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Exploring Farmers' Perceptions and Determinants of Woody Species Conservation Practices in Northwest Ethiopia

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Abstract

Woody species conservation is crucial for preserving biodiversity and supporting sustainable land use; however, it has received limited attention in the Enemay District of Northwest Ethiopia. This study aimed to explore the perceptions and determinants of woody species conservation practices in the East Gojjam Zone, Enemay District. Data were collected from 235 purposively selected households using a semi-structured questionnaire focusing on woody species diversity, their uses, and the socioeconomic characteristics of the respondents. Field observations complemented the survey data by verifying the presence of woody species on farmers' lands. Descriptive statistics and binary logistic regression analyses were conducted using IBM SPSS Statistics (version 20). The findings revealed that 77.8% of households held negative views on woody species conservation. The predominant conservation practices identified were planting woody species (15.7%), home garden/agroforestry conservation (15.3%), and weed removal (6%). Binomial logistic regression analysis identified eight significant factors that influenced woody species conservation practices at 1% and 5% significance levels. These results highlight the urgent need to enhance farmers' awareness of woody species conservation, improve capacity-building initiatives, and address barriers to effective conservation.

Keywords*: Agroforestry, Conservation, Sustainable land use, Woody species*

1. Introduction

Woody species are integral to environmental discussions and serve as both vital resources and critical players in ecological stability (Lindenmayer & Laurance, 2017). Forest destruction and the spread of invasive plant species are recognized as significant contributors to environmental degradation, biodiversity loss, and climate change, which can exacerbate poverty. Conversely, woody species are essential for mitigating climate change effects, stabilizing ecosystems, and fostering socioeconomic development at both local and national levels (Makhambera, 2014). They provide invaluable natural resources that underpin rural livelihoods and contribute to national economies (Bongers, 2010; Nambiar, 2019).

Historically, communities worldwide have engaged in woody species conservation (Usman et al., 2014) by utilizing traditional ecological knowledge (TEK) in their medicinal (Bruchac, 2014) and dietary practices (Razafindratsima et al., 2021). This practice encompasses not only the recognition and documentation of woody species diversity but also the sustainable use and promotion of awareness regarding these resources (Cunningham, 2014). Despite its importance, woody species conservation has received less attention and funding than animal conservation efforts, particularly in Ethiopia, where traditional medicine relies heavily on woody species (Luizza et al., 2013). The primary threats to the conservation of woody species in Ethiopia include habitat loss, deforestation, fragmentation, and fires (Mekonen, 2017).

Current estimates of woody species cover in Ethiopia remain ambiguous, prompting government and non-governmental organisations to promote afforestation initiatives. Active participation of local populations is crucial for the success of these replanting efforts (Heywood & Iriondo, 2003; Mitiku & Expert, 2022). In Ethiopia, woody species conservation practices encompass a range of strategies, including plantation initiatives, agroforestry, sacred grove preservation, and penalties for illegal logging (Corlett, 2016).

In the study area, key woody species such as *Eucalyptus globulus*, *Opuntia ficus-indicus*, L. Miller, *Acacia abyssinica Benth*, *Croton macrostachyus Del*., *Dodonaea angustifolia L.F*., and *Carissa spinarum L*. dominate the landscape as described by EDAO (2021). However, the district faces substantial challenges in conserving woody species diversity, including habitat destruction, resource overexploitation, and deforestation driven by farmland expansion and firewood use.

While previous studies Birhanu and Ayalew (2018); Dendir (2021) have explored farmers' perceptions of planting woody species, there is a notable gap in detailed information regarding the value of different woody species, the types of conservation practices employed, and the barriers hindering effective conservation efforts. This study aims to address these gaps by providing a region-specific analysis of woody species conservation in the Enemay District. It goes beyond previous research by examining the specific conservation practices, socioeconomic factors influencing them, and barriers to effective conservation. Therefore, this study aimed to assess the perceptions, practices, and influencing factors related to woody species conservation in the Enemay District of the East Gojjam Zone, Amhara Region, Ethiopia. This research provides valuable insights for policymakers and practitioners aiming to promote the sustainable conservation of woody species within the region.

2. Methodology

2.1. Description of Study Area

Enemay District is located in the East Gojjam Zone of the Amhara National Regional State in northwest Ethiopia. The district is located 370 km northwest of Addis Ababa, 220 km southwest of Bahir Dar, and 90 km northeast of Debre Markos. Geographically, it is located between

latitudes 10°16'30″ " and 10°37'30" N and longitudes 38°3'0" and 38°24'40"″ E (Figure 1). Enemay shares borders with Dejen to the south, Debay Telatgen to the west, Enarj Enawga to the north, and Shebel Berenta to the east (Tadesse, 2020). The administrative center is Bichena, where the study was conducted across three kebeles: Dima, Debre Tsimona, and Addis Alem.

