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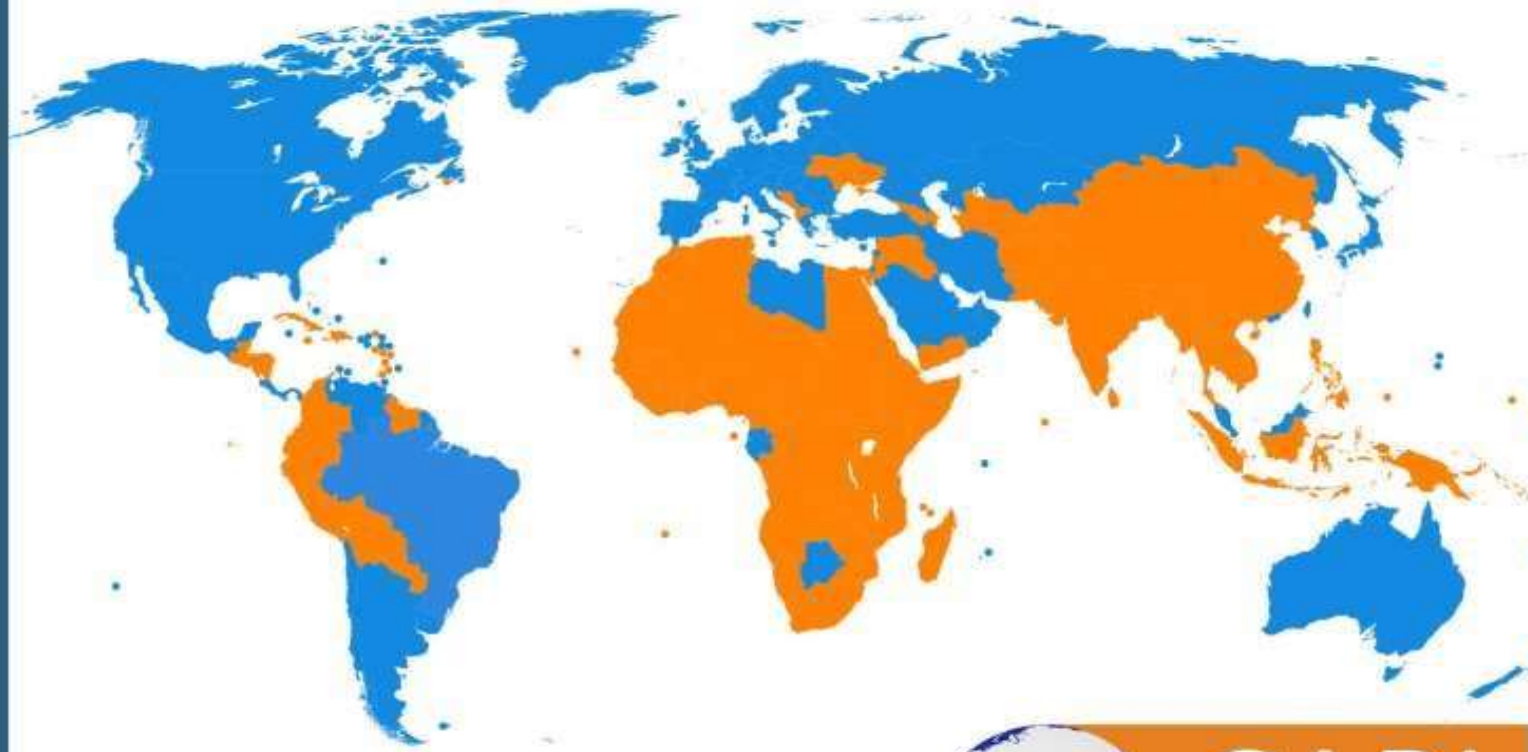

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Afforestation for Household Livelihoods in Alebtong Town Council, Mid-North Uganda

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ABSTRACT

Purpose: This study aimed to describe how afforestation contributes to household livelihoods in Alebtong Town Council, Nakabela ward, specifically; we described the level of afforestation, determined the livelihoods of households and ascertained the contribution of afforestation to the livelihoods of households in Nakabela Ward.

Methodology: A mixed and cross-sectional survey design was employed for this study with a sample size of 56 respondents. A pilot test was conducted to ensure validity and reliability of instruments before use. Whether it is real or not depends on the source of the data. Potential participants were identified as possible beneficiaries who generated ideas for specific study variables.

Findings: Findings revealed that afforestation in Nakabela Ward-Alebtong town council is not excessively severe. According to the survey, 80.4% of participants agreed to engage in afforestation, and 85.7% of respondents were aware of it. 10.7% remain uncertain, though. Afforestation is beneficial to the community (55.3%), while 32.1% disagreed. Despite participating in afforestation, 62.4% of respondents said they are not government employees [reported that they are not government employees]. While 26.8% of respondents are neutral, 58.9% of respondents encourage other members of the community to engage in afforestation. In Nakabela terms, 19.6% of respondents disagreed with the bulk of measures used to evaluate afforestation [resulting in disparities in the majority of measures employed to assess afforestation], although the majority agreed. Additionally, the survey found that 73.2% of participants profited from afforestation, with 55.4%, 69.7%, 62.5%, and 76.1% reporting gains in income, food security, healthcare, and timber supply, respectively.

Contribution to Theory, Policy and Practice: This study contributes to the practice of tree planting as a source of household and community livelihoods even if it calls for awareness for individuals as a means to advancing awareness.

Key words: *Afforestation, Household Livelihood, Tree Planting, Community Participation*

1.0 Introduction

Global forest management strategies had changed since the 1980s to provide communities living close to forests more authority over their management and ownership (Edmunds et al., 2013). In tropical nations, community-based forest conservation efforts had emerged as a result of acknowledging local communities as efficient forest managers and providing incentives for them to preserve trees for better livelihood benefits (Ota et al., 2021). As a means of mitigating and adapting to climate change, reforestation is becoming more popular in industrialized nations. Its goals were to preserve ecosystems, increase biodiversity, and sequester carbon. Increased efforts in this area were being driven by initiatives such as the UN Decade on Ecosystem Restoration and the Bonn Challenge (Andres et al., 2023). By 2030, Russia intends to reforest 7.7 million hectares as part of its ambitious afforestation and reforestation efforts (Cubbage et al., 2025). In 2008, China's afforestation rate was 4.77 million hectares, the highest in the world (Khan et al. 2025). There were 148 million acres of land in the US that might be used for afforestation, and the Biden administration wants to plant more than a billion trees (Lunt, 2024). South Korea today boasts 64% forest cover, demonstrating a tremendous turnaround in restoration efforts (Shim, Kim, & Martin, 2008). Forests were vital for biodiversity, economic activity, and ecotourism, but afforestation projects impact livelihoods and ecosystems by altering resource mix, despite increasing importance in policy interventions (Sahoo et al., 2022).

