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Community Opinion, Marketing and Current Debates on *Eucalyptus* in Huruta District, Arsi Zone of Oromia Region, Ethiopia

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Abstract

The fast growth rate of *Eucalyptus* to provide possible products for the livelihood consumption and for the market has over won the continuing planting of the species irrespective of the policy resistant from the policy makers in Ethiopia. Until the end of the 1990s, the main tree seedling produced in government nurseries was *Eucalyptus,* but starting from the early 2000s, production of *Eucalyptus* in government nurseries has been given up. On the contrary, *Eucalyptus* gives some attention for concern in the context of diversified plantations by smallholder farmers, because owing to its importance to the household livelihood strategy by providing income and wood products for household consumption. With a large proportion of the world population in general, and of developing countries such as Ethiopia in particular, depending on wood for cooking and heating, the economic importance of *Eucalyptus* is immense. *Eucalyptus* outputs have significant impacts of change on rural livelihoods. The objective of the study is to review existing literature on *Eucalyptus* from science, policy, and farmers' perspectives and to assess the local market value and commercialization of *Eucalyptus* by farmers. In this study it was found that *Eucalyptus* wood products contributes 78 % of the local market economy for firewood, 100 % each for construction poles and posts, 20 % for charcoal and 93 % for the four wood product types at Huruta town which amounts a total of birr 99,867 ($ 12,484) in two weeks in 2005 markets and which is $15,189 when discounted at 4 % interest rate at the current market. Farmers have remarked that planting fast growing trees like *Eucalyptus* is the best alternative strategy to minimize the existing firewood scarcity in the locality rather than the use of cow dung and crop residues. The three extensive benefits farmers can obtain if they choose to grow *Eucalyptus* as a commercial tree on their land are (i) diversifying their farm income by growing it as a crop; (ii) increasing the productivity of their existing farm endeavour; and (iii) improving the sustainability of their current farming system.

Key words: *Eucalyptus,* market, livelihood, commercialization, controversy, wood source scarcity

Introduction

Wood shortage for firewood and construction in the highlands of Ethiopia was as old as 19th century. Intrigued by wood products scarcity and tree-less landscape surrounding the then newly established capital, Addis Ababa, Minilik II was forced to introduce a rather fast growing species of *Eucalyptus* in 1895. Since then, the species has expanded into all corners of the country. It also pioneered in the plantation development of the country. Currently, it is common to observe at least few eucalypt trees at the homesteads of most farmers and urban communities in Ethiopia (FAO 2009, Mekonnen *et a*l. 2007, Turnbull 1999). It has supplemented woods from natural forests that do not provide the desired quantity and quality of woods (Zobel 1987). The indigenous tree species of Ethiopia such as *Juniperus procera, Podocarpus afrocarpus, Cordia africana, Hagenia abyssinica,* and *Olea europhea* had become endangered due to the overexploitation of these species for various services and products. Recently *Eucalyptus* has been replacing the commercial values of wood products from other tree species. The fast growth rate of *Eucalyptus* to provide possible products for consumption and market has over won the continuing planting of the species irrespective of the resistance from the policy makers and environmentalists. Eucalypts planting on degraded lands at proper density and management improves the wood product scarcity for household consumption as well as for market and keep the balance of the environment (Liu *and Li* 2010, Mekonnen *et al*. 2007). The study by Mekonnen *et al*. (2007) has found that planting of *Eucalyptus* by poor households could contribute about 28 % of household's income and more than 90 % of wood source for household consumption in the Huruta district. In another study (Selamyihun 2004) it was also reported that *Eucalyptus* has the potential to satisfy the ever increasing fuel wood demand in Ethiopia without inducing a major land use shift.

The objectives of the study were to review and examine available literature, to assess claims from both the supporters and opponents of *Eucalyptus.* Here, the examination of the history and divergence of *Eucalyptus* in Ethiopia would be considered, wider criticisms would be explored in reference to some scientific evidences from Ethiopia and around the world. The role *Eucalyptus* can play in bridging the gap between demand - supply for energy and construction; divided views on the role of *Eucalyptus* were assessed from literature and from field study. The potential for increasing income for the farmers and commercializing it by them and market value assessments were undertaken.

