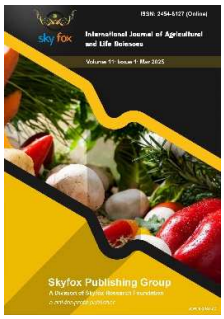

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RESEARCH ARTICLE

Determinants of adoption of home garden agroforestry practice and its role to food security in Southern Ethiopia

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Abstract: Ethiopia's adoption of home garden agroforestry practice is influenced by a number of factors. This study explores the complex network of variables that affect food production, livelihoods, and farmers' decisions to participate in agroforestry in home gardens in the Aleta Chuko Woreda. One common tactic to address food-related challenges is agroforestry. This research aims to evaluate the factors that lead to the adoption of agroforestry practices in home gardens and their impact on food security within the area. The sample households were chosen through a multistage sampling technique. 312 households also took part in the home survey. To triangulate survey data, key informant interviews and focus groups were held. Binary Logit regression models and descriptive statistics were applied. The outcomes of the findings demonstrated the significance of home garden agroforestry practices in the investigated area. Addressing nutritional concerns, and giving households extra revenue streams particularly for women counterparts were all favorable effects. This is due to they have unique knowledge for identification of local crop species. The majority of the area's forest trees are important for preventing and responding to potential climate change extremes and provision of medicinal value. Moreover, homes within the research region stated that technology is crucial for adjusting to and reducing the dangers associated with climate change. The practice of agroforestry home gardens in Southern Ethiopia has a long history. It has a substantial use in the southern Ethiopia adaptation and mitigation to climate change hazards. When it comes to implementing home garden agroforestry, family size, cooperative group participation, educational status, and access to credit and extension services all show statistically significant connections. Thus, in order to help farmers improve their standard of living and improving food security status, the government and other supporting organizations should support home garden agroforestry practices.
Keywords: Adoption, Determinants, Food Security, Home-Garden Agroforestry, Livelihood.

INTRODUCTION

The precise meaning of home garden agroforestry varies depending on the location. This is caused by the physical environment, ecological traits, economic situation, and cultural aspects of the area. The issue of food security has recently become problematic in practically every Ethiopian region. This may be because farmers heavily depended on the monocropping system, which has been vulnerable to extreme weather events owing to climate change. In nations with little resources, such as Ethiopia, the disastrous effects of environmental dangers are evident. Household exposure is thought to be caused by a number of socioeconomic variables, including population growth and inadequate food security. In actuality, agricultural methods have been crucial to Ethiopia's capacity to sustain its way of life. Approximately 80% of Ethiopia's population made their living mostly from agriculture. Additionally, it makes up 42–45% of the country's gross domestic product (Zenebe et al., 2011). The impact of climate change on this potential technology has been enormous recently. Food insecurity is made worse by this and other associated factors, which lead to practically solely rain-fed subsistence (Marleen & Anne, 2022) Ethiopia's food poverty and hunger are mostly caused by variations in rainfall patterns and the corresponding droughts (Salvatore et al., 2012). Financial limitations, food insecurity, and steadily rising malnutrition are the collective effects of the issues, and they are turning into serious issues for human well-being.

Adoption of promising technology is currently a pressing issue, per one study (Melese & Manuel, 2019). Therefore, the most effective way to solve the issue is through climate wise agriculture, especially using home garden agroforestry. A special sort of agroforestry called "home garden agroforestry" surrounds a homestead with multipurpose, multistory trees and crops growing around them, together with animal husbandry (Galhena, 2013). Home gardens are common in most tropical countries and are vital to households' (HHs') well-being in many ways. These consist of the availability of food, fuel, fodder, traditional medicine, building supplies, kitchenware, and financial revenue. They are not only important for diversifying cash streams but also for the social structures and cultures of rural communities. Home garden agroforestry is the one that farmers are using to sustain their livelihoods (Gebrehiwot, 2013; Matson et al., 2013). Climate-smart farming techniques must therefore be implemented, particularly agroforestry in residential gardens. Utilizing the interplay between forestry and agricultural technology, it is an integrated approach that aims to develop more profitable, productive, diversified, healthy, and sustainable land use systems (Gezahegn et al., 2019). Consequently, this method presents a great deal of promise for increased yields on tiny plots of land (Tewabech & Ephrem, 2014). This research topic is poorly understood, despite its importance, thorough empirical studies, documentation, and publication of significant findings. Analyzing the value chain of Ananas Comosus production and commercialization through conventional agroforestry in the research region was the only goal of this investigation (Alie et al., 2019). In order to evaluate the factors influencing the uptake of agroforestry practices in home gardens and their contribution to food security in Aleta Chuko Woreda, Sidama Region, Southern Ethiopia, this study was conducted.