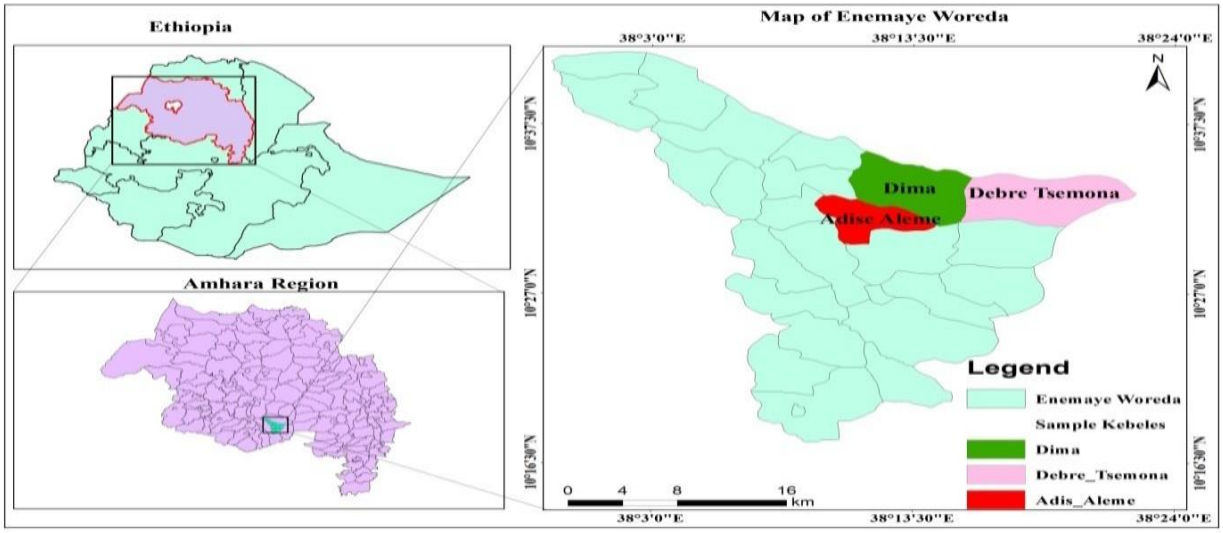

Figure 1. Location map of the study area

The district has a population of 188,447 (93,418 males and 95,059 females), with 11.42% residing in urban areas. The predominant religion was Ethiopian Orthodox Christianity (92.05%). Altitude ranges from 800 to 4,088 meters above sea level, with agro-climatic zones including Dega, Woina Dega, and Kola. The average monthly temperature is 19.5°C, with annual precipitation between 800 and 1,500 mm. Notable tree species in the district include *Cordia africana* (Wanza), *Ficus vasta Forssk* (Warka), *Ficus sur Forssk (Shola), Juniperus procera Hochst. ex Endl (*Yehabesha tid), *Acacia abyssinica Hochst. ex Benth.* (Girar nech), *Croton macrostachyus Hochst. ex Delile* **(**Bisana). The district features diverse vegetation, including forests and grasslands, and major crops grown are teff, maize, wheat, barley, and legumes. Common livestock types include cattle, sheep, goats, and chickens (Tadesse, 2020).

2.2.Data Collection Methods

Data were gathered from both primary and secondary sources. A reconnaissance survey was conducted to assess the suitability of the study area for qualitative and quantitative data collection by employing household surveys, interviews, key informant interviews, and focus group discussions.

During the field surveys, direct observations were employed to gather and verify information on indigenous knowledge practices related to woody species conservation. The presence of various woody species and conservation activities were documented through field observations and photographs.

Semi-structured questionnaires incorporating both open- and closed-ended questions were used to collect data. Open-ended questions were aimed at prompting the respondents' knowledge and perceptions of woody species conservation

Focus group discussions included participants, such as environmental protection officers, kebele leaders, agricultural officers, and other knowledgeable individuals. Three FGDs were conducted, each comprising eight to twelve members, to share insights into indigenous knowledge and practices related to woody species conservation.

Key informant interviews were conducted with knowledgeable individuals, who could provide valuable insights into woody species conservation practices and related determinants. These participants were distinct from those in the FGDs, with each interview group consisting of two to six members.

2.3.Sampling Technique and Sample Size Determination

This study employed a mixed-methods approach, combining descriptive and explanatory research designs with quantitative and qualitative data collection and analysis techniques. Two sampling methods were used: systematic random sampling and purposive sampling.

