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Local farmer's perception towards *Eucalyptus* woodlot: Lesson drawn from Jamma district, Northeastern Ethiopia

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Abstract

***Eucalyptus* woodlot is the most economically important and extensively planted exotic tree species in Ethiopia. This study investigates farmers perception and factors affecting perception towards *Eucalyptus* woodlot plantation. The data collected from 150 randomly selected farmers using semi-structured questionnaires, focus group discussion and key informant interviews. Analysis made through descriptive statistics and binary logistic regression model. The result revealed that 65.3% of farmers had positive perception, but they perceived negative effects like shading effect, nutrient competition, and moisture competition. *Eucalyptus* contributed 41.6% to total household income, next to agriculture (54.2%). Degraded land, roadsides, and farm boundary were the common niches of *Eucalyptus* plantations. The model result revealed that stayed years, farmers experience, age, education status, and distance to market had significant effect on farmers perception towards *Eucalyptus* plantation. The findings suggest that experts and policy makers should consider the interests and perceptions of farmers to make decision regarding *Eucalyptus* woodlot plantation.**

Keywords: Binary logit regression, Determinants, Income share, Niches, Woodlot

INTRODUCTION

In Ethiopia, natural forests and woodlands are shrinking in the one hand while population and wood demands are rapidly increasing on the other hand. The forest depletion and increasing population have resulted in a severe shortage of wood products, especially fuelwood and construction materials (Liang J, et al., 2016) Tadesse SA). One of the most common solutions to response this problem has been the establishment of fast growing tree species plantations. Plantation forests of exotic tree species are one form of forest in Ethiopia (Tesfaye, et al. 2016; Dejene, et al. 2018). Plantation in the form of woodlot is important for meeting the increasing demand of forest products that supply from the plantation forest and able to reduce supplies from natural forests. One of the measures taken by the government to minimize the problem of scarcity of wood products was introduce fast growing exotic tree species (e.g., *Eucalyptus camaldulensis* and *Eucalyptus globulus*) and establish fuelwood projects near urban and peri-urban areas. This rapid growth and adaptability to a range of conditions have made it preferable to any other exotic species grown in the country (Bekele, 2015). Some scholars argued

about its negative impact on soil acidification, nutrient depletion allelopathic effect, and excessive water utilization (Negasa T, et al., 2017).

However, the importance of the species because of its fast growth, high biomass production, coppicing ability, browsing, and disease resistance properties make it widely adopted and expanded tree species (Negasa DJ, et al., 2016). In northern Ethiopia, *Eucalyptus* is the most commonly grown tree species in the community and private woodlots.

Currently, nearly all *Eucalyptus* woodlots are planted mostly on hilly patches, parts of farmlands that are not suitable for growing food crops, and around homesteads (N*egasa, et al. 2016; Negasa, et al. 2017*). The ongoing expansion of *Eucalyptus* plantations by farmers in Ethiopia has been the focus of two major debates on the environmental impact and the economic role of the species. The former debate is related to soil acidification, nutrient depletion, allelopathy effect, and excessive water utilization by the species especially when grown on previously cultivated farmlands (Janice, et al. 2016 and Alemu, 2016).

However, the later debate focuses on the importance of the species because of its fast growth, high biomass production, coppicing ability, browsing, and disease resistance (. Nowadays in Ethiopia, the *Eucalyptus* plantation grown as woodlot have been continuing and used by many farmers for construction materials, fuel wood and related purposes. Despite the potential importance of *Eucalyptus*, the associated environmental concerns, such as the impoverishment of soil fertility depletion of groundwater, and soil acidification are yet to be undermined by different scientists and communities for Ethiopian site-specific conditions associated with assumptions of its negative effect (Daba M, 2016).

This indicated that the demand for further investigation regarding the impacts of *Eucalyptus* is very high. With the expansion of woodlot in developing countries like Ethiopia, concerns are rising about relationships between woodlots and local farmers (Zerga B, 2015). Therefore, this study adds to the scant literature on relationships between farmers' perception and associated factors influencing their perception regarding to *Eucalyptus* woodlot. Unlike previous studies who demonstrated the perception of farmers on the negative impact of *Eucalyptus* expansion related to crop, water, soil, environment and related effects, we use econometric model to examine factors influencing farmers perception towards *Eucalyptus* woodlot (Zerga B, 2016 and Alemayehu, 2022).

To address the mentioned gaps, the main objective of this study was to investigate local farmer's perception and determinants influencing their perception regarding *Eucalyptus* woodlot plantation as well as its contribution to the total household income compared to other income sources.

Accordingly, we hypothesized that local households' perception of *Eucalyptus* woodlot growing in Jamma district is affected by different socioeconomic and demographic variables. Hence, this study aims to answer the following three key research questions:

- What do the local farmers perceive about the *Eucalyptus* woodlot plantation?
- What factors affect the local farmers perception regarding *Eucalyptus* woodlot?
- What *Eucalyptus* woodlot contributes to the households' total income? The findings of this study will help to address the needs and demands of smallholder farmers who are engaged and not engaged in *Eucalyptus* woodlot.