MATERIALS AND METHODS

DESCRIPTION OF STUDY AREA

The Sidama region of Southern Ethiopia is home to Aleta Chuko Woreda (Figure 1). Chuko, the Woreda's administrative center, is located 65 km south of Hawassa and 330 km south of Addis Ababa. Its total size is 7672 km2, with latitudes ranging from 5045 to 6045 N and longitudes from 380 to 390 E (Getinet & Zerhun, 2022). The region has seen kola and dega agro ecological types, according to (CSA, 2010). In addition, the yearly mean temperature was 18°C, while

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the maximum temperature was 28°C.Rainfall occurs in two phases in the area: from June to August and from March to May. Eventually, the region experiences 1000–1800 mm of yearly rainfall.
The study region is located between 1400 and 2000 meters above sea level.

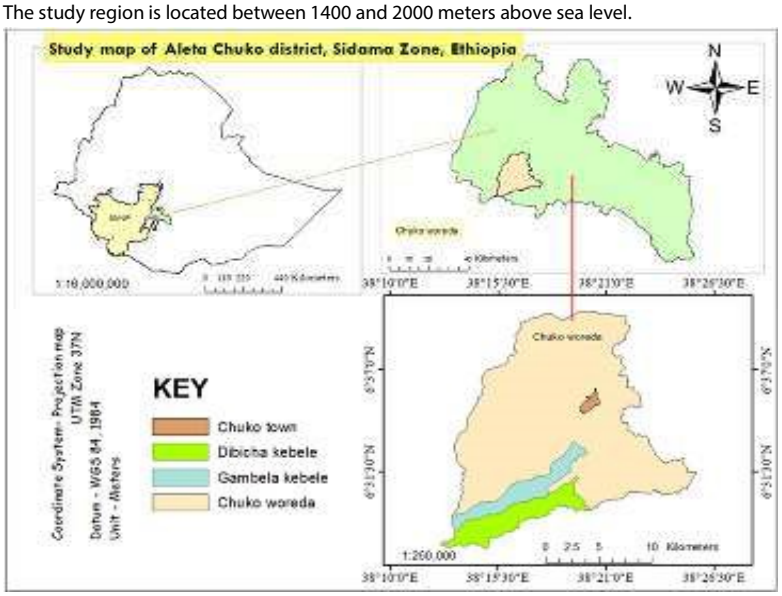

Figure1: Study area map

SITE AND INTERVIEWEE SELECTION CRITERIA

SITE SELECTION CRITERIA

For this specific problem, Aleta Chuko from Southern Sidama Zone was selected purposively due to area endowed with potential of agroforestry home garden production. Besides, easily accessibility of this particular area was other selection criteria. In line with this, two kebeles Dibicha and Gambela were selected to conduct the research problem. To carry out selection of specific site, issue concerned stakeholders were participated in order to minimize bias.

INTERVIEWEE SELECTION CRITERIA

For selection of interview farmers, Woreda and kebele stakeholders were prevailed to carry out appropriate selection. From each selected kebele, 156 farmers were selected to conduct a survey for home garden agroforestry practice and associated questionnaire. Moreover, selection was based on their representativeness, willingness to adoption of crops and fruits as well as availability of sufficient farm land for the practice of the technology. Besides, interviewee selection was based on piece of land which is proximal to public road for easy accessible. Attention was given for inclusion of gender who host agroforestry home garden practice.

