THE CONCEPT OF VALUE CHAINS IN AGRICULTURE, CLIMATE ACTION AND ENVIRONMENTAL RESOURCES

GLOBAL ISSUES & LOCAL PERSPECTIVES

Edited by

Ignatius Onimawo

Stephen Ibitoye

Zacharia Yaduma

Lucky Onyia

Femi Ajisafe

Eteyen Nyong

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

Published By:

Society for Agriculture, Environmental Resources & Management (SAEREM)

First published 2024

SAEREM World

Nigeria

Typeset in Times New Roman

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

THE CONCEPT OF VALUE CHAINS IN AGRICULTURE, CLIMATE ACTION AND ENVIRONMENTAL RESOURCES (GLOBAL ISSUES & LOCAL PERSPECTIVES)

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

Printed at: SAEREM World

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

TABLE OF CONTENTS

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

The Impact of Agricultural Chemicals on Human Health: A Value Chain Analysis of Exposure Pathways

[1]Dr. Nwizia, Baribefii Paagolah & [2]Mbube, Baridanu Hope (Ph.D.)

Chapter Four

Potentials of Local /Scavenging Chicken for Sustainable Protein Production and Poverty Alleviation

Balogun, B.I. PhD

Chapter Five

An Appraisal of Women Participation in Cassava Production and Processing in Ogbia Local Government Area, Bayelsa State, Nigeria

Tasie, C.M. and Wilcox, G. I.

Chapter Six

Analysis of Cassava Value Addition and its Constraints in Emohua Local Government Area of Rivers State, Nigeria

G. I. Wilcox and C. M. Tasie

Chapter Seven

The Effects of Poultry Manure and NPK 15:15:15 Inorganic Fertilizer on the Growth of Maize (Zea *mays L.*) in Ibadan Oyo State

[1]Omidiran, M.O, [1]Adebisi, A.A, [2]Adedokun, D.O and [1]Geply, O.A

Chapter Eight

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

Environmental Hygiene and Disease Management Along Beef Value Chain.

Azeez, Abdullahi Akinwale (DVM) and *Salawu, Mutiat Bukola (PhD)*

Chapter Nine

Food safety challenges of antibiotic-resistant foodborne pathogens in street vended foods and report on evolving remedies

[1,*]Clement Olusola Ogidi, [1]Oluwatoyin Ajoke Oladeji, [2]Olubukola Olayemi Olusola-Makinde, and [1]Adeyanmola Oluwaseyi Faturoti

Chapter Ten

The Role of Remittances on Economic Growth in Nigeria 1980-2022

Atiman Kasima Wilson PhD

Part two: THE CONCEPT OF CLIMATE ACTION

Chapter Eleven

Financing Climate-Smart Agriculture for Sustainable Food Security in Nigeria: Practices, Risks, Responses, and Enabling Policies

Odili, Okwuchukwu *Ph.D*[1]* and **Okoro Kelechi Okoro**[2]

Chapter Twelve

Climate Change and Pollution Appraisal: Scientific and Social Approaches

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

[1]Salami, K. D., [2]Akinyele, A. O., [1]Muhammad, Y. K. and [1]Lukman, A. T.

Chapter Thirteen

Climate Change and Small Holder Agricultural Production in Nigeria

Ettah, O. I. and Edet, E. O.

Chapter Fourteen

Geese Production for Food Security

Balogun, B.I. PhD

Chapter Fifteen

Empirical Analysis Between Inflation and Poverty In Nigeria

Dr. Atiman Kasima Wilson PhD

Chapter Sixteen

Strengthening Climate Resilience and Adaptive Capacity in African Fisheries: Prioritizing Gender Transformation and Inclusive Approaches to Adaptation, Mitigation, and Risk Management

Victoria Folakemi AKINJOGUNLA, Mohammed Sani ISIYAKU and Emmanuel Anietie ESSIEN

Chapter Seventeen

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

[1,4]Salami, K.D. [2]Akinyele, A.O. [1]Lawal, A. A. [3]Abubakar, A. W. [1]Jibo, A. U.
[3,4]Adeniyi, K. A.

Chapter Twenty Six

Effect of Tigernut on Reproductive Indices of *Clarias Gariepinus*

[1] Tusayi, B.W, [2]Onyia, L.U., [3]Musa, M., [4]Bello, H.A, and [5]Ndibrimta, N.

