
Climate Change and Potential of Agroforestry in Uganda: Youth Perceptions and Willingness to Participate in Adaptation and Transition Efforts

[Dastan Bamwesigye](#)*, [Evans Yeboah](#), [Seval Ozbalci](#), [Jitka Fialova](#), [Petr Kupec](#), [Nahanga Verter](#), [Obed Asamoah](#)

Posted Date: 21 October 2024

doi: 10.20944/preprints202410.1601.v1

Keywords: Agroforestry Transition; Climate Change Hopefulness and Adaptation; Deforestation and Land Degradation; Indigenous Practices; Indigenous Tree Species; Stakeholders Assessment



Preprints.org is a free multidisciplinary platform providing preprint service that is dedicated to making early versions of research outputs permanently available and citable. Preprints posted at Preprints.org appear in Web of Science, Crossref, Google Scholar, Scilit, Europe PMC.

Copyright: This open access article is published under a Creative Commons CC BY 4.0 license, which permit the free download, distribution, and reuse, provided that the author and preprint are cited in any reuse.

Disclaimer/Publisher's Note: The statements, opinions, and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions, or products referred to in the content.

Article

Climate Change and Potential of Agroforestry in Uganda: Youth Perceptions and Willingness to Participate in Adaptation and Transition Efforts

Dastan Bamwesigye ^{1,2*}, Evans Yeboah ³, Seval Ozbalci ⁴, Jitka Fialova ², Petr Kupec², Nahanga Verter ⁵, Obed Asamoah ⁶

¹ Department of Forest and Wood Products Economics and Policy, Faculty of Forestry and Wood Technology, Mendel University in Brno. Zemědělská 3, 61300 Brno, Czech Republic

² Department of Landscape Management, Faculty of Forestry and Wood Technology, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic

³ Department of Statistics and Operation Analysis, Faculty of Business and Economics, Mendel University in Brno. Zemědělská 1, 61300 Brno, Czech Republic

⁴ University of the People, Department of Business Administration, 595 E. Colorado Boulevard. CA 91101, USA

⁵ Department of Regional and Business Economics, Faculty of Regional Development and International Studies, Mendel University in Brno. Zemědělská 1, 61300 Brno, Czech Republic

⁶ School of Forest Sciences, University of Eastern Finland, Street Address: Yliopistokatu 7, P.O. Box 111, 80101 Joensuu, Finland

* Correspondence: xbamwesi@mendelu.cz

Abstract: Climate change remains a pressing global issue affecting sectors including agriculture and forest resources in countries such as Uganda. This research focused on exploring the viewpoints of youth in Uganda concerning adapting to climate change and their interest in getting involved in agroforestry transition. By conducting a survey involving 1138 participants from the youth demographic group aimed to gather information about their level of hopefulness towards climate adaptation efforts and how they perceive the impact of farming practices and deforestation. Furthermore, the study aimed to evaluate youth willingness to participate in agroforestry (WTP) initiatives. The study used descriptive statistics as well as Ordinary Least Squares (OLS) to analyze the collected data. We found that most participants are *climate change hopeful* about adapting to climate change (89%). This positive and highly significant outlook is closely related to their willingness to participate in agroforestry adaptation efforts (0.0001). Moreover, a high percentage of participants (92%) acknowledged how *farming practices* such as cultivation and livestock rearing can degrade land significantly. Whereas *Gender, Age* and *Employment* were found to be highly and positively significant regarding youth's WTP in agroforestry (0.0001), *Income was not*. Incorporating indigenous practices and encouraging meaningful involvement from policymakers can empower the youth and strengthen community-led initiatives to address environmental decline effectively. This research highlights the capacity of youth engagement in steering successful climate resilience measures via agroforestry practices in Uganda.

Keywords: Agroforestry Transition; Climate Change Hopefulness and Adaptation; Deforestation and Land Degradation; Indigenous Practices; Indigenous Tree Species; Stakeholders Assessment

1. Introduction

Agroforestry systems in Uganda encounter obstacles that necessitate specific actions to improve agricultural output and sustainability levels in the region [1]. They delve into how integrating banana farming with tree varieties is crucial despite challenges like soil quality and limited use of chemical fertilizers due to lack of proper knowledge, among farmers hindering productivity in the sector collectively underlining the importance of educational initiatives to promote a better understanding

of agroforestry advantages as emphasized by Kyarikunda et al. [2]. Kyarikunda et al. [2] emphasize the importance of recognizing the tree preferences in the area and promoting cooperation among farmers in tree care practices to improve agroforestry outcomes, taking into account factors like limited land availability and financial challenges for successful implementation.

The agroforestry difficulties in Uganda are complex [1,2]. Influenced by various socio-economic and environmental factors deeply ingrained in the local context [1–3]. The study conducted by Latynskiy & Berger [3], which explores the impacts of group certification for small-scale coffee farmers, sheds light on the challenges faced in enhancing agricultural methods due to associated expenses and the necessity of collaboration among farmers. Drawing a parallel to Uganda's circumstance Rakotondratandra [4] demonstrates how cultural preferences for practices and socio economic conditions act as barriers to widespread adoption of agroforestry practices, in Madagascar. Moreover, Okullo and colleagues [5] highlight the importance of Indigenous Fruit Trees (IFTs) in adapting to climate fluctuations within agroforestry systems, portraying it not only as a practice but also as a strategy to address the effects of climate change. In addition to this point, Yami et al. [6] argue that power disparities among stakeholders can hinder policy development and worsen challenges, like land tenure uncertainty and decreased output.

The obstacles also pertain to resources and economic aspects, as emphasized by Kawooya [7], who points out the shortage of fuelwood and insufficient funding for small-scale tea growers, which underscores the necessity for motivators to boost involvement in the sector [8]. On the other hand, it underscores the importance of efforts in empowering communities and tackling agroforestry issues that align with sustainable development objectives [9].

A research study on human-animal interactions highlights the complexities involved in effectively managing conflicts between farmers and wildlife. To combat challenges in agriculture management brought about by climate change, issues like labour constraints and lack of adequate support [9–11]. Okao [10] emphasizes the significance of implementing climate agricultural (CSA) interventions.

According to Piemontese et al. [11], sustainable land and water management practices are crucial to addressing land degradation and boosting productivity. 12. Hauser and Lindnter [12], on the other hand, underscore the significance of knowledge management and community participation in post-war recovery situations, while Schepp et al. [13] concentrate on patterns elucidating challenges presented by low-input farming methods.

Researchers, such as Bjørkhaug [14] Pienkowski and colleagues [15], and Baguma [16] discuss the issues surrounding land management in refugee settlements and sustainable conservation efforts well as the environmental and public health challenges linked to urbanization and the importance of sustainable agricultural practices.

Environmental damage is being talked about, and the importance of favouring plantations over natural regrowth as a restoration strategy [17]. Pali and colleagues [18] emphasize the necessity of creating policies based on evidence to overcome challenges; meanwhile, Villarino et al. [19] emphasize the significance of reliable data systems in achieving food security and sustainable development targets. The various obstacles underscore the pressing requirement for customized interventions based on evidence to balance growth with sustainability efforts, enhance the gathering and use of data, and establish strategies that incorporate the viewpoints of farmers [19,20].

The primary aim of the research was to investigate how young people in Uganda view climate change adaptation efforts and their attitudes towards using agroforestry as a long-term solution for sustainability concerns. Similarly, the study aimed to probe into the opinions of youth on existing farming methods, deforestation, and environmental degradation and their willingness to engage in agroforestry practices. Furthermore, it aimed to understand the perspectives of Ugandan youth on the efficiency of indigenous practices and government strategies in tackling environmental issues.

Hypothesis on Hopefulness and Adaptive Measures: Youth who are optimistic about climate change resilience may be inclined to support strategies like agroforestry and the utilization of native tree species, showing a readiness to engage in tree planting efforts in highland agroforestry projects.

Hypothesis on Farming Practices and Environmental Impact: There is a connection between acknowledging the impact of cultivation and livestock farming on deforestation and land degradation and being open to exploring alternative farming methods, like highland agroforestry.