METHODS

DATA SOURCES AND TYPES

Data were gathered for this study's purposes from primary and secondary data sources, and the goals of the investigation were met. In addition, cross-sectional survey designs were used to gather information.

PRIMARY DATA SOURCES AND TYPES

Through field observation, key informant interviews, focus groups, and household surveys, primary data were directly gathered from sample households. Primary data were gathered through household interviews using both open-ended and closed-ended questionnaires. The primary data were primarily related to respondents' demographic characteristics, the contribution of home garden agroforestry practice to food security, adoption trends and determinant factors that hinder adoption of this promising technology. Moreover, field visits and observation were done. Visit households practicing home garden agroforestry to observe their practices firsthand. Document the diversity of plant species, land management techniques, and the integration of trees in the farming system were gathered to get more precise data.

SECONDARY DATA SOURCES AND TYPES

Relevant secondary data were gathered and sent from the woreda to the agriculture office's regional level office. Additionally, Kebele administration offices were used as secondary data sources, along with other published items including books, journals, and unpublished documents.

ETHICAL STATEMENTS AND CONTENT EVALUATION

Throughout this investigation, the authors adhere to all ethical guidelines and regulations. This research has been approved by Wondo Genet College of Forestry and Natural Resources, Hawassa University's Department of General Forestry (Specialization in Climate Change and Development). Households got

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information on informed consent, confidentiality, and privacy rights prior to the data collection. During the data collection process, participants were made aware of the study's purpose and their role in it. They were also told that the writers would remain impartial while gathering data. Before the questionnaire was given out to the homes, the content validity procedure was carried out. The questionnaire's validity was assessed using the expert review process. Consequently, in order to assess the validity of a questionnaire, two experts were involved. This setup guarantees that the study's objectives are addressed and pertinent data is gathered through easily understood questions.

SAMPLING TECHNIQUES AND SAMPLE SIZE

A multistage sampling technique was employed in this study to choose representative houses. Two kebeles were purposefully chosen for the first level based on their potential as technology adopters and endowment of crops and fruits. The two kebeles where the research was conducted because of the area for this specific technology's adoption were Dibicha and Gambela. A household that integrates coffee and fruit plants into their homestead farm is considered an adopter in this study. At the second level, the Woreda Agriculture Department provided the names of a chosen group of Kebeles household heads who had adopted home garden agroforestry. The entire sample size of technology users was then calculated. As a result, the target population's sample household number of users was ascertained by applying the streamlined formula in (Otabor & Obahiagbon, 2012)

$$n=\frac{N}{1+N(e)^2} \quad \text{----------(1)}$$

Based on the above formula,

$$\frac{1415}{1+1405(0.0025)^2}=\frac{1415}{1+3.5375}=\frac{1415}{4.5375} \quad .$$

n = 312. This comes to about 312. For the purpose of conducting this specific study, 312 sample respondents were chosen as representative households. Where N is the size of the population, e is the precision with a 95% confidence interval, and n is the sample size. Sample methods were employed in the third phase, probability proportional to size (PPS), to ascertain the number of sample houses chosen from each kebeles. Lastly, sample households from the two kebeles were chosen using the simple random sampling (SRS) technique.

METHODS OF DATA ANALYSIS

A descriptive and economic technique was used to examine the information gathered. Descriptive statistics were performed using SPSS, and the household's adoption of home garden agroforestry practices was estimated using a binary logistic regression model.

ECONOMETRIC ANALYSIS

A binary logistic regression model was utilized to assess the impact of explanatory variables on the adoption of the home garden agroforestry system by the family. This study chose binary logistic regression because it offers odds ratios, which other models and Probit do not, and is simpler to understand. When the independent variables can be of any kind and the dependent variable is a dichotomy, the logistic regression model is utilized (Nancy & Karen, 2015). Let Y be the dependent variable. Depending on the home garden agroforestry system adoption, Y can have a value of 1 (one) or 0 (zero). For instance, Y might indicate that a home garden is an adopter of agroforestry (1), and that a home garden is not an adopter (0). The independent variables denoted by X are presumed to impact the likelihood of implementing a home-garden agroforestry system or influences how Y turns out. It can be explained mathematically as follows: If a family decides to purchase and operate a home garden agroforestry system, Yi=1; otherwise, Yi=0 otherwise,

If Pi is the probability of i^{th} farmer to adopt home garden agroforestry system.