While there are several ways through which communities in northern Uganda can sustain their livelihoods (such as youth livelihood program (Achiro & Mwesigwa, 2023, Mwesigwa & Mubangizi, 2019; skills development (Achiro & Mwesigwa, 2022; gambling especially through football betting (Mwesigwa, 2018), understanding the impact of forestry plantations on livelihoods was crucial for designing policies that maximize benefits and minimize negative effects. Forests had historically provided land, building materials, energy, fuel, food, and nourishment (Nigussie et al., 2021). Forest restoration programs aim to mitigate climate change, protect biodiversity, and restore agricultural land. The restoration of degraded landscapes through afforestation, conservation of existing forests through improved protection, and enhancement of livelihoods benefits by engaging rural poor positively impact household livelihoods. Meanwhile, community participation was essential in afforestation, just like it is in other aspects such as local governance (Mwesigwa, Bogere & Ogwal, 2022; Mwesigwa, 2021), policy issues (Mwesigwa & Mubangizi, 2015), democratic processes such as elections (Mwesigwa, 2011), it could improve socioeconomic conditions through sustainable and equitable resource use (Ullah, 2024). However, poor participation of local communities in forest co-management was a challenge, with factors such as local politics, powerful landowners, unavailability of appropriate services, lack of information on natural resource management, poor organization of community members through development organizations, and inequalities among community members being identified (Ullah et al., 2022). Forests were vital for the livelihoods of nearly one-third of the world's population, with roughly

40% of the rural poor in developing regions residing in or near forested areas. However, these communities face poverty, vulnerabilities, and food insecurity due to a complex interplay of environmental, economic, social, and political factors, exacerbated by ecological degradation and climate change (Khan et al., 2020).

In Africa, forest resources were crucial for rural communities in providing essential services, products, and incomes. Common natural forest products include Non-Timber Forest Products (NTFPs), such as wild spinach, fuel wood, charcoal, and medical plants (Shackleton et al., 2024). Jagger et al. (2022) argued that understanding the contribution of forests to poverty alleviation and human well-being had never been more important. Gains in poverty reduction achieved over the past several decades were being erased by the effects of the COVID-19 pandemic, with marginalized communities disproportionately affected. At the same time, climate change was increased the frequency of extreme weather events and natural disasters, especially in poor countries. However, the declined resilience of forests and agricultural sectors, particularly in South Africa, was a public policy challenge due to climate change and other challenges. Vulnerability to climate change is influenced by factors like tropical location and socioeconomic, demographic, and regulatory tendencies (Nguyen et al., 2023). Sub-Saharan Africa is expected to experience higher damages due to high heat and precipitation, requiring forests to adapt to future climate conditions (Bedeke, 2023).

Uganda is a landlocked country located in East Africa. It lies across the equator and is bordered by South Sudan, Kenya, Tanzania, the DRC, and Rwanda. For 15 years, there has been a growing interest in the role of forests in supporting the livelihoods of poor people in Uganda, reducing vulnerability to economic and environmental shocks, and reducing poverty. However, policymakers in non-natural resource ministries were often unaware of forests' contribution to poverty reduction. Few data were available to illustrate how forests contribute to poor households' livelihoods, and poverty reports often underestimate their impact (Bigirimana, 2020). Forests provide essential food and nutrition for forest-dependent Ugandans, especially marginalized ones. Sustainable forest management ensures food security, poverty eradication, and ecological improvement (Wang et al., 2023).

The Lango community was actively involved in resource management through traditional systems and participatory programs like Collaborative Forest Management (SFM), contributing to reforestation, agroforestry, and biodiversity conservation, while ensuring sustainable livelihoods through land-use practices and buffer zones. (FAO, 2022). Alebtong was a district found in the Northern region with a population of 34.1 million, according to the Uganda population and housing census of 2014 (Wesige et al., 2024). In Alebtong district, the level of afforestation was still low. Its impacts on the household's livelihood had not been seen so much, and yet afforestation could have positively impacted the socio-economic lives at the household level. According to Kaweesa et al. (2021), Northern Uganda was facing severe climate change, causing prolonged dry spells

and erratic rainfall, particularly in Alebtong district. This leads to water stress, crop failure, post-harvest losses, pests, and flash floods, negatively impacting food security and socio-economic conditions. 11% of households in Alebtong eat only one meal daily, and many face damage.

In Alebtong town council, it's of no exception that the contribution of afforestation was seen since little interest had been taken to understand. This study, therefore, would describe its contributions to the socio-economic livelihoods of the household in Nakabela Ward.

1.1 Problem Statement

Sustainable Development Goal (SDG) 15, also known as "Life on Land, was a global commitment to protect and restore the land (ESCAP et al., 2022). Although Uganda's government had implemented collaborative forest management (CFM) and community forestry (CF) approaches in the forest sector. The government was promoting climate-smart agriculture, training community members on forest benefits, and encouraging forest management and sustainability. Initiatives like Parish Development Model (PDM), Youth Livelihood Program (YLP), Uganda Women Entrepreneurship Program (UWEP), and Operation Wealth Creation (OWC) support community-based businesses (Mecham, 2020). Eligible entities include community-based organizations, farmers' groups, companies, cooperative societies, and Nongovernmental Organizations (NGOs0. While development partners like Plan International and the Foundation focus on livelihood programs to support afforestation to enhance household livelihood, little was still known about the contributions of afforestation to the household livelihoods. This had motivated the researcher to investigate the contribution of afforestation to household livelihoods in Alebtong town council.

2. Literature Review

2.1 Level of Afforestation

Forest ecosystems are crucial for biodiversity, covering 31% of global land area. Over half is intact, and over one-third is primary forest. However, forests were not evenly distributed globally, with over half in five countries and 66% in ten. The total forest area is 4.06 billion hectares (Ibrahim et al., 2018). In developed countries, a significant portion of the world's forests are generally characterized by a trend of regaining forests after a period of deforestation, with many now focusing on afforestation and reforestation efforts (Georgescu & Nica, 2024). China had the highest afforestation rate of any country or region in the world, with 4.77 million hectares (47,000 square kilometers) of afforestation in 2008. As of 2022, China had the most trees planted in 2021, at more than 2.5 billion trees (Ashraf, 2022). Raihan (2023) asserts that afforestation in Europe had a significant economic impact, supporting industries like forestry and logging, generating substantial value added, and creating jobs, while also contributing to the broader forest-based economy, including timber, non-wood products, and ecotourism.

