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# Farmers' perception towards farm level rubber tree planting: a case study from guraferda, south–western Ethiopia

## Abstract

IIn Ethiopia *Heavea brasiliensis* tree plantation has been mainly conducted by the state. Now a day, attempts are being made to extend the practice towards farm level by the rural communities. Then the future plan may largely depend on addressing farmer's perception as well as the identification of factors that encourage or discourage rubber tree planting on their farms. Also, insight about the above issues will be helpful in designing effective out–growers scheme for rubber tree plantations by the farmers, thereby contributing to the betterment of the livelihood in the country. Thus, the general objective of this study was to identify the factors that underlie farmer's decisions to engage in rubber tree plantation and to understand farmers' perception towards the forest use and conservations in the study area. The study was conducted in Guraferda Woreda, in Southwestern part of Ethiopia. We used informal discussion and semi–structured questionnaire survey. The result indicated that all the respondents were farmers, self–employed in farming. They grow cash crops, food crops, rearing animals and daily labor were their livelihood activities and sources of income. The concept of conservation and forest development is supported by the majority of the respondents and about 40% are dependent on the forests for income generation. Majority of the respondents (68%) expressed their willingness to plant rubber tree on their farm. However, land availability, market for the products, gestation period of the investment, lack of technical knowhow and nearness to resource such as seedlings are discouraging factors for the engagement of rubber plantations by farmers in the study area. Thus, taking all these as opportunities could help us to devise strategies such as rubber tree agroforestry, which probably intensify the farming system and results willingness to plant rubber trees by farmers in the study area.

**Keywords:** Heavea brasiliensis, agroforestry, farmers, perception, out–growers

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## Introduction

Plantation forest of exotic tree species are one form of forests in Ethiopia.[1–3] They deliver a wide range of social, economic and environmental benefits.[4] The importance of plantation forests is increasing as the demand for forest products is rising and the supply from the natural forests is decreasing. Accordingly, the areas under manmade forests have been increasing from an estimated *cal.* 190,000 hectare (ha) in 1990 to *cal.* 972,000 ha in 2011 in the country.[1] Of these, about 20% of the plantations are classified as commercial plantations.[1] The remaining 80% are non industrial plantations, mainly woodlots and trees on farms. Plantation forests are important to meet wood requirements for local use, such as for construction material and for wood fuel[5,6] and thereby helping the rural people improving their livelihood through the contribution to household economy in Ethiopia.[7–9] Furthermore, in Ethiopia, plantations of some tree species can also provide important recognized Non–timber Forest products (NTFPs),[10] including the natural rubber.

Natural rubber is a major industrial raw material with beneficial economic and ecological impact,[11] harvested from the rubber tree. Rubber tree, *Heavea brasiliensis*, is one of the world's important crops, with 8,000, 000 ha under cultivations[12] and can be grown in plantation as a commercial tree worldwide.[11] The tree is native to South America but can grow in any area with an altitudinal range of 600–900 meters above sea level (masl), except in the arid regions. The species requires 180–250 cm of rainfall per year and a temperature of 25–35 °C. Today, *H. brasiliensis* has become a development instrument tree for developing countries and a good way to fight against deforestation and soil erosion, which are critical problems in tropical countries like Ethiopia. It also reduces human pressure on natural forests by supplying an excellent timber.[13,14]

In Ethiopia, *Heavea brasiliensis* tree plantation has been conducted mainly in the south western part of the country, where this region is considered the most suitable for rubber cultivation. The cultivation practices are raised under rainfed conditions and the practice mainly is undertaken by the state. Now attempts are being made to extend the practice towards farm level by the rural communities at the potential rubber growing areas over the country. Although the interest of enhancing this in the country is well recognized, the development of *Heavea brasiliensis* plantations has been lower than anticipated, particularly at farm levels by the rural communities. This might be due to the fact that no emphasis was placed on understanding the perceptions of local people on *H. brasiliensis* tree species. Thus, the future plan may largely depend on addressing farmer's perception as well as the identification of factors that encourage or discourage rubber tree planting on their farms. Also, insight about the above issues will be helpful in designing effective out–growers scheme for rubber tree plantations by the farmers, thereby contributing to the betterment of the livelihood and ultimately rural developments in the country. Thus, the general objective of this study is to identify the factors that underlie farmer's decisions to engage in rubber tree plantation and to understand farmers' perception towards the forest resources in their

vicinity. Specifically this study identifies the possible approaches and opportunities to promote rubber trees plantations for natural rubber production by local farmers in the study area.