Then, the logistic regression model for estimating the probability of adopting a home garden agroforestry practice (Pi) was specified as follows;

Pr(Y=1) =Pi= ---------- (Equ.2)

Similarly, the probability of i^{th} farmer not to adopt home garden agroforestry practice was shown as;

1-pi= ---------- (Equ.3)

When dividing Equ2 by Equ.3, it yields odds ratio;

$$\frac{pi}{1-pi}=\frac{e^{zi}}{1+e^{zi}} \text{ by } \frac{1}{1+e^{zi}} = e^{zi} \quad \text{----------(Equ.4)}$$

result logit model as indicated below:

$\ln(e^z) = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \text{-------} + \beta kXk + \varepsilon i$ ----------(Equ.5.)

Where, e is the base of the natural logarithms;

β_0 is the constant term.

X1, X2, ----------, Xk are explanatory variables

β1, β2,---------- βk are vector parameters to be estimated corresponding to each explanatory variables;

K is number of explanatory variables and ε is the random error term.

The empirical logit model for this study of adoption of home garden agroforestry system was modeled as:

β6(FAMS) + β7(EXT) + β8(CREDIT) + β9(ACCCL) + β MEMBCOOP+ ε ---(8)

RESULTS

ROLE OF HOME GARDEN AGROFORESTRY PRACTICE

Home gardens in the study area provide number of services to the local people (Table 1). The primary function of these home gardens is for the quick and easy access to foodstuffs as justified by the prevalence of high number and dominance of food plants. According to the study, home gardens help local communities enhance their standard of living in many ways. According to the study results, the households surveyed stated that fruit trees play a major role in

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providing food during times of food scarcity caused by climate change extremes like droughts and floods. Farmers in the study region claimed that technology improves food security and plays an essential role by providing sources of income. Additionally, it was discovered that *Catha edulis* assisted households in buying grain from the local market. According to household result, selected forest trees in the area delivers medicinal usage (Table 1). As a result, according to the results of the household survey, 85% of the households reported having food security all year long. Fruit trees are consumed by practitioner households, particularly by children, in the study area. Regretfully, based on the results of the household survey, a portion of homes continued to lack security throughout the year.

Table1: Selected fruit and forest trees and their uses in the study area

S.No	Scientific name	Family name	Local name	Purposes			
				Home consumption	income sources	medicinal value	climate resilience
1.	*Coffee arabica*	Rubiaceae	Buna	X	X	X	X
2.	*Ananas comosus*	Bromeliaceae	Ananaase	X	X	X	X
3.	*Catha edulis*	Celastraceae	Chat		X	X	
4.	*Enset ventricosum*	musaceae	Weese	X	X	X	X
5.	*Mangifera indica*	Anacardiaceae	Mango	X	X	X	X
6.	*Persea americana*	Lauraceae	Avocado	X	X	X	X
7.	*Mussa acuminate*	Musaceae	Muze	X	X	X	X
8.	*Cordia africana*	Boraginaceae	Waadicho	X	X	X	X
9.	*Olea africana*	Oleaceae	Kolisho haqqe	X	X	X	X
10.	*Eucalyptus spp.*	Myrtaceae	Bahirzaafe	X	X	X	X
11.	*Croton macrostchyus*	Euphorbiaceae	Masincho	X	X	X	X
12.	*Ficus vasta*	Moraceae	Qilxo	X	X	X	X