While in Africa, the total forested area of Africa comprises 18% of the global forest area. In SSA, forests cover an area of 487.65 million hectares (including 162 million hectares of Congo Basin rainforest, 218 million hectares of Miombo (open-canopy) woodlands, and 106 million hectares of dry forests) (Wang et al., 2022). The growing demand for wood, fuel wood, charcoal, and non-wood forest products in Africa was putting pressure on natural forests. Plantation forests, which account for 20%-35% of the global wood supply, are used to supplement and increase industrial and domestic wood supply, but their sustainability remains uncertain (Hetemäki, Tegegne & Ochieng, 2023). Therefore, plantation forests had been considered a quick fix to overexploitation of natural forest resources, but their capacity to sustainably supply wood and non-wood products remains uncertain. Estimates range from 20% to 35% of global wood supply from planted forests, with saw logs at 10% (Sheppard et al., 2020).

Uganda was actively pursuing afforestation and reforestation efforts, with initiatives like the "Running Out Of Trees" (ROOTS) campaign aiming to plant 40 million trees annually to restore forest cover and combat climate change (Glatzel et al., 2024). According to Ntawuruhunga et al. (2023), through carbon sequestration and sustainable development, the International Small Group + Tree Planting Program (TIST) argued that there was a need to equip small subsistence farmers to fight poverty, drought, and deforestation; farmers should be encouraged to plant more trees and make money by selling the carbon that the trees store. Additionally, Kajjansi (6th October 2023) states that the Ministry of Water and Environment, in partnership with private sector stakeholders, held a national tree planting day as part of the initiative aiming to restore Uganda's tree cover by 200 million trees over a five-year period until 2026. The ministry's initiative aims to restore Uganda's forestry cover, which had lost half its forestry cover in the past 30 years. While Nabuuma (2019) asserts that partners with local tree-planting communities ensure the sustainability of the projects. Through education, engagement, and empowerment, these communities become stewards of their own environment, nurturing trees that will sustain life for generations.

In the Lango sub region, indigenous trees, particularly Shea, are endangered due to increased demand for charcoal and firewood. Following mass sensitization campaigns, communities were planting trees for wood fuel to limit destruction. The Dwokcan-ipur farmers' group, with support from Kijani Forestry, were growing various tree species for charcoal and timber (Epilla, 2014). Okere Shea Cooperative Society in Otuke District plans to plant 100,000 more shea trees by 2030 to protect them from extinction. The group, which had already planted 5,000 trees, also adds value to Shea nuts. Locals are also planting indigenous trees for charcoal, firewood, fruits, and conservation (Milano, 2021).

On the other hand, Okello Albert, the project coordinator of Farm Radio International (FRI) and the International Union for Conservation of Nature (IUCN) in Omarari and Baya parishes, Omoro Sub County, Alebtong district, said a total of 21 villages in the area were engaged in tree planting for firewood and timber, among other uses. He adds that the tree seedlings will be distributed to

other locals for planting at no cost, and they expect each household to plant at least 1,000 trees (Hallett et al., 2024).

According to the material mentioned above, afforestation had been and was practiced in several places of the world. Both those of the industrialized world and other third-world countries were reviewed. Nevertheless, there was little information in the literature regarding the amount of afforestation in the Alebtong area, and more importantly, it made no reference of the amount of afforestation in the Nakabela ward of the Alebtong town council in any paragraph. This study was be carried out in order to close this gap.

2.2 Household Livelihood

Global household livelihood data reveals a complex picture, with income sources varying significantly across regions and socio-economic groups. While agriculture remains a major source of income for many, especially in rural areas and developing countries, non-farm businesses and wage employment are increasingly important. Diversification of income sources was a common strategy, often driven by economic development and the need to manage risk (Salam & Bauer, 2022).

The World Bank Forest Action Plan highlights the significant impact of forests on poverty in Africa, with forest-related income lifting 11% of rural households out of extreme poverty. Household livelihoods, including human, natural, financial, physical, and social capital, are central to development and were influenced by community, culture, values, and context. Strategies to satisfy immediate needs like food, clothing, housing, education, and health are based on these livelihoods. Household afforestation, which involves planting trees, can combat deforestation and address climate change. Potential livelihoods can be envisioned through five types of assets: human, social, natural, physical, and financial. (Peng et al., 2022). Abdillah & Manaf (2022) and Khan et al. (2020) discuss the varying nature of livelihoods, including subsistence, identity, jobs, and collective enterprises. They emphasized the importance of sustainable, self-determined, and livelihoods security for local people, while land tenure security influences opportunities and societal relationships. Livelihoods were shaped by social, economic, and political contexts, including institutions, processes, and policies. Changes in these contexts create new livelihood obstacles or opportunities, influenced by factors like gender, ethnicity, culture, history, religion, and kinship. These factors influence decisions on access to resources, social norms, and the frequency and intensity of natural hazards. Livelihoods are interdependent, relying on each other for access to assets and markets.

Positive and negative impacts on one livelihood would impact others, making it crucial to consider these factors when planning livelihood assistance (Rakodi, 1999).

a) Livelihood promotion was a development-based approach aimed at enhancing household livelihood resilience to meet basic needs sustainably. It involves diversifying income-generating activities, providing financial services, and strengthening markets. It requires long-term commitment from governments and other actors, focusing on vulnerability and adapting strategies to survive in changing conditions. (Birkmann et al., 2022).
b) The debate on the causes of poor livelihoods, including famine and food insecurity, is contentious. Some argue ecological degradation and bioclimatic issues, while others believe unfair resource distribution. Poverty was a preventable socio-economic crisis, and environmental degradation led to preventable illnesses and premature deaths. Improved health led to healthier lives. (Mastrorillo et al., 2024).
c) Forest resources, particularly afforestation, positively impact household livelihoods in rural areas, contributing to physical, social, and financial well-being. Alebtong Town Council lacks information to reassure the public and stakeholders about its economic impact, prompting researchers to explored lifestyles to address this gap.

2.3 Contribution of Afforestation

Africa's forests were vital for development, providing raw materials and habitats. However, they faced pressure from land demands, poor governance, and climate change. Between 2010 and 2015, Africa experienced the highest annual forest loss. The World Bank's Africa Environment and Natural Resources team had sponsored video stories to raise awareness about deforestation and the opportunity to transform livelihoods through REDD+ and forest improvement efforts (Demaze, Sufo-Kankeu, & Sonwa, 2020). In Uganda, the advantages of afforestation were investigated using a documentary review checklist (Zürcher, 2022). Research indicated that afforestation slows down global warming by increasing O_2 and decreasing CO_2. Soil quality, erosion control, sustainable economic development, and enhanced quality of life are among the environmental advantages of sustainably maintained woods (Azhar et al., 2024). Clean water resources, electricity, renewable products, and habitat for native animals are all provided by forests. Afforestation improves crop and animal productivity, shields communities from the effects of climate change, and provides food, fuel, money, and ecosystem services, all of which had a substantial influence on livelihoods (Cvjetković & Mataruga, 2020).

