International Journal of Agriculture and Environmental Research

ISSN: 2455-6939

Volume: 11, Issue: 06 "November-December 2025"

# AGROFORESTRY PRACTICES IN SOROTI DISTRICT, EASTERN UGANDA: PROSPECTS, CHALLENGES, AND IMPLICATIONS FOR SUSTAINABLE LAND USE

[1]Oscar Stephen and [1]*Mukadasi Buyinza

[1]Department of Agribusiness and Natural Resource Economics, College of Agricultural and Environmental Sciences, Makerere University, P.O. BOX 7062 Kampala, Uganda.

*Corresponding Author

**DOI: https://doi.org/10.51193/IJAER.2025.11612**

Received: 03 Dec. 2025 / Accepted: 15 Dec. 2025 / Published: 26 Dec. 2025

## ABSTRACT

This study examined the prospects and challenges of agroforestry practices in Soroti Sub-county, Uganda. Data were collected through household surveys, questionnaires, direct interviews, and field observations. Findings show that the majority of respondents were male (76%), and most farmers practiced traditional forms of agroforestry, particularly the integration of fruit trees such as *Carica papaya*, citrus species, jackfruit, and *Mangifera indica* within their cropping systems. Common management practices included intercropping, grass fallow, and bush fallow. However, overall yields from agroforestry systems remained low, largely due to limited adoption of improved techniques and inadequate integration of modern and traditional practices. Seedling shortages, insufficient extension services, and lack of technical knowledge further constrained effective agroforestry implementation. Strengthening institutional and extension support, particularly in the provision of technical information and quality seedlings, is therefore essential to enhance productivity and maximize the benefits of agroforestry in the district.

**Keywords:** Agroforestry practices, Indigenous tree species, Seedling supply, Soroti District

## INTRODUCTION

Rapid population growth in many developing countries continues to exert significant pressure on land resources, increasing the demand for food, fuel, and shelter. Traditional systems of shifting cultivation, once effective under low population densities, have broken down due to shortened fallow periods and declining soil fertility. As a result, more integrated and sustainable land-use systems, such as agroforestry, have become increasingly important in ensuring food security and environmental stability. Agroforestry—defined as the deliberate integration of trees with crops

  

ISSN: 2455-6939

Volume: 11, Issue: 06 "November-December 2025"

and/or livestock on the same piece of land—offers a viable approach for enhancing land productivity while simultaneously providing multiple ecological and socio-economic benefits.

In tropical ecosystems, rising human and livestock populations, coupled with limited productive land, have accelerated deforestation and land degradation. The removal of natural vegetation not only reduces biodiversity and the availability of essential tree products such as fuelwood, construction materials, and livestock fodder, but also contributes to soil erosion, nutrient depletion, and declining agricultural output. Consequently, agroforestry has gained prominence among agricultural development practitioners, environmental specialists, and policy planners as a strategy for rehabilitating degraded landscapes and supporting rural livelihoods.

The Teso region, including Soroti District, exemplifies many of these challenges. The area has experienced extensive tree cutting for fuel, charcoal production, construction, and land clearance for cultivation. The situation was further aggravated by political instability and insurgency in the 1980s and early 1990s, which contributed to environmental degradation and disrupted agricultural systems. In addition, erratic rainfall patterns and prolonged dry spells have undermined crop yields and exacerbated food insecurity in the region. Local governments and disaster committees have repeatedly highlighted the need for improved land management practices to address these environmental stresses.

As population pressure has increased, forest cover and tree density on farmlands have declined sharply. Many households depend on natural bushland for fuelwood, while crop residues, leaves, and other plant materials are increasingly used for both energy and animal feed. The widespread removal of vegetation has left soils exposed to erosion, further reducing fertility and productivity. Although sedentary agriculture is the dominant livelihood system in Soroti, the limited integration of trees into farming systems has contributed to declining soil quality and reduced crop output.

Given these challenges, agroforestry presents a promising opportunity for enhancing agricultural productivity and environmental resilience in the district. Integrating trees with crops can provide multiple benefits, including fuelwood, fruits, fodder, timber, erosion control, and micro-climate regulation. Despite the presence of indigenous tree species valued for their multiple uses, their densities have significantly declined due to limited planting, inadequate management, and dependence on natural regeneration. Furthermore, the adoption of agroforestry has been hindered by low levels of technical knowledge, inadequate extension services, limited access to seedlings, and unclear tree-tenure arrangements.

