestead agroforestry, soil management techniques, migration and livelihood diversification, which enable, them to attain a sustainable livelihood and avert risks and uncertainties associated with agricultural production (Falola and Achem, 2017). Among all agro-systems, homestead farming is recognized to be one of the major ecosystems embedded with food and medicinal crop production (Gbedomon *et al*., 2017). Aworinde *et al*. (2013) and Kebebew (2018) stated that, homestead agro-forestry areas represent land-use systems involving deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial agricultural crops and invariably livestock.

In addition, fresh fruits production contributes to the sustainability of the food system because it reduces energy consumption and generates less carbon dioxide emissions since it

does not need to be transported from remote farming areas (Vargas *et al*. 2021). Encouraging the consumption of the fruit with its skin, where possible, minimizes waste. A growing body of evidence shows that man has reached a turning point where a plant-based diet is on the agenda. In the early 21st century, nutritionists began to highlight the benefits of plant-based foods (Hever and Cronise, 2017). According to Clark *et al*. (2020) there is an ambition to provide affordable, natural and personalized food. A lifestyle that promotes the consumption of foods that contributes to a healthy diet and has less impact on the planet's ecosystem is encouraged. Homegardens provide a reliable source of fresh produce, improving household food security and nutrition (Kumar *et al*., 2020c). Fruit production is undoubtedly of great importance in the agricultural sector because of its economic importance and its beneficial effects on human health.

Medicinal benefits

In addition to food production, the role of medicinal plants is of prime importance to livelihood. For instance, *Dioscorea spp* (yam) contain bio-active compounds enriched with numerous benefits such as treatment of degenerative diseases. Pharmaceutically, it is used in the application of diosgenin and dioscorin (Obidiegwu *et al*., 2020). According to Mintah *et al*. (2019) and Dhull (2021) the largely rural population relies on medicinal plants as a source of treatments or to meet their health care needs for several reasons, including accessibility, affordability, and low cost. However, ethno-botanical studies have revealed the importance of hundreds of different kinds of plants used for curing different kinds of diseases in different parts of Nigeria. With the up surging and advancement of modern nutrition science, prevention of various diseases and other health issues through consumption of various vegetables crops are exploited exponentially because of their chemical properties in the form of high levels of antioxidants, vitamin C, anthocyanin and flavonoids (Singh and Khar 2022). Medicinal plant has been used since ancient times as medicines for the treatment of diseases (Ouedraogo *et al.,* 2021).

Over the past decades, there has been a dramatic increase in the demand for medicinal plants for use in traditional medicine, contemporary and alternative medicine in both developing and developed countries (Lee *et al*., 2008) thus, a large number of people habitually use such medication because herbal treatment is, in some cases, considered relatively cheap (Mukul *et al*., 2007). The relevance of plants in the treatment of diverse diseases may be due to the presence of bioactive compounds produce by plants for their protection. Pharmacological activities such as phytochemical properties in plants have been reviewed by many authors, to mention but a few, the antibacterial; anticancer; antiparasitic; antivirus, antiaging; antioxidant; antimicrobial, antivirus, antidiabetics of plant have been reported (Bhatnagar 2023). For instance, Akeko (2023) noted that the main medicinal constituents of A*loe vera* are the natural sugar (polysaccharides), anthraquinoids and vitamin which make it an excellent therapeutic agent's especially biological effect: antimicrobial, antioxidant, anti-inflammatory, anticancer, anti-diabetic, and immunomodulation activities. *Piper guineense* leaf and seed extract possess several pharmacological and therapeutic properties such as antioxidant, anti-microbial, aphrodisiac, and anti-parasitic, anti-inflammatory anti-convulsant, molliuscidal, estrogenic and oxytocic properties (Alagbe *et al*., 2021).

Most of the plants used for traditional medicines have been assessed for safety and efficacy. Kumar *et al*. (2023) pointed out that quality control analysis of medicinal plant even their derived formulated are contributed to the quality, safety, and efficacy as to their regulatory purpose. Herbal medicines, because of their decentralized nature, are generally easily and quickly available to households especially in the rural areas. Currently, the medicinal use of plant plants-based herbal medicine is spreading like wildfire on both social media and other mediums in many developed and developing countries. A decade ago, Budriene *et al*. (2015) noted that the growing demand for traditional medicinal plants encourages investigating new plant species and their application possibilities.