MATERIALS AND METHODS

Study area

The study was conducted in Jamma district, South Wollo zone, Amhara region; Northeastern Ethiopia. Geographically the district is located within the coordinates of 10°09′ 33"-10°35′ 45" N and 39°03′ 24"-39°29′ 1" E (Figure 1). It covers an area of 1,052 km^2. According to Ethiopian Central Statistical Agency (CSA), the district has a total population of 144,038 of whom 71,339 were males and 72,699 were females (CSA, 2007). The district has a total household of 32,163 and a population density of 121 people per km^2. Jamma district has a mean annual temperature of 18◦C and annual rainfall ranging from 500 to 3600 mm. The altitude of the district ranges from 1400 to 2900 M.A.S.L. 77% of Jama district lays in Woyna Dega or mid land agro ecologies. However, the remaining 23% of the distinct has lowland (kola) and high land (dega) agroecologies (Teshome, 2019).

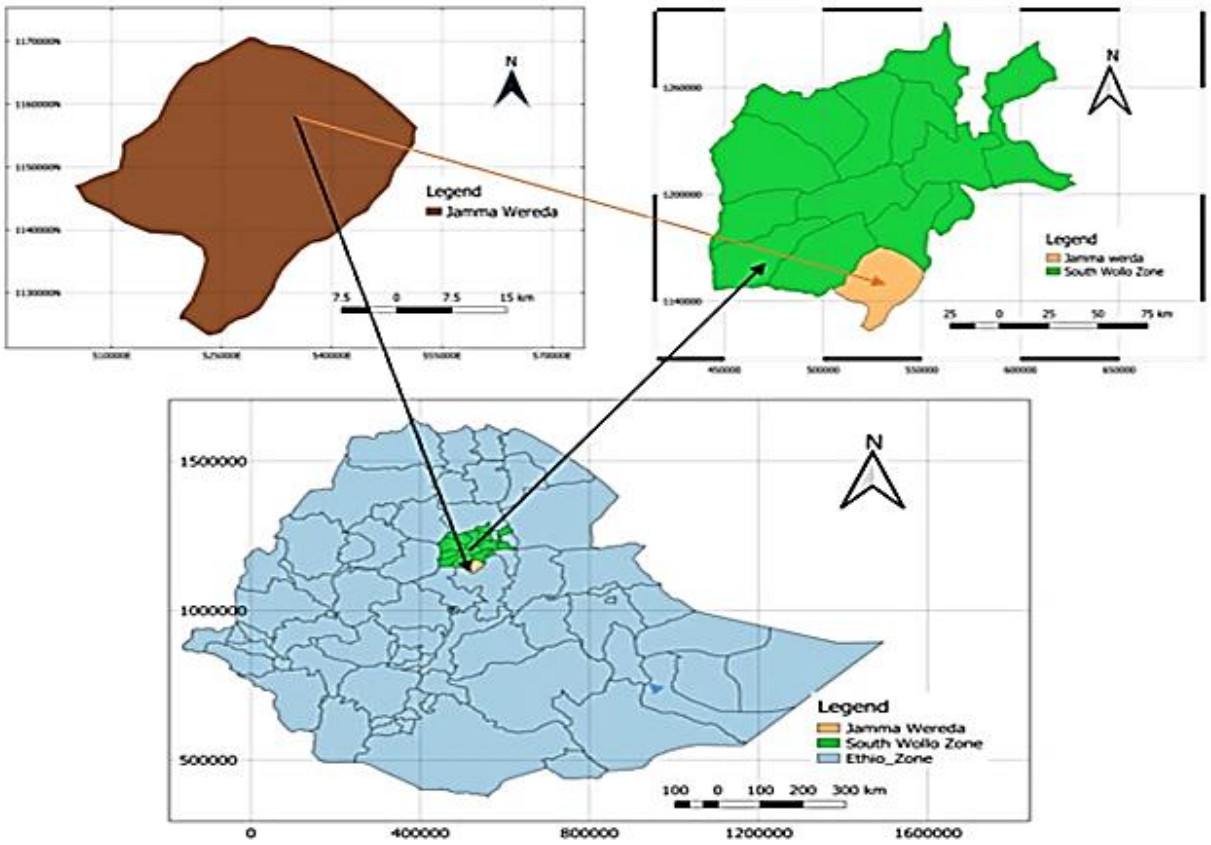

Figure 1: Map of study area.

Sampling technique and data collection method

A total of 3 *Eucalyptus* potential Kebeles were selected using information from Jamma district. From sample kebeles, a total of 150 randomly selected farmers were used through a random number based on the list of farmers obtained from the kebele administration.