This study was therefore undertaken to assess the prospects and challenges of agroforestry in Soroti District. Specifically, it seeks to identify the traditional agroforestry systems and practices in the area, to identify the indigenous tree and shrub species and their uses, and to investigate factors hindering the practice of agroforestry within the sub-county.

  

## METHODS AND MATERIALS

### Description of the Study Area

The study was conducted in Soroti District, located in northeastern Uganda. The district lies between latitudes 1°30' N and 2°00' N and longitudes 33°00' E and 34°00' E, covering approximately 10,983 km². The area forms part of the interior plateau north-east of Lake Kyoga and is characterized by flat to gently undulating terrain with isolated inselbergs rising 30–50 meters above the surrounding plains.

The climate is influenced by the Inter-Tropical Convergence Zone (ITCZ), resulting in a bimodal rainfall pattern with peak rainfall occurring in April and a smaller peak in November. Annual temperatures range from 22°C to 38°C with mean daily values of 25–26°C. The geology is predominantly Precambrian, consisting mainly of granite and light metamorphic formations. The soils are generally loam to sandy clay loam, with high agricultural potential when managed properly.

Vegetation is largely composed of savannah grasslands dominated by *Hyparrhenia rufa*, interspersed with scattered trees that merge into woodland in some areas. Land tenure is mainly customary, with land inherited through family lineage, although pockets of freehold and leasehold systems exist. Livelihoods rely primarily on subsistence agriculture and, to a lesser extent, livestock keeping. The district has experienced environmental degradation due to population pressure, deforestation, and past political instability, making it an important site for assessing agroforestry practices.

### Research Design

A **cross-**sectional household survey was employed to obtain quantitative and qualitative data on agroforestry practices, indigenous tree and shrub species, and constraints affecting their adoption. The study combined questionnaires, key informant interviews, direct observations, and review of local records to generate comprehensive information suited to the research objectives.

This mixed-methods approach enabled triangulation of data sources and strengthened the validity of the findings.

The study population comprised households across the twelve villages of Soroti Sub-county. A multistage sampling procedure was used: All twelve villages in the sub-county were included to ensure broad geographical representation; within each village, six households were selected using simple random sampling from village household listings. To reduce clustering effects and increase spatial coverage, sampled households were located at least two kilometres apart; to minimize gender bias, each village sample included three male and three female respondents aged 16 years

  

ISSN: 2455-6939
Volume: 11, Issue: 06 "November-December 2025"

or older. A total sample of 72 households was obtained. Although small relative to the wider population, the sample provided adequate representation of the dominant farming systems and agroforestry practices in the study area.

A structured questionnaire was developed and pre-tested to ensure clarity, relevance, and completeness. The questionnaire captured information on: Socio-demographic characteristics, land ownership and farming practices, tree and shrub species grown and their uses, sources of seedlings, and constraints to agroforestry adoption.

The literate respondents completed the questionnaire independently, while the researcher administered the questionnaire orally to illiterate respondents in the local languages (Ateso and Kumam).

Semi-structured interviews were conducted with the local leaders, agricultural extension workers, representatives from NGOs (e.g., SOCADIDO), and experienced farmers. These interviews provided deeper insights into historical land-use practices, changes in tree cover, institutional support, and socio-cultural factors influencing agroforestry.

Systematic field observations were used to record tree density and distribution on farms, agroforestry systems (e.g., home gardens, mixed cropping, boundary planting), soil conservation structures, evidence of land degradation, and species regeneration patterns. The observation checklists ensured consistency across sites. Particular attention was given to tree–crop interactions and the extent of traditional agroforestry practices.

We reviewed the secondary data which included the village records, district agricultural reports, and previous studies were reviewed to complement field data, validate community responses, and provide historical context on vegetation changes, rainfall patterns, and population dynamics.

**Data management**

The collected data were cleaned, coded, and entered into statistical software for descriptive analysis. Frequencies, percentages, and cross-tabulations were used to summarize the socio-economic characteristics, types of agroforestry practices, distribution of indigenous tree and shrub species, and reported constraints to agroforestry.

The qualitative data from interviews and observations were analysed thematically and integrated with quantitative findings to strengthen interpretation. The mixed analytical approach allowed a clear assessment of the prospects and challenges of agroforestry in the study area. The participation was voluntary and respondents were informed that the study was strictly for academic purposes. Confidentiality was ensured, and no personal identifiers were recorded. Permission to conduct the study was obtained from local authorities.