Chapter Twenty Seven

Assessing Agroforestry Practices Impact on Environment, Income and Food Production In Southwest Nigeria.

Bolaji K.A., Jatto K.A and Adebayo D.O.

Chapter Twenty Eight

Breaking Barriers: Gender Dynamics and Opportunities for Women's Empowerment in Agricultural Value Chains

[1]Mbube, Baridanu Hope, [2]Odekunmi, Seyi Adeloba, [3]Utoko, Vincent Agu & Usman, Christiana Ilebaye

Chapter Twenty Nine

Ecological Perspectives on Reducing Post-Harvest Losses in Agricultural Value Chains: Implications for Climate Action and Environmental Sustainability

[1]Mbube, Baridanu Hope, [2]Abdulsalam, Rabiu Anate, [3]Ojumu Adedotun Omobayo & [4]Moses, Nueebu Mon

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

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 ***The Concept of Value Chains in Agriculture, Climate Action and Environmental Resources*** 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 change, food security, national security and environmental resources 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 change, food security, national security and environmental resources necessary in policy making process that will stimulate increase in food production and environmental sustainability.

The Concept of Value Chains in Agriculture, Climate Action and Environmental Resources: Global issues and Local Perspectives is organized in three parts. Part One deals with The Concept of Value Chains in Agriculture, Part Two is concerned with The Concept of Climate Actions and Part Three deals with the Concept of Value Chains and Environmental Resources.

Eteyen Nyong/ Ignatius Onimawo

April 2025

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

Chapter Twenty Seven

Assessing Agroforestry Practices Impact on Environment, Income and Food Production In Southwest Nigeria.

Bolaji K.A., Jatto K.A and Adebayo D.O.
Forestry Research Institute of Nigeria, FRIN, P.M.B 5054, Jericho Ibadan.

Correspondence: kofobolaji21@gmail.com;

Table of Content

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

Introduction

The need to produce food to feed the ever-increasing population occupies a top position in the agenda of many countries especially the developing ones. Attempts to produce food using the conventional and traditional slash and burn method of agriculture prevalent in the third world have always resulted in wanton destruction of forest cover and the alteration of the dynamics of the forest ecosystem leading to climate change ((FAO & UNEP. 2020). Balancing the production of food and creating as well as maintaining good ecological environment for sustainable production and management of other forest resources call for an adoption of a system that offers a good opportunity which exploits the synergies that combine the characteristic advantages associated with forestry and agricultural practices commonly called agroforestry (AF). Agroforestry was defined as a land use system in which woody perennials are grown with food crops and/or livestock leading to many beneficial, ecological and economic interactions between trees and non trees components (Wikipedia). The management of forest resources incorporating agricultural practices is called agroforestry. FAO, (2015) defined it as a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. The International Council for Research in Agroforestry (ICRAF) now World Agroforestry Centre defined agroforestry as a `dynamic ecologically based natural resources management system that through interactions of trees on farm and in the agricultural landscape diversifies and sustains production, enhancing social, economic and environmental benefits for land users at all levels''

United Nation Development Project, UNDP, (2024) observed that more than 1.3 billion people worldwide practice the system which ranges from open packed assemblages to dense imitation of tropical rainforests such as home gardens to planted mixture of only few species to trees planted

in hedges or on boundaries of field and farms with differing levels of human involvement of the various management. They observed that agroforestry supports food and nutrition through the direct provision of food, by raising farmers' income and providing fuel for cooking and through various ecosystem services. FAO (2011) noted that agroforestry is one of mankind best hopes to create a climate-smart agriculture, increase food security, alleviate rural poverty and achieve a truly sustainable development. Castle, Miller, Merten, Ordonez and Baylis, (2022) stated that a wider application of agroforestry system will reduce the necessity to cut down additional forest and encourage a fuller use of natural forest ecosystems for the products and services which they only can provide. This, he said, is an addition to its potential to increase organic matters of the soil leading to a more efficient nutrient cycling and improvement of the soil physical conditions among others.