Source: Authors' survey result, 2023/24

HOUSEHOLD'S ANNUAL PRODUCTION AND INCOME OF HOME GARDEN AGROFORESTRY PRACTICE

Table 1 provides a brief overview of the annual production and income generated by agroforestry practices in home gardens for households. According to the household study, the most common home garden agroforestry crops are avocado, mango, pineapple, coffee, and chat. This is supported by the fact that the average yearly production and profits from the coffee crop were 19370.9 and 193319.70, respectively. Additionally, coffee increases a nation's ability to exchange items and provides a source of foreign income for dealers and manufacturers. In a similar vein, households in the research region have been paying close attention to the uptake of chat. In order to achieve this, the yearly production and income were 15000 and 450,000, respectively. In the research region, pineapple was the main source of revenue. Consequently, the yearly income and production were 221297.73 and 20253.30, respectively. The research area's annual production and income from avocado production are around 1346.97 and 6385.38, respectively. Furthermore, the findings demonstrated that the practice had a significant positive impact on women's households. Women often take care of and manage the home garden, spending a large portion of their time doing so, according to the homes with whom we spoke. Additionally, home garden goods are marketed to enhance the community's cash source, particularly for women. Because they tend to, grow, and use the produce from home gardens, women's everyday activities are closely linked to home gardens. The ladies sell items from their home gardens, including fruits, vegetables, stimulants (chat) and other items. To supplement this, the women sell food products to supplement their income. In addition, tree products have made up the majority of the materials used in local construction.

Table 2: Annual production and mean gross annual income in the study area.

Coffee and fruits	**Annual Production Mean (Kg)**	Gross annual income (birr)
Coffee	19370.9	968,545
Chat	15000	450,000
Pineapple	22153.30	202297.73
Avocado	1346.97	6385.38
Mango	430.30	1918.18
Banana	1136	2813.33

Source: Authors' own analysis, 2023/24

RESULTS OF THE BINARY LOGIT REGRESSION MODEL

The factors influencing the adoption of home agroforestry practices were investigated using a binary logistic regression model (Table 2). Diagnostic tests after estimation were carried out to verify the model's goodness of fit. An excellent fit of the model was demonstrated by a statistically insignificant Hosmer-Lemeshow test value (p-value = 0.665). The model was statistically significant and had a great explanatory power, according to the likelihood ratio chi-

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square test result (p-value = 0.000). Pseudo R2 and the 2 Log probability were 150.44 and 0.361, respectively. Additionally, the mode's variance inflation factor (VIF) was 1.5625. This implies that there is typically no multicollinearity issue with the model.

Table 2: Maximum likelihood estimates of the Logit model.

Adoption	Coefficient	Std. err	p>z	Odds ratio
EDUC	0.312	0.158	0.048**	1.367
AGE	0.05	0.192	0.795	1.051
SEX	0.285	0.416	0.493	1.329
LANHOL	-0.121	0.397	0.761	0.886
HHSZE	0.298	0.116	0.010**	1.347
BN	-0.344	0.437	0.432	0.709
EXTS	1.592	0.441	0.000***	4.916
CREDIT	1.388	0.419	0.001***	4.006
MEMBCOOP	O.885	0.424	0.037**	2.423
ACCCLINF	-0.350	0.413	0.397	0.705
Constant	-7.055	2.064	0.001	0.001

Note: ***and ** indicate the level of significance at 1% and 5% respectively; Hosmer–Lemeshow test -2 Log likelihood=150.44; p-value = 0.665; Pseudo R^2=0.36, VIF = 1.5625

DISCUSSION

HISTORY OF THE PRACTICE OF AGROFORESTRY HOME GARDEN

The practice of agroforestry home gardens in Southern Ethiopia has a long history. Potentially dating back 5,000-7,000 years, linked to the origins of agriculture in the region, with home gardens evolving as a complex and diverse agro-ecosystem (Tadese 2002; Negash, Yirdaw & Luukkanen (2011). Home garden agroforestry is a traditional farming system that has been practiced in Southern Ethiopia for centuries. The practice involves planting a diverse range of crops, fruits, and trees in and around households, providing multiple benefits such as food, fuel, and medicine (Zebene et al. 2015). This present study result in lined with the interviewed households in the area. They claimed that practicing agroforestry technology in the home garden has helped against food in-security problems and associated hazards.

