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Research Article

Farmer's Perceptions of Agroforestry Practices, Contributions to Rural Household Farm Income, and Their Determinants in Sodo Zuria District, Southern Ethiopia

Mathewos Tega [1] and Elias Bojago [2]

[1] *Department of Natural Resource Management, College of Agriculture, Wolaita Sodo University, P.O. Box 138, Wolaita Sodo, Ethiopia*
[2] *Department of Environmental Science, College of Natural and Computational Sciences, Wolaita Sodo University, P.O. Box 138, Wolaita Sodo, Ethiopia*

Correspondence should be addressed to Mathewos Tega; tegamathewos@gmail.com

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Agroforestry has been widely used in developing countries as a solution to mitigate the effects of climate variability. However, its significance to the well-being of farmers in rural communities has not been thoroughly investigated. The purpose of this study was to analyze the contribution of agroforestry practices (AFPs) to the farm income of rural families, the perceptions of farmers, and factors that affect AFPs' contribution to household income in the Sodo Zuria district. The optimal sample size of 173 households from the three study sites was selected through a stratified random sampling procedure. Data were collected using structured interviews, focus group discussion, observation, and key informant interviews. According to the findings, most farmers in the research area had a good perception of the benefits of agroforestry methods. The yearly mean gross income from various agroforestry approaches was 15,990.90 ETB·ha^{-1}·yr^{-1} for nonadopters and 32,471.24 ETB·ha^{-1}·yr^{-1} for adopters, respectively. Tree and fruit tree integration with crops, animals, or pastures has the potential to significantly increase food production and farmer economic situations. Multiple linear regression analysis indicated that the size of the farm, the number of livestock, the experience of agroforestry, and the extension service affect the adoption of agroforestry practices to house farm income positively, while the size of the family negatively affects it. Agroforestry plays a critical role in reducing food poverty and enhancing farmer livelihood resilience (reducing farmers' vulnerability to climate variability). However, determining the extent to which this is true is challenging because both farmer groups often have low levels of assets such as land and income, which limits tree planting to reaping maximum benefits from agroforestry. As a result, the government and other responsible entities should pay special attention to assisting smallholder farmers in using agroforestry practices for the sustainability of their livelihoods that have been hampered by agricultural land scarcity.

1. Introduction

1.1. Background of the Study. Agroforestry is a land management system that intentionally blends trees or shrubs with agricultural crops and livestock [1–3]. Agroforestry can help to maintain agricultural productivity [4–7], increase food security [8], alleviate temporary water and energy shortages [9], and facilitate adaptation to climate change [10].

The growth of trees in agricultural landscapes, known as agroforestry, has the potential to achieve sustainable agriculture in smallholder agriculture [11–14]. Over extended periods of time, agroforestry methods have evolved in response to interactions between agroecological conditions, plant diversity, and farmer resources and demand [11, 15–18]. The various multipurpose trees and shrubs planted in agroforestry systems can provide the community with a variety of services and goods critical to rural livelihoods [19–22].

Since time immemorial, most Africans living in rural areas have relied on small-scale agriculture as their primary source of income [23–26]. These smallholder farmers face numerous challenges, including low productivity, reliance on rainfed agriculture, insecurity of the traditional land tenure system, and environmental degradation with all of its attendant repercussions [27–29]. As a result, food insecurity and poverty will be prevalent [30, 31]. In nations with a high population density, such as Ethiopia, the situation can be particularly harsh and brutal [27, 32–36]. The farmer's household is pressured to use the least amount of land possible at all times, which could accelerate soil fertility degradation [37, 38].

Smallholders in Ethiopia engage in a variety of agroforestry practices based on socioeconomic and biophysical variables that affect their livelihood [39–41]. Smallholders frequently retain naturally occurring trees in fields for monetary, material, environmental, and cultural reasons [42–44]. However, due to the increase in the demand for fuel wood and the degradation of the surrounding forests, the practice of agroforestry on farmlands is disappearing in many agricultural settings in Ethiopia.

High population pressure can also have a negative impact on the unsustainable use of other natural resources, increasing the demand-supply imbalance for forest products [45, 46]. According to Badege et al. [24], most of the parts of Africa have a high rate of deforestation and severe land degradation. Low agricultural productivity and the dependence on surviving natural forests to meet demand are possible explanations [47–50]. Because their livelihoods are so closely linked to agriculture, the whole problem eventually affects small farmers in rural areas [51, 52].

The research found a scarcity of studies that specifically address agroforestry in farmlands. This appears to be related to a lack of conceptual clarity and rigor in differentiating farmland agroforestry from other agroforestry methods. Many research studies on agroforestry does so implicitly and does not acknowledge it as a distinct activity [53–56]. As a result, the findings of these studies do not fully illuminate this practice and the elements that influence its socioeconomic and environmental characteristics. Most studies that explicitly distinguish farmland agroforestry from other types of agroforestry focus on factors influencing adoption and socioeconomic benefits [17, 57, 58] and largely fail to address the practice's wider integration of tree-based household livelihoods, trends in adoption of farm income, and drivers of species diversity.

As a result, an integrated approach to crops and trees is required to maximize productivity, maintain ecological balance, and improve the socioeconomic status of rural people. As a result, to gain a better grasp of the facts, an investigation was launched to analyze the contribution of agroforestry practices on household farm income and Farmers' Perception in the Sodo Zuria District.

1.2. *Theoretical Background*

1.2.1. Agroforestry. Agroforestry is a broad term that refers to a collection of land use strategies and agricultural technologies (AgTs) that include the incorporation of woody perennials into agricultural systems. Agroforestry has long been practiced, but as food production intensified and monocropping became the norm, the technique of integrating trees and farming became disconnected. Then, in the late 1970s, as the environmental and social consequences of intensifying food production systems became increasingly apparent during the "green revolution," agroforestry gained traction as an alternative and received substantial attention from the international development community [59]. In comparison to intensive agriculture systems, the benefits of agroforestry take longer (years) to manifest and are frequently more environmentally, economically, and structurally complicated [60]. There are various forms of agroforestry systems, including tree integration with livestock, fisheries, or beekeepers, forest farming, agrosilvipasture (livestock and crop integration), agrisilviculture (crop integration), silvopasture (livestock integration), and urban agroforestry [61]. The configuration and components of the agroforestry system determine agroforestry categorization. This also includes a temporal component that takes into account the various species within the agroforestry system, as well as the additional benefits of trees such as soil conservation, shade, and windbreak.

1.2.2. Definition of Farmer Perceptions. Within the context of agricultural technology adoption, this research defines farmer perceptions as the farmer's subjective preferences, which are fundamental characteristics that may impact decision-making processes [62]. Farmer perceptions are affected by a variety of prior behaviors, experiences, and observations, as well as future aspirations. These are also influenced by a variety of external factors, including as individual and household characteristics, institutions, socioeconomic conditions, and environmental conditions [63]. Farmers' perceptions may shift over time when new information becomes available and earlier perceptions adapt [64]. Farmer impressions may or may not correspond to actual reality [65–68]. As a result, in order to avoid biased results, the study takes into account all farmer impressions, whether they reflect reality or not.

1.2.3. Definition of Adoption. Adoption is most commonly defined as the decision of the adopter; in our case, smallholder farmers implement and use an invention (agroforestry) as the best viable course of action for a given necessity [69]. In this context, an innovation is defined as an idea, practice, or thing that is widely accepted and employed by an individual, group, or community. According to Nair [61], agroforestry is the intentional integration and maintenance of trees on farms, which, according to Somarriba [70], is distinguished by the types and numbers of species interacting within a single agroecological system [71]. For the purposes of this study, a farmer is considered to have adopted agroforestry if they have integrated the use of woody perennials into their farming system [61], have continued to practice agroforestry, and/or have planted at least one new tree or shrub that improves productivity and/or economic capacity in the previous year [71].