The Study Area

The study area of Huruta district is about 175 km southeast of Addis Ababa. The rainfall in the study area is bimodal. The longer rainy season extends from June to September, which supports the major crop production. The shorter rainy season comes in March and April, and allows minor crop production. Main livelihood system is mixed agriculture with the main smallholder subsistence livestock are

cattle, Shewats, and donkey; crops are wheat, barley, and bean; and the principal smallholder cash crop is onion.

The physiographic characteristics of the study area include altitude 1800–2500 m, annual rainfall 800–1000 mm, mean annual temperature 19 ºC, mean maximum annual temperature 27 ºC and mean minimum annual temperature 10 ºC. According to information from the Woreda Office of Agriculture (2005), much of the land in the Woreda is used for crop production (70.9%). Rangelands, forestlands, and others (including settlements) account for 16.9%, 4.5% and 7.7%, respectively. About 84.9% of the forest area is natural woodlands with acacias as the main species, and the remaining part is plantation forest, in which *Eucalyptus* contributes more than 85%. According to the same source, the wereda's agro-ecological configuration consists of lowland (7%), middle altitude (58%), and highland (35%).

Information Collection

A detailed review and survey has been conducted using different published literatures and web-based websites. Here both the negative and positive opinions were assessed from different perspectives. During field assessment 65 randomly selected farmers, who have *Eucalyptus* trees, were interviewed to know their opinion why they plant *Eucalyptus* and the strategy they took in case for wood shortage in the locality, especially for fuel wood and the income generation potential of *Eucalyptus* wood products. A market assessment was made to recognize the current and potential market condition of *Eucalyptus* wood products by asking 30 end-use buyers and sellers. Inflow registration of different wood products to town was made at four main entrances to be acquainted with the market economies from eucalypt and other species to the local market. The data collected was analyzed qualitatively by interpreting it being from the spot with group discussion and quantitatively by using SPSS-V 10 and Microsoft excel.

Findings

History and divergence of *Eucalyptus* in Ethiopia

Intrigued by wood products scarcity and tree-less landscape surrounding the then newly established capital, Addis Ababa, Minilik II was forced to introduce a rather fast growing species of *Eucalyptus* in 1895. *Eucalyptus* is increasing in importance globally**,** because many species of eucalypts have the ability to improve conditions in treeless areas. In Ethiopia, its divergence had increased in 1980s and then slows down (Fig.1). In many places, eucalypt*s* have helped to raise people's living standard by providing several end uses. In addition, the growing of eucalypts was financially more profitable, with a considerable positive net present value, compared to the alternative agricultural crops (Tesfaye 1997, Daba 1998, Asaye 2002, Demamu 2002, Zerihun 2002). Willingly, people grow and cut eucalypts to meet the needs of their families, without having to import goods from elsewhere. *Eucalyptus* gives some attention for concern in the context of diversified

plantations, because owing to its importance to the household livelihood strategy by providing income and wood for household consumption.

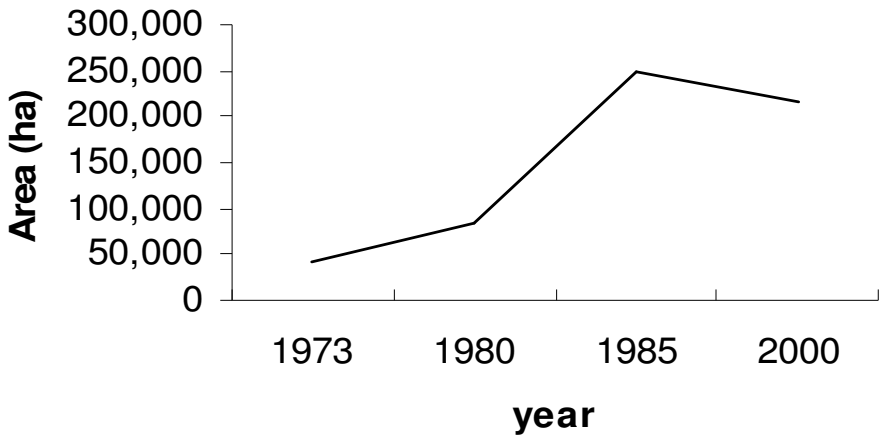

Figure 1: The trend of *Eucalyptus* plantation in Ethiopia (Adapted from FAO 1979, 1988, 1996, Davidson 1989 and Eldridge *et al.* 1997)