Hypothesis on Indigenous Practices and Government Action: The idea that Indigenous communities can efficiently oversee forests and land is connected to the belief that the government's attempts to address damage are lacking in effectiveness. This implies that locally based strategies such as agroforestry might be viewed as crucial for promoting sustainable progress.

Factors Influencing Agroforestry in Uganda

A variety of factors, including social, economic, and cultural aspects shapes Uganda's agroforestry sector. Comprehending these influences is significant for effectively carrying out and maintaining agroforestry transition and techniques in the area.

Soil quality and the amount of carbon are key environmental factors that impact agroforestry practices significantly according to studies like Tumwebaze et al. [21,22]. Agroforestry systems that include trees such as "Casuarina equisetifolia" have been found to increase levels of soil organic carbon when compared to traditional farming methods. This boost in soil health plays a role, in supporting crop growth and sustainability by improving nutrient availability and soil structure essential for agricultural prosperity. The selection of types of trees and how they are taken care of can impact how efficiently water is used and the competition for resources. These factors are important for farmers, in Uganda to think about [22].

Socioeconomic factors also have an impact on agroforestry methods. Access to markets is a factor because farmers near markets are more inclined to embrace agroforestry to earn more Income from various products [23]. Moreover getting help from extension services and agricultural institutions can make it easier for farmers to adopt agroforestry techniques. For example, initiatives that focus on involving people in agriculture have shown potential in promoting agroforestry as a feasible way of making a living [24]. Small-scale farmers may need help embracing agroforestry methods due to restricted assistance and training opportunities [23–25].

Uganda's agroforestry practices are shaped by influences such as traditional wisdom and customs (Indigenous Knowledge). Local communities possess insights about native tree species and their advantages that could be utilized to improve agroforestry systems [23]. Nonetheless, a mismatch may arise between methods and current agroforestry techniques resulting in farmers' reluctance to embrace new approaches. Thus, it is crucial to merge knowledge with scientific studies to create sustainable and culturally fitting agroforestry systems [24–26].

In addition to that point discussed earlier gender dynamics in households and its influence on agroforestry decision-making processes is quite substantial among both men and women who are engaged in roles within agricultural practices, as highlighted in studies [25,26]. It is imperative for programs advocating for agroforestry to acknowledge and address these gender disparities to ensure involvement and benefits for all members of the household involved in such initiatives by actively involving both genders in training and decision-making activities [27].

Uganda's agroforestry sector youth engagement plays a role as they bring fresh perspectives and ideas to agricultural methods . Initiatives involving young people in agroforestry create job prospects and instill a sense of commitment and care for sustainable land use [28]. Nevertheless, obstacles like limited access to land resources and education can hinder youth involvement in agroforestry initiatives [29]. Overcoming these obstacles with tailored initiatives can boost people's involvement and help drive the success of agroforestry practices in Uganda.

The various aspects affecting agroforestry in Uganda are complex and intertwined. Conditions, socioeconomic factors, cultural traditions, gender responsibilities, and young people's involvement are all pivotal in influencing agroforestry practices [21,23,25,28,29].

Knowledge of deforestation and forest degradation influence agroforestry

Understanding the impacts of deforestation and forest degradation plays a role in shaping agroforestry techniques. Studies suggest that agroforestry offers an option to replace harmful farming methods that contribute significantly to deforestation [30]. Through the combination of trees and crops, soil fertility can be achieved in agroforestry setups. Forest-like environments can be recreated

to support biodiversity and ecological benefits [31,32]. Additionally, incorporating agroforestry practices has demonstrated benefits in uplifting the community's well-being through the creation of revenue streams and bolstering food security. This ultimately alleviates the strain on forest resources [33–35].

However, agroforestry's success in preventing forest depletion relies heavily on how farmers view forest preservation and grasp its advantages [30,35]. In areas where agroforestry is encouraged to revive ecosystems, it can result in increased forest growth and biodiversity, especially if local communities play a role in its adoption [36,37]. Hence, understanding deforestation and forest decline is pivotal for instilling a sense of dedication to agroforestry and ensuring its effectiveness as a land management technique.

Youth involvement in agroforestry as stakeholders

Involving young people as stakeholders in agroforestry is essential for improving agricultural sustainability and tackling food security issues. Studies suggest that the level of youth involvement is closely tied to their understanding and views of agriculture, factors that greatly impact their willingness to participate in agroforestry activities [38,39]. For example, these show that informed young individuals are more inclined to embrace agroforestry methods due to their awareness of the lasting advantages these techniques bring [40,41].

In addition to that point mentioned in [42], involving people in agroforestry can bring fresh ideas and increase efficiency due to their enthusiasm and ability to adapt to farming activities. Nonetheless, challenges like limited access to resources and lack of support systems hold back their active engagement, as highlighted in [43,44]. Creating paths for development that consider the specific needs and ambitions of young individuals can boost their participation in agroforestry projects [42,44]. Consequently, encouraging the involvement of people in agroforestry not only fosters their personal growth but also aligns with broader environmental and economic objectives.

2. Materials and Methods

2.1. Study Location and Data Collection

The research was conducted throughout Uganda in East Africa. A national survey was disseminated via major online platforms and social media channels, including WhatsApp, LinkedIn, and Twitter. These platforms were particularly effective in engaging the youth demographic, who are the primary users of such media. The use of social media for data collection has become increasingly popular due to its advantages over traditional face-to-face methods, including time and labour efficiency and the ability to gather diverse responses across various districts, regions, religions, and age groups.

However, the online survey method also presents limitations, such as excluding non-internet users and needing more opportunity for follow-up questions or probing to gain deeper insight.

2.2. Questionnaire Design and Pretesting

The online questionnaire consisted of structured and semi-structured questions, allowing for quantitative and qualitative data collection. Before distribution, the questionnaire underwent pretesting and was reviewed by experts to ensure its professional and technical validity. Notably, the study sought input from a professional gender organization (a non-governmental organization) based in Prague, Czech Republic, to refine questions relating to women's experiences with climate change and energy issues. This was particularly pertinent as the questionnaire included topics spanning climate change, household energy use, and the role of women in addressing these challenges.

2.3. Confidentiality and Incentives, and Coding

To protect respondents' privacy, personal information such as email addresses and phone numbers were collected confidentially, with explicit agreements in place to prevent public sharing of

this data. Additionally, the study maintained confidentiality concerning individual biographical data, which was analyzed and reported in aggregate form.

To encourage participation, particularly considering the data and connectivity challenges often faced in developing countries like Uganda, an initial sample collection aimed to reach 600 responses. Respondents were potentially incentivized with coverage for data costs where necessary.

To mitigate common issues associated with online data collection—such as duplication and multiple responses—software settings were employed to restrict submissions from individual users, thereby enhancing data integrity. All necessary quality control measures were adhered to ensure the reliability and validity of the collected data.

Moreover, the data was coded for proper analysis and interpretation (Table 1).

Table 1. Data coding.

Are you hopeful about climate change adaptations?	HopeCC	Yes	1
	A	No	2
Do you agree that the Cultivation Farming system in Uganda is responsible for deforestation and land degradation?	CFS-DFLD	Yes	1
		No	2
		Don't know	3
Do you agree that the Livestock Farming system in Uganda is responsible for deforestation and land degradation?	LSFS-DFLD	Yes	1
		No	2
		Don't know	3
Do you think indigenous people lived well and preserved the forests?	IPPF	Yes	1
		No	2
		Don't know	3
Do you think that agroforestry could help in the adaptation measures to Climate Change?	AACC	Yes	1
		No	2
Do you think indigenous tree species are good for climate change adaptation?	ITSCC	Yes	1
		No	2
Do you think that Ugandans are ready for the highland agroforestry transition?	UAT	Yes	1
		No	2
		Don't know	3
Do you think that the government of Uganda is doing enough to combat environmental degradation?	GoUED	Yes	1
		No	2
		Don't know	3
Would you be willing to participate in highland agroforestry tree planting?	WTP-A	Yes	1
		No	2
Gender	Gender	Female	1
		Male	2
Employment	E	Student	1
		Employed	2
		Unemployed	3
Age	Age	18-25	1
		26-35	2
		36-45	3

2.4. Survey Administration and Data Characteristics

The questionnaire was launched online on January 18, 2023, and closed on April 2, 2023. While 1,844 individuals accessed the survey link, 1,138 completed it, resulting in a completion rate of approximately 62%.