1.3. Conceptual Framework. The degradation of forest resources and rising demand for forest products, particularly among rural people who rely on forests for a living, have exacerbated the gap between supply and demand for forest products. Despite increased awareness of the importance of on-farm trees, this practice cannot significantly improve the positions of landless and impoverished households in areas where land holding disparities persist. Rather, these practices provide a higher financial return to land-rich households while providing a lower financial return to land-poor households. Farmers in the study areas are using agroforestry in two ways: conventional and advanced agroforestry practices. As previously indicated, we developed a framework (Figure 1) to demonstrate how diverse agroforestry systems contribute to household income and assist farmers in building resilience. Multiple factors influence these characteristics, ultimately motivating farmers to choose agroforestry as a superior method for their improvement. We designed this study to investigate the drivers of household farm income from AFP at the study sites based on this premise.

2. Methodology

2.1. Description of the Study Area. The current study was carried out in the Sodo Zuria District, one of the administrative districts in the rural region of the Wolaita Zone's Southern Nations Peoples' Region. The district was 390 kilometers (southwest) from Addis Abeba. The Gasuba district was to the south, the Boloso Sore district to the west, the Damot Gale district to the north, and the Damote Woyede district to the east. There are 20 administrative rural Kebeles in the district (Figure 2). The district has a total land cover of 33,649.8 hectares, of which 18,264 ha (54%) are assigned for crop production, 2740.5 ha (8%) for grazing land, 8,594.2 ha (26%) for forest land, and others 4,051.3 ha (12%) [72]. The agroecology of the district is dominated by the Midland, which occupies approximately 90% of the overall area, while the remaining 10% is highland with harsh mountains and hills [73]. The Damota Mountain is the district's highest point (>2800 meters above sea level) and the primary source of water for neighboring towns. The mountain is surrounded by Kebeles. The elevation of the district ranges from 1500 to 2958 meters above sea level. The district receives 1398 mm of rain per year on average, with daily temperatures ranging from 150 to 300 degrees Celsius. Clay and clay loam are the most common soil types in the area.

The total population of the district, according to the WZFEDO office (Wolaita Zone Finance and Economic Development), was 163, 771 individuals, with 80,525 men and 83,246 women [74]. The population density of the district is 490 persons per square kilometer [75]. The majority of the population lives in rural areas, and subsistence agriculture is their main source of income. Each household has five people on average. The population of the study area was 7,405 people (men 6345 and women 1060) [72].

2.2. Selection of Study Area and Sampling Techniques. The research was carried out in three stages using stratified random sampling procedures [76]. A combination of objective and stratified random sampling approaches was used to choose sample Kebeles and household respondents. In the first stage, the Sodo Zuria district was intentionally selected among the Wolaita zone districts because it had the largest coverage of agroforestry activity. Sodo Zuria is divided into 20 Kebele administrations and two agroecological zones. Following a reconnaissance assessment, three Kebele administrations were purposely selected from among the 20 Kebele administrations within each agroecological zone's grouped homogeneous categories. The availability of various agroforestry practices, the representativeness of the agroforestry practices in the district, the availability of financial resources, human resources, and time were considered while determining the number of Kebeles at the study site from different climatic zones. The Dalbo Wogene Kebele was chosen from among highland Kebeles, while the Waja Kero and Bossa Kacha Kebeles were chosen among midaltitude Kebeles. The sample sizes were calculated on the basis of the proportion of household heads in the selected Kebeles.

Finally, in the third stage, Kothari [76] identified a proportionate representative household selection of three selected Kebeles as part of: "If the population from which a sample is to be drawn does not constitute a homogeneous group, a stratified technique is generally applied in order to obtain a representative sample." This sampling process is beneficial when the sample frame is in the form of a list. Household lists were received from each site's Kebele manager. In each Kebele, two groups of farmers were designated adopters and nonadopters with the support of community leaders. As a result, wealth is a key socioeconomic criterion for grouping farmers and having a representative sample in order to understand their various requirements and skills for adopting agroforestry practices. As a result, wealth and adoption were used as strata to evaluate variances in practice adoption. As a consequence of applying KI and local criteria, adopter and nonadopter farmers from each sampled Kebele were further divided into various wealth categories (for being poor, medium, or rich according to their locally accepted criteria for wealth classification such as land size, livestock ownership, and house status). As a result, KI was used to stratify all farmers in each Kebele sampled into three wealth categories. A random sampling procedure was then used to select respondents from each wealth level. As a consequence, 173 HHs were selected at random.

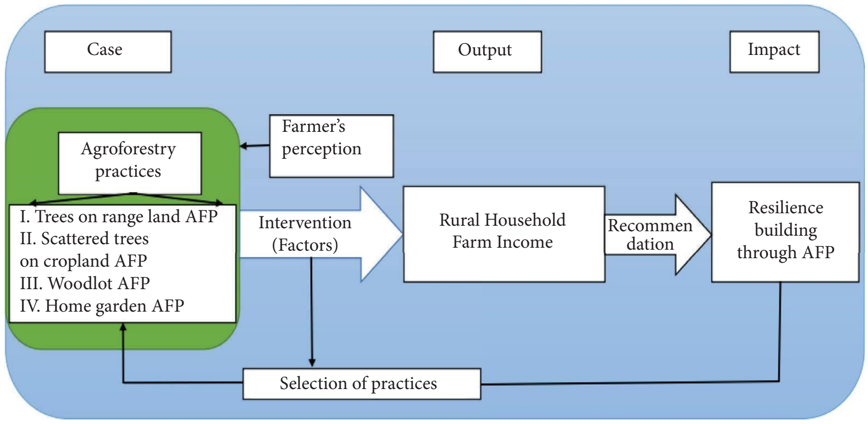

Figure 1: Conceptual framework.

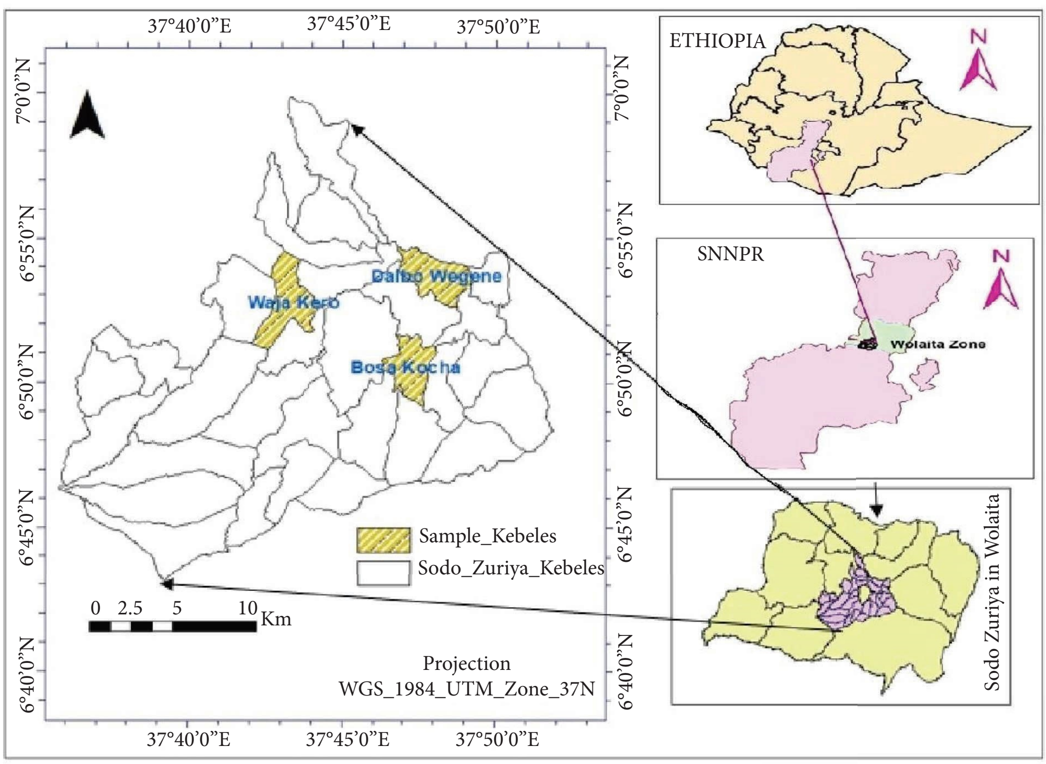

Figure 2: Map of the Sodo Zuria district showing the location of the study areas.