Eucalyptus from science and policy perspectives

Eucalyptus plantation has offered both negative and positive opinions from around the world in general and in Ethiopia too. It has negative impacts when it is planted on wrong sites, done by replacement of existing natural forests coupled with poor management and silviculture. However, it would have positive impacts, which outweigh the negative ones when it is planted on the right sites that are marginal and degraded with good management planning and proper tending. In this case it could help to fulfil the need of wood for energy, construction, income and farm implements plus an enhancing effect on environment (Amanuel 1996, Daba 1998, FAO 1988, Solomon 1999, Jagger and Pender 2000) – *Table 1 and 2*. The gap between supporters and opponents of *Eucalyptus* can be considered as driver, because the opposition between the various competing interests directly structures the social and policy discussion that is needed to find solutions (Buttoud 2009).

Table 1: Negative arguments on *Eucalyptus*

Negative arguments	Sources
• *Eucalyptus* trees compete for water and other nutrients with crops in their vicinity, and deprive of healthy growth of crops • *Eucalyptus spp* need plenty of water, and drain away sub-soil water and cause water scarcity • *Eucalyptus* trees suppress undergrowth and cause degradation of land • *Eucalyptus* trees do not support wildlife • "*Eucalyptus* is nothing less than ecological fascism, which can be described as a species that destroys the hydrological balance, impoverishes the soil of its nutrients, and reduces biodiversity." • "*Eucalyptus* is not only a soil degrader but also a crop destroyer, a depriver of fodder, flattener of natural forests, destroyer of security, creator of poverty and dependence, and killer of knowledge of future generations about how to live on one hand and livelihood and environment on the other."	Shiva and Bandyopadhyay 1985; Poore and Fries 1985; FAO 1988, 1992, 1996; IUCN 1992; Evans 1992; Lisanework 2000; El-Khawas and Sheheta 2005; Lohmann (1990) cited in Turnbull (1999)

Table 2: Positive arguments on *Eucalyptus*

Aspects	Positive arguments	Sources
Water loss	Transpiration rates from *Eucalyptus* species are similar to other tree species	Lima 2004; ARACRUZ 2004
	The intercepted water loss from *Eucalyptus* is relatively lower than that for other tree species	Amanuel 1996; ARACRUZ 2004
	In India and China, eucalypts consumed less water per unit of biomass produced than other species.	FAO 1988; Evans 1992; Davidson 1989; Bai 1996
Biodiversity impact	*Eucalyptus* acts as one of the best "nurse trees" for fostering native plants regeneration in Ethiopia and elsewhere	Feyera *et al.* 2002 ; Eshetu 2002 ; Mulugeta 2004
	In Malaysia, border plantation of eucalypts has increased wildlife diversity by providing additional habitat types not found in the natural forest.	Sawyer (1993)
	In India, the number of animals in Rannibennur Blackbuck Sanctuary was increased by planting eucalypts.	FAO 1988; Soni and Vasistha 1991
	Light, moisture and minerals under the canopy of *Eucalyptus* are adequate to support other growth	Davidson 1989; Amanuel 1996
	In Ethiopia, several indigenous species including *Juniperus procera*, *Podocarpus afrocarpus, and Hagenia abyssinica* grow in *Eucalyptus* plantations.	Amanuel 1996; Kidane 1998; Pukkala and Pohjonen 1987; Feyera 1998; Eshetu 2002
	In China and Brazil, species diversity of birds, animals and insects was found to increase in *Eucalyptus* plantations	Bai 1996; Poore and Fries 1985; ARACRUZ 2004
	Eucalyptus might be used to reduce eutrophication	Poores and Fries 1985