This depicts that both ecological and economical interactions between the different components make up the agroforestry systems. It is diverse in nature, ecologically based and made up of natural resources. According to Okereke-Ejiogu, Ukponobom &Umunakwe, (2021), the integration of trees in the agricultural landscape promotes diversification and sustainable production for increase social, economic and environmental benefits to all land users at all levels. The timber rich zones of Africa are faced with diminishing forest resources due to forest degradation, human and animal population increase, mismanagement of the forest and other forms of forest exploitation (Tebkew, Asfaw, Worku, 2024). Rural people have been discovered to have a wealth of indigenous knowledge and have incorporated trees in production systems in areas where they lived for a very long period of time

The practice of agroforestry in Southwest Nigeria started in form of `tuangya' system which is a Burmese word used to describe the practice of establishing tree plantations by planting and tending tree seedlings together with food crops. This was prompted by scarcity of land, food insecurity or

what was generally regarded as land hunger in the area and to arrest the situation as well guarantee the planting of trees alongside food production, the taungya system was introduced by the early foresters operating in the area.

Justification of the Study

The Food and Agriculture Organization (FAO) reported a loss of 420 million hectares of forest worldwide between 1990 and 2020, with the trend continuing at a rate of 10 million hectares per year. The FAO also reported that around 90 per cent of this deforestation is attributed to agricultural expansion, with South America, Africa and Asia experiencing the highest net forest losses. The reasons for deforestation are intertwined in a complex cycle. Deforestation can also be a result of market pressure and low prices. For example, poverty in rural communities sometimes offers no other option than to clear forests for agriculture, wood or charcoal production. Furthermore, deforestation in hill areas can lead to reduced water availability for agriculture and food production. Agroforestry which is a farming system that combines the planting of trees and the cultivation of crops and/or rearing of livestock on the same piece of land not only guarantees vegetal cover for fragile lands but also ensures food production. The adoption of agroforestry in some parts of Nigeria has proven to prevent some environmental problems like soil erosion, flooding and desert encroachment in addition to ensuring that several thousand hectares of marginal lands are salvaged and planted with economic trees as well as securing land for the farming population for food production.