2.2.1. Sample Size Determination. As a consequence of applying KI and local criteria, adopter and nonadopter farmers from each sampled Kebele were further divided into various wealth categories (for being poor, medium and rich according to their locally accepted criteria for wealth classification such as land size, livestock ownership, and house status). As a result, KI was used to stratify all farmers in each Kebele sampled into three wealth categories. A random sampling procedure was then used to select the respondents from each wealth tier. As a consequence, 173 HHs were selected at random.

The formula is as follows:

$$n = \frac{Z^2 * N * p * q}{e^2 (N - 1) + Z^2 * P * q}, \quad (1)$$

where n = sample size, N = total households in selected Kebeles, e^2 = the error of 7% point, z^2 = standard variation at a given confidence level (1.96 to 95%), $p = 0.5$, $q = 0.5$ and P = proportion of successes, q = proportion of failures, and e^2 = acceptable error. Using the above formula, the total sample of the study was 173 households selected proportionally from 1,881 households in the study area.

2.2.2. Determination of Sample Size at Sublevel. For determining the sample size at the Kebele level, the following proportional allocation formula of Kothari [76] was used.

$$n = \frac{Ni * n}{N}, \quad (2)$$

where n_i is the sample size collected from each stratum/sector, Ni is the total population of each stratum/sector, n is the total sample size of the study, and N is the total population size.

The proportional sample households of the study areas (Dalbo Wogene, Waja Kero, and Bossa Kacha) were as follows based on the aforementioned formula.

Table 1 shows the sample size and proportionate sample size for each Kebele of different agroecological zones. Dalbo Wogene, Waja Kero, and Bossa Kacha (64, 56, and 53) households were estimated as proportionate sample household heads among total households.

2.3. Types of Data and Data Collection Tools

2.3.1. Primary Data. The Agriculture and Rural Development Office, the Kebele government, and the model farmer were all interviewed as important informants. Two key informants from the Agriculture Office, one key informant from the Kebele Administration, and two model farmers were intentionally selected. Five key informants from each Kebele were carefully selected to acquire an overview of general information on agroforestry techniques in the study area. The interview schedule was divided into two halves. The first segment sought information about the backgrounds of the respondents, their primary agroforestry practices, and their contributions to household income, while the second piece sought information about the key limitations and motivating factors (AFP advantages) for adopting agroforestry practices. Three field assistants were hired and educated in basic data collection principles before the interviews began. Focus group discussions were held between the chosen groups to increase the efficiency of data collection. The participants were separated into focus groups according to sex and age by the researchers. Because the country's custom forbids women from speaking in front of males and the public, this systematic grouping was chosen because men may have dominated women's thoughts.

Furthermore, the age gap can reveal a considerable difference in older people's attitudes and experiences; so, the researcher wishes to compensate for the gap by categorizing the group based on age. The focus group allowed the researcher to address the opinions of the community on the determinants of the adoption of agroforestry practices and their contribution to rural household income. As a result, participants were divided into four gender-based groups: older women, older men, young men, and young women, including village leaders, model farmers, and agricultural experts. Focus group discussions were held after the initial meetings and the identification of participating farmers. At the Kebele level, focus group interviews were performed, with four people participating in each group discussion. Household survey: to begin the Kebele, the administrator and development agents compiled a list of all household heads in the chosen Kebeles. A random selection approach was utilized to obtain representative samples of individual households from the heads of the listed households in the selected Kebeles. One hundred and seventy-three (173) homes were chosen and interviewed. Based on the information collected during the informal survey, the questionnaires were constructed, amended, and translated into the required language to make it easier for the enumerators. The final version of the English questions was developed after the required revisions were made based on input from the pilot survey. Three diploma-qualified enumerators were recruited, trained, and dispatched to different Kebeles to collect data. While the enumerators interviewed the respondents, the researchers followed up daily, and the completed questionnaires were evaluated daily throughout the data collection operations.

A structured and semistructured questionnaire was used to collect socioeconomic data. For interviews with household heads, closed and open questions were used to determine their farming practices, the number of dependent variables, various sources and quantities of income and food supply, sources of firewood, its availability and price, the type of integrated trees, crops, and livestock products, and the amount of food and income obtained from agroforestry practices (amount in kilograms/year, liters/year, of availability, and prices). Personal observation: for this study, the researcher recorded what he saw in the study region in relation to agroforestry practices (AFP) on the farm. This allows the researcher to describe existing agroforestry practices and compare reported data with actual occurrences in the study area, according to Castle et al. [77]. In selected household farm fields, direct researcher observations were made on the general condition of their farming practices; the identification of various agricultural practices practiced; their contribution to rural farm income in the study area; their components, such as tree crop components and tree crop animal components; and the type of tree and shrub species used in their farms. Secondary data on the contribution and impact of agroforestry methods were collected, as well as district work records.

2.4. Data Analysis. Household surveys, field observations, and interviews were used to collect quantitative data, which then were processed using Microsoft Excel version 10, Stata software version 15, and the Statistical Package for Social Sciences software (SPSS version 20) [78]. Descriptive and econometric data analysis approaches were employed. Descriptive statistics are used to describe the demographic, socioeconomic, and institutional characteristics of the household sampled. In SPSS, descriptive statistics were used to obtain the mean, percentage, standard deviation, and frequency. SPSS was also used to perform inferential statistics, such as the chi-square test and the *t*-test. The chi-square test was used to test and compare the presence of associations in the determinant variables for dummy/categorized variables; the *t*-test was used to verify the presence of significant differences between the proportion of

Table 1: Household sample distribution in sampled Kebeles of each stratum.

Sampled rural Kebele	Agroecological zones	Total HHs per Kebele	Number of sample HHs head ($PSS = \text{Ni}/N * n$)
Dalbo Kebele	Highland	550	64
Waja Kebele	Midland	480	56
Bossa Kebele	Midland	451	53
Total		1,481	173

respondents who adopted agroforestry practices and those who did not adopt for continuous variables. The combined effect of explanatory variables on the dependent variable is typically not predicted using descriptive statistics Kaliyadan and Kulkarni [79]. As a result, this gap must be filled by identifying and applying appropriate econometric models. This study used an econometric model to predict the effects of explanatory variables on dependent variables, specifically the influence of agricultural practices on rural household agricultural income. There are various models available to examine the impact of technology adoption and utilization. A multiple linear regression model was used to examine the influence of agroforestry practice on the income of rural families.