2.3.1 Increased household income

The forest income and its impact on economic inequalities among rural households was the second most crucial income portfolio, with bush meat being the most significant, and reducing access to forests could increase income disparities and impact rural households' welfare. The findings can help develop sustainable forest management policies to maintain forest use without damaging biodiversity conservation (Ray & Mukherjee, 2023). Afforestation was believed to reduce carbon dioxide emissions, but it may not necessarily mitigate global warming. Plantations can absorb

newly emitted carbon dioxide and some that had increased the concentration in the atmosphere (Chauhan, 2020). Carbon dioxide is easy to measure and directly related to Earth's rate of warming, but it is only a part of the equation. Heat emissions, generated by fossil fuel combustion or nuclear fusion, also release heat energy, which could explain global warming. For rural people, forests increase household income; especially for those with little or no land of their own, forests may provide the main source of cash income. This income did not come from wood harvesting only. Non-wood forest resources can often generate greater, more sustainable incomes than can be gained from the same land when used for agriculture or logging (Mathew, 2022). World trade in rattan, for instance, is worth US$2 000 million annually. In India alone, forest-based industries support 30 million people. Forest products contribute 28.1% to annual average income in the Wolaita zone, Ethiopia, while forests account for 38.3%. Factors such as family size, farmland size, occupation, and distance to forest influence forest product contribution. Male-headed households rely more on forest resources. Poor households derive the highest relative forest income. Afforestation can boost rural economies by creating jobs, providing raw materials for local industries, and generating income from the sale of forest products. This supports livelihoods and contributes to overall economic development (Tiwari, Kumar & Lynser, 2020). Forests provide food and income during the "hungry season" or planting season, while non-timber forest products (NTFPs) like fruits, nuts, and medicinal plants also contribute to food security. The income earned from these activities can be reinvested in other assets, further enhancing household livelihoods. Forestry subsidies had a positive impact on forest farmers' income, as they motivate them to operate forests.

The incentive theory suggests that these subsidies drive family benefit maximization, leading to higher operating income. However, the study suggests that forestry subsidies may not release the labour force but restrict off-farm work. To improve the impact, the study suggested modifying subsidies to focus on ecological construction, considering social equity, and increasing subsidies to ensure forest farmers' income (Olajuyigbe et al., 2020). Consequently, forestry can generate employment due to its low capital requirements and flexibility. As industries contract, investing in forest asset rebuilding becomes critical. Upstream forestry activities contribute to climate change mitigation and adaptation with carbon sequestration from newly planted trees. This doubles the benefits of slowing down deforestation, improving forest management, and reducing forest fires (Nair & Rutt, 2009).

2.3.2 Increased Food Security

Forests and tree systems in Africa were crucial for household food supply, providing essential dietary elements that traditional agricultural produce lacks. However, progress had been slow in implementing measures to increase the contribution of wild plants and animals to food production and food security. Forests also indirectly contribute to food security by ensuring the sustainability of agricultural production systems. FAO's Special Programme for Food Security (SPFS) had

addressed this issue by introducing diversification components in its strategy. The challenge now is to increase land productivity through sound technological practices, agricultural inputs, and effective food markets. Intensification was not only increase food production but also ease pressure on forest resources and natural landscapes. Afforestation significantly contributes to household food security by providing diverse and nutritious foods, supplementing diets, offering income and employment opportunities, and acting as a safety net during food shortages, all while supporting sustainable agricultural practices (Rao, 1997). One of the most important direct contributions of the forest to the food supply is wildlife. In many areas, small rodents, reptiles, birds, snails and insects, as well as larger animals, make up a much more important part of the diet than is generally realized (Small, 2021).

Meanwhile, Rao (1997) stresses that, trees enhance agricultural productivity, soil fertility, and nutrient recycling while also providing essential nutrients and animal foods, preventing malnutrition during food shortages or emergencies. Forests provide fodder and rangeland for 30 to 40 million pastoralists worldwide who herd some 4 000 million cattle, goats and sheep.

Trees help to protect pastoral rangelands, providing shade for cattle and crops and thereby supporting livestock production. For instance, bush meat in Peru and springhare meat in Botswana provide animal protein. Rattan, a non-timber forest product, contributes to global trade in Indonesia. Mushrooms provide protein and minerals in Zaire's Upper Shaba area. Nonetheless, while livestock were increasing in number, the area available for grazing was being reduced because of conversion to crop production. Forest products were crucial for food, nutrition, and wildlife in developing countries. In Northeast Thailand, 60% of food comes from forests, while Java's 60% comes from home gardens. Wildlife consumption contributes to food supply, but illegal hunting was common. Trees and forest products provide essential vitamins, such as vitamin A, which is crucial for diets. As natural vegetation depletes, forestry planning could help reverse this trend. Fuel wood is essential for food security, and multipurpose trees can address local needs. Forests also support sustainable agricultural production, such as animal husbandry and fisheries (Nugroho & Baral et al., 2022).

2.3.3 Improved Health Status

Forests, covering nearly one-third of Earth's land, offer significant health benefits for all people. Health is defined as a state of complete physical, mental, and social well-being, including disease prevention and treatment (Toker, 2022). Health-wise, forests improve human health by reducing stress, improving mood and sleep, boosting the immune system, providing clean air and water, and offering opportunities for exercise and recreation. They also serve as natural filters, maintain water cycles, and promote mental well-being, even for children with ADHD. Forests are indispensable to human health. Forests provide natural resources, such as food, fiber, and fuel, that support

people's health and livelihoods. They also filter our air, regulate water cycles, and help mitigate the hazardous effects of climate change through carbon sequestration (DeMicco, 2022).

Trees aid entire ecosystems by stabilizing soils, offering wildlife rich habitat, absorbing and filtering storm water, lowering temperatures, and more. They also had a number of positive effects on human health. One cannot overestimate the benefits of living close to trees, from the medicinal trees that human societies have used for hundreds of years to provide life-saving medicine to the urban trees that protect city people from dangerously high temperatures. We find solace in their limbs, healing in their medicinal chemicals, protection as they absorb dangerous pollutants, wonder in their presence, and sustenance in their nutrient-rich fruits.

Indigenous people had long known that trees were essential to our survival, both generally for the planet's health and personally for our health, and current studies have only confirmed this (Morgan et al., 2021). Forests provide nutrition and essential ecosystem functions and support mental health by reducing stress and anxiety. They also provide nutrient-rich foods, medicinal plants, and wood fuel for cooking, which is crucial for rural and urban populations (Snyder, 2024). Additionally, forests had cultural significance, as Indigenous people associate the well-being of forests with enhanced collective and community well-being. Deforestation and degradation of forests can cause negative mental health issues. Overall, forests play a crucial role in promoting overall health and well-being (Schaafsma, 2021).