## Methodology

### Study area description

The study was conducted in Guraferda Woreda, found in southwestern part of Ethiopia. It is located between 34°55'59" to 35°26'13" E Latitude and 6°29'5" to 7°13'20" N Longitude (Figure 1). The district town, Biftu, is about 630 km Southwest of Addis Ababa. Guraferda is bordered on the south by Bero district, on the west and north by the Gambela Region, on the northeast by Sheko, on the east by South Bench, and on the southeast by Menit Shasha. The elevation ranges of the district lays between 559 and 2389 masl. The Agro–climatic zones of the study area include low land (Moist Qolla ~78.25%) and medium (Woynadega ~21.75%) of the total area of the district.[15] The annual rainfall varies from 1601–2000 mm whereas the mean annual rainfall is about 1332 mm. The mean annual minimum and maximum temperature of the area ranges between 20**°C** and 29**°C**, respectively. The vegetation is characterized by *Combretum spp*., *Oxythenanthra abyssinica*, *Boswellia papyrifera, Lannea schimperi, Anogeisus leiocarpus*, and *Stereospermim kunthianumcham*.[16] An estimated area of Guraferda district is about *cal.* 2565.42 km$^2$. According to Belay et al.,[15] the population of Guraferda district was 45,028 in 2015. The criteria used for selecting the study area included the farming system and the presence of farmers who have rubber tree farms in the study area. The inhabitants of the study area practice mixed agriculture, crop production and livestock rearing. They commonly grow cash crops, like coffee and rice. The first four major products of the district are coffee, rice, maize, and sorghum. Besides crop production, farmers of the district rear livestock.[15]

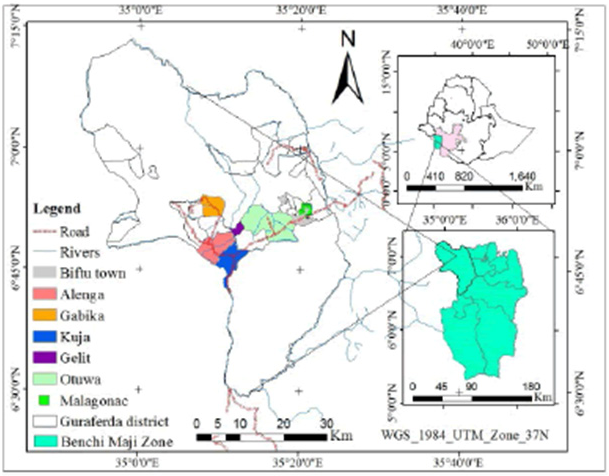


**Figure 1** Map of Ethiopia and the southern nation's nationalities and peoples region, showing the location of Guraferda, the study area.

### Data Collection and analysis

Data for the study were collected from the socio–economic survey that involved various data collection techniques, such as informal discussion, semi–structured questionnaire survey and observations of the study area. Before the survey began, farmers were contacted to explain the purpose of the survey and to develop trust. For the questionnaire survey, 25 farmers were purposively selected,[17] using the criterion of 'having rubber tree plantation on their farm land'. The survey was conducted in two groups, 17 farmers who were already engaged in rubber tree plantation and 8 who were not engaged in planting rubber trees on their farms. A semi–structured questionnaire was developed and pre–tested, and interviews were finally undertaken with the selected farmers. Information regarding the objectives of the study was collected through the interview.

Data collected was checked, corrected, coded and entered into micro–soft excel. The data were analyzed using the statistical package for social studies (SPSS). The result presented as percentages, graphs and mean values by applying descriptive statistics. Secondary sources were mainly published and unpublished sources also used to complement and refine the information that had been collected.

## Results and discussion

### Socio–economic characteristics

For the interviewed farmers, average family size was six, with a range from 3–9 individuals per family. The majority of the respondents (40%) had a family size of 5–8 (Table 1). Illiteracy is high; 56% (N=14) of interviewed individuals were uneducated, i.e. unable to read and write, while 24% (N=6) had attended school up to grade 4 and the rest beyond grade 4. The majority (76%) of the respondents were between 15–50 years of age, while 24% were above 50 years of age, which shows that the majority are in the active working age (15–50 years), so that labor might not be a problem at least at household level in the study area.

All the respondents were farmers, self–employed in farming. Observation also showed that some were engaged in other work as a supplement to their farming engagement. From the survey it was also known that 32 % (N=7) of the respondents have less than 1 ha, 14% (N=3) have between 2.0 and 4.0 ha, and the remaining 54% (N=12) have greater than 4.0 ha of land. The range lies between 0.25 and 7 ha, and the average land holding was 1.9 ha. Growing cash crops, food crops, rearing animals and daily labor were their livelihood activities and sources of income.