Medicinal herbs uses have been reported by several authors such as; (King of bitters) *Andrographis Peniulata* is commonly used in indigenous medicine, especially as a bitter tonic, to treat fevers, diarrhea and to get rid of intestinal worms, as liver tonic, blood purifier, and stomachic Bhatnagar (2023), Tiger-nut cultivated and utilized to produce drink and also as medicinal materials (Ambarwati *et al*. 2019). Moreover, different parts of the plant poses specific secondary metabolites such as flavanoids, phenolic compounds, alkaloids, tannins, Terpenoids, saponins, and cardiac glycosides that have healing potential and medicinal and therapeutic proposes (Oludara (2020), *Aloe-vera vulgaris* (Lam) has been used in many treatment including immunomodulatory, wound and burn healing, hypoglycemic, anticancer, gastro-protective, antifungal, and anti-inflammatory properties (Salaem *et al.* 2022) and Li *et al*. (2019) submitted that *Cymbopogon citratus* (DC) stapf. (Lemon grass) taken as tea has the mechanisms of regulating blood pressure.

Currently, raw materials for drugs that are plant-based are increasing and the level of exploitation for many of the medicinal plants is affecting both their availability and natural population. Perhaps this could also be one of the reasons (Shosan *et al*., 2014), noted the global clamor for more herbal ingredients creates possibilities for the local cultivation of medicinal and aromatic crops as well as for the regulated and sustainable harvest of wild plants. Gbedomon *et al.* (2017) predicted that food and medicinal function obtained from homestead plants will pre-dominates the other functions. Moreover, plant species from different families have been reported by several authors. Tida *et al*. (2020) reported that plant species in the *Fabaceae* family predominate in number of species and the leaves were the most used plant parts and digestive system and the skin were the most commonly treated diseases. Also, the genus *Ipomoea batata* (L.) is a well-known antidandruff and *Carica papaya* is used in the treatment of wounds, sexually transmitted diseases, constipation and urinary retention, kidney issues *etc*.

Provision of Non-Timber Forest Products (NTFPs)

The non-timber forest products (NTFPs) are biological materials other than timber, industrial round-wood and pulpwood that are extracted from the forest. NTFPs are derived from large variety of plants and animals and may be consumed or processed into different set of products. The quantity and types of NTFPs that are available in different parts of the sub-region depend on the vegetation type of such location. Different types of non-timber forest products

are available in the mangrove, rainforest and derived savanna. Examples of NTFPs are: fruits: citrus, seeds/nuts, mushrooms, gamemeat (bushmeat), spices, resins, rattan and medicinal plants, The important functions of NTFPs ranged from economic to social, cultural and religious.

The popular acceptance of NTFPs for medicinal purpose was attributed to the socio-economic status of the people and their confidence in the efficacy of herbal medicine. The sale of NTFPs in local market provides income for people in the rural area. Some people also engage in the collection and sales of leaves, fruits, seeds/nuts, bark and roots of homegarden trees as source of livelihood. Handicraft enterprise is one of the most predominant cottage industries in the rural areas. It provides employment opportunity and income to the people. A lot of non-Timber Forest products (NTFPs) are very valuable as craft materials as such plant fibres from *Raphia* spp. and palm trees are used in making brooms, ropes, fishing nets, baskets and mats.

Rattan and climbing palms are also used for building and construction of furniture items. Rattan furniture items are now commonly used in homes and recreation centers. These furniture items have been found to be good, attractive, comfortable, presentable and economical. Tannin and dyes are also obtained from the bark and roots of some trees. These products have both economic and social importance in the life of the people. Singh *et al*. (2020) reported that NTFPs provide food, medicine, handicraft, tannin, dyes and cosmetics.