2.4 Research gaps

Summarily, the aforementioned literature had focused mostly on the level of afforestation, household livelihood and contributions of afforestation, especially in developed nations. Relatively, little attention was paid to sub-Saharan Africa, Uganda, and Alebtong District. The information on the level of afforestation and household livelihoods in Alebtong Town Council is scanty in the studies. Additionally, the contributions of afforestation to Alebtong Town Council were hardly mentioned, leading to inadequate information about the level of afforestation, household livelihood and the contributions of afforestation to the said community. This had motivated the researcher to carry out the study to close the gap by examining the above objectives and specifically the contributions of afforestation in Alebtong town council, Nakabela ward.

3.0 Material and Methods

3.1 Study Design, Location, Population, Sample and sampling techniques

The researcher used a mixed and cross-sectional survey design to examine the impact of afforestation on households' livelihoods in Nakabela ward. The model was collection of data directly from respondents or participants, providing first-class information. The cross-sectional research design was optimizing defining, predicting, and examining the consequences between variables. The study was conducted among the communities of Nakabela ward with the intention

to describe the contribution of afforestation to the household livelihood in Nakabela ward, Alebtong Town Council, Alebtong District. The study populations were included community members, political leaders, civil servants, and representatives of non-governmental organizations, religious and cultural leaders. They were selected because the researcher expected them to have information concerning the effect of afforestation on livelihoods at the household level in Nakabela Ward, Alebtong Town Council, Alebtong District.

A sample of 56 respondents was made to represent the entire population under study. This sample was distributed as below: members in the community at household level 35, cultural leaders 05, sub-county staff 03, political leaders 05, religious leaders 05, and non-governmental organizations (NGOs) 03. This was to enable the researcher to gather enough data pertaining to the contributions of afforestation to the household livelihoods in Nakabela ward, Alebtong Town Council, Alebtong District. In order to prevent the possibility of researcher bias, the researcher used two sample designs in this instance: a stratified sampling approach supported by a random sampling strategy. Nonetheless, representatives of non-governmental groups, civil servants, and political leaders was also included in the purposive sample technique. Because those groups had specialized expertise of the issues facing the populations they represent, the researcher employed this sample strategy.

Table 1: Showing Categories of respondents and sampling technique to be used in the study

No	Category of respondents	Frequency	Sampling method	Percent
1.	Community members	35	Stratified	62.5
2.	Political leaders	05	Purposive	8.9
3.	Civil servants	03	Purposive	5.4
4.	NGO's	03	Purposive	5.4
5.	Cultural leaders	05	Purposive	8.9
6.	Religious leaders	05	Purposive	8.9
Totals		**56**		**100**

3.2 Data collection instruments/methods of data collection

The researcher constructed and used the instrument to track information from those respondents who were purposefully chosen because of its advantages. It was consisted of a preformatted list of written questions that participant was utilized to write down their answers. In regard to the research variables that the data collectors were unable to witness, it was utilized to document the respondents' thoughts, feelings, perceptions, and opinions. The instrument was used by the researcher due to its associated benefits, which include the ability to quickly gather data from a large sample group in a dispersed location. Both open-ended and closed-ended questions were included in the tool.

3.3 Interview Guide Instrument

To get information from those who can't read or write, the researcher created and used the tool. The researcher interacted with the targeted respondents in person and made sure that all of the information is provided to them so that they could provide the researcher with clear information. Because it promotes in-person communication between the responder and the researcher, the tool was seen as essential. Among other things, it reduced time and encourages participation from illiterate respondents in the data collection process.

3.4 Data Processing, Analysis and Presentation

The collected data was properly checked for its completeness, category, coding, and later on entered in the computer data analysis program for it to be considered quantitative or qualitative in nature. The processed was analyzed using Statistical Package for Social Sciences (SPSS) that will be for quantitative data and for qualitative data, analysis was done thematically.

4.0 Findings

4.1 Demographic characteristics of the respondents

The data about the gender of respondents, age bracket, marital status and educational level were tracked. The results demonstrated that gender representation was taken into account, even though only 37.5% of respondents were female and the majority (62.5%) were male, indicating that it was a good representation. The researchers divided the respondents into age groups during the research design. According to the study's findings, 8.9% of respondents were between the ages of 18 and 27; 37.5% were between the ages of 28 and 37; 33.9% were between the ages of 38 and 47; 16.1% were between the ages of 48 and 57; and 3.6% were beyond the age of 50. Therefore, the results showed that the majority of respondents were between the ages of 28 and 37. According to the rounded findings of the marital status data obtained, 92.8% of the respondents were married couples, 1.8% were single, 3.6% were divorced, and 1.8% were widowed. This suggests that married persons were more likely to engage, followed by widowed, single, and divorced people,

in that order. The respondents' educational background was one of the elements included under their demographic characteristics. In this case, 32.1% of the respondents were primary leavers, per the findings. 12.5% received certifications from various educational institutions, and 37.5% had completed secondary school. The percentage of people with a degree was 5.4%, while those with a diploma was 12.5%. This finding implies that more respondents completed their secondary schooling. According to the same data, the majority of responders who hold degrees (5.4%) were civil and non-governmental organization workers; this shows that just a tiny minority had a degree. Nardi (2018) pointed out that as survey research is only as good as its participants, researchers need to be aware of the various kinds of respondents and how they affect the findings.

4.2 Level of Afforestation

On the one hand, Uganda been implementing afforestation and reforestation initiatives, such as the "Running Out Of Trees" campaign, to restore forest cover and combat climate change. The International Small Group + Tree Planting Program (TIST) encourages small subsistence farmers to plant more trees and make money from selling carbon. The Ministry of Water and Environment and private sector stakeholders aim to restore 200 million trees over five years until 2026 (Kajjansi, 6th October 2023). On the other hand, Okello Albert, the project coordinator of Farm Radio International (FRI) and the International Union for Conservation of Nature (IUCN) in Omarari and Baya parishes, Omoro Sub County, Alebtong district, says a total of 21 villages in the area are engaged in tree planting for firewood and timber, among other uses. He adds that the tree seedlings will be distributed to other locals for planting at no cost, and they expect each household to plant at least 1,000 trees (Hallett et al., 2024). To better comprehend the amount of afforestation in Alebtong Town Council, the researcher created eight factors. Strongly agree, agree, neutral, disagree, and strongly disagree were the ratings assigned to the statements. The field yielded the following results based on the parameter.