**Table 1** Family size of the interviewed farmers in area.

| Family size | Count | % |
|---|---|---|
| 1–4 | 8 | 32% |
| 5–8 | 10 | 40% |
| >8 | 7 | 28% |

### Forest use and conservation

Ethiopia is ecologically very diverse country owing to the varied topographic features and altitudinal variations.[18] The country also experiences a very high variation in macro and micro–climatic conditions.[19] This varied ecological conditions enabled Ethiopia to inhabit various forest types,[20] which could deliver a wide range of social, economic and environmental benefits.[4]

In this preliminarily study, we found that local people depend on the forest resources for their livelihoods. The forest products used by the local people including coffee, timber, charcoal, firewood, wild fruits, traditional medicinal plants, honey, mushrooms, and bamboo (Table 2). The result is in line with that indicate the forest products

are crucial elements of rural communities' livelihoods. However, in this study all the respondents are directly dependent on the forests for their livelihood. Among the respondents, 40% (N=10) are directly dependent on the forests for income generation and 60% (N=15) of the respondents did not directly dependent on forests to generate income, except honey. This is probably due to the relatively good availability of land for farming and pasture for grazing.[15] The most commonly collected forest products by the local people are Coffee, timber, charcoal, firewood and honey (Table 2).

The concept of conservation and forest development is supported by 72% (N=18) of the respondents on the context of the resources use. In case of the forest use ban, 64% (N=16) of the respondents would oppose such a decision, the rest are ready to go in for alternatives. Thus, this result indicated that a new approach in the study area is needed to bring community–based forest management and conservation strategies.

**Table 2** Main forest products use by the local people and their perception towards use and conservation.

| Questions | Farmers response | |
|---|---|---|
| | Yes (%) | No (%) |
| 1. Benefits /products drive from the forest resources | | |
| 1.1. Coffee | 80 | 20 |
| 1.2. Timber | 48 | 52 |
| 1.3. Charcoal | 80 | 20 |
| 1.4. Firewood | 100 | – |
| 1.5. Wild fruits | 60 | – |
| 1.6. Medicine | 36 | 64 |
| 1.7. Honey | 84 | 16 |
| 1.8. Mushrooms | 12 | 82 |
| 1.9. Bamboo | 68 | 32 |
| 1.10. Fodder | 100 | – |
| 2. Mode of forest products use | | |
| 2.1. Purchased from market | 12 | 88 |
| 2.2. Own collection from the natural forest | 80 | 20 |
| 2.3. From own forest developed | 8 | 92 |
| 3. Agreement on the conservation and development of forest | 100 | – |
| 4. Mode of forest conservation and development | | |
| 4.1. Afforestation by state | 80 | 20 |
| 4.2. Social forestry | 12 | 88 |
| 4.1. Farmers | 48 | 52 |
| 5. Acceptance of alternatives for forest use in case it is ban | 64 | 36 |

### Factors influencing farmers' rubber tree planting activity

Among the respondents, about 68% expressed their willingness to plant rubber tree on their farm for natural rubber production. This might be associated with the socio–economic characteristics of the respondents and their view rubber tree would increase income, provide wood for lumber, and control of erosion. Those respondents (45%) planted rubber trees on their farm listed the following as encouraging factors for their engagement of rubber plantations:

a) The availability of larger area of land

b) Awareness on the economic importance of rubber tree

c) Training on the cultivation and production systems

d) Nearness to the resource such as seedlings

On the other hand, the negative aspects also mentioned by these farmers in that the rubber tree can cause hindrance in performing agricultural operations and ultimately damage crops. However, this might not be the case that rubber trees in agroforestry systems, which are not intensively managed, provide plentiful benefits.[21] Studies indicated that rubber agroforestry system is more productive and more economical.[22] In Thailand, for example, which is the largest rubber producer in the world; farmers use the agroforestry system to combine rubber with livestock, fruit, fisheries, rice and other crops.[21] Thus, the drawback provided by the respondent regarding the less performing of agricultural crops is due to lack of awareness of the practice in the study area, indicating rubber agroforestry practice is one of the intervention area in the study sites.