2.4.1. Multiple Linear Regression Model Specification. The goal is to investigate the effects of agroforestry practices on household farm income and the factors that influence household farm income from AFP. A multivariate linear regression model was created to predict whether the dependent and independent variables were significantly connected and to assess the strength of their relationship [80]. The dependent variable, net income from farm production of a household, was regressed against the independent variables (farm size, household size, education, age, credit access, market access, cooperative association, and extension service) to determine the standard regression coefficient, beta weight (ß) of each independent variable, multiple correlation (R), and multiple coefficient of determination (R^2). These independent variables were added because they were believed to account for a greater proportion of the variation in the dependent variable. The general model used in linear regression was as follows:

$$Yi = a + b_1x1 + b_2x2 + \cdots\cdots\cdots + bjxj + ei, \quad (3)$$

where $Yi = i$th observed value of income from household farm production (dependent variable). a = Intercept, b_1 = to be independent variable coefficients. X_1 = farm size, X_2 = household size, X_3 = education level, X_4 = age, X_5 = access to credit, X_6 = access to market, X_7 = cooperative association, X_8 = access to market, X_9 = extension service, X_{10} = experience of agroforestry practice, X_{11} = tenure of the land, X_{12} = load, X_{13} = number of livestock (TLU), and ei = random error.

2.4.2. Perception of Smallholder Farmers towards the Adoption of AFPs. The goal was to determine how farmers felt about adopting agroforestry practices. Respondents were asked to indicate the extent of their agreement on each indicator using a Likert-typefive-point continuum scale 1–5 (1 = strongly disagree, 5 = strongly agree, and with 3 undecided/neutral), and a weighted mean was calculated for each indicator as follows:

$$WM = \frac{[(fSA * 5) + (fAG * 4) + (fUN * 3) + (fDA * 2) + (fSD * 1)]}{n}, \quad (4)$$

where WM = weighted mean; f = frequency; n = total sample size; values 5, 4, 3, 2, and 1 are weights assigned to perceptions of strongly agree, agree, undecided/neutral, disagree, and strongly disagree, respectively. Using perception analysis [81–84], the means for all indicators were then classified as follows: the means 1.00–1.49 = strongly disagree (SD), 1.50–2.49 = disagree (DA), 2.50–3.49 = undecided/neutral (U/N), 3.50–4.49 = agree (AG), and 4.50–5.00 = strongly agree (SA).

2.5. Variables Used in the Empirical Model and Hypothesized Effects

2.5.1. Dependent Variable. The dependent variable is household farm income, which is a continuous variable in the study area.

2.5.2. Independent Variables. It is hypothesized that the farmer's decision on the effects of agroforestry practices on household farm income, as well as the factor that influences farmer income decisions in AFP, is related to the farmer's socioeconomic, demographic, and institutional characteristics (Table 2).

3. Results

This section presents the findings and discussion based on the objectives of the study. For this purpose, the parts are divided into two sections. The first section describes the characteristics of the small farmer household in the study area. The second section presents the results of the multiple regression model on factors that influence AFP household farm income, and the Likert scale was

Table 2: Description of explanatory variables and expected signs of the effect of agroforestry practices on household farm income.

Variables	Full definitions	Unit of measurement	Type of variables	Expected sign
AGEHHs	Age of household	Years	Continuous	+
EDUHHs	Education household	Years	Categorical	+
SEX HH	Sex of household	1 = male, 0 = female	Dummy	−/+
LOBHH	Labor of household	Year	Continuous	−/+
FAMSIZ HH	Family size house hold	Years	Continuous	+
LHA HH	Landholding household	Hectares	Continuous	+/−
LANDTEN	Land tenure security	Feels land secured (1 = yes, 0 = no)	Dummy	+
EXTSERVC	Extension contacts	Extension service (1 = yes, 0 = no)	Dummy	+
ACCCRED	Access to credit	Credit access (1 = yes, 0 = no)	Dummy	+
ACCMARK	Access to market	Access to market (1 = yes,0 = no)	Dummy	+
AFPEXP	Agroforestry practicing experience	Years	Continuous	+
COPASS	Cooperative association	Member of cooperative (1 = yes, 0 = no)	Dummy	+
LIVHOL	Livestock holding	Number	Continuous	+

Source: own description after extensive literature review.

measured on a scale of 1–5 (1 = strongly disagree and 5 = strongly agree, with 3 being undecided or neutral) for the respondents' perceptions about the adoption of agricultural practices.

3.1. Household and Socioeconomic Characteristics of Respondents.

3.1. Household and Socioeconomic Characteristics of Respondents. Data from study sites were analyzed to learn more about the households sampled. The household and socioeconomic characteristics of the respondents for each study area are also briefly described.

The socioeconomic characteristics of the farmers studied in this study included sex, marital status, age, household size, farm size, and level of education. The purpose of selecting these characteristics was to gain a general understanding of who the respondents are and how these characteristics could influence the adoption of agroforestry practices in the study area. Table 3 shows that men made up the majority of farmers (80.34%), while women made up only 19.66%, despite the fact that women are the primary caregivers in most farm households.

The smallest household contained two people, while the largest contained 11 people. The respondents (42.50%) had elementary education, 32.2 percent had secondary education, 14.90% were illiterate, 8.60% had higher secondary education, and 1.10 percent had a vocational/diploma education. Except for the minority (14.9%) who had no formal education, most of the respondents were educated. The majority of the respondents (94.7%) had farms that were less than or equal to one hectare in size. It was discovered that the average farm size is 0.31 ha. The smallest and largest farms measured 0.125 and 1 hectare, respectively. Most households have farms of less than 0.5 hectares.

Agroforestry practices were used by approximately 78% (135) of the respondents at the study sites, while 22 percent (38) did not. Farmers in the study area used a variety of agroforestry practices for various reasons. Among the practices identified in the study area were home gardens, scattered trees on farms, woodlots, boundary planting, and trees on land (Supplementary Materials: Annex 3 and Figure 3). The home garden (40), scattered trees on farm land (28), woodlot (26), border planting (23), and trees on land (18) had the highest frequencies of agroforestry adoption practices in the study area, representing 23.12%, 16.18%, 15.02%, 13.29%, and 10.4%, respectively.

Table 3: Socioeconomic characteristics of respondents in the study area ($n = 173$).

Characteristics	Categories	Frequency	Percentage (%)
Sex	Male	139	80.34
	Female	34	19.66
Age	30–45	158	91.30
	46–64	13	6.90
	>65	3	1.70
Education level	Illiterate	26	14.90
	Elementary	74	42.50
	Secondary	56	32.2
	Higher secondary	15	8.60
	Vocational	2	1.10
Family size	2–4	68	39.30
	5–7	99	57.20
	>8	6	3.40
Land size	0.125–0.5	164	94.70
	0.75–1	9	5.30
Marital status	Single	1	0.60
	Married	142	81.60
	Divorced	12	6.90
	Widowed	18	10.60

Source: own survey, 2021.

3.2. Respondent's Perception about Adoption of Agroforestry Practices. This presents the farmer's perspective on the adoption of agroforestry practices. Ten statements (Table 4) on various adoptions of agroforestry practices were evaluated. A 5-pointLikert-type scale was used to assess respondents' attitudes toward various agroforestry practices. Respondents were expected to select one of the options available for each statement/item. The responses of the sample households were then analyzed using frequency, percentage, and mean because the Likert scale was measured on a scale of 1 to 5 (1 = strongly disagree, 5 = strongly agree, and 3 undecided/neutral).