4.3 Interpretation and discussion of the findings

The data above shows that 60.7% of respondents strongly agreed that they understood the meaning of afforestation, whereas 25% agreed and 14.3% were not sure. It was discovered, meanwhile, that none of the respondents objected or disapproved significantly. This implies that more respondents were aware of afforestation. According to the study's findings, 14.3% of participants strongly agreed that they engage in afforestation, 66.1% agreed, and 10.7% were neither in agreement nor disagreement. 7.1% disagreed with the statement that they had never engaged in afforestation, whereas 1.8% disagreed and strongly objected. However, the majority of respondents acknowledged that they have engaged in and continue to engage in afforestation. The researchers posed the question, "is afforestation good for the community?" in an effort to learn how the community views the importance of afforestation in Nakabela Ward. Of the 56 respondents, 17.8% highly agreed, 37.5% agreed, 32.1% disagreed, 10.7% disagreed, and 1.9% strongly disagreed that

afforestation is bad for the community. These answers show that a significant portion of the populace still does not think that community afforestation is important. According to the study's findings, 44.6% of participants strongly disputed that they were not government workers, 17.8% disagreed, and just one respondent was unable to provide his stance. Nevertheless, 16.1% strongly agreed and 19.6% agreed that they were government employees, even if they benefited from afforestation. To ascertain whether individuals engaged in afforestation promote similar practices among others, 37.5% of respondents affirmed that they consistently urge others to engage in forestry, 26.8% were uncertain if they had ever done so, and 21.4% strongly concurred that they do.

4.3.1 Household livelihood

The researchers in this investigation found out that respondent who agreed that they can support my household members using afforestation 55.4, 25% strongly agreed, 10.7% were undecided, 5.3% disagreed and only 3.6% strongly disagreed. Although the local community was aware that afforestation provides a source of wood fuel, the following opinions were gleaned from the respondents following an examination. 53.6 percent agreed, 23.2% strongly agreed, 10.7 percent were unsure, and 10.7 percent disagreed, with 1.9% strongly disagreeing. The findings thus show that the majority of respondents concurred that afforestation is utilized for wood fuel. The researchers sought to determine whether afforestation, which is considered an economic activity, could improve basic services for the community of Nakabela Ward in Alebtong District at the household level. Of the 56 respondents, the largest percentage (42.9%) agreed that afforestation helps household members obtain basic services, followed by 28.6% who did not decide on the parameter and 17.8% who strongly agreed with it. However, 10.7% of respondents disagreed, and none of them disagreed severely. The study noted that charcoal is a vital fuel source. In urban areas like Alebtong Town Council, the majority of communities use charcoal as their primary fuel source. The researcher investigated assessing the extent to which afforestation is seen as a primary source of charcoal, which is significant to the community. The following findings were found.19.6% of respondents were neutral, 30.4% disagreed, 5.3% strongly disagreed, 14.3% strongly agreed, and 30.4% agreed. At 30.4 replies apiece, the agreement and disagreement groups were at a standstill.

Despite the fact that forests and their products have use at every level, many farmers view afforestation as a non-economic endeavor. It is not enough to presume that afforestation is considered a commercially driven economic activity. The researcher was concerned in obtaining confirmation from the participants on their perceptions. 16.1% of respondents, 12.5% strongly agreed, and 37.5% agreed with the field results that afforestation is a commercial activity. However, 30.3% of respondents disagreed with the statement because they had an unfavorable opinion, and 3.6% strongly disagreed. Thus, more people in the community, particularly those who have never participated, need to be made aware of the value of afforestation. People who have

worked in the afforestation field are urged to raise awareness among the other members of the community. The researcher wanted to know whether afforestation practitioners were raising awareness among others. According to her results, of the 56 respondents, only 7.1% strongly agreed, 17.9% agreed, and 44.6% were reluctant that they raise awareness among other community members. On the other hand, 21.4% disagreed and 8.9% strongly disagreed that they had ever educated anyone about afforestation

4.3.2 Benefits of Afforestation

Africa's forests are essential to its growth, but they are under threat from climate change, land demands, and bad administration. Africa saw the most yearly forest loss from 2010 to 2015. Deforestation and REDD+ initiatives are being promoted by the World Bank's Africa Environment and Natural Resources team. In Uganda, reforestation improves soil quality, reduces erosion, promotes sustainable economic growth, and increases agricultural and animal output. To determine the extent to which afforestation has benefited the Nakabela ward community, the researchers created a parameter. 55.4% of respondents agreed, according to the summary of their answers. However, 17.8% said that afforestation did not benefit them, 7.1% were neutral, and 17.8% strongly agreed. Merely 1.9% strongly disagree that afforestation has any advantages. The majority of respondents, in summary, concurred that afforestation has benefited them. By supplying varieties of nutrient-dense crops, income, jobs, and a safety net during times of food scarcity, afforestation improves family food security. In addition to supporting animals, forests help improve soil fertility, nutrient recycling, and agricultural production. 30–40 million pastoralists throughout the world use them for rangeland and feed while they care for 4,000 million sheep, goats, and cattle. The researcher conducted his study on 56 respondents to learn the truth about the advantages of afforestation. Of those respondents, 35.7% had no idea, 28.6% agreed, and 26.8% agreed that forests provide food security for households, while 8.9% disagreed and 8.9% strongly disagreed. Rao (1997) stresses that, trees enhance agricultural productivity, soil fertility, and nutrient recycling while also providing essential nutrients and animal foods, preventing malnutrition during food shortages or emergencies. Forests provide fodder and rangeland for 30 to 40 million pastoralists worldwide who herd some 4 000 million cattle, goats and sheep.

Forest income is crucial for rural households, especially those with limited land. Afforestation reduces carbon dioxide emissions but may not mitigate global warming. Forests provide sustainable incomes, contribute to food security, and can generate employment. Forestry subsidies should focus on ecological construction, social equity, and increasing subsidies. Upstream forestry activities also contribute to climate change mitigation. In the study conducted, the results indicated that 16.1% of the respondents did not show their side, 66.1% agreed that afforestation contributes to the household income, 3.6% strongly agreed, and 14.2% disagreed with the fact, while none of them strongly disagreed.

Trees are essential to ecosystems because they stabilize soils, provide habitat for species, absorb rainwater, and reduce temperatures. By offering comfort, healing, protection, wonder, and nutrition, they also benefit human health. Indigenous people understand how vital trees are to their existence and well-being. Forests sustain both rural and urban inhabitants by providing nutrient-rich crops, nourishment, and vital ecosystem services. For general well-being, woods are vital since deforestation can lead to detrimental mental health problems. According to the study's findings, 41.1% of participants agreed with the statement that afforestation help my household afford basic healthcare, 25% did not express an opinion, and 21.4% strongly agreed. However, 3.6% disagreed and 8.9% agreed, respectively, with the statement. The aforementioned finding shows that 51.8% of respondents agreed that afforestation is a source of timber, representing a significant portion of the sample. Those who disagreed made up 17.9% of the sample, followed by those who strongly disagreed at 14.3%, those who disagreed at 10.7%, those who were neutral, and those who strongly disagreed at 5.3%.