Effect on Soil nutrients	*Eucalyptus* was found to have beneficial effects on soil structure and to improve soil fertility on treeless site.	FAO 1988; Daping *et al* 1997; Zerfu 2002; Cossalter *and Pye-Smith* 2003
	In China and Ethiopia, soil organic matter content increased in *Eucalyptus* plantations where there was no gathering of dead leaves and branches by people.	Bai 1996; Zerfu 2002
	Eucalyptus is a species with low nutrient demands	Amanuel (1996)
Yield and allelopathy	In India and Ethiopia, farmers plant eucalypts along farm boundaries, because the elongated crowns and vertical roots do not noticeably reduce crop yields.	FAO 1988; Selamyihun 2004; Mekonnen *et al.*2007
	Sorghum and millet crops are found to grow well beneath *Eucalyptus* plantation in Senegal	Baumer (1990)
	In Thailand and Bangladesh, the use of *Eucalyptus camaldulensis* in agroforestry is fairly common.	Evans 1992; Poore and Fries 1985; Ahmed *et al.* 2007
	The effects of *Eucalyptus* on the microclimate are similar to those of other evergreen plantation species	FAO (1988)
Calorific value and timber quality	*Eucalyptus* is found to have a comparable calorific value with that of other species	Eckholm *et al*. 1984; Mulugeta and Tsegaye 2005
	In Ethiopia, *Eucalyptus* has been identified to be used as sawn boards and proved to have high quality timber.	Tsegaye (1996)
	E. globulus wood burns freely, leaving little ash, and carbonizes easily, making good charcoal.	Duke 1983; Mekonnen *et* al. 2007

Role of *Eucalyptus*

With a large proportion of the world population in general, and of developing countries such as Ethiopia in particular, depending on wood for cooking and heating, the economic importance of *Eucalyptus* is immense. Even if it is difficult to obtain year-to-year cash income from tree cultivation in general, the average cash income from *Eucalyptus* over the rotation period is greater than that from other agricultural crops (Niskane and Saastamoinen 1996, Daba 1998) Table (3). Moreover, farmers' willingness to grow trees on their farms is a function of their attitudes towards the advantages and disadvantages of growing trees, their perception of the opinions of salient referents and factors that encourage and discourage farm level tree planting (Zubair and Garforth 2006).

Table 3: Comparative analysis of profitability of *Eucalyptus* plantation and cassava cultivation in Thailand

Management options (15 years period)	Profitability per year per hectare (US Dollars)			
	Economic	Socio-economic	Environmental economic	Financial
Industrial plantation	1062	1103	1529	931
Community-based plantation	718	915	1026	410
Agro-forestry	819	956	901	106
Cassava cultivation	56	186	-219	-511

Source: Niskane and Saastamoinen 1996

In Ethiopia, Daba (1998) in his study on the financial return of small-scale *Eucalyptus globulus* plantation against other agricultural production options at discount rate of 10%, found that NPV ha^{-1} yr^{-1} from agricultural options ranged

from Birr 97 to 7,579, whereas that from *Eucalyptus* plantations ranged from Birr 16,151 to 74,966. A study made in Tigray (Ethiopia) had come with the conclusion that a woodlot of average-sized *Eucalyptus* trees would be worth more than 80,000 Ethiopian Birr/ha, or $ 10,000, and much more in places where trees are scarce. With more than 70 ha of woodlots per *tabia*[6], this represents a substantial contribution to the wealth of communities in Tigray (Gebremedhin *et al*. 2000). Similarly, in India, it was found that an investment of intercropping *Eucalyptus* and cotton that cost $ 1,700 ha^{-1} in the first year had gained a total return of $ 5,900 ha^{-1} after five years (FAO 1996).