Systematic random sampling involves randomly selecting the first household and then choosing additional households at predetermined intervals from a population list, providing a balance of precision and efficiency (Ayal & Leal Filho, 2017)**.** Purposive sampling was used to select knowledgeable individuals for focus group discussions (FGDs) and key informant interviews (KIIs) based on their relevant expertise.

According to the EPOED (2021) report, three kebeles namely Dima, Debre Tsimona, and Addis Alem were selected from the district's 25 kebeles due to significant declines in woody species diversity. These kebeles were chosen to investigate the factors contributing to species loss and identify barriers to effective conservation. The study covered 5,193 households, with sample sizes of 1,918 in Dima, 1,739 in Debre Tsimona, and 1,536 in Addis Alem, selected based on population density and conservation practices.

Before selecting representative households using systematic sampling, where the first household is chosen randomly and subsequent ones are selected at predetermined intervals, the sample size was calculated using the following equations (Ibrahim et al., 2022):

$$n_o = \frac{z^2 pq}{D^2} \quad \text{..... EQ (1)}$$

$$n = \frac{n_o}{1+\frac{(n_o-1)}{N}} \quad \text{.....EQ (2)}$$

Where: n_o= desired sample size for populations over 10,000

n= desired sample size for populations under 10,000

z= 95% confidence level (1.96)

P= 0.2 (20% sample proportion)

q=1- 0.2 = 0.8

N= total population

D= margin of error (0.05)

$n_o = \frac{z^2pq}{D^2}$ $n_o = \frac{(1.96)^2 \times 0.2 \times 0.8}{0.05^2} = \frac{0.6146}{0.0025} = 246$

Assuming that population is less than 10,000, the sample size is further calculated as:

$n = \frac{n_o}{1+\frac{(n_o-1)}{N}}$ $n = \frac{246}{1+\frac{246-1}{5193}}$ n =235

Based on the above formula, 235 respondent households were selected from the total population (N=5,193) using (equation3).

$n_i = \frac{n(Ni)}{N}$ ……..EQ (3)

Where ni denotes the number of sampled households for each kebele, n is the total sample size, Ni is the population of each kebele, and N is the total population across the three kebeles.

Table 1. Distribution of Sample Respondents

No	Sample kebeles	Total number of household	Sampled household	Sample Percentage (%)
1	Dima	1918	87	37%
2	Addis Alem	1536	70	30%
3	Debre Tsimona	1739	78	33%
	Total	N =5193	235	100%

2.4.Methods of Data Analysis

Following the data collection, the dataset was thoroughly reviewed to identify and address any inconsistencies or gaps. The questionnaire responses were subsequently coded and entered into IBM SPSS (version 20.0) for statistical analysis. Quantitative data were analyzed using inferential statistics, while qualitative data were subjected to coding techniques to capture participants' perspectives and experiences, facilitating the extraction of in-depth and reliable insights. The quantitative analysis incorporated various descriptive statistical methods, including chi-squared tests, percentages, frequencies, cross-tabulations, and binary logistic regression analysis. A binary logistic regression model was employed to examine the factors influencing woody species conservation and to assess the relationship between multiple independent variables and a binary dependent variable.The results are presented using graphs, tables, and charts to enhance clarity and ensure effective communication of the findings.

2.5.Specification of Econometric Model

2.5.1 Dependent Variables

The dependent variable in this study was the practice of woody species conservation, which was defined as a binary variable indicating whether households engaged in conservation strategies for woody species. The dependent variable was coded as a dummy variable, with a value of 1 for households that practiced woody species conservation, and 0 for those that did not.

2.5.2 Independent Variables

The independent variables were predictors that influenced local perceptions and practices related to woody species conservation. These included gender, age, education level, family size, marital status, farming experience, access to extension services and credit, and the distance from the household to conservation areas.

Table 2. Variables used in binary logistic regression

Variables	Code	Type	Definition and Measurement	Expected Sign
Dependent Variable				
Woody species Conservation Practice	WSCP	Dummy	1 = Woody species Conserver , 0 = Woody species Non-conserver	
Independent Variables				
Age	Age	Continuous	Number	±
Gender	Gender	Dummy	1 = Male, 0= Female	±
Education status	Educst	Dummy	1= Literate and 0 otherwise	±
Family Size	Fsize	Continuous	Number	±
Marital Status	Mrstatus	Dummy	1 = Married and 0= Unmarried	±
Farmland Size	Frmsize	Continuous	Hectare	±
Farming Experience	Frmexp	Continuous	Year	±
Extension Service	Extserv	Dummy	1 = Yes, 0 = No	+
Access to Credit	Accredit	Dummy	1 = Yes and 0 = No	±
Type of Occupation	Toccup	Dummy	1 = Farmer and 0 = Farmer and Merchant	+
Distance of Farmland	Disfrm	Continuous	Kilometer	±