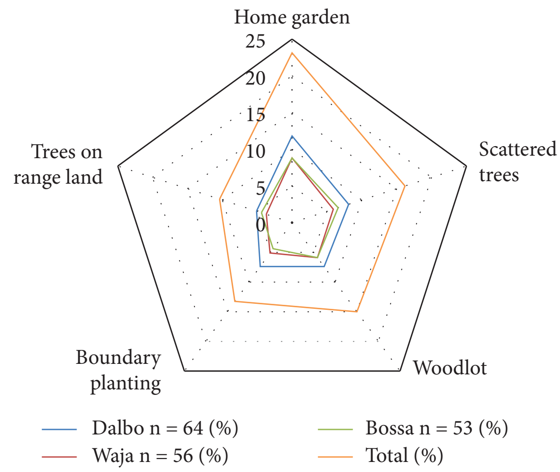

Figure 3: Spider graph of agroforestry practices adopted (source: own survey, 2021).

Table 4: Perception of the respondent on the adoption of agroforestry practices.

Statements	Respondents' distribution based on their response						
	SA (5)	AG (4)	*N* (3)	DA (2)	SDA (1)	Mean	STD
AFPs have economic advantage	8 (4.6)	125 (72.3)	22 (12.7)	18 (10.4)	0 (0)	3.71	0.713
AFPs save time on collecting feed and fuel wood from the forest	0 (0)	133 (76.9)	20 (11.6)	20 (11.6)	0 (0)	3.65	0.678
AFPs reduced chances of complete crop failure	0 (0)	133 (76.9)	19 (11)	21 (12)	0 (0)	3.64	0.688
AFPs conserved soil and water	0 (0)	134 (77.5)	13 (7.5)	26 (15)	0 (0)	3.62	0.733
AFPs improve crop yield	4 (2.3)	129 (74.6)	11 (6.4)	29 (16.8)	0 (0)	3.62	0.787
AFPs long time to get income	0 (0)	133 (76.9)	14 (8.1)	26 (15)	0 (0)	3.61	0.734
AFPs increase soil fertility	0 (0)	133 (79.6)	13 (7.5)	27 (15.6)	0 (0)	3.61	0.743
AFPs increase farm income	0 (0)	133 (76.9)	12 (6.9)	28 (16.2)	0 (0)	3.60	0.752
AFPs can improve soil cover and fix nitrogen	0 (0)	134 (77.5)	12 (6.9)	24 (13.9)	3 (1.7)	3.60	0.790
AFPs improve surrounding environment condition	0 (0)	133 (79.6)	1 (0.6)	39 (22.5)	0 (0)	3.54	0.838

The number with ( ) percentages and the numbers without ( ) frequency SDA (strongly disagree), DA (disagree), *N* (neutral), AG (agree), and SA (strongly agree). Source: own survey, 2021.

Table 4 shows how each respondent in the study area perceived agroforestry practices, with a brief discussion of each statement below.

3.2.1. Perception of the Respondents about the Practice of Agroforestry in Strongly Agreed and Agreed Categories. The majority of the respondents agreed on the study area based on the given statement, some disagreed and strongly disagreed, and the rest agreed and were neutral with their clear mean perception.

3.2.2. Perception of the Respondent about the Agroforestry Practice in the Neutral/Undecided Category. Some respondents answered in the neutral or undecided category because they were unsure or did not perceive whether the adoption of agroforestry practices improved their economy in relation to all statements mentioned above.

3.2.3. The Perception of the Respondents about the Practice of Agroforestry in the Categories of Disagreeing and Strongly Disagreeing. However, a small number of respondents disagreed or strongly disagreed with agroforestry practices, believing that growing trees in farm fields reduces crop yields and farm size. Due to the trees, the canopy covers a large portion of the farm field; therefore, crop yields are lower under the tree canopy because there is no light entry through the canopy, especially for cereal crops. In this statement, agroforestry practices save time when collecting feed and fuel wood from the forest. Perception of the total sample of respondents were agreed (76.9%), disagreed (11.6%), and were undecided 11.6%. Furthermore, agroforestry practices reduced the likelihood of total crop failure; with this statement, 11% of the respondent's agreed and 79% were undecided. According to this result, the majority of the respondents agreed and stated that some time may occur after complete crop failure due to various internal and external factors. As a result, if there is a woody component, farmers can substitute crop failure, as indicated by a total mean value of 3.64. The results improved with a mean of 3.62 of the total sampled respondents who strongly agreed (2.3%), agreed (74.6%), were indifferent (6.4%), and disagreed (16.8%) with the statement of agroforestry practice. Most of the respondents agreed and stated that planting leguminous tree species in agriculture increased crop productivity and soil fertility. Many of the respondents agreed with the statement that the integration of trees does not increase the agricultural output in the farm area, while a tiny percentage of respondents who were certain or uncertain as provided the answer that, trees may or may not improve crop yield.

Few respondents (15%) disagreed with this claim since fruit trees produce quickly and those who were uncertain (8.1%) claimed that agroforestry practices can or cannot generate income for a long period of time. Even the simplest agroforestry practice is more complex, and especially the woody section that is rich enough to produce fruit or lumber, it requires a long amount of time with a total mean of 3.61. Others, however, agreed that the agroforestry practice cycle is always longer than one year (Table 4).

3.3. Effects of Agroforestry Practices on Household Farm Income. This study aimed to see how agroforestry practices affected the income of rural households in the study area. The calculated mean annual income reflects the total value of the effect of agroforestry on households in the study area, as well as its contribution to household income. When compared to farmers who practiced agroforestry, the mean income of those who did not practice agroforestry was significantly different ($P < 0.05$).

The mean income generated from the agroforestry products of the woodlots for adopters and nonadopters was 5208.35 ET birr and 3571.15 ET birr, respectively, according to Table 5. The statistical results indicated a significant mean difference between adopters and nonadopters of the woodlot agroforestry practice (t-test = 2.45 and $p < 0.05$).

In the study area, the mean gross farm income of adopters from various agroforestry practices was 32471.24 ETB per year, while nonadopters earned 15990.87 ETB per year.

3.4. Determinants of Household Farm Income from AFP. The multiple linear regression method was used to determine the relationship between agricultural practice income and explanatory variables. According to the regression results, five explanatory variables (family size, farm size, experience in practice, extension service, and number of animals) were statistically significant. Land size and livestock availability were less than 1% significant, while agroforestry practice experience, family size, and extension service were less than 5% significant. This means that the five predictors had a greater impact on the net income of households in the study area than others. The change in the size of these predictors caused an increase or decrease in the household's annual gross income at the magnitudes indicated by their respective coefficients, indicating how much these factors are responsible for the change in income (Table 6).

4. Discussion

4.1. Household and Socioeconomic Characteristics of Respondents. The emphasis of the study on household heads as primary domestic decision makers may explain this pattern [85, 86]. Except for a few households with a female head of household, the majority of households were headed by men. According to the findings, 81.6% of the respondents were married, 0.6% was single, 10.6% were widowed, and 6.9% were divorced. The farmers' ages ranged from 30 to 45 years, according to the study (91.30%).

The average age was 38 years. The age range was 46 to 64 years (6.90%) and older than 65 years (6.90%). With a mean household size of 5.01 people (1.7%), this implies that most of the farmers were of economically productive age [87, 88].

4.2. Respondent's Perception about Adoption of Agroforestry Practices. People in rural areas, according to the results of the survey, have a high demand for agroforestry practices. However, there were some factors that influenced the adoption of agroforestry [17, 77, 89–93]. The farm households in the sample had the following demographic, socioeconomic, and institutional characteristics.