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

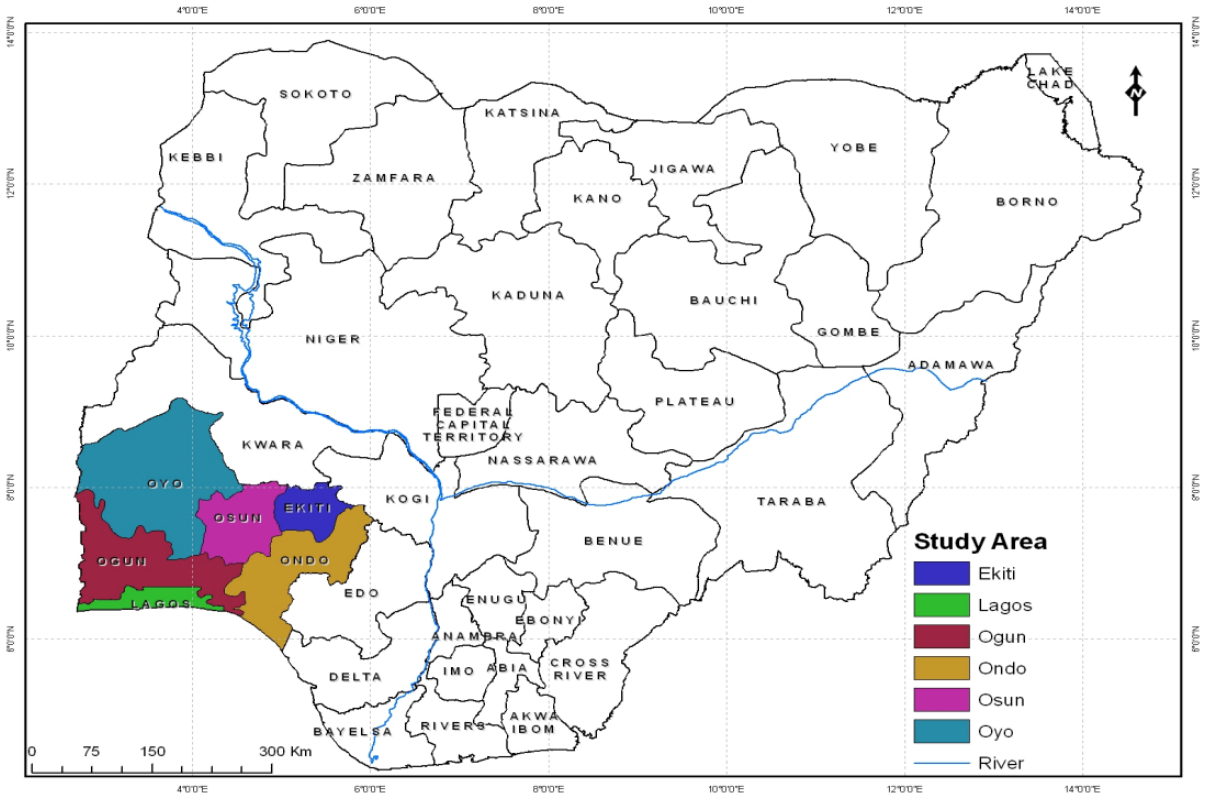
Methodology

Description of the area of study:

The study reviewed rural Southwestern Nigeria (Fig 1) which is a geographical area spreading between latitude 2^0 to the North and 6^0 to the south. It is marked by longitude 4^0 to the west and 6^0 to the east. It has a land area of 114,271km^2 representing 12% of the country's land mass and comprises six states namely Oyo, Osun, Ondo, Ekiti, Ogun and Lagos. It has a total population of 35.2million (Central for Intelligence Agent, CIA, 2012) and is predominantly agrarian, more than 96% of the population are Yoruba. Figure 6**,** shows the map of southwestern states. The zone is characterised by a typically equatorial climate with distinct dry and wet seasons. The main growing season last nine months with two peaks in July and September. Rainfall ranges between 2600mm in the coastal areas of Lagos and Ogun states to nearly 1200mm in the northern areas of Ondo, Ekiti, Oyo and Osun states. The average zone rainfall is 1480mm, with a mean monthly temperature range of 24^{o}C during the raining season and 35^{o}C during the dry season.

There are many natural forests and forest reserves in southwestern Nigeria owned by the state Governments, colleges and institutes such as International Institute of Tropical Agriculture (IITA). These include Gambari and Osho in Oyo State; Olokemeji and Omo in Ogun State; Ago-Owu, Oni, Ise, Aramoko, Isan-Ayede in Ekiit, Shasha in Osun State, Idanre, Akure, Owena and Oluwa in Ondo State and many others to mention a few..

Map of the area of study



Farmers in the area grow both tree and arable crops. The major trees crops grown are oil palm, rubber, citrus, cocoa, coconut etc while the major arable crops grown are cassava, maize, groundnut, yam, plantain, banana and so many other crops. Historically, farmers in part of the region have adopted various cultural practices such as agroforestry compatible with the environment regimes.

VARIETY OF AGROFORESTRY PRACTICES (SYSTEM) IN NIGERIA

Taungya Farming

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

This is an agroforestry system whereby food crops are interpolated with trees in a unit area of land for 2 - 3 years. Food crops cease to exist on the land when the tree crops close canopy. The taungya system was the main agroforestry method practiced in the forest reserves since 1950 to date. Most of the State owned artificial plantations now being exploited were raised through the taungya system (Waldron, Malhi, Girardin, Miller and Seddon, 2017. In these plantations, maize, potatoes, yams or beans are inter-cropped between the young plants for the first 1-2 years, to 51 avoid competition from weeds. The system has proved effective in providing food for forest workers and forage for cutting by cattle rearers (Nair, Kumar, and Nair, 2021).

Alley-Cropping (hedge row intercropping): This is a relatively new technique developed at the International Institute for Tropical Agriculture (IITA) and ICRAF. In this system arable crops are grown between hedge-rows of planted shrubs and trees, preferably leguminous species which are periodically pruned to prevent shading of the companion crops and the pruning applied as much for the crops. The trees provide nitrogen from atmospheric fixation, recycle nutrients from the depth of soil, suppress weeds and increase organic matter content of the soil (UNDP, 2024). Alley cropping is found most suitable for food production in altisols and other high-base soils in the humid and sub-humid tropic. The tree species considered are those with deep rooting, light crown, ability to coppice, nitrogen fixing and good for folder.