The total sample size was determined according to Israel by using the following formula (Equation 1).

$$n = \frac{N}{1+N(e)^2} \qquad (1)$$

$$n = \frac{240}{1 + 240(0.05)^2} \quad n = 150$$

Where:
n=sample size; N=total population of household; e=precision level

Before final data collection, a preliminary survey was conducted to get better information about the study area and the kind of data to be collected. Both quantitative and qualitative data were collected from primary and secondary sources. To collect data, a household survey, key Informant Interview (KII), and Focus Group Discussion (FGD) was employed. They mainly conducted to obtain quantitative data while KII and FGD conducted to obtain qualitative data. A household survey was conducted through a semi-structured questionnaire, while KII and FGD were conducted through a checklist. The data collection tools were conducted by considering various socio-economic characteristics, income sources, perceptions regarding niches and effects of *Eucalyptus*, and cognitive (e.g., knowledge, beliefs, and experience) variables. Selected farmers were involved in data collection related to 15 major explanatory variables supposed to affect farmers perception of the *Eucalyptus* woodlot (Table 1). Those explanatory variables were selected following the previous studies. A total of three FGD was conducted from three sampled kebeles as well as nine KII were selected in the interview with the developmental agent to obtain the general information of *Eucalyptus* woodlot.

Method of data analysis

The collected data were analyzed using descriptive statistics and binary logistic regression model and summarized into tabular and graph format through the help of STATA version 17. Descriptive statistics, such as percentage, frequency, graphs, means, and standard deviation, were used to analyze descriptive variables. A binary logit regression model was used to analyze factors affecting local farmer's perception of the *Eucalyptus* plantation. The logit model was selected in this study because the distribution of

the data followed the logistic distribution function. The qualitative data obtained from the FGD and KII was summarized using texts and contexts.

Binary logit regression analysis was applied to identify the factor that influences the farmer's perception to establish and allocate the land for the *Eucalyptus* woodlot. Demographic, institutional, socioeconomic, and biophysical factors, which affect the farmers' perception, were examined using binary logistic regression. In the logit model farmers who have a positive perception of the *Eucalyptus* woodlot take the value of 1 and the farmers who have a negative perception of the *Eucalyptus* woodlot take the value of 0. The dependent variable is a categorical dichotomy (*i.e.*, positive/ negative) while the independent variables include a mix of continuous, and nominal variables (Table 1). According to Gujarati, the functional form of the logit model is presented as follows:

$$Li=\ln\left(\frac{pi}{1-pi}\right) = Zi = \beta 0 + \beta 1x1 + \beta 2x2 + \beta 3x3 + \beta 4x4 \ldots \beta nxn \quad (2)$$

Where; Pi = the probability of perception of farmers on *Eucalyptus* woodlot ranges from 0 to 1.

L=the natural log of the odds ratio or logit.

$$Zi = \beta 0 + \beta 1x1 + \beta 2x2 + \beta 3x3 + \beta 4x4 \ldots \beta nxn \quad (3)$$

β0=the intercept. It is the value of the log oddratio, (pi/(1-pi)) when X is zero.

β=β1+β2+β3+β4…βn the slope, measures the change in L for a unit change in X; Thus, if the stochastic disturbance term (Ui) is taken into consideration the logit model becomes

Li=β0+β1 X i+U i.

Table 1: Summary of factor variables affecting farmer's perception of *Eucalyptus* woodlot.

Variables	**Types of variables**	**Measurements**	**Hypothesis**
Farmers perception of *Eucalyptus* woodlot	Dummy	1=Positive, 0=Negative	Dependent variable
Sex	Dummy	1=Male, 0=Female	+
Education status	Dummy	1=Literate, 0=Illiterate	+
Age	Continuous	Farmer's age in years	-
Family size	Continuous	Number of persons in the household	-
Farmers experience in *Eucalyptus* production	Continuous	Number of years farmers engaged in *Eucalyptus* production	+
Length of residence in the area	Continuous	Length of years farmers lived in the area	+
Landholding size	Continuous	Landholding size in hectares	+
Livestock holding size (TLU)	Continuous	Number of livestock holding in Tropical Livestock Unit (TLU)	-
Access to credit service	Dummy	1=Farmers have credit access, 0=no credit access	+
Distance from road access	Continuous	Distance between farmer's house and road access in hours	+
Distance from natural forest	Continuous	Distance between farmer's house and natural forest in hours	+
Distance from market to home	Continuous	Distance between farmer's house and marketplace in hours	+
Agricultural income	Continuous	Amount of income from agriculture in Ethiopian birr	-
Off-farm income	Continuous	Amount of income from off-farm sources in Ethiopian birr	-
Eucalyptus income	Continuous	Amount of income from *Eucalyptus* in Ethiopian birr	+