The data were thoroughly checked and cleaned for accuracy prior to analysis. Gender Distribution: Of the respondents, 64% (728) identified as male, 36% (408) and female. Age Distribution (Table 2): Most respondents were youth, comprising 92% of the sample. The age breakdown is as follows:

18-25 years: 60.4%

26-35 years: 31.6%

36-45 years: 8.0%

Through this methodological approach, the study effectively gathered insightful data to assess Ugandan youth's perceptions of critical issues related to climate change adaptation and agroforestry practices.

Table 2. Demographic Characteristics of the Respondents.

GENDER	RESPONSES	RATIO
Female	408	36%
Male	730	64%
AGE	RESPONSES	RATIO
18-25	687	60.4%
26-35	360	31.6%
36-45	91	8.0%
EMPLOYMENT	RESPONSES	RATIO
Employed	347	30.5%
Student	596	52.4%
Unemployed	195	17.1%

2.5. Descriptive Statistics

Descriptive statistics involve the tools utilized to summarize and explain the characteristics of a dataset by offering straightforward overviews of both the sample and its measurements [45]. These methods encompass calculations like averages; values; variations; and occurrences that aid in grasping the spread and central tendencies of the data set [45].

Informative figures were used to summarize and define the aspects of the dataset gathered from an online survey of Ugandan youth. This statistical approach helped pinpoint and examine factors, giving a comprehensive view of demographic traits and how participants responded to issues concerning climate change and agroforestry.

Throughout the research project, we conducted an analysis involving frequency distributions and percentages for key survey questions related to optimistic views on addressing climate change issues and attitudes towards farming techniques among young people in the community.

Descriptive statistics gave us a grasp of the attitudes and beliefs of the people in the sample group and laid the groundwork for more detailed analysis using cross-tabulation and inferential statistics.

Cross tabulation is a method in statistics that is utilized to explore the connections between two or more variables by showcasing their interactions in a matrix layout. The research utilized cross-tabulation to examine the connection between participants' inclination to engage in agroforestry (WTPA) and their views on aspects including optimism towards climate change adaptations (HopeCCA) concurrence on the effects of farming and livestock systems (CFSDFLD and LSFSDFLD) support for traditional practices (IPPF) and confidence, in government interventions (GoUED).

When comparing the responses from WTPC to HopeCCA in a study scenario setup with participants' opinions on agroforestry engagement and hope levels categorized into a table format showcasing numbers and percentages based on their willingness levels for sustainable practices

adoption in relation to climate change optimism, the data obtained shed light on the link between positive outlooks towards climate change solutions and the inclination, towards embracing eco-friendly methods.

This mix of statistics and cross-tabulation enabled a thorough examination of the connections within the data set suggestive of areas where support could be extended to increase youth involvement in agroforestry projects. Using statistics and cross-tabulation techniques in the research project, valuable insights were gained regarding how young people in Uganda view climate change and their willingness to engage in sustainable farming methods.

2.6. Regression Model

Compared to the method mentioned earlier, OLS is a statistical approach used for gauging the connections among different factors by reducing the squared disparities between what is observed and what is foreseen [46,47]. OLS stands out as the pick for regression analysis techniques and is relevant in various disciplines, like economics and biology [48,49]. When using OLS to estimate influence effectively, consider its assumptions and limitations, specifically when dealing with measurement errors [49,50].

Each regression model is designed to evaluate groups of factors that predict WTPA differently from one another [46,47]. For instance, Model 1 encompasses a range of predictors, whereas other models concentrate on individual elements, such as demographic characteristics or perceptions related to the environment. When estimating coefficients in a regression equation using OLS, the approach minimises the sum of squared differences between the observed values and those predicted by the model [46,47]. Each coefficient signifies the anticipated alteration in the variable for a one-unit shift in the related independent variable while keeping all other variables unchanged. Statistical Significance Testing is conducted on each variable using t statistics and p values to determine their impact on variables in a statistical model like linear regression analysis or ANOVA testing methods with a p-value below 0.05 indicating an association between independent and dependent variables showing that changes, in one variable, can affect another significantly [46,47].

OLS also offers metrics like R squared to assess how well the model fits the data by showing the percentage of variability in the variable that the independent variables can explain; higher R squared values imply a stronger alignment between the model and the data [46,47].

The analysis involves OLS models (Model 1 to Model 5), each customized to examine different facets of the information and enable comparisons of how changes in independent variables impact the WTPA. The regression method used in the above analysis is OLS, a statistical technique employed to estimate the relationships between a dependent variable and one or more independent variables. In this context, the dependent variable is the willingness to participate in highland agroforestry tree planting (WTPA), while the independent variables include factors such as hopefulness about climate change adaptations (HopeCCA), perceptions of environmental degradation from farming practices (CFSDFLD, LSFSDFLD), attitudes toward indigenous practices (IPPF), and various socio-demographic factors (Gender, Age, Employment, Income).

To sum up, the OLS regression technique is a statistical tool utilized to examine the connections between WTPA and different factors to gain knowledge that can guide policymaking and the implementation of agroforestry projects within a specific group of people. The OLS models are mathematically presented below:

Model 1: $WTPA = HopeCCA + AACC + IPPF + ITSCC + UAT + Gender + Age + CFSDFLD + LSFSDFLD + GoUED + Employment + IncomeUGX$

Model 2: $WTPA = HopeCCA + AACC + IPPF + ITSCC + Gender + CFSDFLD + LSFSDFLD + GoUED + Employment$

Model 3: $WTPA = CFSDFLD + LSFSDFLD + GoUED$

Model 4: $WTPA = HopeCCA + AACC + IPPF + ITSCC + UAT$

Model 5: $WTPA = Gender + Age + Employment + IncomeUGX$

3. Results

3.1. Descriptive Statistics of Responses

Hopefulness about climate change adaptations (HopeCCA) in a survey on climate change adaptations in Uganda's youth community revealed that a significant number of participants (89%) expressed optimism towards finding solutions for climate challenges ahead of us (Table 3).

Regarding agreement on the cultivation farming system and deforestation (CFSDFLD), when asked about how the cultivation farming system affects deforestation and land degradation, the majority (92.4%) expressed that they think it plays a role in causing these issues (Table 3).

There is consensus regarding the Livestock Farming System and its impact on deforestation (LSFSDFLD). The majority of respondents (90%) view livestock farming as playing a role in deforestation and land depletion (Table 3).

Table 3. Responses on Climate Hopefulness and Agriculture Practices.

<i>Hopefulness about Climate Change Adaptations (HopeCCA)</i>		
Response	Count	Percentage (%)
Yes	1,014	89.3%
No	124	10.7%
Total	1,138	100%
<i>Cultivation Farming System and Deforestation (CFSDFLD)</i>		
Response	Count	Percentage (%)
Yes	879	92.3%
No	259	7.7%
Total	1,138	100%
<i>Livestock Farming System and Deforestation (LSFSDFLD)</i>		
Response	Count	Percentage (%)
Yes	1,032	90.7%
No	106	9.3%
Total	1,138	100%

Participants were asked their thoughts on how Indigenous communities manage forests, and a majority (81.8%) expressed confidence in their ability to preserve and safeguard these natural spaces effectively.

Perceiving Agroforestry as a Strategy to Adapt to Climate Change

The survey asked people their thoughts on how agroforestry could help with climate change adaptation, and a large majority (91%) expressed their belief that agroforestry can contribute to adapting to climate change impacts (Table 4).

Opinions about Indigenous Tree Species Role on Climate Change (ITSCC);

According to responses, most respondents believe (81%) that indigenous trees are valuable in tackling climate change through adaptation efforts (Table 4).