3. Results and Discussion

3.1. Socioeconomic Characteristics of the Respondents

A total of 235 participants were included in the study, with 79.6% male and 20.4% female (Table 3). Chi-square analysis showed a significant association between gender and engagement in woody species conservation practices ($\chi^2 = 22.035$, $p < 0.001$), highlighting a noticeable gender disparity in conservation behaviour. The age of the participants ranged from 20 to 79 years, with 62.1% falling within the 31-50 age groups. Family sizes ranged from one to nine members, with an average of 4.58 members, although no significant relationship was found between family size and conservation practices. Furthermore, 80.4% of the respondents were married, but marital status did not show a significant correlation with conservation practices.

Table 3. Significant Socioeconomic and Institutional Characteristics

Variables		Conservation Practice				Total sample		Chi-square
		Conserver		Non-conserver				
		№	%	№	%	№	%	
Gender	Male	164	85.4	23	53.5	187	79.6	$\chi^2 = 2.035^{***}$
	Female	28	14.6	20	44.5	48	20.4	
	Total	192	100	43	100	235	100	
Education Status	Illiterate	108	56.2	37	86.1	145	61.7	$\chi^2=13.7^{***}$
	Read and write	44	22.9	2	4.6	46	19.6	
	Elementary	27	14.1	3	7.0	30	12.8	
	High school	10	5.2	1	2.3	11	4.7	
	College & above	3	1.6	0	0.0	3	1.3	
	Total	192	100	43	100	235	100	
Type of occupation	Farmer	190	99.0	40	93.0	230	97.9	$\chi^2 = 5.9^{**}$
	Merchant & farmer	2	1.0	3	7.0	5	2.1	
	Total	192	100	43	100	235	100	
Extension Service	Yes	93	48.4	34	79.1	127	54.0	$\chi^2=13.273^{***}$
	No	99	51.6	9	20.9	108	46.0	
	Total	192	100	43	100	235	100	
Credit Access	Yes	99	51.6	31	72.1	130	55.3	$\chi^2=5.991^{**}$
	No	93	48.4	12	27.9	105	44.7	
	Total	192	100	43	100	235	100	

Source: Household Survey Result, 2022

The majority of respondents (61.7%) were illiterate, with 19.6% being able to read and write, and only a small percentage (12.8%) having completed elementary school or higher education (Table 3). A positive correlation was observed between educational level and conservation practices,

with those with lower levels of education being less likely to engage in conservation behaviours. Regarding farmland ownership, 49.8% owned between one and two hectares, 35.7% owned more than two hectares, and 14.5% owned less than one hectare. Larger landholders were more likely to engage in conservation practices. A significant relationship was found between farming experience (83% with more than 10 years of experience) and participation in woody species conservation efforts, suggesting that experienced farmers possess better knowledge of effective conservation methods.

In terms of the proximity of households to their farmland, 42.1% lived more than 3 km away, while 34% lived between 1 km and 2 km from their plots, with an average distance of 5.41 kilometers. A significant association was observed between occupation and conservation practice (χ^2 = 5.943, df = 1, p = 0.015). The majority of respondents (97.9%) were farmers, with a smaller proportion involved in both farming and trading. Regarding extension services, 54% of households received guidance from agricultural extension agents, which was positively correlated with conservation practices (χ^2 = 13.273, df = 1, p = 0.000). Furthermore, 55.3% of the respondents had access to credit services, which also had a significant positive correlation with conservation behaviour (χ^2 = 5.991, df = 1, p = 0.014), indicating the importance of financial support in adopting conservation techniques.

3.2.Reasons for Conservation of Woody Species

Households cited various reasons for conserving woody species, including their utility in providing food, medicine, fuelwood, construction materials, and aesthetic value (Figure 2). Woody species, with their robust root systems and high biomass production, are particularly suited to short-rotation coppice systems, contributing to energy generation and ecological restoration. They are also vital for carbon sequestration, aiding in climate change mitigation. According to focus group discussions (FGDs) and key informant interviews (KIIs) in the study area, some woody species are crucial for local economies because of their medicinal properties and their use in construction and furniture making. Species such as *Azadirachta indica* (neem) and *Commiphora molmol* (myrrh) play essential roles in traditional medicine, whereas *Eucalyptus globulus* and *Cordia africana* are important for timber and fuelwood.