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

A total of 150 farmers responded to the questionnaire survey. The majority of the respondents (82.7%) were males, and the average age of the respondents was about 48 years with a standard deviation of 10.34. On average, the respondents were lived in the area for about 44.71 years. The average family size in a household was about 6.45 persons. Regarding the status of education, the vast majority of the respondents (71.3%) were illiterate. The average *Eucalyptus* production experience of farmers was about 23.61 years with a standard deviation of 6.77. The average landholding size was about 2.51 ha as well as the average livestock holding was 14.88 animals. The majority of the respondents (74%) had access to credit services and about 65.3% of farmers had a positive perception of *Eucalyptus* plantations. The average annual income of the farmers was about 55729.3200 in Ethiopian birr. The average distance between the houses of the respondents and the nearby forest was taken about 4 hours (Table 2). The average distance between the

houses of the respondents and the nearby natural forest was about 5.37 hours as well as the average distance between the houses of the respondents and the marketplace was about 3.7 hours.

Table 2: Summary of samples and descriptive results.

Variables	**Descriptive results**	**(%)**
Total sample size (n)	150 respondents	
Sex	Female	17.3
	Male	82.7
Educational status	Illiterates	71.3
	Literate	28.7
Age	Mean=48.0067 years, SD=10.34213	
Family size	Mean=6.4533 years, SD=3.00690	
HH experience in *Eucalyptus* woodlot production	Mean=23.61 years, SD=6.773	
Length of residence in the area	Mean=44.7133 years, SD=9.69698	
Landholding size	Mean=2.51 hectare, SD=.710	
Livestock holding size (TLU)	Mean=14.8795 animals, SD=8.72256	
Access to credit service	Yes	74
	No	26
Farmers perception of *Eucalyptus* woodlot	Positive	65.3
	Negative	34.7
Annual income	Mean=55729.3200 birr, SD=14964.05807	
Distance from road access	Mean=4.0773 hours, SD=4.15777	
Distance from natural forest	Mean=5.3679 hours, SD=4.37934	
Distance from market to home	Mean=3.70975 hours, SD=2.64290	

Niches and contribution of *Eucalyptus* plantation

The survey result shows that about 66.1% of the farmers plant Eucalyptus on degraded land. This is because *Eucalyptus* is the farmers most preferred tree type in the area to recover their income, maintain food security, and for mitigating rural poverty.

Thus, degraded areas have been given priority for tree planting by households and the government afforestation program to prevent further loss of land. About 23.6% of the respondents have planted *Eucalyptus* on the farm boundaries of homesteads and around farmland. Low land holding size and fragmentation of lands, which will increase boundary areas and respond to the new tenure system, could explain the desire to plant trees on farmland boundaries.

The other 8.7 % and 1.6% of *Eucalyptus* growers planted *Eucalyptus* along the roadside and on farmland with the crop, respectively. *Eucalyptus* woodlot plantations on degraded land and roadside have to be encouraged when compared to farm boundaries and on farmland plantations with crops since their adverse effect on cereal crops are substantial (Figure 2).

Eucalyptus plantation in the study area has many patterns. Farmers plant *Eucalyptus* in different forms, such as woodlots around homestead areas, on degraded land or the land that declines in productivity of cereal crops, along the roadside, on-farm boundaries. Similar results were reported by Zerga, Mekonnen, Tefera, Kassa, Gizachew.

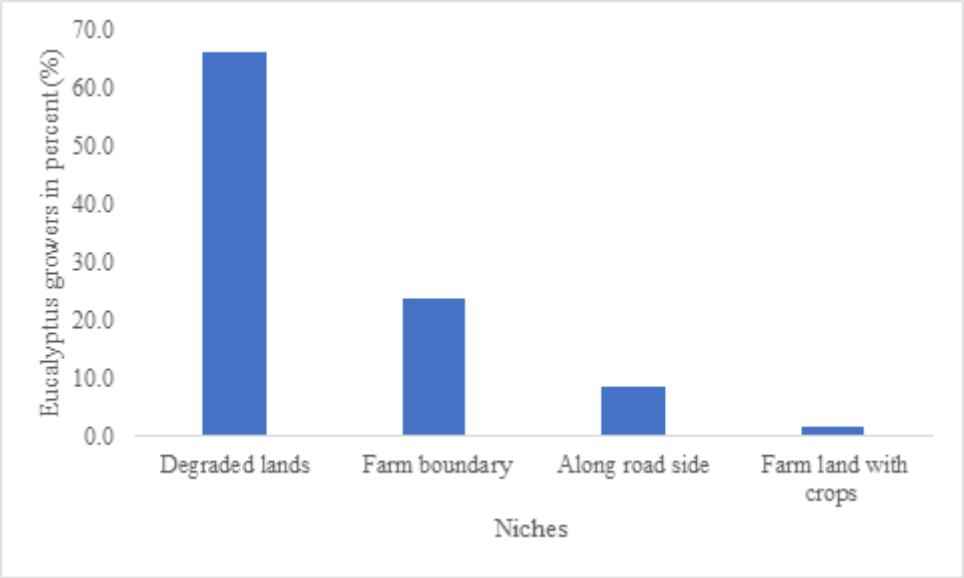

Figure 2: Niches of *Eucalyptus*.