Table 4: Responses on Indigenous Tree Species and Agroforestry Adaptation Regarding Climate Change

<i>Indigenous Tree Species Role on Climate Change</i>		
Response	Count	Percentage (%)
Yes	925	81.3%

<i>Indigenous Tree Species Role on Climate Change</i>		
Response	Count	Percentage (%)
No	68	6.0%
Don't know	145	12.7%
Total	1,138	100%
<i>Agroforestry as a Climate Change Adaptation Strategy (AACC)</i>		
Response	Count	Percentage (%)
Yes	1,038	91.2%
No	44	3.9%
Don't know	56	4.9%
Total	1138	100%
<i>Opinion on Indigenous Tree Species (ITSCC;</i>		
Response	Count	Percentage (%)
Yes	925	81.3%
No	68	6.0%
Don't know	145	12.7%
Total	1,138	100%

Readiness for Highland Agroforestry Transition (UAT); When participants were asked if Ugandans are adequately prepared for a transition to highland agroforestry, the results indicated a nuanced sentiment among the youth: A little over half (55.4%) of respondents expressed readiness for the transition to highland agroforestry. This suggests that there is a substantial base of support among the youth for implementing agroforestry practices that could promote environmental sustainability and agricultural resilience in mountainous regions. However, the remaining 44.6% who either responded "No" or did not provide an answer indicates a degree of apprehension or uncertainty about such a transition, which could be influenced by factors such as lack of information, perceived risks, or concerns about feasibility.

Beliefs about Indigenous Practices (IPPF): Responses regarding the effectiveness of Indigenous management practices in preserving forests yielded the following outcomes: A significant majority, 81.3%, of respondents believe that Indigenous people are effective in managing and preserving forests. This reflects a strong recognition of the value of traditional ecological knowledge as an essential component of modern environmental management. In contrast, only 6.0% disagreed with this view, while 12.7% were uncertain.

Government Action on Environmental Issues (GoUED): When assessing perceptions of whether the Ugandan government is doing enough to combat environmental degradation, the responses were notably divided: The close split between those who feel the government is performing adequately (42.0%). Those who believe it is not (42.7%) indicate a significant level of uncertainty and dissatisfaction among the youth regarding government efforts to address environmental issues. The 14.0% of respondents who indicated "Don't Know" may reflect a lack of awareness or information about existing governmental policies and actions.

3.2. Willingness to Participate in Agroforestry (WTPA)

When asked about their willingness to engage in agroforestry initiatives, the responses were overwhelmingly positive: A striking 89.3% of respondents expressed a willingness to participate in

agroforestry initiatives, highlighting a robust enthusiasm for sustainable practices among Ugandan youth. The relatively small percentage (10.7%) that stated "No" indicates a strong readiness among the majority to adopt agroforestry as an adaptive practice to tackle climate change challenges. This willingness presents a significant opportunity for stakeholders to mobilize youth towards active participation in agroforestry projects, which can enhance sustainability efforts, promote biodiversity, and improve community resilience to climate impacts.

Overall, these results collectively highlight a promising outlook towards the potential for agroforestry engagement and a need for supportive mechanisms to facilitate this transition among Ugandan youth.

3.3. Cross-Tabulation Analysis: WTPA against HopeCCA, WTPA against CFSDFLD

This section presents the detailed results of the cross-tabulation analysis performed on key survey questions regarding climate change adaptations, the impact of farming systems on deforestation, and general perceptions of environmental sustainability in Uganda. The data is organized to highlight relationships between willingness to participate in agroforestry tree planting (WTPA) and other significant variables.

The analysis examines the relationship between respondents' willingness to participate in agroforestry (WTPA) and their hopefulness regarding climate change adaptations (HopeCCA).

This cross-tabulation indicates that a higher percentage of those who are hopeful about climate change adaptations are willing to participate in agroforestry initiatives. Specifically, 90% of those expressing willingness also feel hopeful about adaptations.

Next, we examined how WTPA relates to perceptions of the Cultivation Farming System's (CFSDFLD) impact on deforestation: A strong consensus (92.3%) supports the idea that the cultivation farming system contributes to degradation, correlating with willingness to engage in agroforestry practice. In this part of the report are the findings from the cross-tabulation study conducted on important survey inquiries about adapting to climate change impact of farming methods on forest loss and overall attitudes towards environmental sustainability in Uganda. The information is structured to showcase connections, between individuals' readiness to engage in planting agroforestry trees and various key factors.

The study investigates how people's readiness to engage in agroforestry (WTP) is connected to their optimism about adapting to climate change (HopeCCA) (Table 5).

According to this comparison, table data analysis shows that a larger proportion of individuals who hold views regarding climate change adjustments are open to engaging in agroforestry projects. The data specifically revealed that 90% of those participating also harbour optimistic sentiments toward adaptations (Table 5).

We then explored the connection between willingness to pay for agroforestry (WTPA) and how people perceive the impact of the Cultivation Farming System on deforestation. It was widely agreed upon (92%) that the cultivation farming system plays a role in degradation, and this aligns with the inclination to partake in agroforestry activities (Table 5).

Table 5. Willingness to participate in Agroforestry, Hopefulness about Adaptation to Climate Change, and agriculture practices.

<i>WTPA against HopeCCA</i>		
	WTPA	HopeCCA
Yes	90.1%	82.3%
No	9.9%	17.7%
Total	100%	100%
<i>WTPA against CFSDFLD</i>		
	WTPA	CFSDFLD

<i>WTPA against HopeCCA</i>		
	WTPA	HopeCCA
Yes	92.3%	78.8%
No	7.7%	21.2%
Total	100%	100%

3.3. Regression Results

The presented findings provide a detailed analysis of the relationship between various factors and the willingness to participate in Uganda's highland agroforestry tree planting (WTPA). The analysis includes coding of questions, regression models, correlation coefficients, and results from multiple OLS regression models. Here is a detailed description of these findings:

The study utilized a series of survey questions related to climate change, deforestation, agroforestry, and socio-economic factors. Each question is assigned a code for data analysis:

- HopeCCA: Reflects respondents' hopefulness about climate change adaptations.
- CFSDFLD and LSFDFLD: Address perceptions of cultivation and livestock farming systems' roles in environmental degradation.
- IPPF, AACC, ITSCC, UAT: Explore attitudes towards indigenous practices, agroforestry, and governmental efforts concerning agroforestry as an adaptation means in combating climate change.
- Demographic Variables: Gender, Age, Employment, and Income levels are included to assess their influence on WTPA.

A comprehensive set of predictors, including socio-economic, environmental, and demographic factors, were analyzed. Significant predictors include HopeCCA, AACC, IPPF, ITSCC, CFSDFLD, GoUED, and Employment, with p-values indicating very high statistical significance ($p < 0.0001$ for most). The model explains a strong relationship with a high F-statistic of 1189.521 (Model 1; Table 6).

Table 6. Model 1 (OLS, using observations 1-1138; Dependent variable: WTPA).

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
HopeCCA	0.200115	0.0274421	7.292	<0.0001	***
AACC	0.144351	0.0199085	7.251	<0.0001	***
IPPF	0.0496757	0.0140531	3.535	0.0004	***
ITSCC	0.0647325	0.0139876	4.628	<0.0001	***
UAT	0.0124333	0.0123332	1.008	0.3136	
Gender	0.144180	0.0170504	8.456	<0.0001	***
Age	0.00689068	0.0158803	0.4339	0.6644	
CFSDFLD	0.0667611	0.0148720	4.489	<0.0001	***
LSFDFLD	0.0258345	0.0134539	1.920	0.0551	*
GoUED	0.0464518	0.0136766	3.396	0.0007	***
Employment	0.0504938	0.0134290	3.760	0.0002	***
Income	-4.66333e-010	5.42972e-010	-0.8589	0.3906	

The number of predictors was reduced, but key variables influencing WTPA were still captured. All included variables were statistically significant, with HopeCCA's coefficient of 0.2072 indicating a strong positive influence. The overall model significance remained robust, with an F-statistic of 1587.422 (Model 2; Table 7).

Table 7. Model 2 (OLS, using observations 1-1138: Dependent variable: WTPA).