4.4 Discussions of the Finding

In the study conducted by the researcher, the finding indicates that 63.2% of the respondents who responded to the different parameters. Nevertheless, a small number of the respondents did not show their side. Alice Atoo of Nakabela Cell, for instance, said she neither knows whether she practices afforestation nor does not, and conversely, 19.6% of the respondents disagreed with all the parameters. But according to Odur Vincent from Nakabela Cell, he argued that he does not know about afforestation, does not practice afforestation, is not a government employee, and does not encourage others to practice afforestation since he does not see its importance to the community of Nakabela Ward.

According to Okello Albert, the project coordinator of Farm Radio International (FRI) and the International Union for Conservation of Nature (IUCN), 21 villages in Alebtong were engaged in tree planting for firewood and timber, among other uses. He adds that the tree seedlings would be distributed to other locals for planting at no cost, and they expect each household to plant at least 1,000 trees (Hallett et al., 2024). Glatzel et al. (2024) stated that Uganda was actively pursuing afforestation and reforestation efforts, with initiatives like the "Running Out Of Trees" (ROOTS) campaign aiming to plant 40 million trees annually to restore forest cover and combat climate change. Additionally, Kajjansi (6th October 2023) posed that the Ministry of Water and Environment, in partnership with private sector stakeholders, held a national tree planting day as part of the initiative aiming to restore Uganda's tree cover by 200 million trees over a five-year period until 2026. above, afforestation had been and was practiced in several places of the world. Nevertheless, there was little information in the literature regarding the amount of afforestation in the Alebtong area, and more importantly, it made no reference of the amount of afforestation in the Nakabela ward of the Alebtong town council in any paragraph. This study was carried out in order to close this gap.

Ray & Mukherjee, (2023) posit that Afforestation has led to improved household livelihoods of the community members of Nakabela ward. The forest income and its impact on economic inequalities among rural households was the second most crucial income portfolio, with bush meat being the most significant, and reducing access to forests could increase income disparities and impact rural households' welfare. The findings can help develop sustainable forest management policies to maintain forest use without damaging biodiversity conservation. For rural people, forests increase household income; especially for those with little or no land of their own, forests may provide the main source of cash income. This income did not come from wood harvesting only. Non-wood forest resources can often generate greater, more sustainable incomes than can be gained from the same land when used for agriculture or logging (Mathew, 2022). World trade in rattan, for instance, is worth US$2 000 million annually. In India alone, forest-based industries support 30 million people.

Forest products contribute 28.1% to annual average income in the Wolaita zone, Ethiopia, while forests account for 38.3%. Factors such as family size, farmland size, occupation, and distance to forest influence forest product contribution. Male-headed households rely more on forest resources. Poor households derive the highest relative forest income. Afforestation can boost rural economies by creating jobs, providing raw materials for local industries, and generating income from the sale of forest products. This supports livelihoods and contributes to overall economic development (Tiwari, Kumar & Lynser, 2020). Forests provide food and income during the "hungry season" or planting season, while non-timber forest products (NTFPs) like fruits, nuts, and medicinal plants also contribute to food security. The income earned from these activities can be reinvested in other assets, further enhancing household livelihoods. Forestry subsidies had a positive impact on forest farmers' income, as they motivate them to operate forests. The incentive theory suggests that these subsidies drive family benefit maximization, leading to higher operating income. However, the study suggests that forestry subsidies may not release the labour force but restrict off-farm work. To improve the impact, the study suggested modifying subsidies to focus on ecological construction, considering social equity, and increasing subsidies to ensure forest farmers' income (Olajuyigbe et al., 2020).

5.0 Conclusion and Recommendations

5.1 Conclusion

This study was about the contribution of afforestation to the livelihoods of communities in one town council located in Alebtong district in mid-north Uganda. It was revealed that afforestation at both household and community plays a positive role towards enhancing the livelihoods of local households in the town council and beyond. The researchers concluded that community should be mobilized and supported by government and other development partners to increase the level of afforestation, without compromising food security, in addition to sensitization towards the practice

of afforestation more than they are currently doing. Otherwise, afforestation is likely to be key to household livelihoods in mid-north Uganda given the many positive roles it plays at household and community levels.

5.2 Recommendations

It is recommended that government agencies, development partners should encourage community members to prioritize afforestation in order to safeguard the environment, provide food for the homes, serve as a foundation for health care, and other benefits. Also, A program that requires every home to plant at least one acre of trees should be established by the government and implemented in order to enhance the environment and the situation. And at the community level, more awareness is needed regarding tree planting in order to promote awareness for all individuals.

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Declaration of conflict of interest

No conflict of interest was registered.

REFERENCES

Abdillah, KK., & Manaf, AA. (2022). Land tenure security for low-income residents' urban livelihoods: A human development approach review of temporary occupation license. *Land Use Policy*, *119*, 106223.

Achiro, ED., & Mwesigwa, D. (2022). The Relationship between Skills Development Support and Self-Reliance among the Youths: A Study on Youth Livelihood Program in Lira City, Uganda. *American Journal of Social Sciences and Humanities*, *7*(2), 154–65. https://doi.org/10.55284/ajssh.v7i2.800

Achiro, ED., & Mwesigwa, D. (2023). Analysis of the contribution of the Youth Livelihood Program towards enhancing Self-Reliance among the Youths in Lira City, Uganda. *Journal of Social, Humanity, and Education*, *3*(2), 157–71. https://doi.org/10.35912/jshe.v3i2.1337

Aliero, AA. (2020). Plants and environment for sustainable development. *Nigerian Journal of Botany*, *33*(1), 1-14. mitigation and biodiversity. *Plants, People, Planet*, *5*(1), 27-38

Ashraf, U. (2022). Participation and exclusion in mega tree-planting projects: a case study of the Ten Billion Tree Tsunami Program, Pakistan.

Augsburg, B., Farquharson, C., & McKendrick, A. (2024). *Longer-term impacts of the COVID-19 pandemic on the dietary purchasing choices of British households* (No. R306). IFS Report.

Bedeke, SB. (2023). Climate change vulnerability and adaptation of crop producers in sub-Saharan Africa: a review on concepts, approaches and methods. *Environment, development and sustainability*, *25*(2), 1017-1051.

Bigirimana, C. (2020). *Uses and management of indigenous fruit trees in the Lake Victoria basin districts of Rwanda and Uganda* (doctoral dissertation, Makerere university).

Cisse, F. (2024). *Rethinking A Sustainable Agricultural Innovation Model in Senegal* (Doctoral dissertation, University of Guelph).

DeMicco, FJ., & Poorani, AA. (Eds.). (2022). *Medical Travel Brand Management: Success Strategies for Hospitality Bridging Healthcare (H2H)*. CRC Press.