Although, the farmers have a positive attitude towards the rubber tree, about 32% of respondents indicated they have not planted rubber trees on their farmland. They provided less availability of land, lack of awareness on the rubber tree, unavailability of market for the products, long gestation period of the investment and lack of technical knowhow. Among these factors, the most frequently encountered response by the farmers' was less availability of land and long investment gestation period. This may an indication that tree planting is more likely among farmers who have large area of land for farming[23] as the availability of land is a major encouraging factor contributing towards rubber plantations in the study area. This indicated that the competition between trees and agricultural crops assumes importance if both compete for the same land: if the good agricultural land were put under forestry, then obviously crop production would be adversely affected.[24] On the other hand, the long gestation period of the rubber tree investment mentioned might be associated with the farmers' risk perception. Appropriate risk perception can be seen as a prerequisite for choosing an effective risk–coping strategy, because a farmer that is not aware of the risks faced on the investment is clearly unable to manage them effectively. Such kinds of problem were discussed, among others.[25] This indicated that risk aversion among the farmers in our study area could increases the chances of implementing farm level rubber planting. Thus, strategies to have sufficient knowledge by the farmers concerning the outcomes of certain actions on risk reduction have to be done, which probably results in willingness to plant rubber trees by farmers in the study area.

## Lesson learnt and conclusion

Rubber tree planting will be largely dependent on the factors which encourage or discourage planting on farmers' farmland. The results of this preliminarily study suggest that farmers in the study area are aware of the benefits associated with rubber trees. Furthermore, the attitudes towards rubber tree were mostly positive, meaning that farmers associated more positive than negative outcomes of rubber tree. However, land availability, market for the products,

gestation period of the investment, lack of technical knowhow and nearness to the resource such as seedlings are discouraging factors for the engagement of rubber plantations by farmers in the study area. Our result also indicated that the economic characteristics of the respondents have an impact towards rubber planting. Farmers who had more lands are involved in rubber plantation. Thus, taking all these as opportunities could help us to devise strategies, which probably intensify the farming system and results in willingness to plant rubber trees by farmers in the study area. The following lessons are made to assist rubber plantation in the study area:

a. In this study, the availability of land is reported as a major encouraging factor contributing towards the expansion of rubber trees in the study area. This suggested a need to adopt intensive rubber based agroforestry systems when farming is more directed towards subsistence level. According to Kenney–Lazarand[26] & Viswanathan[21] there are four main types of rubber agroforestry or mixed cropping systems. These include;

*I.* ***Rubber–food intercropping systems*****:** short–lived plants such as pineapples, chillies, bananas, sweet potatoes, long beans and maize, can be grown in between the rubber tree rows for up to three years before the trees shade out the crops.

*II.* ***Rubber–fruit crop system*****:** fruit tree species can be grown in between the rubber tree rows throughout the whole productive period, as the fruit trees grow up with the rubber trees and thus continue to gain sunlight.

*III.* ***Rubber–timber species systems*****:** timber species like *Azadirachta indica* can be grown in between the rubber tree rows throughout the life of the rubber trees.

*IV.* ***Rubber–livestock farming systems*****:** cows, poultry and sheep can be raised in the plantations once the trees are older than 18 months. An average of 6–8 livestock can be raised per hectare.

b. Awareness creation on the market, with the alternatives; market information and market link, for the rubber product is an important factor to consider and also the economic benefits of rubber products in the country need to consider.

c. There is a need to organize rubber tree planters in groups such as co–operatives to participate in the wider plantation and good marketing infrastructure and reliable information system should be developed mainly to address the issue of lack of awareness on the part of consumers of price and competitiveness of rubber products

d. Further researches on the economic benefits of intercropping annual and perennial crops with rubber tree to diversify the income from rubber tree plantations to maximize acceptance the required acceptance by the farmers.

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## Conflict of interest

Author declares there is no conflict of interest.