Eucalyptus from policy perspective

As Janz and Persoon (2002) expressed, there are serious shortcomings in the supply and use of information needed for policy-making in the forestry sectors, particularly those of developing countries. It should be underlined that, for a successful forest policy process, it is often necessary to know, among several other things, more about plantations and their role for rural communities. There is a general prejudice against forestry, particularly against fast-growing trees plantation, as compared to agriculture. To support this, for example, the conversion to forestry plantations of natural forests in the tropics, which accounts for 6–7% of the loss of natural forests in the tropics**,** has been more criticized than conversion to agriculture and industrial development, which account for 93–94% of that loss (Cossalter and Pye-Smith 2003). The current policy issue regarding *Eucalyptus* planting in Ethiopia supports the issues specified under table 1. There is no encouraging concern in the country to raise *Eucalyptus* seedlings from government nurseries and distribute them for smallholder farmers. Moreover, the previously established plantations around Addis Ababa have been given to floriculture investors and being uprooted. The views of policy makers are largely less favourable to *Eucalyptus.* Farmers are aware of the negative impacts of *Eucalyptus.* They attempt to manage it through proper planting site selection and tree/stand management. Most farmers raise seedlings from their own nurseries and commercializing it to the local market for wood products. Sale of *Eucalyptus* wood provides sole income for the poor households. Owning to this importance, the policy practice of discouraging and in some cases banning planting of *Eucalyptus* by farmers need rethinking from the side of the policy makers. Taking into account the dwindling natural forests in Ethiopia, of which the area *per capita* is less than one-tenth of a hectare (FAO 2005); it would be necessary to pass legislation to require that almost all charcoal, poles and firewood be derived from plantations of fast-growing species such as *Eucalyptus,* to prevent further loss of natural forests (Turnbull 1999).

Eucalyptus species have been accepted as suitable for shelterbelts and for admixture with agricultural crops in Columbia, Tunisia, Senegal, Nigeria, Cameroon, Pakistan, India, China, Sri Lanka, and Bangladesh (Sunder 1993, Ahmed *et al*. 2007). The effects of eucalypt on the associated crop are not different from those of any other kind of trees when planted in shelterbelts and agroforestry

[6] *The lowest administrative division in the region which is equivalent to mean kebele in other regions of Ethiopia*

(Poore and Fries 1985). There is a need for care when comparing policy and actual practice, because stated intentions in policy documents sometimes bear no relation with how policies are interpreted and applied (Sithole 2002). In another concern, interventions to support market prices for the products of tree growing and to ensure producers' access to markets may be as effective as or more effective than subsidies. Agricultural policies should be complementary to tree growing. Subsidies for credit, price supports and incentives, including measures affecting land and tree tenure, should be seen in parallel to both agricultural crops and tree growing like eucalypts by farmers in order to avoid policy measures that likely to distort decisions against one at the expense of the other (FAO 1991).

Farmers' opinion and market assessments

Farmers in the Huruta district are planting *Eucalyptus* trees, perhaps not the species that the government would prefer. Farmers have suggested what trees they want, and have *Eucalyptus* trees within their farming systems for specific purposes (marketing poles or other products). In the field assessment from the sixty-five interviewed farmers in the district, about 80 % of them have planted *Eucalyptus* while only 15 % of the farmers have planted other species. Farmers select tree species for planting according to their service and product functions (Table 4).

Table 4: Farmers' priority to plant a tree based on the function it provides

What a tree could provide?	Weight of farmers' priority to plant
Fodder	3
Windbreak	1
Building materials and farm implements	5
Income generation	6
Live fence	3
Soil improvement and protection	2
Fuel wood and charcoal	4
Food/ fruit	6
Shade	2
Timber products	3
Non-timber products	2
Combination of two or more of the above	6

Note: 6 indicate six times more weight than 1, and functions with equal weight means equal importance to farmers

Eucalyptus wood products contribute 78% of the local market economy for firewood, 100 % each for construction poles and posts, 20 % for charcoal and 93 % for the four wood product types which amounts a total of birr 99,867 in two weeks in 2005 markets and which is $15,189 when discounted at 4 % interest rate at the current market (2010) (Table 5). With 52 weeks per *year*, this represents a sizeable input to the affluence of smallholder farmers in Huruta district. It was also reported that *Eucalyptus* contribute 92 %, 74 %, 85 %, 40 %, 83 % and 91 % of construction poles, timber, firewood, charcoal, posts and farm implements wood sources for rural livelihoods (Mekonnen *et al*. 2007). Farmers pointed out that during the Dergue regime (pre-1991) having *Eucalyptus* plantation was considered

as 'live bank account', because farmers sell it during high-income needs or had been guaranteed as collateral to take loan from bank.