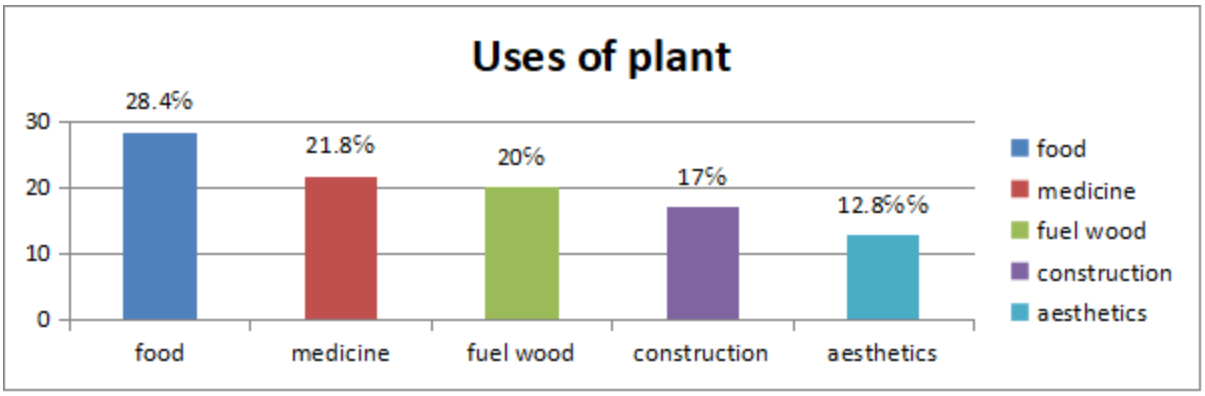

Figure 2. Key Uses of Woody Species in the Study Area

3.3.Perceptions of Woody Species Conservation

Approximately 77.8% of the respondents expressed negative views about current conservation practices, while only 22.2% held positive opinions. The primary source of conservation knowledge was peer discussions (74.9%), with formal training being the least common (25.1%). The majority (91.5%) believed that punishments were necessary to deter illegal cutting of woody species for agricultural purposes (Table 4).

Table 4. Perceptions of Respondents on Woody Species Conservation Practices

Perceptions		Conservation Practice				Total	Percent (%)
		Conserver		Non- conserver			
		№	%	№	%		
Perceptions of Woody Species Conservation	Positive	42	21.9	10	23.3	52	22.2
	Negative	150	78.1	33	76.7	183	77.8
	Total	192	100	43	100	235	100
Perceptions of Knowledge Sharing	Peer discussion	146	76	30	69.8	176	74.9
	Training	46	24	13	30.2	59	25.1
	Total	192	100	43	100	235	100
Perceptions of Current Conservation Practice	Good	142	74	27	62.8	169	41.3
	Poor	50	26	16	37.2	66	58.7
	Total	192	100	43	100	235	100
Perceptions of Current Woody Species Status	Increasing	74	38.5	19	44.2	93	39.6
	Decreasing	118	61.5	24	55.8	142	60.4
	Total	192	100	43	100	235	100
Perception Punishment for Illegal Destruction	Agree	177	92.2	38	88.4	215	91.5
	Disagree	15	7.8	5	11.6	20	8.5
	Total	192	100	43	100	235	100

Source: Household Survey Result, 2022

3.4. Woody Species Conservation Practices

These data indicate that households are actively engaged in various woody species conservation practices. The most common activities included planting (15.7%) and home gardening/agroforestry (15.3%). Other notable practices were enforcement of community laws (11.5%) and parkland agroforestry (9.4%) (Table 5).

Table 5. Woody Species Conservation Practices

Conservation Practices	Frequency	Percent
Home Garden/agroforestry conservation	36	15.3
Change in cropping and planting pattern	14	6.0
Parkland agroforestry conservation	22	9.4
Removal of weeds from woody species	14	6.0
Woody species pest control	10	4.3
Buffer zone preparation	5	2.1
Plantation	37	15.7
Replanting of woody species after logging	6	2.6
Preserving woody species as sacred groves	10	4.3
Declaration of certain periods as closed seasons	11	4.7
Cutting down woody species without permission is a crime	8	3.4
Enforcement of community laws conserving woody species	27	11.5
Construction of fences around the woody species	15	6.4
Use of vigilante groups to protect the woody species	10	4.3
Seed storage/conservation	10	4.3
Total	235	100

Source: Household Survey result, 2022

3.5. Challenges of Woody Species Conservation

The findings revealed that agricultural expansion (31.5%) and population density (26%) were the foremost challenges facing woody species conservation. Additionally, issues such as poverty, disregard for local knowledge, fires, and a general lack of awareness significantly hindered conservation efforts (Table 6).