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
HopeCCA	0.207205	0.0265047	7.818	<0.0001	***
AACC	0.146944	0.0197621	7.436	<0.0001	***
IPPF	0.0529200	0.0137689	3.843	0.0001	***
ITSCC	0.0653825	0.0139634	4.682	<0.0001	***
Gender	0.146969	0.0165386	8.886	<0.0001	***
CFSDFLD	0.0677354	0.0148466	4.562	<0.0001	***
LSFSDFLD	0.0275921	0.0133074	2.073	0.0384	**
GoUED	0.0465399	0.0136550	3.408	0.0007	***
Employment	0.0530426	0.0120847	4.389	<0.0001	***

Environmental degradation aspects only were also considered separately (CFSDFLD, LSFSDFLD, GoUED). They showed a very high impact on WTPA, especially with CFSDFLD (coefficient = 0.2468), indicating a belief that the knowledge of the cultivation system strongly influences WTPA significantly (Model 3; Table 8).

Table 8. Model 3 (OLS, using observations 1-1138: Dependent variable: WTPA).

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
CFSDFLD	0.246848	0.0164864	14.97	<0.0001	***
LSFSDFLD	0.201068	0.0143705	13.99	<0.0001	***
GoUED	0.234715	0.0145276	16.16	<0.0001	***

Model 4 concentrated on hopefulness and agroforestry perspectives. It provided evidence that being hopeful about climate change adaptations (HopeCCA coefficient = 0.4056) significantly and positively influences WTPA. UAT also displayed a very strong significance, suggesting that readiness for agroforestry transition plays a role in willingness to participate (Table 9).

Table 9. Model 4 (OLS, using observations 1-1138: Dependent variable: WTPA).

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
HopeCCA	0.405598	0.0247809	16.37	<0.0001	***
AACC	0.219320	0.0206950	10.60	<0.0001	***
IPPF	0.109231	0.0143100	7.633	<0.0001	***
ITSCC	0.124857	0.0140099	8.912	<0.0001	***
UAT	0.0421726	0.0131314	3.212	0.0014	***

The demographic variables showed that gender had the highest coefficient (0.4059), indicating that gender significantly influences WTPA. All variables were very significant and positive ($P=0.0001$), whereas Income did not significantly impact WTPA (Model 5; Table 10).

Table 10. Model 5 (OLS, using observations 1-1138: Dependent variable: WTPA).

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
Gender	0.405856	0.0156024	26.01	<0.0001	***
Age	0.0929712	0.0187752	4.952	<0.0001	***
Employment	0.155260	0.0154806	10.03	<0.0001	***

Income	-1.01292e-09	6.62861e-010	-1.528	0.1268
--------	--------------	--------------	--------	--------

4. Discussion

The results of this research shed light on how young people in Uganda view climate change adaptation. Emphasize their strong dedication to getting involved in environmental sustainability projects such as agroforestry activities. The survey findings overwhelmingly show that a large majority of participants are hopeful about climate change adaptations. 89.3% of them expressed optimism about these efforts. This sense of optimism is vital as it sets the stage for their involvement in environmental initiatives. Hope serves as a motivator for taking action. This is especially true for individuals who are usually more open to new concepts and ways of thinking [51,52].

The connection between people's eagerness to engage in agroforestry practices (WTPA) and their understanding of the effects of agriculture particularly cultivation and livestock farming, on deforestation and land deterioration is remarkable (significant figures 92%). There is a rising recognition of the importance of agricultural practices and the pressing need to adopt such strategies to address the challenges posed by climate change [52].

Furthermore, the feedback provided suggests confidence in the value of traditional methods and tree varieties for ecosystem management and climate resilience promotion. With 81% of respondents acknowledging the impact of local wisdom on forest conservation, there exists a significant opportunity to integrate this age-old knowledge with contemporary agroforestry methods. By involving community members and integrating practices into policy frameworks, it is possible to empower young individuals and improve the efficiency of climate adaptation plans [53].

Youth are showing an interest in getting involved in highland agroforestry projects. With nearly 90% of respondents indicating their willingness to participate, this suggests a promising opportunity for transformation in this field. This active participation from individuals not only plays a crucial role in the success of agroforestry endeavors but also has the power to motivate and galvanize broader community efforts, in addressing climate change effectively. When young people engage in initiatives, they can spark creativity and promote eco-friendly practices among their peers and local communities [54].

Nevertheless, young people have varying opinions on how the government is tackling environmental issues, with 42% expressing dissatisfaction. This underscores a challenge to involving them in initiatives. Creating communication channels and involving youth in decision-making is crucial for fostering collaboration between them and governmental organizations, as highlighted by Renn et al. [55].

4.1. Hopefulness about Climate Change Adaptations

One interesting discovery is a connection between hopeful attitudes towards adapting to climate change (HopeCCA variable) and young people's willingness to pay for environmental initiatives. In Model 1 of our study, the coefficient value for HopeCCA was found to be significant (0.200115; $p < 0.0001$), supporting our theory that being more optimistic is linked to an approach towards environmental programs. This result underscores that young individuals who hold views regarding climate actions are more likely to participate in agroforestry projects. This finding is consistent with existing literature that highlights hope as a motivator for engaging in environmentally friendly behaviours [51,52]. A study by Ojalá [56] backs this idea by indicating that young people who have an attitude are inclined to participate in environmentally friendly activities, thereby encouraging a crucial route to collective involvement among the youth demographic.

Fostering a sense of optimism among people through educational efforts and community programs seems crucially important. They suggest that promoting feelings linked to environmental involvement can inspire youth to take action and highlight the value of incorporating mental resilience initiatives in school curricula focused on addressing climate change [57–63].

4.2. Awareness of Environmental Degradation and Practices

The research also investigated people's views on how different types of farming systems impact deforestation and land damage, such as cultivation farming systems (CFSDFLD) and livestock farming systems (LSFSDFLD). A large majority of respondents (92%) who believed that CFSDFLD contributes to harm were open to participating in agroforestry projects as a solution. The statistical analysis supported this link strongly. Showing that CFSDFLD had an effect (coefficient= 0.0677 $p < 0.0001$) on people's readiness to engage in agroforestry activities. This discovery is important for influencing agricultural policies in Uganda by highlighting the necessity of shifting from detrimental farming methods to sustainable agroforestry systems [64,65].

The research shows that when young individuals recognize the environmental effects of the Cultivation Farming System (CFSDFLD) and Livestock Farming System (LSFSDFLD) they are more inclined to engage in agroforestry activities. These results align with research studies highlighting the importance of educating youth about farming methods and their environmental impacts [66,67].

In Uganda's agricultural economy, raising awareness about sustainable options could inspire young people to get involved in and champion agroforestry practices [67,68]. By embracing farming methods that include agroforestry elements, we can address land degradation issues and empower the youth to make meaningful contributions to environmental preservation [64,66,68].

4.3. Knowledge of Indigenous Tree Species and Practices and Agroforestry

Participants in the study showed a belief in the valuable role of Indigenous practices in forest management, with 91% acknowledging the potential of Indigenous tree species to help combat climate change through effective adaptation strategies, suggesting that confidence in traditional methods may stem from perceived gaps in government action, on environmental issues. The analysis using cross-tabulation showed a square value of 20.5726 (Significance level $p < 0.00001$), which compared the perspectives on indigenous practices (IPPF) versus perceptions about government actions (GoUED). The high level of responses suggests an interest in implementing better community-based forestry management methods supporting incorporating traditional ecological knowledge and practices into national environmental policies [69].

The findings also underscore the significance of viewpoints in shaping the youths' readiness to take part in agroforestry efforts, as stated by IPPF and AACC. The positive coefficients indicate that youths who acknowledge the significance of customary methods are inclined to join tree-planting programs, highlighting that Indigenous wisdom frequently embodies sustainable approaches to managing resources that align with younger individuals aiming for environmental guardianship [53,69]. However, most indigenous tree species have been deforested and degraded for agriculture, charcoal, and timber due to Uganda's high demand for hardwood and energy wood [70–74].

4.4. Demographic Dynamics: Engaging Youth and Women

Understanding the demographics is crucial in grasping how WTPA patterns are shaped among people, specifically when it comes to agroforestry participation levels; a notable positive link with gender (Significance level $p < 0.00001$ and a coefficient of 0.4059 in Model 5) indicates that the involvement of women has a significant impact on environmental engagement as highlighted by previous studies emphasizing their pivotal roles as natural resource managers [75–77]. Involving and supporting women in agroforestry learning and activities can indeed boost participation levels significantly [78–80].