Soil Fertility

In agroforestry, studies have shown that the tree crown and leaf litter layer protect the soil against the direct impact of rain and sun, diverse, permanent deep root systems enhance nutrient cycling; that tree build up a larger carbon stock than other forms of agriculture (Schroth *et al*., 2002; Leite *et al*., 2016). Homegarden systems enhance soil nutrient pools and turnover and reduce reliance on external inputs by promoting a closed system with internal recycling of nutrients, whereby nutrients are accessed from lower soil horizons by plants roots and returned to the soil through leaf fall (Thevathasan and Gordon, 2004). Soils under the tree canopy are enriched by micro-organic life that thrives in the shade of the tree canopy and by the nutrients that are added to the soil as the fallen tree leaves decay. Leguminous species in homegadens are of great importance. Studies have shown that when leguminous species are used in farmlands, the nitrogen fixed by the tree roots further enriches the soil. Legumes aid in solubilizing unsolvable phosphorus (P) in the soil, increasing soil microbial activity, ameliorating the physical environment, restoring organic matter, and smothering weed (Stagnari *et al*. 2017).

Homegardern trees can also significantly influence nutrient additions to crops through intercepting rainfall, via rainwater falling through tree canopies and stem flow rainwater falling from branches and stems. As practices of agricultural production and improvement, rhizobial inoculants represent a practically effective, ecologically safe, and economically alternative means of realizing maximum agricultural production (Kebede 2020b). In addition, Biological nitrogen fixation (BNF) through rhizobia-legume symbiosis is, thus the best alternative and a more sustainable process by a group of symbiotic bacteria, so called rhizobia, which fix the atmospheric N_2 and make the fix nutrient available to the host legume and other crops in the cropping system. Woody species used for this purpose include tree varieties that are wind-resistant and have a good ability to coppice, grow in height and branches (Stagnari *et al.,* 2017).

In homegardern agroforestry systems, leguminous trees species are paramount. Legumes play a crucial role in the traditional diets of many regions throughout the world and provide a multitude of benefits to both the soil and other crops grown in mixture with them and following them in cropping system and also play a pivotal role in nutrient enrichment and cycling in agricultural systems Kebede, (2020a). Also, studies reported the exceptional capacity of legumes to fix atmospheric nitrogen through symbiotic association with rhizobia, a root nodule bacterium that comprise Rhizobium, *Bradyrhizobium, Sonorhizobium, Azorhizobium and Mesorhizobium,* could be used to increase agricultural productivity (Kebede, 2021; Kebede *et al.*, 2021).

Furthermore, differences in litter quality between the tree and crop components promote spatial diversity in enzyme activities and microbial functioning and this spatial variation is enhanced by trees and crop effects on microclimate (Mungai, 2005). Also, Arbuscular mycorrhizal (AM) fungi enhance plant nutrient uptake and growth, soil stability, soil aggregation, and litter decomposition rates, and could potentially enhance crop yields while reducing the need for chemical fertilizer input (Rillig, *et al.*, 2002; Hijri, 2006).

Windbreaks (Shelterbelt)

Rows of trees grown in bands perpendicular to prevailing winds are called windbreaks or shelterbelts (Birane *et al.*, 2019). These rows of trees and/or shrubs on agricultural land provide ecological goods and services e.g., shelter from the wind, wildlife habitat, carbon sequestration, filter for dust, noise or odor, and also produce timber and non-timber products. This practice is utilized as part of a crop and/or livestock operation to enhance production, protect livestock and control soil erosion. Ukaegbu (2014) observed that the windbreak protects crops directly by shielding them against the scouring and drying effect of wind and indirectly by preventing erosion.

Decorative woody floral, berries, native grasses and crops are incorporated into the buffer. According to (Ukaegbu, 2014) this practice requires establishing a series of specific zones - native trees, shrubs and grasses to protect the temperature and clarity of moving water and to keep agricultural chemicals and soil from eroding directly into stream water However, infrastructural damages that would have been caused by windstorms are abated by some homegarden trees planted for wind control.