Most of the respondents agreed with the adoption of agroforestry practices and utilization of that agroforestry practices are critical for the farm community to improve their economic, social, and environmental benefits. This finding is consistent with the findings of [94, 95], who discovered that agroforestry practices contribute to an increase in income of agroforestry adopters when compared to nonagroforestry. A small number of respondents strongly agreed that agroforestry practices provided significant economic benefits by producing multiple products from small parcels of land and improving yields [96]. According to a focus group member and KI, the use of different leguminous trees in the farm field increases soil fertility by fixing nitrogen and improves yields without the use of chemical fertilizers, which is also consistent with Kassie [97].

Some respondents believed that canopy shade would prevent maize, beans, and other crop species from growing well and those trees take a long time to produce, indicating their dissatisfaction. Small farmers focused on shifting their farming strategy to market-oriented monoculture to meet their basic food security and income from the home. This shows that the respondents lack sufficient knowledge of various agroforestry management practices. This finding was consistent with that reported by [98, 99], who found an increased likelihood of crop failure and pathogenic attack. In the study area, respondents (10.4%) disagreed, (12.7%) were undecided, (73.25%) agreed, and (4.6%) strongly agreed with the statement that agroforestry practices may have economic benefits for rural farmers. This means that with a total mean of 3.71, the majority of respondents agreed that trees, agronomic crops, and animals provide food, wood, fuel wood, feed, and income for human benefits/uses that improve economic advantages for rural farmers (Table 4). The findings are consistent with agroforestry practices, which provide numerous benefits such as diversification of agricultural revenues through the production of wood and nontimber forest products [11, 100]. These fruit trees are necessary for the diet and, in some cases, for the economy [101, 102].

According to the mean results and percentages in the study area, most of the respondents (76.2%) agreed with the statement that agroforestry practices save time collecting

Table 5: Adopters and nonadopters mean annual household farm income (ETB) from agroforestry practices.

Types of agroforestry practices	Adopters		Nonadopters		Statistical value	
	Mean	Std.	Mean	Std.	t	P value
Tress on range land agroforestry practices	17048.34	14387.75	10918.42	6319.847	2.554	0.012**
Scattered trees on cropland agroforestry practices	2977.57	1710.001	2017.36	981.795	3.225	0.002**
Woodlot agroforestry practices	5208.35	3205.185	3571.15	2334.188	2.451	0.016**
Home garden agroforestry practices	3520.02	3437.340	2973.967	5356.935	0.701	0.484

**Significant at the probability level of 1%. Source: own survey, 2021.

Table 6: Multiple regression results of the factor that influences the household's farm income from AFP ($N = 173$).

Variables	Coef.	Std. error	T	$P > t$	95% confidence interval	
Nlvs	7264.128***	1526.274	4.71	0.000	4181.769	10218.44
Sex	−6904.221	4636.925	−1.49	0.138	−16062.13	2253.687
Age	−184.7911	406.3304	−0.45	0.650	−987.2922	617.71
Hh size	−4904.566**	1812.1	−2.71	0.008	−8483.456	−1325.675
Land size	57406.97***	10469	5.48	0.000	36730.74	78083.2
Education	−1383.846	2100.419	−0.66	0.511	−5532.166	2764.474
Accredit	−7454.015	3732.728	−2.00	0.068	−14826.14	−81.89176
Ext service	8184.581**	3796.832	2.16	0.033	685.8523	15683.31
Ltenure	18057.6	12406.64	1.46	0.148	−6445.464	42560.67
Accomack	6002.7	3928.626	1.53	0.129	−1756.321	13761.72
Coopasso	−7755.468	4166.386	−1.86	0.075	−15984.06	473.1278
Labor	3457.84	2044.066	1.69	0.093	−579.1834	7494.863
Fm exp	1118.615**	480.9569	2.33	0.021	168.7271	2068.503
_cons	−10458.65	18317.36	−0.57	0.569	−46635.36	25718.06

Dependent variable = household's farm income, $n = 173$, $R^2 = 0.755$, adj-$R^2 = 0.7446$, and *** represents less than 1% significance level and ** represents less than 5% significance level, $P = 0.001$, root MSE = 23239, and F (13,159): 8.27 (source: model output from own survey, 2021).

feed, wood, and animal dung from the forest and surrounding environment [103]. This means that with a total mean score of 3.65, most of the respondents agreed to the reality that if agroforestry practices in our farmland save time, labor, and expense to go to forest to collect trees from a long distance for fuel wood, construction, and feed that minimize forest degradation. Trees contribute to livelihood strategies through a variety of mechanisms, including crop diversification (farmers can offset crop failures), forage feed for livestock [104, 105], which allows the producer to include trees in his agricultural system, resulting in additional income diversification and food for times when crop harvest is low or failure.

Regarding whether agroforestry practice could conserve soil and water, few respondents were undecided (7.5%) and agreed (15%) about it, while others agreed(77.5%) with the total mean of 3.62 which implies that a large number of respondents agreed and reported the fact that different agroforestry practices in the field of agriculture, especially those that live on high-land part of the study area, ensure that they conserve both water and soil by planting seed trees in physical soil and water conservation structure that anchors soil by its deep and branched root system. This finding was corroborated by [104, 106–108], who reported that trees generally prevent soil erosion, which is a very serious problem these days in many parts of the country, as their perennial root networks stabilize the soil and are able to recover nutrients by pumping from deeper soil layers.

The most studied agroforestry species in Ethiopia, "*Faidherbia albida*," increases sorghum yields in Ethiopia by 56% compared to yields outside the tree canopy [109]. It also increases maize productivity [110, 111] and barley productivity [109, 112]. Agroforestry techniques take a long time to develop. Agroforestry practices improve soil fertility according to the majority of respondents (79.5%), who also concurred that farmers' costs for fertilizer are decreased or eliminated when using agroforestry practices instead of artificial fertilizers. The other respondents gave unbiased responses and refuted this assertion.

According to [24, 113, 114], if we consider improved fallow, farmers use it to boost soil fertility as an alternative to inorganic fertilizers by smallholder farmers. This perspective result is supported by these studies, in which 76.5% of the respondents agreed that agroforestry practices increase farm income, 16.2% of the respondents disagreed that agroforestry practices can increase farm income, 6.9% of the respondents were unsure of the answer, and 16.2% of the respondents said that the size of the land does not afford to do this tree component because our land size is too small. This means that, with a total mean of 3.60, the majority of respondents agreed that integrating tree, crop, and livestock farmers increases their daily farm income in a sustainable way.

Agroforestry is a collective name for land use systems and practices in which woody perennials are deliberately integrated with agricultural crops and/or livestock for a variety of benefits and services [11, 115], and with a mean perception of 3.60, agroforestry practice can improve soil cover and fix nitrogen. Most respondents agreed that agroforestry practices can improve soil cover and fix nitrogen through mulching and tree pruning after harvesting the crop to retain moisture in the soil and improve soil structures (77.5%) while the remaining respondents disagreed with the statement (13.9%), strongly disagreed with it (1.7%), and were undecided (6.9%). According to [116–118], trees increase the input of nutrients by adding nutrients to the soil through nitrogen fixation, nutrient pump from deeper soil horizons, and the fall of litter and dead roots as organic matter.

Most of the respondents in the study area, 79.6% agreed, 0.6% were neutral, and 22.5% disagreed with the statement that agroforestry practices improve the local environment. With a mean score of 3.54, respondents generally agreed that “trees provide shade and protection against windbreaks” throughout the study area. This suggests that, except for a few, all respondents agreed that using agroforestry techniques to sequester CO_2 from the atmosphere can help mitigate climate change. According to ICRAF [119], carbon emissions from deforestation and degradation of woody vegetation exceed those from the entire global transportation sector, which make up 20% of emissions.