  

ISSN: 2455-6939

Volume: 11, Issue: 06 "November-December 2025"

## RESULTS

### Socio-Demographic Characteristics

A total of 72 households were surveyed across twelve villages in Soroti Sub-county. Household heads were predominantly male (76%), reflecting the cultural patterns of land inheritance and decision-making in the area. Female-headed households (24%) were mainly widows or single women managing farms without a spouse, which may affect access to labor and resources.

Most respondents were middle-aged, with a large representation in the 45–64 age group, indicating that farming is largely managed by older adults. Younger household members often migrate to urban centers for employment or education, leaving older residents responsible for agricultural activities. Household sizes were comparatively large, averaging eight members, suggesting substantial domestic labor potential, even though labor shortages were still reported due to competing activities such as schooling and off-farm work.

Long-term residence in the area was common, with 43.3% having lived there for over 20 years. This implies strong familiarity with local farming systems, traditional agroforestry practices, and environmental changes. Only 10% were recent settlers, demonstrating a relatively stable population.

**Table 1: Length of Time Farmed in the Area**

| Farming experience | Frequency | Percent |
|---|---|---|
| ≤5 | 7 | 10 |
| 5-10 | 21 | 30 |
| 10-20 | 12 | 16.7 |
| >20 | 30 | 43.3 |

Household sizes were large, averaging eight members.

ISSN: 2455-6939
Volume: 11, Issue: 06 "November-December 2025"

**Table 2: Number of individuals in the household**

| Household size | Frequency | percent |
|---|---|---|
| 1-4 | 14 | 20 |
| 5-7 | 28 | 40 |
| 8-10 | 16 | 23.3 |
| >10 | 12 | 16.7 |

**Land Tenure and Land Use**

Most households (90%) had access to land through ownership or long-term family arrangements. Private freehold and customary tenure dominated, providing some level of security that generally favors long-term investments such as tree planting. However, some farmers expressed concerns about fragmented plots and unclear boundaries, which may discourage establishing trees that require long-term management.

Land size varied widely. About 23.3% owned less than 1 ha, yet the average size stood at 4.9 ha due to a small proportion of households with large holdings. Larger farms typically belonged to families with a long history in the area or those engaged in both crop and livestock production.

Crop production was the primary livelihood activity, complemented by tree planting, small-scale livestock keeping, and occasional income-generating activities such as brick making. The integration of these activities reflects the mixed farming systems typical of the Teso region.

**Table 3: Land Ownership**

| Land tenure | Frequency | Percent |
|---|---|---|
| Private freeholds | 23 | 33.3 |
| Communally owned | 21 | 30.0 |
| Private leasehold | 19 | 26.7 |
| Squatters | 7 | 10.0 |

Average land size was 4.9 ha, with 23.3% of households owning less than 1 ha.

ISSN: 2455-6939

Volume: 11, Issue: 06 "November-December 2025"

**Table 4: Size of Land Owned**

| Total land size(ha) | Frequency | Percent |
|---|---|---|
| ≤1 | 16 | 23.3 |
| 1-2 | 9 | 13.3 |
| 2-3 | 9 | 13.3 |
| 3-5 | 12 | 16.7 |
| >5 | 23 | 33.3 |

Mean land size: 4.9 ha

Crop production and tree planting were the main livelihood activities.

**Farming Systems**

Intercropping was widely practiced (57%), largely driven by land scarcity and the desire to maximize output from limited land. Cassava, groundnuts, sweet potatoes, millet, sorghum, and maize were the dominant crops. These combinations reflect traditional farming strategies that minimize risk, improve food security, and optimize land use.

Fallowing (21%) and crop rotation (13%) were practiced but at reduced rates compared to past decades due to population pressure. Slash-and-burn cultivation was reported as a common method for preparing land before planting. While it temporarily improves soil fertility, it contributes to vegetation loss and exposes topsoil to erosion.

Soil conservation practices showed moderate adoption. Ridging was the most prevalent (56.3%), used to reduce run-off and soil erosion. Windbreaks (31.3%) protected crops and homesteads from strong seasonal winds, and drainage canals (12.5%) were constructed in low-lying areas affected by waterlogging. Overall, the conservation measures remained insufficient relative to the extent of land degradation reported by local communities.

ISSN: 2455-6939

Volume: 11, Issue: 06 "November-December 2025"

**Table 5: Soil and Water Conservation Practices**

| Conservation practice | Frequency ( % ) |
|---|---|
| Ridging | 56.3 |
| Windbreaks | 31.3 |
| Drainage canals | 12.5 |

Farmers grew a wide range of crops dominated by cassava, sweet potatoes, groundnuts, sorghum, and millet.