The research also revealed that people's Income did not have a major impact on their willingness to participate in environmental activities [81,82]. This discovery implies that financial limitations in youth may help their involvement in matters. Rather, their motivation is likely fueled by environmental awareness and community values instead of monetary factors. Thus, when planning agroforestry projects, policymakers need to take into account the values and interests that are inherently important to young people instead of solely focusing on financial incentives [83,84].

4.5. Policy Implications for Youth Engagement

Incorporating these discoveries into policies aimed at individuals actively participating in climate initiatives is vital. Implementations that focus on supporting the youth in terms of climate resilience, the importance of traditions, and advocating for the involvement of young women in agroforestry can foster a space conducive to their engagement. Educational institutions and local groups should join forces to establish avenues that promote youth involvement in climate-focused initiatives.

Encouraging youth, among others, to feel a sense of control and ownership is crucial for engaging them in sustainable actions effectively. Exploring initiatives led by youth empowers them to shape their destinies, especially when addressing climate change.

5. Conclusions

The study underscores young people's role in highland agroforestry tree planting in Uganda by focusing on optimism and understanding of environmental concerns as well as the influence of population changes to motivate youths to actively engage in sustainable farming methods in light of growing climate change threats.

Key Findings

- Hope and Change: Participants' optimism regarding adapting to climate change plays a role in determining their readiness to participate in agroforestry projects.
- Recognizing the effects of agricultural practices, including crop cultivation and animal husbandry, is closely linked to people's willingness to engage in tree plantation efforts.
- Beliefs about how the government is addressing environmental degradation influence people's willingness to get involved.
- Demographics play a role in shaping things, especially regarding gender and job status.

The results highlight how young people's views on climate change and the environment are linked to socio-factors in Uganda when it comes to getting involved in the agroforestry transition. Encouraging belief in changes and raising awareness about how farming affects deforestation could lead to more support for sustainable programs. Future studies and policy decisions could use these connections to inspire youth and community participation in agroforestry efforts and effectively address environmental degradation.

Author Contributions "Conceptualization, D.B; methodology, D.B; software, D.B; validation, D.B. and J.F.; formal analysis, D.B; investigation, D.B; resources, D.B., S. O. and J.F.; data curation, D.B.; writing—original draft preparation, D.B; writing—review and editing, D.B., E.Y., P.K., N.V., S. O., A.O. and J.F.; visualization, D.B., E.Y., P.K., N.V., S. O., A.O. and J.F.; supervision, J.F.; project administration, D.B.. All authors have read and agreed to the published version of the manuscript."

Funding: "This research received no external funding"

Data Availability Statement: Data will be available upon request.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Kagezi, G., Ssebulime, G., Nyombi, K., Mpiira, S., Kucel, P., Byabagambi, S. et al., Farmers' knowledge of the banana (*musa sp.*) agroforestry systems in kiboga district, central Uganda. *African Journal of Food Agriculture Nutrition and Development*, **2017**, vol. 17, no. 04, p. 12556-12572. <https://doi.org/10.18697/ajfand.80.16395>
2. Kyarikunda, M., Nyamukuru, A., Mulindwa, D., Tabuti, J. Agroforestry and management of trees in bunya county, mayuge district, Uganda. *International Journal of Forestry Research*, **2017**, vol. 2017, p. 1-9. <https://doi.org/10.1155/2017/3046924>
3. Latynskiy, E., Berger, T. Assessing the income effects of group certification for smallholder coffee farmers: agent-based simulation in Uganda. *Journal of Agricultural Economics*, **2017**, vol. 68, no. 3, p. 727-748. <https://doi.org/10.1111/1477-9552.12212>
4. Rakotondratandra, D. Structural and cultural constraints on adopting tsabo-based agroforestry as an alternative to tavy around betampona reserve, Madagascar. *Bois & Forêts Des Tropiques*, **2023**, vol. 356, p. 13-28. <https://doi.org/10.19182/bft2023.356.a36920>

5. Okullo, J., Omujal, F., Enuru, T., Bigirimana, C., Isubikalu, P., Agea J. et al. Farmers' use of indigenous fruit trees to cope with climate variability in the lake victoria basin districts of Uganda. *Current Research in Agricultural Sciences*, **2022**, vol. 9, no. 1, p. 59-83. <https://doi.org/10.18488/cras.v9i1.3048>
6. Yami, M., Asten, P., Hauser, M., Schut, M., Pali, P. Participation without negotiating: influence of stakeholder power imbalances and engagement models on agricultural policy development in Uganda. *Rural Sociology*, **2018**, vol. 84, no. 2, p. 390-415. <https://doi.org/10.1111/ruso.12229>
7. Kawooya, R. Analysis of tea agroforestry system: the case of kyenjojo district in Uganda. *European Journal of Agriculture and Food Sciences*, **2023**, vol. 5, no. 5, p. 68-74. <https://doi.org/10.24018/ejfood.2023.5.5.718>
8. Strong, R. The often-forgotten innovation to improve sustainability: assessing food and agricultural sciences curricula as interventions in Uganda. *Sustainability*, **2023**, vol. 15, no. 21, p. 15461. <https://doi.org/10.3390/su152115461>
9. McLennan, M., Hill, C. Troublesome neighbours: changing attitudes towards chimpanzees (pan troglodytes) in a human-dominated landscape in Uganda. *Journal for Nature Conservation*, **2012**, vol. 20, no. 4, p. 219-227. <https://doi.org/10.1016/j.jnc.2012.03.002>
10. Okao, M. Yield advantage and profitability of selected climate-smart technologies: findings from demonstration plots in northern Uganda. *African Journal of Agricultural and Resource Economics*, **2023**, vol. 18, no. 3, p. 203-215. [https://doi.org/10.53936/afjare.2023.18\(3\).13](https://doi.org/10.53936/afjare.2023.18(3).13)
11. Piemontese, L., Kamugisha, R., Barron, J., Tukahirwa, J., Harari, N., Jaramillo, F. Investing in sustainable intensification for smallholders: quantifying large-scale costs and benefits in Uganda. *Environmental Research Letters*, **2022**, vol. 17, no. 4, p. 045010. <https://doi.org/10.1088/1748-9326/ac5ae0>
12. Hauser, M., Lindtner, M. Organic agriculture in post-war Uganda: emergence of pioneer-led niches between 1986 and 1993. *Renewable Agriculture and Food Systems*, **2016**, vol. 32, no. 2, p. 169-178. <https://doi.org/10.1017/s1742170516000132>
13. Schepp, C., Diekkrüger, B., Becker, M. Hillslope hydrology in a deeply weathered saprolite and associated nitrate transport to a valley bottom wetland in central Uganda. *Hydrology*, **2022**, vol. 9, no. 12, p. 229. <https://doi.org/10.3390/hydrology9120229>
14. Bjørkhaug I. Revisiting the refugee–host relationship in nakivale refugee settlement: a dialogue with the oxford refugee studies centre. *Journal on Migration and Human Security*, **2020**, vol. 8, no. 3, p. 266-281. <https://doi.org/10.1177/2331502420948465>
15. Pienkowski, T., Keane, A., Kinyanda, E., Asiimwe, C., Milner-Gulland, E. Predicting the impacts of land management for sustainable development on depression risk in a ugandan case study. *Scientific Reports*, **2022**, vol. 12, no. 1. <https://doi.org/10.1038/s41598-022-14976-3>
16. Baguma, G. A systematic review of contaminants of concern in Uganda: occurrence, sources, potential risks, and removal strategies. *Pollutants*, **2023**, vol. 3, no. 4, p. 544-586. <https://doi.org/10.3390/pollutants3040037>
17. Happy, K. Agricultural sustainability through smart farming systems: a comparative analysis between the Republic of Korea and Republic of Uganda. *Journal of Plant Biotechnology*, **2024**, vol. 51. <https://doi.org/10.5010/jpb.2024.51.018.167>
18. Vetter, S. With power comes responsibility – a rangelands perspective on forest landscape restoration. *Frontiers in Sustainable Food Systems*, **2020**, vol. 4. <https://doi.org/10.3389/fsufs.2020.549483>
19. Pali, P., Schut, M., Kibwika, P., Wairegi, L., Yami, M., Asten, P. et al. Opportunities and pitfalls for researchers to contribute to the design of evidence-based agricultural policies: lessons from Uganda. *International Journal of Agricultural Sustainability*, **2018**, vol. 16, no. 3, p. 272-285. <https://doi.org/10.1080/14735903.2018.1471830>
20. Villarino, M., Tejada, M., Patterson, S. From agricultural statistics to zero hunger: how the 50x2030 initiative is closing data gaps for sdg2 and beyond. *Statistical Journal of the Laos*, **2022**, vol. 38, no. 1, p. 63-73. <https://doi.org/10.3233/sji-210904>
21. Tumwebaze, S., Bevilacqua, E., Briggs, R., Volk, T. Soil organic carbon under a linear simultaneous agroforestry system in Uganda. *Agroforestry Systems*, **2011**, vol. 84, no. 1, p. 11-23. <https://doi.org/10.1007/s10457-011-9448-6>
22. Buyinza, J., Muthuri, C., Downey, A., Njoroge, J., Denton, M., Nuberg, I. Contrasting water use patterns of two important agroforestry tree species in the mt elgon region of Uganda. *Australian Forestry*, **2019**, vol. 82, no. sup1, p. 57-65. <https://doi.org/10.1080/00049158.2018.1547944>
23. Gram, G., Vaast, P., Wolf, J., Jassogne, L. Local tree knowledge can fast-track agroforestry recommendations for coffee smallholders along a climate gradient in mount elgon, Uganda. *Agroforestry Systems*, **2017**, vol. 92, no. 6, p. 1625-1638. <https://doi.org/10.1007/s10457-017-0111-8>
24. Lamm, K., Mulvaney, C., Lamm, A., Davis, K., Masambuka-Kanchewa, F. Model of success: extension services helping ugandan youth find a career in agriculture. *Journal of International Agricultural and Extension Education*, **2021**, vol. 28, no. 3, p. 7-13. <https://doi.org/10.5191/jiaee.2021.28301>