Eucalyptus is the most commonly planted tree genera in the highland areas of Ethiopia, due to its adaptability, fast growth, and no palatability for livestock. As presented in Table 3 respondents indicate that about 78.95% of them respond that it is an increase in *Eucalyptus* woodlot plantations followed by there is no change (14.04%) and the remains think that there is decreasing in Eucalyptus woodlot plantations (7.01%) in the study area. This indicated that the majority of households highlighted that there is an increasing trend of *Eucalyptus* woodlot. Thus, the study is in line with Tefera and Kassa from Lake Tana Watershed, Derbe, et al., from north Gonder, et al., Alemayehu, et al., from Sidama, Edesa, from Tesfaw, et al., from Blue Nile highland confirm the increasing trend of *Eucalyptus* planting in the respective study sites. Likewise, Taddesse, et al. stated that the current trends show that smallholder farmers in Ethiopia have engaged in tree planting increasing especially in fast growing trees like *Eucalyptus*.

Table 3: Perception of farmers on the trends of *Eucalyptus* woodlot plantation.

Trends of *Eucalyptus* woodlot plantation	**Frequency**	**%**
Increasing	1118	78.95
Remain the same	21	14.04
Decreasing	11	7.01

Eucalyptus in the study area has several contributions to the livelihood of the households. The key informants reported that *Eucalyptus* play important role in reducing destruction from natural forests; because of the farmers have their own *Eucalyptus* plantation they don't need to go to the forest for construction materials and firewood.

Farmers grow *Eucalyptus* for construction (38.7%) followed by fuelwood (35.3%) and income generation (26%) as shown in Figure 3. The KIIs and FGDs also pointed out that the variability of *Eucalyptus* growing niches was due to the availability of land, market availability, conservation of degraded lands, and road access. Previous pieces of the literature demonstrated that farmers grow *Eucalyptus* trees to fulfill the shortage of fuel wood, construction materials and for income generation for livelihood.

Farmers plant *Eucalyptus* in different forms, such as woodlots around homestead areas, on degraded land, or on land that declines in productivity of cereal crops, along the roadside, on-farm boundaries (Gizachew, 2017). *Eucalyptus* has multiple benefits for smallholder farmers for firewood, construction materials, source of income, and farm tools.

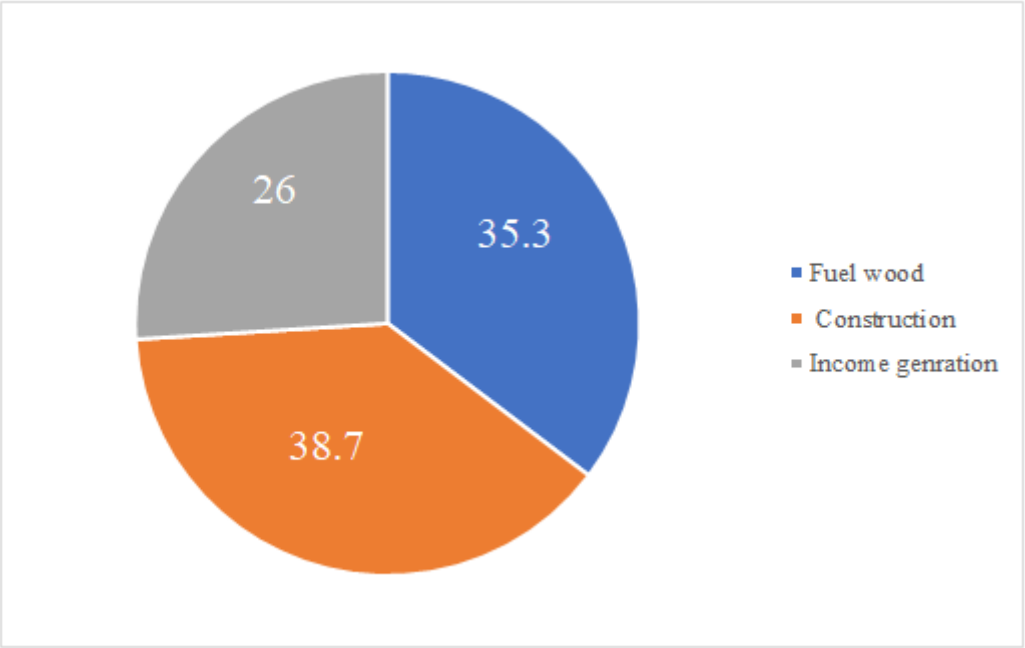

Figure 3: Households purpose of growing *Eucalyptus* tree.