**Table 6: Crops Grown**

| Crop | Frequency | Percent |
|---|---|---|
| G/nuts | 18.0 | 13 |
| Cassava | 20.4 | 14 |
| Cotton | 0.9 | 1 |
| Maize | 5.4 | 4 |
| Millet | 7.8 | 5 |
| Sorghum | 12.9 | 9 |
| Peas | 4.2 | 3 |
| Bananas | 6.0 | 4 |
| Cowpeas | 0.6 | 0.4 |
| Beans | 0.9 | 0.6 |
| Simsim | 0.9 | 0.6 |
| Pineapple | 0.6 | 0.4 |
| Yams | 0.6 | 0.4 |
| Tomatoes | 1.5 | 0.1 |
| Rice | 0.3 | 0.2 |
| Sugar cane | 0.3 | 0.2 |

ISSN: 2455-6939

Volume: 11, Issue: 06 "November-December 2025"

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|---|---|---|
| Onions | 0.3 | 0.2 |
| Sweet Potatoes | 17.7 | 12 |
| Sisal | 0.3 | 0.2 |

**Tree and Shrub Species**

A diverse mixture of indigenous and exotic species was observed. Fruit trees such as *Mangifera indica*, *Citrus spp.*, *Carica papaya*, and jackfruit were common because they provide both food and income. Farmers preferred species offering multiple benefits—shade, food, medicinal uses, fuelwood, and construction materials.

Tree distribution varied across the landscape. Home compounds (50%) and home gardens (27.1%) contained the highest densities, as farmers planted fruit trees and shade trees near residences. Trees on cropland (7.1%) were fewer, often due to concerns over shading effects on crops. Few trees were planted on grazing land or public places.

Seedlings were sourced predominantly from natural regeneration (48%). This indicates reliance on volunteer seedlings and limited access to formal nursery services. Purchased seedlings (16%) were mainly exotic species such as *Eucalyptus* and *Grevillea*, although termite attacks and high maintenance discouraged some farmers from expanding these plantings.

**Table 7: Trees and Shrubs and Their Location**

| Species | Location |
|---|---|
| *Mangifera indica* | Courtyard, scattered |
| *Tamarindus indica* | Home garden, scattered |
| *Viterllaria paradoxa* | Courtyard, scattered |
| *Albizia coriaria* | Scattered |
| *Senna spectabilis* | Home garden |
| *Melia azedarach* | Courtyard |
| *Combretum spp.* | Scattered |
| *Ficus dekdeka* | Scattered |

  

ISSN: 2455-6939
Volume: 11, Issue: 06 "November-December 2025"

| | |
|---|---|
| *Ficus glumosa* | Scattered |
| *Ficus sycomorus* | Scattered, courtyard, boundaries |
| *Erythrina abyssinica* | Scattered |
| *Acacia seberiana* | Scattered |
| *Citrus spp.* | Courtyard, home garden |
| *Vitex doniana* | Scattered |

Seedlings were sourced mainly from natural regeneration, other farms, and local nurseries (figure already included in original document).

**Livestock and Energy Use**

Livestock production was a supplementary livelihood activity. Goats, cattle, and poultry were the most common animals kept. Livestock contributed to food, income, and cultural functions. Feed was sourced from farm pastures, neighboring farms, and crop residues, showing limited investment in improved fodder systems.

Energy needs were met predominantly through firewood and charcoal (97%), reflecting limited access to modern energy sources. Firewood was mainly collected from farms, woodlots, and roadside vegetation, placing pressure on local tree resources. Only a small proportion reported difficulty finding firewood, although many acknowledged a gradual reduction in availability.

**Table 8: Animals Reared by Farmers**

| Animal type | No. owned | Percent |
|---|---|---|
| Cattle | 15 | 25.8 |
| Poultry | 9 | 24.3 |
| Pigs | 3 | 14.5 |
| Goats | 10 | 30.6 |
| Sheep | 2 | 4.8 |

Animal feed was obtained from farm pastures, neighboring farms, and crop residues.

  

ISSN: 2455-6939

Volume: 11, Issue: 06 "November-December 2025"

**Table 9: Source of Animal Feed**

| Source of animal feed | Percent (%) |
|---|---|
| Pastures on own farm | 31.1 |
| Pastures produced elsewhere | 33.3 |
| Plant residues | 31.1 |
| Tree/ shrub cut | 4.4 |

Firewood and charcoal were the primary household energy sources.