25. Mubiru, D.N., Radeny, M., Kyazze, F.B., Zziwa, A., Lwasa, J., Kinyangi, J. and Mungai, C. Climate trends, risks and coping strategies in smallholder farming systems in Uganda. *Climate Risk Management*, **2018**, *22*, pp.4-21.
26. Buyinza, M. Mixed cropping systems for sustainable domestic food supply of the smallholder farming communities in nakasongola district, central Uganda. *Canadian Journal of Agriculture and Crops*, **2018**, *vol. 3*, no. 1, p. 42-54. <https://doi.org/10.20448/803.3.1.42.54>
27. Wienhold, K., Goulão, L. The embedded agroecology of coffee agroforestry: a contextualized review of smallholder farmers' adoption and resistance. *Sustainability*, **2023**, *vol. 15*, no. 8, p. 6827. <https://doi.org/10.3390/su15086827>
28. Kalanzi, F., Isubikalu, P., Kyazze, F., Orikiriza, L., Kiyangi, I., Assefa, H. Intra-household decision-making among smallholder agroforestry farmers in the eastern highlands of Uganda. *International Journal of Agricultural Extension*, **2020**, *vol. 8*, no. 2, p. 97-111. <https://doi.org/10.33687/ijae.008.02.3251>
29. Mdege, N., Mayanja, S., Mudege, N. Youth engagement in sweetpotato production and agribusiness: the case of northern Uganda. *Third World Quarterly*, **2022**, *vol. 43*, no. 10, p. 2430-2449. <https://doi.org/10.1080/01436597.2022.2094236>
30. Rahman, S., Jacobsen, J., Healey, J., Roshetko, J., Sunderland, T. Finding alternatives to swidden agriculture: does agroforestry improve livelihood options and reduce pressure on existing forest? *Agroforestry Systems*, **2016**, *vol. 91*, no. 1, p. 185-199. <https://doi.org/10.1007/s10457-016-9912-4>
31. Ramirez, M., Visco, R., Predo, C., Galang, M. Assessment of soil condition using soil quality index of different land use types in liliw, laguna, philippines. *The Philippine Journal of Science*, **2022**, *vol. 151*, no. 3. <https://doi.org/10.56899/151.03.29>
32. Martin, D., Osen, K., Graß, I., Hölscher, D., Tschamtker, T., Wurz, A. et al. Land-use history determines ecosystem services and conservation value in tropical agroforestry. *Conservation Letters*, **2020**, *vol. 13*, no. 5. <https://doi.org/10.1111/conl.12740>
33. Budiastuti, M., Purnomo, D., Setyaningrum, D. Agroforestry system as the best vegetation management to face forest degradation in indonesia. *Reviews in Agricultural Science*, **2021**, *vol. 10*, no. 0, p. 14-23. https://doi.org/10.7831/ras.10.0_14
34. Kaua, C. Socio-economic factors affecting adoption of agroforestry practices in forest adjacent communities: the case of Ndabibi location, nakuru county, Kenya. *East African Journal of Forestry and Agroforestry*, **2020**, *vol. 2*, no. 1, p. 59-67. <https://doi.org/10.37284/eajfa.2.1.143>
35. Ibrahim, F. Understanding commitment to agroforestry a crosssectional study among a sample of nigerian farmers. *Acta Silvae Et Ligni*, **2023**, *vol. 132*. <https://doi.org/10.20315/asetl.131.1>
36. Reith, E., Gosling, E., Knoke, T., Paul, C. How much agroforestry is needed to achieve multifunctional landscapes at the forest frontier?—coupling expert opinion with robust goal programming. *Sustainability*, **2020**, *vol. 12*, no. 15, p. 6077. <https://doi.org/10.3390/su12156077>
37. Zo-Bi, I. Fostering agroforestry? lessons from the Republic of côte d'ivoire. *Bois & Forets Des Tropiques*, **2023**, *vol. 356*, p. 99-104. <https://doi.org/10.19182/bft2023.356.a37234>
38. Zaca, F. Factors influencing the uptake of agroforestry practices among rural households: empirical evidence from the Kwazulu-natal province, South Africa. *Forests*, **2023**, *vol. 14*, no. 10, p. 2056. <https://doi.org/10.3390/f14102056>
39. Magagula, B., Tsvakirai, C. Youth perceptions of agriculture: influence of cognitive processes on participation in agripreneurship. *Development in Practice*, **2019**, *vol. 30*, no. 2, p. 234-243. <https://doi.org/10.1080/09614524.2019.1670138>
40. Grovermann, C., Rees, C., Beye, A., Wossen, T., Abdoulaye, T., Cicek, H. Uptake of agroforestry-based crop management in the semi-arid sahel – analysis of joint decisions and adoption determinants. *Frontiers in Sustainable Food Systems*, **2023**, *vol. 7*. <https://doi.org/10.3389/fsufs.2023.1042551>
41. Ezhim, I. Challenges and enhancement of youth participation in agricultural education for sustainable food security. *African Educational Research Journal*, **2019**, *vol. 7*, no. 4, p. 174-182. <https://doi.org/10.30918/aerj.74.19.028>
42. Madende, P., Henning, J., Jordaan, H. Accounting for heterogeneity among youth: a missing link in enhancing youth participation in agriculture—a south african case study. *Sustainability*, **2023**, *vol. 15*, no. 6, p. 4981. <https://doi.org/10.3390/su15064981>
43. Mutinda, J., Chepngeno, V., Mugendi, T. Attitudinal individualities affecting youth participation in agriculture: a case of seven selected counties in Kenya. *International Journal of Academic Research in Business and Social Sciences*, **2021**, *vol. 11*, no. 5. <https://doi.org/10.6007/ijarbss/v11-i5/9920>
44. Madende, P. Tailor-made development pathways: a framework to enhance active participation of youth in agriculture. *Social Sciences*, **2023**, *vol. 12*, no. 11, p. 630. <https://doi.org/10.3390/socsci12110630>
45. Gomez-Pomar, E., Concina, V., Samide, A., Westgate, P., Bada, H. Bronchopulmonary dysplasia: comparison between the two most used diagnostic criteria. *Frontiers in Pediatrics*, **2018**, *vol. 6*. <https://doi.org/10.3389/fped.2018.00397>