Alley- Farming

This is an agroforestry system focusing on livestock production. In alley farming, trees, shrubs and other perennials are planted with arable crops to supplement the woody plants in the rows. The alleys are designed to suit local environment. Alley farming is designed mainly for sheep and goat grazing. The advantages of alley farming are that crop residues control soil erosion through windbreak. The major disadvantage of the two systems (alley cropping/farming) is the competition

of hedgerows with crops for soil water, which is often limiting in semi-arid tropics (Nair et al., 2021).

Shelterbelts

This is an agroforestry system in which food crops are planted between rows of trees planted as shelter. The shelterbelts are modified to suit the farmers. The trees and shrubs are planted in one or more rows at right angles to the prevailing winds. The practice often increases crop yield because of their beneficial effects on soil and microclimate. The effect on animals is to reduce stress from heat and wind. Around houses, shade and wind protection are often combined with production of fruit, edible leaves for human and animals and even fuel wood. The main points to consider are placing of the trees in relation to each other and to the houses and crops and ways of managing them in order to have sustained production of the desired benefits. Disadvantages of the system are that labour involvement is enormous and species used as hedgerow crops are without edible products. (FAO & UNEP. 2020).

Windbreaks

In this agroforestry method a double row of trees are planted around the boundary of a food crop farm on the windward side. Each windbreak is 150m long with 100 trees planted at a spacing of 3m x 3m (Tebkew et al., 2024). The advantage is that windbreaks reduce wind erosion and at the same time produce forest alongside food crops. This is most suitable for the semi-arid zone of Katsina State, the area of study.

Home Garden

This is an agroforestry system, which has a long tradition in many tropical countries. 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 (Tebkew et al., 2024). Nair et al., (2021) reported that in this system multipurpose tree and shrubs in multi-stories associated with arable crops are raised with small livestock in homesteads. Home garden is a traditional farming system with an agroforestry focus. The whole crop-tree-animal unit is managed by family labour. The system affords diversified production, improves the food production level and conserves the soil and indigenous plant species.

Multipurpose Trees on Crop Land (trees on farmland or farm (Forestry)

This is an agroforestry component applied to the savanna and rain forest ecosystems. It is a practice in which farmers intentionally leave few trees on farms when clearing the land. The trees commonly left are those of economic importance to the farmers. The economic trees are replaced by young ones at maturity. There is also deliberate planting of desirable fruit bearing trees (fruit trees) on farmlands where the density of the natural tree is low (Okereke-Ejiogu et al, 2021)

Aqua forestry

This is an agroforestry system not popular but widely practiced by traditional farmers in inland water courses where the farmers have full rights to the land. Aqua forestry is a practice that links trees with aquaculture. Trees are planted around fishponds to provide fodder for herbivorous fish. The trees also serve as shelter and shade which create a desirable microclimate for the pond.

Apiculture (Api-silviculture)

Carefully chosen woody species grown for their nectar-producing flowers and pollen valued by bees can boost wax and honey production particularly if flowering is staggered, allowing the bees to work as long as there are flowers instead of only working for a few months in the year. This is

probably the production with the highest ratio of value of products harvested to plant biomass consumed (Okereke-Ejiogu et al 2021).

Protein Bank

In production systems that include animals, it is difficult to rely solely on annual plants to supply forage during dry seasons or years of low rainfall. Woody perennial vegetation is judiciously used to help meet this difficulty; not only does it provide green forage when the grass cover has withered but it can also supply more protein than grass. The advantage of woody plants in dry season is therefore, both quantitative and qualitative (Reichhuber, Gerber, Mirzabaev, Svoboda, López Santos, Graw, Jia, 2020)

Benefits of Agroforestry

Benefits include increasing farm productivity and profitability, reduced soil erosion, creating wildlife habitat, managing animal waste, increased biodiversity, improved soil structure, and carbon sequestration. Agroforestry systems can provide advantages over conventional agricultural and forest production methods (UNDP. 2024). They can offer increased productivity; social, economic and environmental benefits, as well as greater diversity in the ecological goods and services provided. It is essential to note that these benefits are conditional on good farm management. This includes choosing the right trees, as well as pruning them regularly (FAO & UNEP. 2020).

Biodiversity

Biodiversity in agroforestry systems is typically higher than in conventional agricultural systems. Two or more interacting plant species in a given area create a more complex habitat that can support a wider variety of fauna. Agroforestry is important for biodiversity for different reasons.