**Table 10: Principal Source of Energy**

| Principal source of energy for cooking | Frequency | Percent |
|---|---|---|
| Firewood | 65 | 93.4 |
| Charcoal | 2 | 3.3 |
| Agricultural residues | 2 | 3.3 |

Firewood and charcoal were the dominant household energy sources (97%). Firewood was largely collected from respondents' farms (44.4%), woodlots (29.6%), roadsides (18.5%), and neighboring lands (7.4%). Although only 20% reported difficulty obtaining firewood, overall availability was declining due to deforestation and population growth. Firewood was collected mainly from respondents' farms, woodlots, and nearby roadsides.

**Table 11: Source of Firewood**

| Source of firewood | Frequency | Frequency percent |
|---|---|---|
| Own farm | 31 | 44.4 |
| Gather from woodlots | 21 | 29.6 |
| Gather from roadsides | 13 | 18.5 |
| Gather from other farms | 5 | 7.4 |

ISSN: 2455-6939
Volume: 11, Issue: 06 "November-December 2025"

**Extent of Traditional Agroforestry**

Traditional agroforestry was widely practiced through home gardens, scattered trees on cropland, and naturally regenerated trees around homesteads. Fruit trees were especially valued for food security and income generation. However, the density of trees in farmlands had declined compared to past decades, partly due to increased demand for agricultural land and insufficient tree planting efforts.

Farmers maintained between one and four tree species around their homes. Species selection was driven by cultural preference, perceived usefulness, and availability of seedlings. Although indigenous species played an important role in household welfare, intentional planting and management were limited, indicating opportunities for promoting improved agroforestry practices.

**Table 12: Location of Trees**

| Place | Frequency | percent |
|---|---|---|
| Home garden | 19 | 27.1 |
| Crop land | 5 | 7.1 |
| Home compound | 35 | 50.0 |
| Boundaries | 4 | 5.7 |
| Woodlots | 4 | 5.7 |
| Roadsides | 2 | 2.9 |
| Fences | 1 | 1.4 |
| Grazing land | 0 | 0 |
| Public places | 0 | 0 |
| Total | 70 | 99.9 |

A wide range of species was reported, dominated by fruit trees and commonly used indigenous species.

ISSN: 2455-6939

Volume: 11, Issue: 06 "November-December 2025"

**Table 13: Trees Grown by the Local Community**

| Species | Frequency | Percent |
|---|---|---|
| *Mangifera indica* | 34 | 12.6 |
| *Senna spectabilis* | 21 | 7.8 |
| *Tamarindus indica* | 13 | 4.8 |
| *Eucalyptus spp* | 12 | 4.5 |
| *Citrus spp* | 36 | 13.4 |
| *Carica papaya* | 20 | 7.4 |
| *Melia azederach* | 21 | 7.8 |
| *Pines* | 2 | 0.7 |
| *Cashew nuts* | 14 | 5.2 |
| *Emalaina(local name)* | 21 | 7.8 |
| *Markhamia lutea* | 7 | 2.6 |
| *Psidium guajava* | 7 | 2.6 |
| *Ficus sycomorus* | 2 | 0.7 |
| *Albizia coriaria* | 4 | 1.5 |
| *Viterllaria paradoxa* | 3 | 1.1 |
| *Kigelia africana* | 1 | 0.4 |
| *Musanga cecropioides* | 1 | 0.4 |
| *Persia americana* | 2 | 0.7 |
| *Grevellia robusta* | 2 | 1.1 |
| *Cocos nucifera* | 3 | 1.1 |
| *Delonix regia* | 1 | 0.4 |
| *Milicia excelsa* | 3 | 1.1 |
| *Jacaranda mimosfolia* | 1 | 0.4 |
| *Artocarpus heterophyllus* | 7 | 2.6 |
| *Passiflora edulis* | 12 | 4.5 |

ISSN: 2455-6939

Volume: 11, Issue: 06 "November-December 2025"

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|---|---|---|
| *Thevetia paraviana* | 2 | 0.7 |
| *Cedralla cedrata* | 2 | 0.7 |
| *Ficus sur* | 2 | 0.7 |
| *Combretum collinum* | 1 | 0.4 |
| *Vitex doniana* | 1 | 0.4 |
| *Syzigium lusitanica* | 1 | 0.4 |
| *Eboboryei(local name)* | 2 | 0.7 |
| *Ejumula(local name)* | 5 | 0.0 |
| *Cupressus lusitanica* | 3 | 1.9 |