The survey result shows that the source of construction materials of the respondents are mainly wood products of *Eucalyptus* which is from their plantation (77.67%), buying from the market (19.25%), from the natural forest (2.48%) and community plantation (0.62%) (Figure 4). The decision to grow *Eucalyptus* is predominantly endangered by the need to meet household wood demand. Most household fuel and construction wood demands are met from their *Eucalyptus* plantation. *Eucalyptus* wood products are the most preferable construction materials for local communities particularly. The construction of many infrastructures such as health centers, schools, roads, water walls, and community halls is largely dependent on *Eucalyptus* (Alfred, et al. 2020).

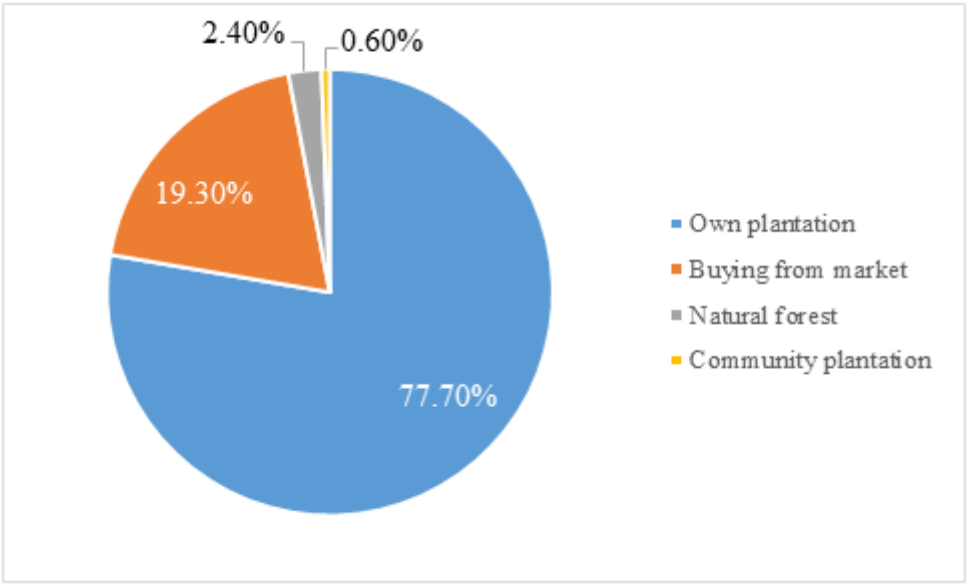

Figure 4: Household source of wood for construction.

The household survey revealed that *Eucalyptus* has different products and contributes to the total household income. The result showed that *Eucalyptus* is the second income contributor (41.6%) to the total household income next to agriculture (Table 4). The finding of this study showed that the contribution of *Eucalyptus* to the total household income is higher than Alemayehu, et al., found that 35% in Sidama Zone, Southern Ethiopia, and Derbe, et al., found 29% in Wogera District Northern Ethiopia. However, the finding of this study is lower than Edesa, 2021 who found that *Eucalyptus* contributes about 87% to the total household income in Chelia district, Oromia region. Other findings revealed that the *Eucalyptus* woodlot was the second income contributor to the total household income. The result is also in line with Getnet, et al., which indicated that the *Eucalyptus* woodlot contributes significantly to the household's total income. Among *Eucalyptus* products income from stumpage price is the first (63.1%) followed by

income from construction material (19%) and income from fuelwood (17.9%) regarding the contribution of the total income from *Eucalyptus* in the study area.

Table 4: Proportion of different income sources to the total household income.

Income sources	**N**	**Mean**	**Std. deviation**	**Maximum**	**Minimum**	**Share (%)**
Agricultural income	150	30186.8	12468.76	65000	4800	54.2
Off-farm	150	2382.52	6081.68	36100	0	4.3
Eucalyptus income	150	23160	6253.75	53000	12600	41.6
Total income	150	55729.32	14964.06	109000	26860	100
Income from *Eucalyptus* products						
Fuelwood income	150	4136	1875.14	900	18000	17.9
Construction material income	150	4401.33	1265.71	1700	10000	19
Stumpage price income	150	14622.67	4804.56	9000	33100	63.1
Total *Eucalyptus* income	150	23160	6253.75	12600	53000	100

Farmer's perception of the effects of *Eucalyptus* woodlot

Table 5 indicated the perception of farmers about the effects of *Eucalyptus* woodlot plantation on crops and related components. The result shows that *Eucalyptus* woodlots have effects in terms of shading effect (91.3%), nutrient competition (96.7%), and moisture competition (91.3%). Farmers also perceived that *Eucalyptus* affected the property of soil by causing infertility (91.3%) and drying of other plant species (94.7%) and most of the farmers assumed that *Eucalyptus* has an effect on water resources regarding drying out of streams (96%). This result is supported by previous findings who reported that more water is consumed by *Eucalyptus* than by any other tree species or crops (Xu, et al. 2020). Thus, the plantation expansion of *Eucalyptus* could affect the future food security of the farmers because of its adverse effect and the competition for food crops (Tadesse SA, 2017).