In Southern Ethiopia, home garden agroforestry has been a key strategy for smallholder farmers to ensure food security and maintain sustainable livelihoods. The adoption of this practice has helped communities to diversify their sources of food and income, especially during periods of drought or crop failure ((Tesfaye, Wiersum & Bongers 2010; Tadese 2002). Over the years, the practice of home garden agroforestry in Southern Ethiopia has evolved to incorporate more modern techniques and crop varieties. Farmers are increasingly integrating agroforestry with crop rotation and intercropping methods to maximize their land productivity and resilience to climate change. Besides, it has contributed a lion share for biodiversity conservation (Kindu 2001; Kabir & Webb 2008). This present study result corroborated with key informants interview. Research has shown that households practicing home garden agroforestry in Southern Ethiopia have improved food security, nutrition, and income levels compared to those who rely solely on conventional farming methods (Belachew et al., 2022). This demonstrates the importance of traditional farming practices and the potential of agroforestry systems in enhancing food security in the region.

Overall, the history of home garden agroforestry in Southern Ethiopia highlights the significance of indigenous knowledge and sustainable farming practices in promoting food security, enhancing biodiversity, and supporting resilient livelihoods in rural communities.

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ROLE OF HOME GARDEN AGROFORESTRY PRACTICE

In Aleta Chuko Woreda, Sidama Region of Southern Ethiopia, the purpose of this study was to evaluate the function and determinants of home garden agroforestry implementation in terms of food security. Using data from a cross-sectional socioeconomic survey, the 2023–2024 farming season was examined. It is clear that home garden agroforestry has made a significant contribution to resolving issues with food security. Notably, it contributes significantly to the improvement of living conditions. The farmer's belief is therefore consistent with earlier research. Specifically, the findings demonstrated that domestic agroforestry fruit trees are a major contributor to the domestic environmental disaster, which in turn exacerbates food insecurity (Elfri et al**.,** 2020). This may be related to the strategy of boosting agricultural households' resilience by increasing the amount of items available for sale or domestic use (Habtewold & Fekadu**,** 2020). This study sought to evaluate the function and contributing factors of household. The current study's findings are consistent with those of (Tewabech & Ephrem**,** 2014). Aleta Chuko Woreda in Southern Ethiopia conducted a study named "Value Chain Analysis of Pineapple (*Ananas comosus*) production and Marketing." The results showed that pineapple can serve as a stand-in crop in the event that a drought destroys annual crops. In comparison to monocropping, the home garden agroforestry method has significantly increased farm productivity, according to the households that participated in the anonymous interviews. This may be related to its reduced susceptibility to climate change extremes like drought and flooding. Moreover, households within the study region stated that technology is crucial for adjusting to and lessening. The current study's findings are consistent with those of Tewabech & Ephrem**,** 2014). Aleta Chuko Woreda in Southern Ethiopia conducted a study named "Value Chain Analysis of Pineapple (Ananas comosus) Production and Marketing." The results showed that pineapple can serve as a stand-in crop in the event that a drought destroys annual crops. In comparison to monocropping, the home garden agroforestry method has significantly increased farm productivity, according to the households that participated in the anonymous interviews. The research area included *species of Eucalyptus, Croton macrostchyus, Cordia Africana,* and *Cuperssus* lusitanica combined with fruit trees. Their incorporation into the homestead inevitably improves mitigation and adaptability to the threats of climate change. Moreover, homes within the research region stated that technology is crucial for adjusting to and reducing the dangers associated with climate change. This present study findings has consistency with study finding of Julia et al., 2024). The results of (Meine et al**.,** 2021**;** Tona**,** 2017) are supported by our current finding. The findings showed that the technologies many other uses included building, providing fuel wood, and providing shade for coffee. Focus group participants and key informants asserted that the dispersed integration of trees and crops yields benefits such as wood, fodder, and other uses. The current study's conclusions were supported by (Smith & Wollenberg**,** 2012) research. In addition, the results of the household survey showed that 85% of the study area's households could afford to buy food security all year round. This could be related to the fact that both governmental and non-governmental organizations have provided substantial support for the area. Additionally, the area's integrated forest has trees with medicinal benefits. According to households surveyed, *Croton machyrostachyus*, *OLea Africana*, and *Eucalyptus globulus* have therapeutic value in the study region. This result in lined with (Tewolde**,** 2018)