Table 6. Challenges of Woody Species Conservation

Challenges of woody species conservation	Frequency	Percent
Expansion of farmland	74	31.5
Population density	61	26
Poverty	39	16
Fire	13	5.5
Disrespect for local knowledge	29	12.4
Lack of awareness	19	8
Total	235	100

Source: Household Survey Result, 2022

3.6.Analysis of Determinants of Woody Species Conservation Practices

Diagnostic tests for multicollinearity were conducted to ensure the robustness of the regression analysis results. The results of the Variance Inflation Factor (VIF) and Contingency Coefficients (CC) indicated no multicollinearity issues among the continuous variables and no significant multicollinearity between categorical explanatory variables. The goodness-of-fit statistic is essential for assessing how well a model fits data. For categorical outcomes, an ideal model should have a theoretical maximum value less than one. Nagelkerke R^2, a modification of the Cox and Snell R^2, ranges from 0 to 1(Vodouhê et al., 2010). In this analysis, the binary logistic regression model yielded a Nagelkerke R^2 value of 0.378, suggesting that approximately 37.8% of the variance in the dependent variable was explained by the independent variables (Table 7).

Table 7. Model Summary of Binary Logistic Regression Analysis

Chi-square	Df	Sig	-2 Log likelihood	Cox & Snell R-Square	Nagelkerke R-Square
62.141	11	0.000	161.523	0.232	0.378

Source: Model output, 2022

This analysis employed a validated model suitable for this study. Eleven explanatory variables, including family size, marital status, and farmland size, were descriptively analysed but did not exhibit a significant influence on conservation practices. In contrast, eight variables gender, age, education level, farming experience, access to extension services, and proximity to farmland, credit access, and type of occupation–demonstrated significant effects on woody species conservation practices. Binary logistic regression analysis (Table 8) confirmed these variables as significant determinants of conservation behaviour.

Table 8. Results of Binomial Regression Model

Variables	B	S.E.	Df	Sig.	Exp(β)
Gender	1.621	0.444	1	0.000***	5.059
Age	-0.947	0.444	1	0.033**	0.388
Marital status	0.387	0.339	1	0.254^{NS}	1.473
Family size	0.384	0.411	1	0.351^{NS}	1.468
Farmland size	-0.055	0.335	1	0.870^{NS}	0.946
Farming experience	-1.317	0.531	1	0.013**	0.268
Extension service	-0.908	0.459	1	0.048**	0.403
Credit access	-0.967	0.448	1	0.031**	0.380
Type of occupation	2.790	1.130	1	0.014**	16.278
Distance of land	0.620	0.273	1	0.023**	1.859
Education status	-0.644	0.284	1	0.023**	0.525
Constant	-1.583	2.159	1	0.463	0.205

Number of observation = 235

Note: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% probability levels, respectively, Whereas, NS also refers to not significant at p-value ≥ 0.1; B= Estimated Coefficient; S.E. = Standard Error; df = Degrees of Freedom; Sig = Significance level; Exp(β)= Odds Ratio.

Source: Model output, 2022

Gender: The analysis shows that gender positively and significantly influences the probability of conservation efforts at the 1% level of significance. The value of odds ratio 5.06 indicates that other factors are kept constant; males are approximately 5.06 times more likely to engage in conservation practices than females.

Age: These results suggest that age is a crucial factor in determining the likelihood of engaging in conservation. The odds ratio for age (0.388) indicates that under constant assumption, keeping the influences of other factors constant, the weighted log odds ratio in favour of conservation practice decreases by 0.388 units as age increases by one year.

Farming Experience: A negative correlation exists between farming experience and conservation practices. The value of the odds ratio 0.268 indicates that other variables are kept constant, and the farmer's engagement in conservation practice decreases by approximately 73.2% as farming experience increases by one unit.

Extension Service: The data indicated a negative correlation between access to extension services and woody species conservation practices (Table 8). This suggests that increased access to extension services decreases the likelihood of engaging in woody species conservation by 59.7%.

Access to Credit: A significant negative correlation exists between access to credit and conservation practices. This indicates that increased credit access reduces the likelihood of engaging in woody species conservation by approximately 62%.

Type of Occupation: The type of occupation was significantly positively correlated with woody species conservation practices. A strong coefficient of 2.790 indicates that individuals in agriculture- and conservation-related jobs are 16.278 times more likely to engage in woody species conservation than other types (Table 8).

Farmland Distance: The analysis revealed a positive correlation between farmland distance and conservation practices, as shown in Table 8. This suggests that a greater distance from a household's farmland increases the likelihood of engaging in conservation practices by 1.859 times compared to a shorter distance.

Education Status: Education is negatively correlated with woody species conservation practices. The odds ratio of 0.525 indicates that, keeping the influences of other factors constant, the weighted log odds ratio in favour of conservation practice decreases by 0.525 units as the education level increases by one grade.