ESCAP, U. (2022). SDG 15: Life on land: protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Glatzel, K., Virchow, D., Nakitto, AMS., Niyonsenga, S., Babu, S., Srivastava, N., ... & Osano, P. (2024). Bioeconomy Pathways: Experience from Africa, Asia, and Latin America.

Guégan, JF., Ayouba, A., Cappelle, J., & De Thoisy, B. (2020). Forests and emerging infectious diseases: unleashing the beast within. *Environmental Research Letters*, *15*(8), 083007.

Hee, TH., Yong, HA., Tan, Y., Yip, C., Foo, FCC., & Senadjki, A. (2022). Prevention And Mitigation of Zoonotic Disease Emergence Public Health Threats: Lessons in Tackling Ecological Issues. *Malaysian Journal of Science Health & Technology*, *8*(2), 43-50.

Hetemäki, L., Tegegne, YT., & Ochieng, RM. (2023). Outlook for sustainable forest bioeconomy in Gabon, Kenya, Nigeria, South Africa and Tanzania. *Outlook for sustainable forest bioeconomy in Gabon, Kenya, Nigeria, South Africa and Tanzania*.

Hirschon, R. (2021). Essential Objects and the Sacred: Interior and Exterior Space in an Urban Greek Locality 1. In *Women and space* (pp. 70-86). Routledge.

Hoang, NT., & Kanemoto, K. (2021). Mapping the deforestation footprint of nations reveals growing threat to tropical forests. *Nature Ecology & Evolution*, *5*(6), 845-853.

Jagger, P., Cheek, JZ., Miller, D., Ryan, C., Shyamsundar, P., & Sills, E. (2022). The role of forests and trees in poverty dynamics. *Forest Policy and Economics*, *140*, 102750.

Khan, N., Fahad, S., Naushad, M., & Faisal, S. (2020). Analysis of Livelihood in the World and its Impact on World Economy. *Available at SSRN 3717265*.

Kirkpatrick, J. (2024). A Big History of Land Clearance and Deforestation. *Journal of Big History*, *7*(3), 1-18.

Mathew, MD. (2022). Nuclear energy: A pathway towards mitigation of global warming. *Progress in Nuclear Energy*, *143*, 104080.

Mawa, C., Babweteera, F., & Tumusiime, DM. (2022). Livelihood outcomes after two decades of co-managing a state forest in Uganda. *Forest Policy and Economics*, *135*, 102644.

Mecham, J. (2020). Forest Rights Act Implementation and Tribal Livelihoods: A Community-Based Field Study in Jharkhand, India.

Milano, S. (2021). Safeguarding Local Food Biodiversity. In *State of the World 2011* (pp. 71-82). Routledge.

Moellering, H. (2000). The scope and conceptual content of analytical cartography. *Cartography and geographic information science*, *27*(3), 205-224.

Mwesigwa, D. & Mubangizi, BC. (2015). Citizen Participation and policy formulation: A study of bottom-up, top-bottom, and horizontal scenarios in local councils in western Uganda. *Journal of Administratio Publica.* 23(4), 13-29.

Mwesigwa, D. (2011). Voters' perception of the contribution of citizen participation in local council elections in Uganda. *Journal of Development Issues.*

Mwesigwa, D. (2018). Football betting among the youths in lira municipality: will livelihoods improve? *International journal of development and sustainability.* 7(4), 1299-316.

Mwesigwa, D. (2021). Towards enhancing local citizen participation in Uganda. *Dynamics of Politics and Democracy,* 1(1), 15-28.

Mwesigwa, D. and Mubangizi, BC. (2019). Contributions of the Youth Livelihood Programme (YLP) to Youth Empowerment in Hoima district, Uganda. *International journal of Business and management studies.* 11(1), 54-71.

Mwesigwa, D., Bogere, M., & Ogwal, JB. (2022). Local citizen participation in Uganda: Examining the political, administrative and financial aspects in Hoima district. *Journal of Governance and Accountability Studies*, *2*(1), 49-63. https://doi.org/10.35912/jgas.v2i1.892

Nandala, IF. (2023). *Land Use and Land Cover Changes (1985-2023) from Multiple Drivers in Kikuube District, Western Uganda* (Master's thesis, NTNU).

Nigussie, Z., Tsunekawa, A., Haregeweyn, N., Tsubo, M., Adgo, E., Ayalew, Z., & Abele, S. (2021). The impacts of Acacia decurrens plantations on livelihoods in rural Ethiopia. *Land Use Policy*, *100*, 104928

Ojuok, IA. (2020). *Influence Of Socio-Economic Factors On Sustainability Of Rural Community Based Afforestation Projects, Nyatike Sub County, Migori County, Kenya* (Doctoral dissertation, University of Nairobi).

Ota, L., Mukul, SA., Gregorio, N., & Herbohn, J. (2021). Community based management of tropical forests: lessons learned and implications for sustainable forest management. *Achieving Sustainable Management of Tropical Forests. Burleigh Dodds, Cambridge, UK.*

Safo Kantanka, SN., Addaney, M., Akudugu, JA., Anaafo, D., Apeatse, RQ., & Clarke, L. (2023). Impact of land use and climate change on forest reserves in Ghana. *African Geographical Review*, *42*(4), 447-66.

Sakketa, T. G. (2023). Urbanization and rural development in sub-Saharan Africa: A review of pathways and impacts. *Research in Globalization*, *6*, 100133.

Shackleton, CM., Adeyemi, O., & Setty, S. (2024). Why are non-wood forest products still the poor relative in Global Forest Resources Assessments? *Forest Policy and Economics*, *163*, 103232

Sinkgraven, J. (2024). *Effectiveness of protected areas in preserving biodiversity in the Congo Basin* (Doctoral dissertation).

Small, E. (2021). In defense of the world's most reviled vertebrate animals: part 2: mammals (bats, hyenas, mice, rats, and skunks). *Biodiversity*, *22*(3-4), 194-244.

Snyder, A. (2024). Greening Urban Spaces: Harnessing Houseplants to Reclaim Ecosystem Services.

Sunesti, Y., Putri, AK., Winarni, L., & Zusiana, ET. (2024). Resilience and Livelihood Strategies. *The International Journal of Interdisciplinary Social and Community Studies*, *19*(1), 211.

Ullah, A. (2024). Forest landscape restoration and its impact on social cohesion, ecosystems, and rural livelihoods: Lessons learned from Pakistan. *Regional Environmental Change*, *24*(1), 26.

Ullah, A., Zeb, A., Saqib, SE., & Kächele, H. (2022). Landscape co-management and livelihood sustainability: Lessons learned from the billion trees afforestation project in Pakistan. *Land Use Policy*, *115*, 106034.

Wang, L., Wang, E., Mao, X., Benjamin, W., & Liu, Y. (2023). Sustainable poverty alleviation through forests: Pathways and strategies. *Science of The Total Environment*, *904*, 167336.