HOUSEHOLD'S INCOME OF HOME GARDEN AGROFORESTRY PRACTICE

The study area's home garden agroforestry practices have significantly contributed to the eradication of rural households' issues with food security. According to the sampled households, home garden agroforestry lowers risk compared to later systems because it accommodates more components than non-tree based systems. Ewuketu (2014) Provides support for this conclusion. The results of the household survey showed that these things are essential for the consumption and extra income of the household. The current survey's findings are consistent with (Kebebew et al**.,** 2021). Additionally, the current study's conclusions were supported by the research conducted by (Sikhulumile, 2020). According to this specific study, compared to monocropping, households that practice home garden agroforestry have a more secure situation in terms of food security. Furthermore, home garden agroforestry is currently receiving increasing attention as a means of supporting women peers financially. Studies have also demonstrated that women provide diversity to gardens by bringing in new plant species from their parents' gardens. The results of this investigation are consistent with those of (Mathewos & Eyasu**,** 2016). Agroforestry in home gardens has become popular among households in the research area, and it is a vital social and economic pillar. For this reason, the households whose members were interviewed asserted that technology plays an essential role in enhancing nutrition and offering a means of supplementary revenue for the household. This may be related since the practice shows a lot of potential resilience to climate change and can sustain the destruction. The current study's findings are consistent with those of (Smith & Wollenberg**,** 2012). According to Table 1 of the household survey results, *Catha edulis, Enset ventricosum*, and *Coffee arabica* were the most common crops grown by households. Moreover, farmers in the region have made a living by growing *Ananas comosus, Mangifera indica*, *Persea americana*, and *Musa acuminate*, to mention a few. The table's results suggested that the aforementioned practices had a significant yearly yield, which significantly raises the standard of living for households. This could be because of a region where the agro-ecology is favorable for using this promising technology.

CHALLENGES IN ADOPTING AGROFORESTRY PRACTICES

While agroforestry practices have many advantages, there are drawbacks to their setup and upkeep. Because agroforestry practices depend on the growth of trees, they only turn a profit after a few years, depending on how long a given tree species takes to mature. As a result, farmers that dedicate land to agroforestry may experience a temporary loss of revenue. Smallholder farmers, whose land is typically tiny in size and becoming more fragmented, are most affected by this (Yigezu**,** 2021). The issue of land rights, which are either unprotected or typically held by men, is another obstacle to the establishment of agroforestry practices. This limits the ability of women and other marginalized groups to build agroforestry practices Gebrehiwot et al**.,** 2018). Once established, agroforestry systems require a lot of labor to maintain (such as routine tree pruning or fruit harvesting), which could put more of a strain on women, who are typically in charge of this kind of agroforestry and providing food for their families, particularly in home gardens.

INTERPRETATION OF THE BINARY LOGIT REGRESSION MODEL RESULTS

This section's goal is to go over the most important theoretical independent variables that are thought to control the dependent variable, which is the study area's adoption of home garden agroforestry practices.

Educational status of household: At the 5% level of significance, the Logit regression model's result showed that the household's educational status had a substantial beneficial impact on the adoption of home garden agroforestry technology (Table 2). This finding suggests that households with higher educational

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attainment may be more likely than households with lower educational attainment to practice and innovate with technology. More educated homes were, in fact, less conservative and more open to innovation, which is why they were more likely to embrace agricultural technology than farm families with lower levels of education. In addition, farmers must become knowledgeable about the possibilities of these technologies in order to implement profitable climate change adaptation strategies. The variable's marginal effect value was 1.367. This suggests that as the level of education of households increased by one unit, the likelihood that the household would adopt a home garden agroforestry technique increased by 1.367 while the other component remained same. The results of (Sangeetha et al**.,** 2016) were consistent with the study that was conducted.