Due to differences in social status, cultural background, and economic traits, it was discovered that the perceptions of the respondents in each statement about the adoption of agroforestry practices for farm income varied. A large portion of the farmers in the study area have favorable opinions about the use of agroforestry techniques. Local farmers have a positive opinion toward agroforestry practices. All farmers in the research region relied on agroforestry systems for food from their home gardens and animal rearing with crops, as well as fuel wood from agricultural land, which is a basic need of house holding farmers. Farmers also earn money by selling agroforestry goods such as chat and timber from eucalyptus species. All farmers in the study region eat enset and use it as fodder for their animals, especially during the drought season.

Most of the households polled felt that agroforestry practices play a significant role in managing space utilization, increasing yields, and satisfying household demands for wood, firewood, and other forest products. They also felt that agroforestry practices do not interfere with their traditional agricultural system. They thought agroforestry was more profitable and less risky than other agricultural options. Some of them were not practice respondents, and smallholder farmers are in the process of changing their farming strategy to market-oriented monoculture to meet their needs for household food security and income. A common misconception is that planting trees in fields will negatively affect the growth of agricultural crops. Overall, respondents thought agroforestry farms were slightly more essential than traditional farms in terms of delivering environmental benefits. Agroforestry is distinguished from other land uses by the intentional inclusion of woody perennials on farms, which typically results in considerable economic and/or ecological interactions between woody and nonwoody system components.

4.3. Effects of Agroforestry Practices on Household Farm Income. Farmers who practiced agroforestry had a higher mean income on average at the three study sites (Supplementary Materials: Annex 4*). This implies that farmers who practice agroforestry perform better than those who do not. They have higher incomes, which could help them solve many of their daily socioeconomic problems, and thus contribute more to the reduction of household income and poverty than those who do not practice agroforestry [11, 20, 120, 121]. The average annual income earned from agroforestry practices by adopters and nonadopters was calculated using the t test, as shown in Table 5. Adopters of household heads earned more money than nonadopters. In general, these were multipurpose trees and shrubs that were intentionally designed to produce wood, poles, fuel wood, feed, and food/fruits while also providing shade, restoring soil fertility, reducing soil erosion, and improving microclimate [122].*

In the lowering of extreme temperatures, farmers obtain firewood, building materials, and livestock feed by pruning trees in woodlots and shrubs. For some farmers, the spacing between trees in the woodlot was too wide to effectively support the intended goal of soil erosion control. Most of the trees in the woodlots were planted to save food, feed, wood, firewood, poles, and other building materials, as well as to reduce soil erosion. According to [123, 124], some of the trees and shrubs introduced for the improvement of soil fertility, including *Leucaena leucocephala*, *Leucaena diversifolia*, *Calliandra callothyrsus*, Stylosanthus spp., and *Desmodium* spp., performed poorly due to edaphic and climatic factors. Because the land is entirely dedicated to trees and there is little competition from crops, the fastest growing trees, such as Eucalyptus, can be used in woodlots. A high level of wood production can be achieved for domestic or monetary gain [125].

The average income from the scattered trees on the farmlands of adopters was 2977.57 ETB with a standard deviation of 1710.001, while nonadopter households earned 2017.36 ETB with a standard deviation of 981.795. This implies that farmers who planted trees on their croplands earned more money than those who did not. The survey results revealed that there were significant mean differences in this agroforestry practice between adopter and nonadopter households (Table 5). The findings indicated that most farmers with trees on cropland had managed to mitigate soil erosion to some extent, first by reducing the old free livestock grazing system, which exacerbated the problem, and second, by planting more trees. With such accomplishments, the practice’s productivity is likely to improve, depending on the management system. Respondents described higher crop yields as a result of integrating forestry and crop production in the same land management unit. Integrating tree species in farmlands provides productive, protective, socioeconomic, and religious functions that can improve societal livelihoods, particularly for small farmers in developing or underdeveloped countries who suffer from hunger, poverty, and malnutrition [51, 126, 127]. The average income generated by trees in rangeland agroforestry practices for adopters was 17048.34 ETB, while nonadopters earned 10918.42 ETB (Table 5).

Farmers who planted trees on their rangeland earned significantly more than those who did not ($P < 0.05$). One of the economic activities of adopters in the study area is the rearing of livestock. The scattered trees on the rangeland benefit the study area in a variety of ways, including providing shade for livestock and herders, as well as food and wood. Trees are typically scattered at random, and there is no need to be particular about any regular spatial arrangement. Key informants discuss how *Cordia africana* and *Sesbania sesban* interact with animal production by providing shade and feed, as well as acting as a supplementary feed during dry months. Farmers in the study area supplemented animal feed with Leucaena leaves during normal grazing hours. Because Leucaena leaves help to improve milk production and animal health, farm households can increase their income. According to studies [68, 128, 129], improved dairy cattle produced more milk after receiving adequate feed.

The average income from home garden agroforestry practices for adopters was 3520.02 ETB, while nonadopter households earned 2973.96 ETB. Fruit trees were mixed with feed crops, vegetables, beans, and even maize in small gardens near the homestead. In their gardens, the majority of adopters grow vegetables as well as a variety of fruit and feedstock species. The farmland on the homesteads on the study site is a mix of different types of vegetables and fruit trees that help farmers make the best use of the limited land (Supplementary Materials: Annexes 1 and 2).

In addition to the focus groups, the dissection revealed that agroforestry practices in the home garden were practiced in the three sublocations of the study area. The statistical findings revealed an insignificant mean difference in agroforestry practices in the home garden between adopters and nonadopters. Home garden agroforestry practices are economically significant in farm households because they provide a continuous supplementary supply of products such as food for household consumption and income sources when main crops fail [103, 120, 131]. As shown in Table 5, adopters in the study area cultivate a variety of crops, fruits, multipurpose trees, and livestock for household consumption and income. Most smallholder farmers and farming households cultivate (produce) crops, trees, and livestock. Finally, there were significant differences in farm income sources between adopter and nonadopter households. This finding was consistent with the finding [98, 132] that the financial benefit of the farm was positively and significantly associated with the adoption of agroforestry.

According to the majority of respondents in the study sites who are adopting agroforestry practices, they may bring a mean difference in their annual income than nonadopters because higher adopters can improve soil fertility rate, reduce erosion problems, increase soil moisture content, and increase productivity smallholder farm income. Adopters of agroforestry practices had a higher mean gross income than nonadopters, according to Table 7. The following tables summarize the general adopters and nonadopters of agroforestry practices, as well as the mean gross annual production and income gained.

Table 7: In general, the mean gross annual income (ETB) of adopters and nonadopters of agroforestry practices.

Adoption category	Mean	Std.	Statistical value	
			t value	P value
Adopters	32471.24	31418.404	3.184**	0.002
Nonadopters	15990.87	9857.565		

**Significant at the 5% probability level. Source: own survey, 2021.

The t-test was used to compare nonadopters' and adopters' overall mean gross annual income from different agroforestry practices on farmland. As a result, nonadopters' mean annual gross income was significantly lower than that of adopters' ($p < 0.05$).

In the study area, the mean gross farm income of adopters from various agroforestry practices was 32471.24 ETB per year, while nonadopters earned 15990.87 ETB per year. This implies that the contribution of agroforestry practices to the farmer's income of the adopter is high compared to the income of nonadopter households; thus, the income of the adopter obtained from diversified agroforestry practices increases the farmers' financial power (Table 7). This finding supports the report [17, 133] on the adoption of agroforestry practices, which can lead to improved crop and livestock production by improving soil fertility for crops and providing supplementary feed for animals, among other benefits.