Trees commonly cultivated include, *Melia azedarach*, *Markhamia lutea*, *Viterllaria paradoxa*, *Senna spectabilis*, *Tamarindus indica*, Eucalyptus spp., Citrus spp., Mangifera indica, and Sodom apple. There are also a number of trees planted as boundary marks and fences. These include: Ficus sp., Euphorbia spp., *Thevetia paravian*, Ejumukla (local name). Some times trees are found scattered among crops in the field or as seen in several occasions, beneficial trees are left stranding in the area, for example, Combretum spp. And Ficus spp. Left scattered in cassava fields. This is a form of mixed intercropping. Trees provide a lot of services and products to man and the environment. Some of these products include; fruits, vegetables, pods, seeds, firewood for energy provision, fodder for livestock e.g. Harrisona abyssinica and *Mangifera indica* provide fodder to goats, sheep and cattle. This is in agreement with literature given by FAO (1989) and Etale Barley (1987). Most of the indigenous tree species and shrubs are scattered in the fields, found around courtyards, boundaries, fences, e.t.c. as shown in the table.

ISSN: 2455-6939

Volume: 11, Issue: 06 "November-December 2025"

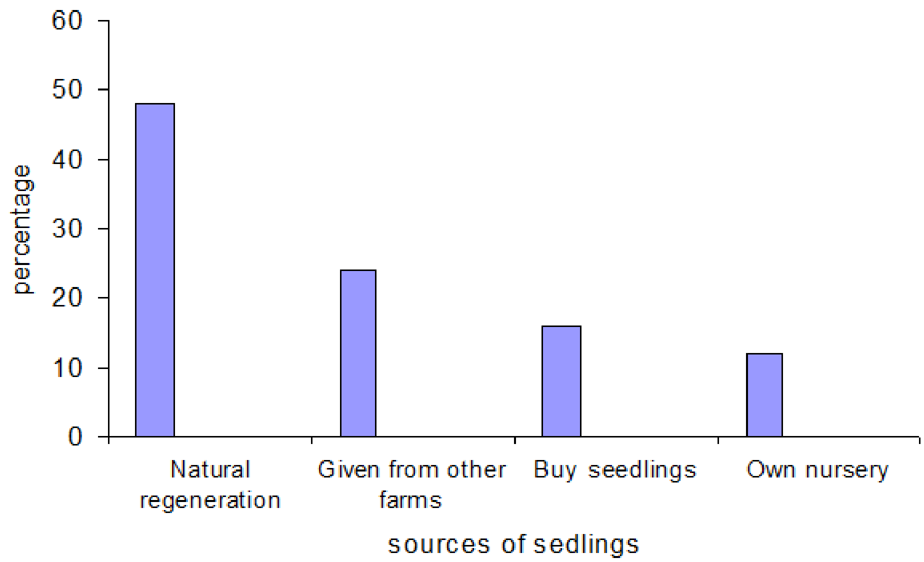


**Figure 1: Showing sources of seedlings to farmers in the subcounty**

The seeds for indigenous trees are generally collected or propagation is left to nature regeneration (plant wildings) and these are found growing under a mother tree. Relatively mainly because charcoal is expensive and the respondents cannot meet the costs. It was not determined whether residues were used to provide energy due to lack of firewood or because they are more convenient to collect. As can be seen from figure. Above, 48% of the respondents mentioned natural regeneration as their source of seedlings, 24% get seedlings from other farms, 16% buy seedlings from seedling centers in the area, and 12% from their own nurseries.

**Constraints to Agroforestry Adoption**

Several constraints hindered the adoption of agroforestry. Land scarcity (23%) was commonly cited, even among households with adequate land—suggesting perceptions rather than actual shortages. Lack of technical knowledge (21%) and inadequate seedling supply (20%) were significant barriers. Farmers lacked knowledge on spacing, pruning, intercropping combinations, and species selection.

Capital limitations (10%) restricted investment in tree planting materials and labor. Termite damage affected the survival of young trees, particularly exotic species. Tree tenure issues and seasonal rainfall variability further discouraged adoption.

A critical challenge was inadequate extension support. About 90% of respondents reported receiving no agroforestry-related advice from extension workers, NGOs, or forestry officials. This gap severely constrained the adoption of improved practices and the integration of scientific knowledge into traditional systems.