It provides a more diverse habitat than a conventional agricultural system in which the tree component creates ecological niches for a wide range of organisms both above and below ground. The life cycles and food chains associated with this diversification initiates an agroecological succession that creates functional agroecosystems that confer sustainability. A further contribution to biodiversity is that the germplasm of sensitive species can be preserved (Béliveau, Lucotte, Davidson, Paquet, Mertens, Passos, Carlos, and Romana. (2017). As agroforests have no natural clear areas, habitats are more uniform. Furthermore, agroforests can serve as corridors between habitats. Agroforestry can help to conserve biodiversity having a positive influence on other ecosystem services.(FAO & UNEP,. 2020).

Soil and plant growth

Depleted soil can be protected from soil erosion by ground cover plants such as naturally growing grasses in agroforestry systems. These help to stabilise the soil as they increase cover compared to short-cycle cropping systems (Béliveau et al 2017). Soil cover is a crucial factor in preventing erosion (Brandolini, Compostella, Pelfini, and Turner, 2023). Cleaner water through reduced nutrient and soil surface runoff can be a further advantage of agroforestry. Trees can help reduce water runoff by decreasing water flow and evaporation and thereby allowing for increased soil infiltration according to Agroforestry for landscape restoration. Compared to row-cropped fields nutrient uptake can be higher and reduce nutrient loss into streams.

Agroforestry to combat climate change

Adopting agroforestry practices can moderate the effects of climate change by reducing atmospheric concentrations of greenhouse gases, by sequestering carbon in woody plant tissue via photosynthesis, and in surrounding soils, which are typically higher in carbon than soils under conventional cropping regimes. Agroforestry can also allow farms to adapt to future shifts in

climate by supporting various production and ecological ecosystem services, which increase farmland resilience to climate change. These include the production factors mentioned above, such as greater resilience to weather extremes, but also through diversifying crop options: in other words, if a crop fails due to unexpected climatic conditions, farmers still have a tree crop to fall back on, which provides greater economic stability (Reichhuber, 2020). The timber or fuel products produced may also foster greater environmental sustainability. The production of energy from biomass growth is a carbon neutral approach to energy generation. Developing systems such as short rotation coppice can be an effective way to satisfy the need for energy production, in a cost effective and sustainable way (FAO & UNEP. 2020)

IMPACT OF AGROFORESTRY ON INCOME, YIELD, POVERTY AND FOOD SECURITY

Agroforestry systems provides ecosystem services which can contribute to sustainable agriculture through diversification of agricultural products, such as fuelwood, medicinal plants, and multiple crops which increases income· It Increases food security and nutrition by restored soil fertility, crop diversity and resilience to weather shocks for food crops (Reij and Winterbottom 2015). According to the United Nations Food and Agriculture Organization (FAO)'s the State of the World's Forests 2020, adopting agroforestry and sustainable production practices, restoring the productivity of degraded agricultural lands, embracing healthier diets and reducing food loss and waste are all actions that urgently need to be scaled up. Agribusinesses must meet their commitments to deforestation-free commodity chains and companies that have not made zero-deforestation commitments should do so (FAO & UNEP. 2020).

CONCLUSION AND RECOMMENDATION

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

The timber rich zones of Africa are faced with diminishing forest resources due to forest degradation, human and animal population increase, agriculture production, mismanagement of the forest and other forms of forest exploitation. Therefore there is need for a holistic strategic, sustainable system that will reduce deforestation, allow agriculture production, accommodate human population increase and sustainable land management. Balancing the production of food and creating as well as maintaining good ecological environment for sustainable production and management of other forest resources call for an adoption of a system that offers a good opportunity which exploits the synergies that combine the characteristic advantages associated with forestry and agricultural practices commonly called agroforestry. Agroforestry was defined as a land use system in which woody perennials are grown with food crops and/or livestock leading to many beneficial, ecological and economic interactions between trees and non-trees components. This study reviewed agroforestry practices in southwest Nigeria, such as Taungya Farming, Alley-Cropping (hedge row intercropping), Alley farming,, shelterbelt, Windbreak, Home garden, Acquaforestry, Multipurpose Trees on Crop Land (trees on farmland or farm (Forestry), Apiculture and Protein bank. It is therefore recommended that different suitable farming system should be adopted for different ecological zones and not just practicing traditionally causing food insecurity with little or no income for the farmers.