Biofuel and Bio-energy Production

Biofuels are renewable liquid fuels coming from biological raw materials and have proven to be good substitute for oil in the transportation sector (Ukaegbu 2014). They are gaining worldwide acceptance as a solution for problems of environmental degradation, energy security, restricting imports, rural employment and agricultural economy. According to Anitta and Sathya (2013) 70- 80 % energy in rural areas, comes through biomass from trees and shrubs. Buyinza *et al.* (2015) observed that homestead plant species also contribute to a cleaner environment as they sequester more carbon compared to exotics plants.

With the increased green cover, the environment will also benefit greatly. Sutradhar *et al.* 2015) added that a good adaptation practices for adapting to climate change requires practices

such as homestead vegetable gardening among others. However, about environmental benefits, (OECD, 2010) stated that the provision of homestead forestry services such as purification services: homegardens and forests lands aids immensely in the filtration of air pollution and in ecological cycling, carbon dioxide is a greenhouse gas being an end product of respiration by man and animals. Therefore, biomass facilitate in reducing the gas from the atmosphere; in respect of provision of habitat: gardens and forests are store houses for biological diversity which may likely reduce the risks of ecosystem resilience in addition to sources of food production, recreational and aesthetic values as well as scientific exploration; also, in regulation: forests and homegardens regulate watershed, weather imbalance and reduces flood risk.

Also, animals such as birds, rodents etc. are in intimate interaction with the natural environment; in terms of regeneration and production, plants in gardens produces biomass through the conversion of light energy into foods, raw materials and other forms of energy like fuelwood. Equally, it ensures that the pollination and seed dispersal take place, ensuring that the systems are renewed. In estimation, about 30 % of world's food productions are solely dependent on natural pollination; life support and information: gardens provides life support to living things and millions of information right from evolution is embedded in this habitat (OECD, 2010).

Climate change mitigation

Climate change is known to be a global phenomenon and most important environmental challenge which is facing by all living creatures including humans albeit the disturbance of the natural ecosystem, agriculture and health (Toppo and Raj, 2018). This climate change and weather patterns scenarios result in unsustainable agricultural production. Climate change is now recognized as a true global emergency that requires concerted efforts by all countries, businesses, and even individuals to achieve the Paris agreement goals aimed at addressing the crises (Anabaraonye *et al.* 2022). Trees are also known as the "lungs" of the earth and serve in mitigation of climate (Aba *et al*., 2017; Chukwuji *et al*., 2020).

Planting trees can contribute to greenhouse gas emissions reduction, and drastically eliminate the threats that climate change poses to other sustainable development goals (Badmus, 2019; Anukwonke *et al*., 2022). To ameliorate the effect of climate change, agroforestry plays a viable role to mitigate negative effects and reduce global warming by absorbing greenhouse gases (GHGs) i.e. carbon dioxide (CO_2) through the process of carbon-sequestration. As such, agroforestry is a form of Climate Smart Agriculture (CSA) and as such, Leakey (2017) pointed out that this form of agriculture is a promising adaptation option for small scale farmers throughout the developing economies like Africa.

Moreover, some of the tree species in homegardens helps in absorbing green gases. (Kumar *et al*., 2020b) reported that one fruit tree consumes about 20 kg of CO_2 per year, which can significantly aid in the carbon imprint reduction. However, climate change awareness level needs to greatly increase across sub-Sahara Africa as this will help communities, cities and institutions in Africa to better understand the role of tree planting as a climate change adaptation strategy for sustainable development (Anabaraonye *et al*., 2022)

Conclusion

Homegarden agroforestry substantiates an essential agro-ecological approach that simultaneously supports biodiversity conservation, food security and climate change mitigation. Globally, it offers a diverse range of products including food security, medicinal plants, and non-timber forest products that augment rural livelihoods and socio-economic well-being. The system enhances soil fertility through nutrient cycling and biological nitrogen fixation and provides ecological services such as wind protection and carbon sequestration. Given the mounting challenges of climate change and food insecurity, homegardens represent a sustainable and adaptable agricultural practice critical for rural resilience. Their multifaceted benefits underscore the need for greater integration into broader agricultural and environmental policies. Hence, the need to integrate homegarden agroforestry into national and regional climate-smart agriculture and sustainable development strategies to harness its potential for climate change mitigation and adaptation.

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