Table 5: Wood products inflow rates to Huruta town for two weeks and estimation of their market value (2005)

Inflow type	Unit	Amount by source		Unit price per source		Total price per source	
		eucalypt	others	eucalypt	others	eucalypt	others
Firewood	Kg	51,912	17,941	0.26	0.215	13,497	3,857
Construction poles	M^3	314.8	0	250	-	78,700	-
Splitted posts	M^3	34.35	0	200	-	6,870	-
Charcoal	Kg	3,200	12,200	0.25	0.30	800	3,660
					Total	**99,867**	**7,517**

Note: the unit for the price is Birr (8 birr = 1 USD In 2005)

The market value assessment for *Eucalyptus* end uses had shown a high market value in the local market. This is also true for the national market since there is a high potential and the market condition is unstable and unsaturated (Tables 6 and 7). However, some factors influence income and profitability of *Eucalyptus* tree commercialization by farmers. Those factors are technical, financial and awareness support; market mechanism; cash flow gains (wood price) and non-income gains (environmental).

Table 6: Market value assessment for *Eucalyptus* end-uses at Huruta town (2005)

End use type	Market value	
	During the assessment year	Potential to the consecutive years
Firewood	High	High
Construction poles	High	High
Posts	High	High
Timber	Medium	High
Essential oils	Low	Medium
Charcoal	Medium	high

If farmers choose to grow *Eucalyptus* as a commercial tree on their land, they can get the following benefits:

- diversifying their farm income by growing it as a crop;
- increasing the productivity of their existing farm endeavour; and
- Improving the sustainability of their current farming system

Table 7*:* Market survey results for *Eucalyptus* end-uses at Huruta town (2005)

End use type	Market conditions			
	Supply	Demand	Stability	Saturation
Firewood	Medium	High	Medium	Low
Construction poles	Low	High	Low	Low
Posts	Medium	Medium	Medium	Medium
Timber	Low	High	Very low	Very low
Essential oils	Nil	Nil	Nil	Nil
Charcoal	Low	High	Very low	Very low

Farmers have expressed that the more accessible and available sources of trees and forest products in the nearby areas, the least interest have been developed in planting trees in the farming systems. Farmers at the other corner of the availability extreme in contrast have emphasized as they have the highest interest in tree planting in order to close the gap between wood demand and supply. In addition, the farmers have remarked that planting fast growing trees like *Eucalyptus* is the best alternative strategy to minimize the existing firewood scarcity in the locality rather than the use of cow dung and crop residues. Fuel wood scarcity reduces the quality of the diet if women have to cook for less time; in some instances, the food may be undercooked, in others the consumption of reheated foods may increase, by which undercooking and reheating leftovers can have a serious impact on disease incidence. In this study, it was understood that *Eucalyptus* can play a paramount role in supplying fuel wood to smallholder households in both rural and urban communities.

From the market assessment, study it was found that price of poles and posts for construction is higher in the dry season (high demand) as there are more house and fence construction, while the price of fuel wood is higher during the wet season. The market chain that was found from the market assessment for construction pole product began with the collection of poles through farmers who collect pole from own farms and woodlots, and sell their products to regular purchasers of residential and commercial consumers or individual retailers. And the commercial consumers purchase poles directly from farmers and local market and sold it to other commercial consumers of bigger towns such as Asella, Nazareth, and Addis Ababa (Figure 2 and table 8).