It is recommended that extension agents should intensified to sensitize and motivate farmers towards adopting new agroforestry technologies. The opinion of farmers should be sorted by the government when designing policies related to agroforestry to ensure their effective participation in practices that will proffer solutions to their land-use problems. Also, inputs like improved planting materials and tree stocks should be subsidized so that the poor rural farmers will easily adopt the technologies. In this vein, the establishment of farmer's cooperatives can also be a viable tool to enhance farmers financial capabilities to adopting improved agroforestry technologies

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

REFERENCES

Béliveau, Annie; Lucotte, Marc; Davidson, Robert; Paquet, Serge; Mertens, Frédéric; Passos, Carlos J.; Romana, Christine A. (December 2017). "Reduction of soil erosion and mercury losses in agroforestry systems compared to forests and cultivated fields in the Brazilian Amazon". Journal of Environmental Management. **203** (Pt 1): 522–532. Bibcode:2017JEnvM.203..522B. doi:10.1016/j.jenvman.2017.07.037. ISSN 0301-4797. PMID 28841519.

Brandolini, Filippo; Compostella, Chiara; Pelfini, Manuela; Turner, Sam (2023). "The Evolution of Historic Agroforestry Landscape in the Northern Apennines (Italy) and Its Consequences for Slope Geomorphic Processes". Land. **12** (5): 1054. doi:10.3390/land12051054. ISSN 2073-445X.

Castle, Sarah E.; Miller, Daniel C; Merten, Nikolas; Ordonez, Pablo J.; Baylis, Kathy (2022). "Evidence for the impacts of agroforestry on ecosystem services and human well-being in high-income countries: a systematic map". *Environmental Evidence*. **11** (1): 10. Bibcode:2022EnvEv..11...10C. doi:10.1186/s13750-022-00260-4. S2CID 247501751.

FAO (2015). Food and Agricultural Organization Online Statistical Database on Agroforestry practices, Rome, Italy: Food and Agriculture Organization of the United Nations. From (Retrieved on March, 2020)

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

FAO & UNEP. 2020. The State of the World's Forests 2020. Forests, biodiversity and people – In brief. Rome doi:10.4060/ca8985en. ISBN 978-92-5-132707-4. S2CID 241416114

FAO, 2022 "Agroforestry". www.fao.org. Archived from the original on 4 November 2022. Retrieved 26 February 2022.

Nair, P. K. Ramachandran; Kumar, B. Mohan; Nair, Vimala D. (2021), "Soils and Agroforestry: General Principles", An Introduction to Agroforestry, Cham: Springer International Publishing, pp. 367–382, doi:10.1007/978-3-030-75358-0_15, ISBN 978-3-030-75357-3, S2CID 245924011, retrieved 13 May 2023

Okereke-Ejiogu, N.E., Ukponobom M.T. &Umunakwe,P.C (2021) Agroforestry Practices And Household Food Security Among Women Farmers In Imo State, Nigeria Journal Of Erosion And Environment Degradation (Jeed) Futo, June 2021. Issn 115-1943

Reichhuber, A.; Gerber, N.; Mirzabaev, A.; Svoboda, M.; López Santos, A.; Graw, V., … Jia, X. (2020) The land-drought nexus: Enhancing the role of land-based interventions in drought mitigation and risk management. A Report of the Science-Policy Interface. United Nations Convention to Combat Desertification (UNCCD), Bonn, Germany. 2019. Available online https://knowledge.unccd.int/sites/default/files/2019-08/UNCCD_SPI_2019_Report_1.2.pdf (Accessed 18 September, 2020).

UNDP. 2024. https://www.undp.org/yemen/press-releases. Accessed 2 Mar 2024.

Waldron, A.; Garrity, D;, Malhi, Y.; Girardin, C.; Miller, D. C.; Seddon, N. Agroforestry can enhance food security while meeting other sustainable development goals. Tropical Conservation Science, 2017, 10, 1–6

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1

Tebkew, M., Asfaw, Z., Worku, A. (*2024*Contribution of agroforestry practices to income and poverty status of households in Northwestern Ethiopia. *Discov Agric* **2**, 48 (2024). https://doi.org/10.1007/s44279-024-00062-x

SAEREM BOOK CHAPTERS First Published 2025 ISBN 978-978-60709-7-1