## References

1. Bekele M. *Forest Plantations and Woodlots in Ethiopia*. Kenya: African Forest Forum; 2011. p. 1–56.
2. Moges Y, Eshetu Z, Nune S. *Ethiopian forest resources: current status and future management options in view of access to carbon finances*. Ethiopia: A report submited to Ethiopian climate resarch and networking and UNDP; 2010.
3. Tesfaye MA, Bravo F, Bravo–Oviedo A. Alternative silvicultural stand density management options for Chilimo dry afro–montane mixed natural uneven–aged forest using species proportion in Central Highlands, Ethiopia. *European Journal of Forest Research.* 2016;135(5):827–838.
4. Thomas I, Bekele M. *Role of planted forests and trees outside forests in sustainable forest management in the republic of Ethiopia*. Italy: FAO; 2003.
5. Gezahgne A. *Diseases of exotic plantation forestry trees in Ethiopia*. South Africa: University of Pretoria Pretoria; 2003. p. 1–16.
6. Lemenih M, Bekele M. *Participatory forest management best practices, lesson learnt and challenges encountered: The Ethiopian and Tanzanian experiences*. Ethiopia; Farm Africa; 2008. p. 1–2.
7. Asnake A. *Growth performance and economics of growing Eucalyptus camaldulensis by smallholder farmers of Amhara Region: the case of Gonder Zuria District, North Gonder, Ethiopia*. Ethiopia: Wondo Genet College of Forestry; 2002.
8. Kebebew Z. *Profitability and household income contribution of growing Eucalyptus globulus (Labill.) to smallholder farmers: the case of the Central Highlands of Oromia, Ethiopia*. Ethiopia: Wondo Genet College of Forestry; 2002.
9. Mesfin D. *Economic analysis of Eucalyptus globulus plantation in the former Dessie Fuelwood Project, South Wollo, Ethiopia*. Ethiopia: Wondo Genet College of Forestry; 2002.
10. Dejene T, Oria–de–Rueda JA, Martín–Pinto P. Wild mushrooms in Ethiopia: a review and synthesis for future perspective. *Forest Systems.* 2017;26(1):1–7.
11. Barraud S, Miramond M, Le gauffre P. A posteriori analysis of the relevance of a multicriteria decision–aid method for best management practices choice in urban storm drainage. *Urban Water Journal.* 2004;1(3):209–216.
12. Barraud S, Azzout Y, Cres FN, et al. Selection aid of alternative techniques in urban storm drainage proposition of an expert system. *Water Science and Technology.* 1999;39(4):241–248.
13. Clément–Demange A. *Convention IFC / Cirad*. Côte d'Ivoire; Etude des clones d'hévéa; 2007.
14. Compagnon P. Le Caoutchouc Naturel. Biologie, Culture, Production. Maisonneuve et Larose: Paris, France. Delabarre M, Serier J–B. 1995. L'hévéa. France: Maisonneuve & Larose; 1986.
15. Belay H. Drivers of Land Use/Land Cover Change in the Guraferda District of Bench–Maji Zone, Southwestern Ethiopia. *Research & Reviews: Journal of Ecology and Environmental Sciences.* 2018;6(1):52–62
16. Sue E. *Important bird areas of Ethiopia: A first inventory*. Ethiopia: Ethiopian Wildlife and Natural History Society; 1996. p. 294–300.
17. David S. Household economy and traditional agroforestry system in western Kenya. *Agriculture and Human Values.* 1997;14(2):169–179.
18. Bongers F, Tenngkeit T. Degraded forests in Eastern Africa: Introduction. In: Bongers F, Tenningkeit T, editors. *Degraded Forests in East Africa: Management and Restoration*. UK: Earthscan Ltd; 2010. p. 1–18.
19. Demissew S, Nordal I. *Aloes and Lilies of Ethiopia and Eritrea*. Ethiopia; Shama Books; 2010.

20. Tewolde E. Diversity of Ethiopian Flora. In: Engels JMM, Hawkes JG, Worede M, editors. *Plant Genetic Resources of Ethiopia*. UK: Cambridge University Press; 1991. p. 75–81.

21. Viswanathan PK. Emerging Smallholder Rubber Farming Systems in India and Thailand: A Comparative Economic Analysis. *Asian Journal of Agriculture and Development.* 2008;5(2):1–20.

22. Food and Agriculture Organization of the United Nations (FAO). Case Study of Tropical Forest Plantations in Malaysia. Forest Plantations Working Paper No. 23. Italy: Forest Resources Division, FAO; 2002.

23. Zubair M, Garfoth C. Farm level tree planting in Pakistan: the role of farmers' perceptions and attitudes. *Agroforestry systems.* 2006;66(3):217–229.

24. Sharma K, Ballabh V, Pandey A. An analysis of farm forety in Gujarat. In: Saxena NC, Ballabh V, editors. *Farm Forestry in South Asia*. England: Sag publications; 1995.

25. Pennings J, Leuthold R. The role of farmers' behavioral attitudes and heterogeneity in futures contracts usage. *American Journal of Agricultural Economics.* 2000;82(4):908–919.

26. Kenney–Lazar M. *Assessment of governance mechanisms, livelihood outcomes and incentive instruments for green rubber in the Lao PDR*. Indonesia: CIFOR; 2016.

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