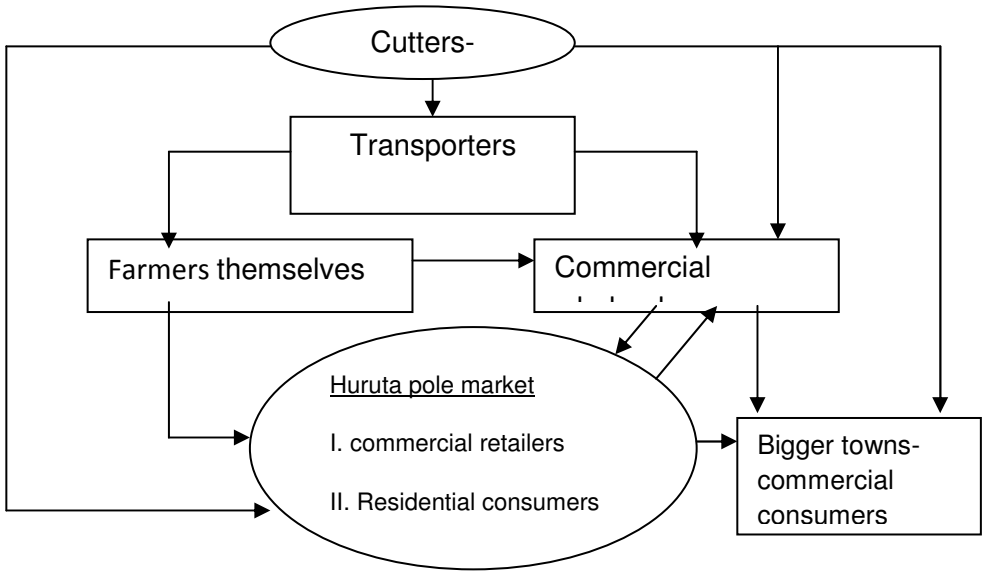

Figure 2: Market chain flow diagram for poles at Huruta.

Table 8: The marketing margin for a single *Eucalyptus* pole of size 5 to 8 cm in diameter and a height of about 7 m in the supply chain from Huruta to Addis Ababa (2005)

Farm gate	Cost (Birr)	Benefit (Birr)	Margin (Birr)
▪ Labour cost	1.50		
▪ Management cost	1.00		
▪ Total cost	2.50		
▪ Selling price		4.00	
Margin			1.50
Huruta town			
▪ Purchase	4.00		
▪ Transport and labour cost	0.50		
▪ Total cost	4.50		
▪ Selling price		6.00	1.50
Margin			
Nazareth city			
▪ Purchase	6.00		
▪ Transport and labour cost	1.50		
▪ Total cost	7.50		
▪ Selling price		10.00	
Margin			2.50
Addis Ababa city			
▪ Purchase	10.00		
▪ Transport and labour cost	2.00		
▪ Total cost	12.00		
▪ Selling price		15.00	
Margin			3.00
Total marketing margin			**8.50**

Conclusion and Recommendation

Eucalyptus is seen as an opportunity by its advocators, and a threat by environmentalists and policy makers. It is advocated as it grows well on poor soils and provides economic benefit to the farmers within a short period. On the other hand, it is criticized because of its detrimental effect on biodiversity and negative effect on water and soil nutrient. This could obscure the role the genus plays in the present day rural reality of wood scarcity in Ethiopia. Despite a drive for development and modernization, Ethiopia still maintains a largely biomass dependent society. Because of a growing population, and increased degradation of natural forest from agricultural and grazing land demands, it is imperative that local biomass needs are met from the existing natural forests. The policy practice of discouraging and in some cases banning planting of *Eucalyptus* by farmers need rethinking from the side of the policy makers. It was learnt that farmers have commercializing *Eucalyptus* wood products such as construction poles, posts, and fuel wood at the local market besides their own consumption. By doing this, the species helped in farmers' livelihood improvement. To this end, therefore, farmers should be certified for its planting in the way that is friendly to the environment and commercialize it to the local market in the short term and to the national market in the end.

To make concrete policy and management decision with regard to *Eucalyptus,* basic information is needed on the following areas:

- the importance of growing eucalypt to fulfil the growing demand for wood products;
- Socio- economic dimensions of growing and marketing *Eucalyptus*;
- In depth understanding about the positive and negative environmental effects of *Eucalyptus*;
- Information on the opportunities, limitations and acceptance of mixed planting of *Eucalyptus* with other native species;
- Information on the growth characteristics of different species of *Eucalyptus*;
- Information on nutrient distribution, nutrient cycling and water condition in *Eucalyptus* plantation;
- Information on the site factors that affects the conditions of *Eucalyptus*; and
- Information to establish whether much of the negative effects are due to species or human management errors.

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