Table 5: Farmers perception of the effects of *Eucalyptus* plantation expansion.

Perceived effects of *Eucalyptus* plantation	**Frequency**	**The proportion of responses (%)**
Shading effect on crop	137	91.3
Nutrient competition of *Eucalyptus* on crop	145	96.7
Moisture competition	137	91.3
Causing soil infertility	137	91.3
Changing soil color	15	10
Drying out of other plant species	142	94.7
Effect on water resource	144	96

Determinants of farmer's perception towards *Eucalyptus* woodlot plantation

Results from the binary logit model indicated that the age of the farm household heads negatively and significantly influenced the perception of farmers on *Eucalyptus* plantations at less than a 1% significance level (Tadesse W, et al., 2019). The estimated coefficient and the odds ratio of the variable were -0.2378 and 0.78839, respectively. This means as the age of farmer's increases by one year, the tendency of farmer's perception to be negative on *Eucalyptus* woodlot plantation would lead to an increase in their negative perception by the odds of 0.78839 keeping other variables constant (Tesfaye MA, et al., 2016). This may be younger farmers are often better disposed to devote themselves to long-term investments like *Eucalyptus* and have lower risk aversion and longer planning horizons to justify investments in *Eucalyptus* based technologies. It is probable that with increased age, as a factor of experience and observed changes of the *Eucalyptus* woodlot plantation over a longer period of time, older farmers oppose the planting of *Eucalyptus* in their land, unlike the younger farmers. On the other hand, this finding is opposed to other findings, the positive impact of age and farm accumulated experience in favor of more trees on the farm has been reported (Kebede TA, 2022).

The binary logit model result revealed that educational status was negatively correlated with farmer's perception of *Eucalyptus* woodlot plantation (Table 6). The result shows that the

educational status of the farmer influences negatively and significantly on *Eucalyptus* plantation at a 1% significance level. The odds ratio shows that keeping other variables constant being a farmer is educated probability of their perception on *Eucalyptus* woodlot plantation decrease by the odds of 0.17183 (Tesfaw A, et al., 2021). The plausible reason could be when the farmer is educated, they might be well aware of how to manage any impacts of *Eucalyptus* plantation. Therefore, as compared to illiterate farmers, more educated farmers would likely minimize the potential negative impacts of *Eucalyptus* plantations (Getnet MT, et al., 2022). Previous studies stated that perception of *Eucalyptus* plantation plays a key and central role in *Eucalyptus* plantation management and development (Alemayehu, A., 2018).

Table 6: Binary logistic regression model to predict the perception of farmers to *Eucalyptus* woodlot plantation.

Variables	**Coef.**	**Std. err**	**z**	**Odds ratio**	**P>z**
Sex	0.7407	0.6769	1.09	2.09738	0.274
Age	-0.2378	0.0896	2.65	0.78839	0.008***
Educational status	-1.7612	0.6669	2.64	0.17183	0.008***
Family size	0.048	0.1011	0.47	1.04914	0.635
Length of residence in the area	0.2708	0.0928	2.92	1.31095	0.004***
Farmers experience in *Eucalyptus* production	0.3406	0.0695	4.9	1.40582	0.000***
Landholding size	0.2504	0.4364	0.57	1.2845	0.566
Livestock holding (TLU)	-0.019	0.0304	0.62	0.98119	0.533
Agricultural income	0	0	0.94	1.00002	0.349
Off-farm	0	0	0.93	0.99996	0.35
Eucalyptus income	0.0001	0.0001	1.14	1.00009	0.256
Credit access	-1.0121	0.655	1.55	0.36345	0.122
Distance to road access	-0.2555	0.1018	2.51	0.77453	0.012**
Distance to forest	0.0137	0.1095	0.13	1.01381	0.9
Distance to market	-0.263	0.1012	2.6	1.30082	0.009***
_cons	-10.7616	3.7472	2.87	0.00002	0.004***
Number of observations	150				
LR *chi square* (15)	86.66				
Prob >*chi square*	0				
Pseudo R2	0.4476				