As a result of soil, adopters produce more maize than nonadopters. And the environmental management advantages of agroforestry practices, as reported by agroforestry practices, that included more than one component (trees/shrubs/annual crops; tree/shrubs/annual crop/livestock components) favored the community's access to food and income throughout the year [134–136]. As a result, as discussed by agroforestry practices, significantly improved the financial and food status of households in the communities [137–139]. Motiur et al. [140] found that agroforestry practices contributed 15.9 and 11.8 percent of household income in southwest and northern Bangladesh, respectively. As a result, according to the number of workers, agroforestry practices continue to be the main source of income and food for rural communities in the study area [22, 97, 100, 141]. However, the insignificance of agroforestry practices in terms of income generation can be attributed to a variety of factors.

4.4. Determinants of Household Farm Income from AFP. Land size and livestock availability were less than 1% significant, while agroforestry practice experience, family size, and extension service were less than 5% significant. This means that the five predictors had a greater impact on the net income of households in the study area than others. The change in the size of these predictors caused an increase or decrease in the household's annual gross income at the magnitudes indicated by their respective coefficients, indicating how much these factors are responsible for the change in income (Table 6).

4.4.1. Number of Livestock. As shown in Table 6, livestock ownership is significant at the 1% level and has a positive relationship with income from agroforestry practice. The coefficient value indicates that if all other factors remain constant, increasing the number of cattle by one unit increases the income earned from agroforestry practice by 7264.128 ETB, with a possible logical explanation that more livestock means greater availability of oxen, which is the dominant source of plough farming. The size of the herd has a significant positive effect on the adoption of agroforestry practices. The number of cattle herds is an indicator of household wealth and resource availability, and capital is more likely to be invested in agroforestry practices. The findings are consistent with those of Khanal [142]. This finding is consistent with the findings of [17, 135, 143] that an increase in the number of animals increases the demand for food and wood for livestock infrastructure (fences, cattle pens, stalls, and feeders), which could be met using multipurpose shrubs and trees.

4.4.2. Family Size. The size of the family was statistically significant at a level of significance of less than 5% and was negatively associated with the income of the agroforestry practice. This negative impact could be attributed to the nature of farm activity and a scarcity of farmland, which requires less family labor. The size of farmland and the number of family sizes if they are not proportionate or balanced over utilization of the resource and all family labor relies on the limited resources that hamper the annual household income. A large number of families settled on small farmland, and there was less diversification of the agroforestry components and overuse of limited agroforestry practices, which reduced the system's income. When all other factors remain constant, the coefficient value indicates that increasing family labor by one unit (one adult equivalent) reduces the income from agroforestry practices by −5079.618 ETB. This contradicts the findings of Manjur et al. [144], who discovered that having a large family has a positive impact on farm income in northern Ethiopia. Few farmers used their family labor for tree planting due to the growth of agricultural crops. This is consistent with the findings of [34, 145, 146], who state that farmers whose primary source of income is agriculture may be discouraged from allocating family labor to tree planting activities. However, [147] found a negative relationship between household size and farmer participation in improving tree fallows and other intensive technologies, such as animal manure use.

4.4.3. Land Size. In the study area, the size of the farm was statistically significant (less than 1%) and positively associated with the income from the practice of agroforestry. The coefficient value indicates that, with all other variables kept constant, increasing the size of the farm by one unit (1 ha) increases the income generated by agroforestry by 57406.97 ETB. This is because when there is a large amount of land, there will be more component diversification, which increases the system's income and is consistent with the discovery of new components [148–151]. According to the findings of [58, 138], increasing the components of agroforestry can increase the system's income, but the diversification of the component is directly affected by the farm's size.

4.4.4. Extension Service. The agricultural extension service in the study area provides a variety of activities, such as training, visits, and field days. These activities have a direct impact on farm households' attitudes and decisions. Extension service is statistically significant at a significance level of less than 5%, which is consistent with the previous expectation that it is positively associated with agroforestry income. Farmers who have access to extension services will increase their household income by 8288.044 ETB, according to the coefficient value. As it stands, extension services are not only important for increasing farmers' knowledge and skills to increase income, but they are also a means of communicating the message that comes from research centers and development agencies, allowing for the implementation of technology. This result is consistent with the study by [152–155].

4.4.5. Farming Experience. The results show that the farming experience has a positive effect on the income of agroforestry practice at a level of significance less than 5%. The farm experience was critical to the adoption of agroforestry practices. Farmers have extensive experience in agriculture and understand the benefits of agroforestry practices in terms of income generation. The coefficient value implies that, if all other factors remain constant, increasing farm experience by one year increases income from agroforestry practice by 1129.48 ETB, a finding similar to that of [11, 12, 156].

5. Conclusions and Recommendation

The following conclusions are drawn from the study findings. Most of the respondents agreed and had a positive perception of adopting agroforestry practices as a means to meet their basic needs in terms of fuel wood, fruits, fodder, timber, vegetables, and so on, as well as accepting that agroforestry practices are critical for the agricultural community to adopt, thus benefiting the economic, social, and environmental well-being of the agricultural community. Few respondents agreed with the practice, assuming that because our farm land is limited, the introduction of trees into the fields would have a negative impact on crop growth and yields. Small farmers are focusing on the process of transforming their farming strategy toward market-oriented monoculture to meet their needs for household food security and income, while other respondents were neutral, stating that tree integration may or may not change 'farmers' living status. Adopters of agroforestry practices earned a higher mean gross annual income than nonadopters, according to the study. The main characteristics of the adopters groforestry practice were used in more than one component (tree/shrubs/annual crops; tree/shrubs/annual crop/livestock component), which ensures access to food and income throughout the year, as it has great potential to improve food production and farmer economic conditions in a sustainable way. Although it is an important component of agriculture, the income of nonadopters from agroforestry products was significantly lower than that of adopters in the study area. The scarcity of land, lack of knowledge, and lack of interest are all to blame. The size of the land, the number of livestock and the size of the family, the extension service, and the experience of farming are the five main variables that affect the income of the household farm earned from agroforestry practices.

The following policy measures and interventions are recommended:

(i) Market and road expansion, land rights security, and market expansion for agroforestry and nonfarm activity outputs could all contribute to increasing the extent and intensity of agroforestry and nonfarm income-generating activities. Access to agricultural technologies and institutions for farm households appears to aid in the sustainable growth of the rural economy.

(ii) This study identified several factors that programs aimed at inspiring or encouraging home agroforestry adoption and tree planting should focus on or seek to address.

(iii) Policy actions or interventions that improve the security of existing land tenure while also supporting increased education of the family head would raise household knowledge of adoption and tree planting.

(iv) Complementary efforts must be made to guarantee that farmers comprehend the information and are able to change their agricultural activity.

(v) As a result, we propose that future study investigates the relationship between farmers' network belonging and their identity and how this influences farmers' inclinations to adopt agroforestry indirectly.

(vi) The influence of influencing factors on income is linear remains to be discussed, and there is interaction among various influencing factors should be taken into account in further research.

Data Availability

The data generated and analyzed during this study are included within the article.

Consent

All authors agreed to make this original research work available to the public.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

All authors contributed to the conception and design of the study and read and approved the final manuscript. Material preparation, data collection, and analysis were performed by Mr. EB and Mr. MT.

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Supplementary Materials

Supplementary data are also included in this manuscript as annexes: Supplementary material (Annex: 1) describes market prices of vegetables and fruits in the study area. Supplementary material (Annex: 2) describes the annual average vegetable and fruit production for adopters and nonadopters of agroforestry practices in the study area. Supplementary material (Annex: 3) describes the adoption status and types of agroforestry practices in three Kebeles. Supplementary material (Annex: 4) describes the distribution of the household's annual mean income for adopters and nonadopters of agroforestry practices. (*Supplementary Materials*)

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