  

ISSN: 2455-6939

Volume: 11, Issue: 06 "November-December 2025"

**Table 14: Limitations to Tree Planting**

| Problems limiting tree planting | Frequency | Percent |
|---|---|---|
| Seedling supply | 14 | 20 |
| Lack of technical knowledge | 14.7 | 21 |
| Land scarcity | 16.9 | 23 |
| Land ownership | 3.5 | 5 |
| Cultural constraints | 0.7 | 1 |
| No capital | 7 | 10 |
| Lack of interest | 2.1 | 3 |
| Tree tenure rights | 2.8 | 4 |
| Pests, especially termites | 3.5 | 5 |
| Seasonal rainfall | 1.4 | 2 |
| Crops favored | 4.2 | 6 |

## DISCUSSION

The findings of this study indicate that agroforestry in Soroti Sub-county is deeply rooted in traditional farming systems, yet its potential remains largely underutilized. Although a majority of households integrate trees—especially fruit species—within their homesteads and croplands, these practices are predominantly unplanned and not guided by scientifically informed agroforestry principles. This aligns with observations in many parts of Uganda where farmers possess strong indigenous knowledge of tree uses but limited technical capacity for managing trees within productive farming systems.

### Socio-demographic Context and Its Influence on Agroforestry

The dominance of male-headed households and the aging population among respondents may partly explain the slow uptake of improved agroforestry technologies. Elderly farmers, though experienced, often have limited labor and lower exposure to new innovations. Younger people migrating to urban areas reduces the availability of labor required for labor-intensive activities such as tree planting, pruning, nursery management, and establishment of soil conservation structures. This is consistent with patterns observed elsewhere in eastern Uganda where rural out-migration constrains agricultural innovation.

  

ISSN: 2455-6939
Volume: 11, Issue: 06 "November-December 2025"

Large households—averaging eight members—should theoretically provide sufficient family labor; however, the study found that although 96% rely on family labor, this labor is often insufficient relative to the demands of agroforestry. This labor shortage restricts proper tree management, ultimately lowering yields and discouraging adoption.

**Land Ownership and Use Patterns**

Land tenure emerges as both an opportunity and a constraint. While 90% of households own land, the fragmentation associated with customary tenure and reliance on inherited land may limit long-term investment in tree planting. Farmers' perception of land scarcity as a major constraint, despite the availability of land, reflects a misunderstanding of agroforestry as a competing rather than complementary land use. This knowledge gap underscores the need for stronger extension services to demonstrate how trees can enhance productivity even on small plots.

The predominance of slash-and-burn agriculture and declining fallow periods reveal unsustainable land-use patterns that degrade soil fertility. Agroforestry could address these challenges through soil improvement, erosion control, and microclimate regulation, but poor technical understanding has prevented wider adoption.

**Tree Species Diversity and Management Practices**

The study documented a rich diversity of both indigenous and exotic tree species, indicating that farmers value trees for multiple functions—food, shade, fuelwood, medicinal uses, fodder, and construction materials. Fruit trees such as *Mangifera indica*, *Citrus spp.*, and *Carica papaya* are highly preferred, reflecting farmers' inclination toward species that provide direct household benefits.

However, the reliance on natural regeneration (48%) and seedlings from other farms (24%) suggests a weak seed supply system. Limited nursery capacity and the high cost or unavailability of quality seedlings reduce farmers' ability to expand tree planting. Termite damage, poor management knowledge, and limited species selection further hinder improved agroforestry establishment.

**Constraints to Agroforestry Adoption**

The most pervasive constraint is inadequate extension support—with 90% of respondents reporting no access to forestry or agroforestry advisory services. Without technical guidance, farmers tend to plant trees randomly or allow natural regeneration without proper spacing, pruning, or tree–crop compatibility considerations. These poor practices can reduce crop yields through shading or root competition, reinforcing negative perceptions about agroforestry.

  

ISSN: 2455-6939

Volume: 11, Issue: 06 "November-December 2025"

In addition, inadequate markets, low prices for farm produce, poor roads, and limited access to capital restrict farmers' willingness to invest in tree planting. Farmers' concern about tree tenure rights also discourages planting, as some fear losing authority over trees when they mature—an issue documented in many rural communities where customary norms influence resource ownership.

**Energy Demand and Pressure on Tree Resources**

The overwhelming reliance on firewood and charcoal for household energy (97%) places continuous pressure on local tree resources. Although many households collect firewood from their own farms, declining availability indicates that current harvesting rates are unsustainable. Agroforestry woodlots would address this gap, yet termite attacks and poor seedling supply prevent their widespread establishment.