4. Discussion

4.1.Socioeconomic Influences on Conservation Practices

The study, as shown in Table 3, revealed significant gender differences in conservation practices, with males being more likely to engage in woody species conservation efforts. This finding aligns with previous research, indicating that men are more likely to adopt indigenous knowledge and practices related to land and resource management (Hassen et al., 2023; Tadesse & Teketay, 2017). Older individuals demonstrated more favorable conservation behaviors, potentially due to accumulated knowledge and experience. However, no significant relationship was found between marital status, family size, and conservation behaviors, suggesting that other factors, such as economic and educational variables, may play a more prominent role.

Educational attainment (Table 3) was inversely related to conservation practices, suggesting that individuals with lower educational levels or who are illiterate are more likely to engage in conservation. This may be because of limited access to modern agricultural techniques or alternative livelihood opportunities (Abdeta et al., 2023). Larger landholdings and greater farming experience were also associated with higher levels of conservation practices, supporting the notion that experienced farmers with larger landholdings are more likely to recognize the long-term benefits of conservation (Lemage & Legesse, 2018).

Access to extension services and credit (Table 3) had significant positive impacts on conservation practices, consistent with previous studies that highlighted the importance of knowledge sharing and financial support in sustainable resource management (Walters, 2012; Woldeamanual et al., 2018). These findings suggest that agricultural extension programs play a critical role in enhancing farmers' awareness and technical skills in conservation. Access

to credit enables farmers to invest in sustainable practices that may otherwise be financially unfeasible.

4.2.Motivations for Woody Species Conservation

The findings of this study highlight the broad range of benefits provided by woody species, including medicinal uses, fuelwood, and construction materials, all of which serve as key motivations for their conservation. These benefits underscore the pivotal role of woody species in promoting both ecological sustainability and supporting local livelihoods, as discussed by (Haglund et al., 2011; Tadesse et al., 2018). The utility of these species for energy production, timber, and traditional medicine emphasizes their importance in enhancing community resilience and conserving biodiversity. Furthermore, many woody species are nutrient-rich and serve as spices, thereby improving the nutritional value and flavor of local cuisines, as noted by (Wafula et al., 2016).

At the local level, woody species are indispensable for both traditional and modern medicine, providing essential resources such as wood, timber, shade, and medicinal compounds (Figure 2). Notable species include *Azadirachta indica* (neem), recognized for its antibacterial properties; *Commiphora molmol* (myrrh), valued for its anti-inflammatory effects; *Terminalia brownii*, used to treat respiratory and digestive ailments; and *Hagenia abyssinica* (kosso), known for its antiparasitic qualities. Protecting these species is critical for preserving biodiversity, cultural heritage, and healthcare access, while simultaneously supporting local economies (Ur-Rahman et al., 2019).

Additionally, species such as *Eucalyptus globulus* (nechbeharzafe), *Cordia africana* (wanza), and *Juniperus procera* (yehabesha tsid) are crucial for construction and furniture production, significantly contributing to the local economy (Tadesse et al., 2018). *Acacia abyssinica* (Girar) and *Eucalyptus globulus* are also key sources of fuelwood, essential in both rural and urban areas (Haglund et al., 2011). Furthermore, Sanou et al. (2019) emphasize the aesthetic value of woody species, noting their contribution to enhancing green spaces and promoting mental well-being. Overall, these species are of substantial ecological, economic, and psychological significance in the district.

4.3.Perceptions and Challenges

As shown in Table 4, negative perceptions of current conservation practices, along with challenges related to agricultural expansion and population growth, underscore the need for more effective conservation policies and community awareness programmes. The belief that punishment for illegal logging is essential highlights the perceived urgency to protect these vital species from unsustainable exploitation (Cao & Wyatt, 2020). Addressing challenges, such as poverty, fire hazards, and limited awareness, could significantly improve conservation outcomes (Table 6).

Conservers were found to engage more actively in conservation activities, whereas non-conservers often relied on alternative income sources including petty trade, handicrafts, and government salaries (Table

5). This finding suggests a potential link between economic stability and participation in conservation efforts. In support of this,, Danquah et al. (2023), emphasized the importance of community enforcement of conservation laws, categorizing unauthorized tree cutting as a criminal act. This community-driven approach integrates legal frameworks with local practices to ensure long-term sustainability of woody species.

4.4.Factors Influencing Conservation Practices

As shown in Table 8, the results of this study identify several significant factors influencing farmers' engagement in woody species conservation practices in the Enemay District. One key finding was the notable influence of gender on conservation efforts. Males were more likely to participate in conservation practices, which aligns with the findings of Savari and Khaleghi (2024), who noted that male-headed households often have better access to extension services and are more likely to utilize indigenous knowledge, both of which promote conservation efforts.