Access to extension Service: The adoption of home garden agroforestry practices was positively and significantly influenced, as predicted, by having access to extension services. In the model, the variable's coefficient was 1.592. This number shows that the adoption of home garden agroforestry practices was higher among households having access to extension services. The variable's odds ratio is 4.916. The odds ratio of contact with extension service showed that, when access to extension service increased by a unit, the probability of adopting agroforestry technology increased by a factor of 4.916. This is while maintaining the other component constant. At the 1% significance level, the results shown in Table 2 indicate that access to extension services was significant. Providing a suitable agricultural extension service is crucial. The results of this study also back up certain findings from carried out thus far. According to the findings, the adoption rate of agroforestry technology was favorably correlated with farmers' contact with extension service providers Gutema & Daniel**,** 2024).

Access to credit: The chance of agroforestry adoption in home gardens was positively and significantly impacted, as expected, by the household head's access to financial services. In the model, the variable's coefficient was 1.388. This number shows that the implementation of a home garden agroforestry system was more common among households with access to credit services. The odds ratio of credit availability indicates that, as one unit increases in credit availability, the likelihood of adopting home-garden agroforestry practices rises by a factor of 4.006. Additionally, access to financial services was shown to be important at the 1% significance level in Table 2. In actuality, the current findings agree with those of Hassan and Nhemachna (2008).

Membership of cooperative group: At the 5% significance level, the probability of adopting homegrown agroforestry practices was favorably and significantly influenced by membership in a cooperative organization. In the model, the variable's coefficient was 0.885. According to this value, home gardens that practice agroforestry were more likely to be adopted by households that had easier access to cooperative group membership. Furthermore, the value of the marginal effect was 2.423. This suggests that for every unit that a household adds to its cooperative group membership, the likelihood that a home garden agroforestry system will be adopted will increase by around 2.423. This study's findings are corroborated by (Nosia et al**.,** 2023).

Family size: According to Table 2, Logit model result, the family size coefficient has positive signals and is statistically significant at the 5% significance level. This suggests that the adoption of home garden agroforestry practices is positively correlated with household size. This is possibly because the practice requires a lot of labor. The variable's marginal effect (odds ratio) value was 1.347. Accordingly, compared to households with smaller families, those with larger families are 1.347 times more likely to choose home garden agroforestry. This result is in line with the research by (Lambert & Ozioma**,** 2012). On the other hand, this study's findings contradict those of (Deressa et al**.,** 2011)

POLICY IMPLICATIONS

The agriculture office of the district shall provide advanced technical support on the implementation of agroforestry home garden in the study area. This situation would help them to better to bounce food security problems and associated shocks. The government should work in consortium with non-government organizations and extension services to promote the adoption of sustainable agroforestry practices to enhance food security option so that adaptation and mitigation to climate change issues. Government and other issue concerned body should be devised with a holistic approach to address the factors that hinder the adoption of home garden agroforestry system in the study area. Eventually, this situation enhance farmers to effectively overcome food security challenges.

CONCLUSION

Home garden agroforestry practices significantly contribute to enhancing food security in the study area. The household's home garden agroforestry approach yielded sustainable annual income throughout the year, according to the results. Women counterparts were highly beneficiary from the practice to obtain income throughout the year. When it comes to home consumption, technology has dominated. *Croton macrostchyus, Cordia Africana,* and *Cuperssus* lusitanica combined with fruit trees. Their incorporation into the homestead inevitably improves mitigation and adaptability to the threats of climate change Therefore, the technique is critical to maintaining livelihoods in the event that climate change materializes. Similarly, several of the area's woodland plants provide therapeutic benefits. The study area's home garden agroforestry practice adoption was found to be primarily influenced by family size, cooperative group participation, household educational status, and availability to financing and extension services.

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CONFLICTS OF INTEREST

"The authors declare no conflict of interest".