Length of residence in the area was positively correlated with farmer's positive perception of *Eucalyptus* plantation (Gizachew K, 2017). One of the possible reasons could be that farmers who have a residence in the area will have ample information on the history of their settlement in the area might be more interested to plant and grow *Eucalyptus* woodlot (Feyisa D, et al., 2018). As a result, they may develop a positive perception towards growing *Eucalyptus* woodlot because they may expect high economic returns derived from *Eucalyptus* including financial profits obtained from the sale of poles, construction materials, and fuel wood. Farmers perceptions could also be influenced by the experience of farmers on *Eucalyptus* production (Bayle GK, 2019). Experience in the farming of *Eucalyptus* was a significant positive impression on farmers regarding *Eucalyptus* plantation (Degnet MB, et al., 2022). With the assumption of citrus paribus condition, the odds ratio indicates that a unit change of household experience on farming of *Eucalyptus* increases the probability of positive perception by 11.40582. The result may be interpreted as experience on *Eucalyptus* woodlot plantation significantly increasing the probability of a farmer considering a positive perception about the species. This implies that with increased experience in *Eucalyptus* woodlot plantation, it was more likely for a person to observe the positive effect of species and had a positive perception of it (Derbe T, 2018). The finding of this study opposed with previous findings Dessie, et al., who found that farmers experience was significantly and negatively associated with *Eucalyptus* woodlot production. The market distance was significant for positive correlation with a negative perception of *Eucalyptus* woodlot plantation (Dessie AB, et al., 2019). The odds ratio indicates that the probability of farmers perceiving the *Eucalyptus* woodlot plantation as not good increases with market distance by the odds of 1.30082, with the assumption of citrus paribus condition (Edesa DY, 2021). This result may suggest that the favorable condition of market facilities in farmer residences may enable farmers to participate in the plantation of *Eucalyptus*, but the low transportation service and

poor market access discourage farmer's engagement in the market of *Eucalyptus* products. As a result of more money and time being spent on the distant market, Farmers might perceive the *Eucalyptus* plantation as unlikely/negative. The finding is agreed with related studies Dessie, et al., that demonstrated that access of market to the nearest distance of farmer's residence positively and significantly correlated with *Eucalyptus* woodlot due to easily availability of *Eucalyptus* inputs and outputs to farmers (Israel GD, 1992). Distance of farmers from the nearest accessible road was associated negatively with a household positive perception of *Eucalyptus* plantation at less than a 5 % level of significance. The model result indicated that the farmers who are far away from the nearest road have a negative perception of *Eucalyptus* woodlot (Nigussie Z, et al., 2017). The odds ratio shows that keeping other variables constant, as the distance of households from accessible road increase by one kilometer, the probability of farmer's perception towards plant *Eucalyptus* decreases by the odds of 0.77453. This is probably due to *Eucalyptus* sellers and buyers mostly choosing roadside plantations to buy for their ease of transportation, which influences the decision of farmers to plant *Eucalyptus* nearest to accessible roads. This is in line with who indicated that a household's proximity to accessible roads makes it easier to obtain seedlings and sell woodlot products without incurring a high transaction cost (Tefera B, 2017 and Gujarati DN, 2004). People can readily move *Eucalyptus* wood items such as poles, construction materials, and fuelwood to the market area as the distance between their homes and the neighboring access road lowers Tadesse, and Tafere, Nigussie, et al., Derbe, et al., stated that road distance from the stand is one of the institutional factors found to influence *Eucalyptus* planting decisions (Zerga B, et al., 2021).

CONCLUSION

Perceptions of local farmers towards *Eucalyptus* woodlot plantation depend on the level of socio-economic and biophysical conditions. Furthermore, the perceptions towards *Eucalyptus* plantation were mostly positive, meaning that farmers associated more positive than negative outcomes of *Eucalyptus* woodlot plantation. Degraded land, roadsides, farm boundary, and cropland, were the common niches of *Eucalyptus* woodlot plantation. The local farmers perceived that *Eucalyptus* plantations have effects in terms of shading, nutrient competition, moisture competition, causing soil infertility, drying of other plant species, and drying out of streams. Evidences from the flinging of this research revealed that *Eucalyptus* is the second contributor of households total income next to agriculture. Further, the finding suggests that stumpage price income is the first income contributor among *Eucalyptus* products. In the present study, the binary logistic regression model revealed that different socio-economic and biophysical variables significantly affected farmer's perceptions either positively or negatively on *Eucalyptus* woodlot. The findings of the study revealed that local farmer's perception of the plantation of *Eucalyptus* was positively correlated with the length of residence in the area and farmers experience in *Eucalyptus* production. But it was negatively correlated with the age of the farmer, educational status, distance to access the road, and distance to the market. The findings recommended that different concerned bodies should be work to address different socio-economic and biophysical factors affecting farmers perception towards *Eucalyptus* woodlot. Further research on prioritization of tree species mixing with *Eucalyptus* tree plantation should be recommended.

AUTHORS CONTRIBUTION

KTA: Designed and performed the surveys, analyzed the data, wrote, review and edit the manuscript. CX designed the research, review, editing and revised the manuscript.

COMPETING INTEREST

The authors declare that they have no competing interests.

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