Age also emerged as a critical factor in conservation participation, with older farmers less likely to engage in conservation practices (Table 8). This finding contrasts with that of Dejen (2018), who suggested that conservation knowledge typically increases with age. This discrepancy may stem from the fact that older farmers often follow more traditional practices and prioritize short-term livelihood concerns over long-term environmental sustainability. Consequently, older farmers may be less inclined to adopt new or unfamiliar conservation techniques.

Education was inversely correlated with participation in conservation practices, contradicting the findings of Walters (2012), who argued that educated communities are generally more aware of the importance of conservation. In this study, highly educated farmers may prioritize other economic activities over conservation, potentially because of access to alternative livelihood opportunities or the perception that conservation efforts are less financially viable (Table 8).

Additionally, the study found a negative correlation between access to extension services and participation in conservation practices (Table 8). This suggests that extension services in the region may not be sufficiently focused on conservation, which aligns with Valencia et al. (2015), who highlighted the need for more targeted training in woody species conservation. Extension services that fail to directly address conservation may not effectively influence farmers' conservation behaviors.

Occupation type also significantly influenced conservation practices. Farmers engaged in agriculture- or conservation-related occupations are much more likely to adopt conservation practices. This finding supports that of Arslan et al. (2014), who reported that individuals involved in land management or conservation work are more likely to adopt conservation practices because of their direct connection to environmental stewardship.

Furthermore, the study found a positive correlation between farmland distance and participation in conservation practices, suggesting that farmers with land farther from their homes were more likely to engage in conservation (Table 8). This finding contradicts that of Asmamaw et al. (2020), who argued that proximity to woody species enhances conservation efforts. One possible explanation for this discrepancy is that farmers with land farther from their homes may face fewer immediate pressures from daily farming activities, allowing them to focus more on long-term conservation.

Farming experience is negatively correlated with conservation practices, which contrasts with the work of Savari and Khaleghi (2024), who found that more experienced farmers tend to have better conservation knowledge. However, in this study, experienced farmers may be more inclined to use traditional farming methods that do not prioritize conservation, possibly because they view these practices as more reliable or cost-effective (Table 8).

Finally, this study found that access to credit was negatively correlated with conservation practices (Table 8), which contradicts the findings of Martin et al. (2013), who emphasized that access to credit, when combined with extension services, enhances farmers' awareness of sustainable management practices. The negative relationship observed here could indicate that farmers with access to credit may prioritize immediate financial needs, such as purchasing inputs or expanding their land, rather than investing in long-term conservation measures.

5. Conclusions

The survey findings revealed a predominantly negative attitude toward the conservation of woody species, with a substantial proportion of respondents expressing supportive views and only a small segment showing unfavorable views. A significant number of participants perceived a decline in conservation efforts, while a considerable majority advocated for the imposition of penalties for illegal cutting to improve conservation practices. These results highlight the importance of understanding the local motivations for preserving woody species, as households recognize their ecological and economic significance. However, widespread skepticism toward current conservation initiatives underscores the urgent need for more effective strategies and increased community engagement. The primary challenges for conservation include agricultural expansion and increased population density. Farmers cultivate woody species for various purposes such as food production, medicinal use, firewood, construction, and aesthetic appeal. The most commonly reported conservation practices include plantation establishment, home garden conservation, the enforcement of community regulations, and agroforestry. This study confirmed that gender, occupation type, and land proximity positively and significantly influenced farmers' engagement in conservation practices. By contrast, age, farming experience, access to extension services, credit, and education were found to have a significant negative effect on participation.

6. Recommendations

In light of the study's findings, several recommendations are proposed to enhance woody species conservation efforts. First, addressing the socio-economic factors identified in the study through targeted training and support initiatives can significantly improve conservation outcomes. Engaging local communities in these efforts is crucial for fostering sustainable practices and ensuring the long-term viability of woody species. Therefore, governmental and non-governmental organizations (GOs and NGOs) should take proactive steps to identify valuable woody species, map their distributions, and develop comprehensive laws and regulations aimed at their sustainable protection, propagation, and management within the district. Additionally, GOs and NGOs must actively involve local communities in conservation initiatives by offering capacity-building programs and training that improve community participation and effectiveness. Furthermore, global and regional research organizations should collaborate to share the latest information on advanced conservation techniques, thereby supporting the development and implementation of relevant conservation policies and practices. Finally, media outlets and seminars should be utilized effectively to disseminate information and raise public awareness about the importance of woody species conservation, encouraging meaningful community.

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