**Potential for Agroforestry Intensification**

Despite the constraints, the study reveals strong potential for expanding agroforestry in Soroti Sub-county. Farmers already practice traditional forms of tree–crop integration and show positive attitudes toward tree planting, particularly fruit trees. The presence of indigenous species with high ecological and socio-economic value—combined with farmers' indigenous knowledge—provides a solid foundation for improved agroforestry systems.

With strengthened technical support, improved seedling supply, better extension services, and supportive policies, the existing traditional practices could be transformed into more productive and sustainable agroforestry systems. The district's bimodal rainfall, fertile soils, and mixed farming systems offer favorable biophysical conditions for advanced agroforestry practices such as boundary planting, improved fallows, live fences, fodder banks, and agro-silvopastoral systems.

## CONCLUSIONS

The study revealed that rapid population growth in Soroti Sub-county has increased pressure on land resources, driving demand for both food and tree-based products. Although agroforestry is widely practiced in traditional forms—often unintentionally—tree density on farmlands has significantly declined over time. Farmers commonly integrate fruit trees such as mangoes, citrus, and papaya within their cropping systems, and they possess substantial indigenous knowledge regarding the identification and uses of local tree and shrub species. However, this knowledge is not adequately translated into deliberate or improved agroforestry practices.

The dominant land management strategies observed include intercropping, grass fallow, bush fallow, and limited crop rotation. Indigenous tree species continue to serve multiple roles, including food provision, fuelwood, construction materials, fodder, and environmental services

  

ISSN: 2455-6939
Volume: 11, Issue: 06 "November-December 2025"

such as soil stabilization and shade. Yet farmers largely rely on natural regeneration rather than intentional tree planting. As a result, the regeneration of valuable species is inconsistent, and the overall contribution of trees to farming systems is diminishing.

A critical finding is that farmers lack adequate technical knowledge on the establishment and management of tree components within agroforestry systems. This limitation is compounded by inadequate extension services and limited access to improved seedlings, which collectively hinder the adoption of modern agroforestry technologies. Although land scarcity was reported as a constraint, it is evident that the core barriers stem from insufficient skills, limited institutional support, unclear tree tenure arrangements, and inadequate resource inputs. Furthermore, termite damage, seasonal rainfall variability, and low household incomes also restrict farmers' capacity to invest in agroforestry.

Despite these challenges, the study demonstrates strong potential for agroforestry development in Soroti Sub-county. Farmers exhibit positive attitudes toward tree growing, particularly fruit trees, and recognize multiple benefits derived from trees. With appropriate training, improved access to planting materials, strengthened extension services, and supportive policies, agroforestry can substantially enhance food security, environmental conservation, and household livelihoods in the district. Meaningful progress will require the integration of indigenous knowledge with scientific agroforestry practices, as well as the participation of local communities in planning and implementing interventions

## RECOMMENDATIONS

To strengthen agroforestry adoption and address the environmental and livelihood challenges identified in Soroti Sub-county, a multifaceted and coordinated approach is required. First, community sensitization on the importance of trees, soil conservation, and sustainable land management should be intensified through school curricula, farmer training programs, and local awareness campaigns. Strengthening extension services is essential; agricultural and forestry extension officers should be equipped to provide regular technical support on species selection, nursery management, planting techniques, and tree–crop integration. Improving farmers' access to quality planting materials is also critical. Government agencies, NGOs, and community groups should establish well-managed nurseries that prioritize locally adapted indigenous species and make seedlings affordable and readily available. Demonstration plots and model farmers should be identified in each parish to showcase successful agroforestry practices and provide practical learning sites for the wider community.

Furthermore, policies addressing land and tree tenure should be clarified and disseminated to encourage farmers to invest in tree planting without fear of losing rights to trees or land. Measures to curb indiscriminate tree cutting—especially for charcoal and firewood—should be implemented

ISSN: 2455-6939

Volume: 11, Issue: 06 "November-December 2025"

alongside promotion of alternative energy sources and efficient cooking technologies. Integrating indigenous knowledge with modern agroforestry practices will enhance local ownership and adoption, while supporting the domestication and conservation of valued indigenous species. Investment in rural infrastructure, particularly feeder roads and local markets, is also necessary to improve access to markets for tree products and strengthen economic incentives for agroforestry. Finally, research institutions, including universities, should undertake continuous research on suitable species combinations, tree management practices, and agroforestry systems tailored to the ecological and socio-economic conditions of Soroti, and ensure that findings are shared with farmers, extension workers, and policymakers.

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