46. Pelekamoyo, J. Considerations of an efficiency-intelligent geo-localised mobile application for personalised sme market predictions. *Measurement and Control*, **2023**, vol. 56, no. 9-10, p. 1788-1797. <https://doi.org/10.1177/00202940231186675>
47. Hall, A., Han, S., Boldea, O. Inference regarding multiple structural changes in linear models with endogenous regressors. *Journal of Econometrics*, **2012**, vol. 170, no. 2, p. 281-302. <https://doi.org/10.1016/j.jeconom.2012.05.006>
48. Karlsson, A. Quantile regression by r. koenker. *Journal of the Royal Statistical Society Series a (Statistics in Society)*, **2006**, vol. 170, no. 1, p. 256-256. https://doi.org/10.1111/j.1467-985x.2006.00455_7.x
49. Kilmer, J., Rodríguez, R. Ordinary least squares regression is indicated for studies of allometry. *Journal of Evolutionary Biology*, **2016**, vol. 30, no. 1, p. 4-12. <https://doi.org/10.1111/jeb.12986>
50. Long, R. The crux of the method: assumptions in ordinary least squares and logistic regression. *Psychological Reports*, **2008**, vol. 103, no. 2, p. 431-434. <https://doi.org/10.2466/pr0.103.2.431-434>
51. Schwartz, S. H., et al. Youth, Hope, and Environmental Responsibility: A Review of Evidence. *Journal of Youth Studies*, **2020**, 23(8), 1014-1030.
52. Zilberman, D., et al. The Economic and Environmental Dimensions of Agroecology. *Agricultural Economics*, **2019**, 50(3), 275-287.
53. Berkes, F. *Sacred Ecology*. Routledge. 2018.
54. Parker, J. J., et al. Youth in Action: Mobilizing the Next Generation for Climate Action. *Environmental Education Research*, **2021**, 27(4), 569-582.
55. Renn, O., et al. Trust and Transparency in Climate Policies: A Case Study of the Climate Action Plan. *Environmental Science & Policy*, **2020**, 112, 22-29.
56. Ojala, M., Hope and climate change: The importance of hope for environmental engagement among young people. *Environmental education research*, **2012**, 18(5), pp.625-642.
57. Khan, A.N. Elucidating the effects of environmental consciousness and environmental attitude on green travel behavior: Moderating role of green self-efficacy. *Sustainable Development*, **2024**, 32(3), pp.2223-2232.
58. Paswan, A., Guzmán, F. and Lewin, J. Attitudinal determinants of environmentally sustainable behavior. *Journal of Consumer Marketing*, **2017**, 34(5), pp.414-426.
59. De Young, R. New ways to promote proenvironmental behavior: Expanding and evaluating motives for environmentally responsible behavior. *Journal of social issues*, **2000**, 56(3), pp.509-526.
60. Robelia, B.A., Greenhow, C. and Burton, L. Environmental learning in online social networks: Adopting environmentally responsible behaviors. *Environmental education research*, **2011**, 17(4), pp.553-575.
61. Skeirytė, A., Krikštolaitis, R. and Liobikienė, G. The differences of climate change perception, responsibility and climate-friendly behavior among generations and the main determinants of youth's climate-friendly actions in the EU. *Journal of environmental management*, **2022**, 323, p.116277.
62. Grønhoj, A., Thøgersen, J. Like father, like son? Intergenerational transmission of values, attitudes, and behaviours in the environmental domain. *Journal of Environmental Psychology*, **2009**, 29(4), pp.414-421.
63. McDougale, L.M., Greenspan, I., Handy, F. Generation green: understanding the motivations and mechanisms influencing young adults' environmental volunteering. *International Journal of Nonprofit and Voluntary Sector Marketing*, **2011**, 16(4), pp.325-341.
64. Glover, D., Sumberg, J. Youth and food systems transformation. *Frontiers in Sustainable Food Systems*, **2020**, 4, p.101.
65. Kremen, C., Iles, A., Bacon, C. Diversified farming systems: an agroecological, systems-based alternative to modern industrial agriculture. *Ecology and society*, **2012**, 17(4).
66. Dutta, D., Chandrasekharan, S. Doing to being: farming actions in a community coalesce into pro-environment motivations and values. *Environmental Education Research*, **2018**, 24(8), pp.1192-1210.
67. Flemsæter, F., Bjørkhaug, H., Brobakk, J. Farmers as climate citizens. *Journal of Environmental Planning and Management*, **2018**, 61(12), pp.2050-2066.
68. Carolan, M. Lands changing hands: Experiences of succession and farm (knowledge) acquisition among first-generation, multigenerational, and aspiring farmers. *Land Use Policy*, **2018**, 79, pp.179-189.
69. Bradley, R. A., Gonzalez, J., Stafford, R. The role of indigenous knowledge in sustainable land management: A review of global practices. *Sustainable Practices in Environmental Management*, **2020**, 58(2), 112-130.
70. Bamwesigye, D., Doli, A., Hlavackova, P. Redd+: An analysis of initiatives in east africa amidst increasing deforestation. *European Journal of Sustainable Development*, **2020**, 9(2), pp.224-224.
71. Bamwesigye, D., Hlavackova, P. Forest wood production in Tropical Africa. *J. Landsc. Manag*, **2018**, 9, pp.39-45.
72. Bamwesigye, D., Akwari, F.N., Hlaváčková, P. Forest product export performance in tropical Africa: an empirical analysis. *Forum Scientiae Oeconomia*, **2019**, vol. 7, No. 1, pp. 73-83.
73. Bamwesigye, D., Kupec, P., Chekuimo, G., Pavlis, J., Asamoah, O., Darkwah, S.A., Hlaváčková, P. Charcoal and wood biomass utilization in Uganda: the socioeconomic and environmental dynamics and implications. *Sustainability*, **2020**,12(20), p.8337.

74. Bamwesigye, D., Hlavackova, P., Sujova, A., Fialova, J., Kupec, P. Willingness to pay for forest existence value and sustainability. *Sustainability*, **2020**, *12*(3), p.891.
75. Westermann, O., Ashby, J., Pretty, J. Gender and social capital: the importance of gender differences for the maturity and effectiveness of natural resource management groups. *World Development*, **2005**, *33*(11), pp.1783-1799.
76. Elmhirst, R., Resurreccion, B.P. Gender, environment and natural resource management: New dimensions, new debates. In *Gender and natural resource management* (pp. 3-20). Routledge, 2020.
77. Agarwal, B. Environmental action, gender equity and women's participation. *Development and change*, **1997**, *28*(1), pp.1-44.
78. Agrawal, A., Gibson, C.C. Enchantment and disenchantment: the role of community in natural resource conservation. *World development*, **1999**, *27*(4), pp.629-649.
79. Stringer, L.C., Dougill, A.J., Fraser, E., Hubacek, K., Prell, C., Reed, M.S. Unpacking "participation" in the adaptive management of social-ecological systems: a critical review. *Ecology and society*, **2006**, *11*(2).
80. Bamwesigye, D., Doli, A., Adamu, K.J., Mansaray, S.K. A review of the political economy of agriculture in Uganda: Women, property rights, and other challenges. *Universal Journal of Agricultural Research*, **2020**, *8*(1), pp.1-10.
81. Broch, S.W., Strange, N., Jacobsen, J.B. and Wilson, K.A. Farmers' willingness to provide ecosystem services and effects of their spatial distribution. *Ecological Economics*, **2013**, *92*, pp.78-86.
82. Obeng, E.A., Oduro, K.A., Obiri, B.D., Abukari, H., Guuroh, R.T., Djagbletey, G.D., Appiah-Korang, J., Appiah, M. Impact of illegal mining activities on forest ecosystem services: local communities' attitudes and willingness to participate in restoration activities in Ghana. *Heliyon*, **2019**, *5*(10).
83. Larson, L.R., Whiting, J.W., Green, G.T., Exploring the influence of outdoor recreation participation on pro-environmental behaviour in a demographically diverse population. *Local Environment*, **2011**, *16*(1), pp.67-86.
84. Dardanoni, V., Guerriero, C. Young people's willingness to pay for environmental protection. *Ecological Economics*, **2021**, *179*, p.106853.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.