

Contribution Of Eucalyptus Tree Farming For Rural Livelihood In Eza Wereda, Ethiopia

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Eucalyptus tree can produce large volumes of poles for construction and wood products for fuel wood and construction in a short time without requiring much attention for management. Particularly the advantage is more meaningful for small landholders like those of the study area. The study assessed causes of eucalyptus tree expansion, farming practices, perceived negative ecological impacts and its contribution to the rural livelihood in three selected KPAs (Kebele Peasant Administrations) namely, Zigba Boto (kolla), Shebraden (woinadega) and Koter Gedra (dega). In each selected KPAs a total of 180 households were selected by using purposive systematic sampling techniques. Direct observations, discussions with key informants and focus groups were undertaken by the researcher. The required data were also collected using schedule through structured open and close-ended questionnaires. The study revealed that households in the study area are benefiting from eucalyptus tree plantation. Fuel wood, construction, and financial benefits are the main reasons of farmers in engaging with this farming activity. Thus, 3% and 60% of the surveyed farmers have ranked eucalyptus tree as first and second source of their income respectively. Hence, eucalyptus tree has dominated all other food crops, chat, and coffee next to enset. Households became beneficiaries from sale of eucalyptus poles of different sizes (small, medium, and big) upon emergencies of cash shortage. Farmers prefer to sell eucalyptus products when there is a fall of prices of grain to sale it latter at high price. In the study area, Eza Wereda, Gurage zone, the decision to grow eucalyptus is predominantly engendered by the need to meet household wood demands and other benefits. Most part of household level fuel and construction wood demand is met by own eucalypt wood lots. Fuel wood forms not only the major source of energy for cooking and lighting but it is also an indispensable source of heating for households particularly during the cold seasons. Moreover in the study area eucalyptus is the second most preferred wood for roof pillars (some farmers rated first) and underground construction works, next to juniperus procera. Eucalyptus wood also lends itself to many other uses in house construction. Fencing along farm and individual plot boundaries are commonly done with eucalypt branches and twigs. Eucalypt logs are also commonly employed as a heavy duty bridge on most water streams. Farmers intentionally plant eucalypt seedlings mainly for economic and social services. Eucalypt seedlings are planted on degraded and erosion prone grounds such as gully banks and inside gullies to reduce landslide and soil erosion.

Key words: Eucalyptus tree farming, livelihood/income diversification, fuel wood, construction, social merit, time saving, Eucalyptus tree poles

Introduction

More and more people are placing ever greater demands on the world's forest for wood and non-wood products. Diminishing natural forests resources are being compensated by rapid expansion of the use of planted exotic trees worldwide (Davidson, 1995). There is a multitude of possible uses to which eucalyptus can be put. A paper by Chinese scientist to the 46th annual conference of Appita in Launceston (Yongfang, 1992) gave an insight into products derived from Eucalyptus. He mentioned construction timbers, furniture, farming tools, transmission poles, railroad sleepers, fuel wood, honey, pulp and paper, rayon, fiberboard and plywood. Then he described some less conventional uses such as essential oils, plant growth regulators, tannin extracts, industrial chemical additives, adhesives, fodder additives, and

fabrics (derivatives of rayon).

It is unthinkable to get other tree species, be it indigenous or exotic, that can substitute eucalyptus in its full range of benefits it provides in near seeable future. The heating value of eucalyptus wood (stem and branches) is 19 MJkg^{-1} (Frederic et. al., 1985) while that of cow dung is 13.8 MJkg^{-1} (Newcomb, 1989). Therefore, 0.73 kg Eucalyptus wood can supply the same amount of energy as 1 k.g. of dung (Selamyihun, 2004). The wood harvest from 8 year old eucalypt boundaries planted on a hectare of land would have a potential to replace 12 ton of dung which could bring back 176 kg N, 156 kg P and 60 kg k organic fertilizer to farming system. Eucalypt boundaries can produce large volume of timber and wood products within a short time without requiring a major shift in land use. This has advantages for land constrained smallholder farmers who cannot spare land for block plantations (Selamyihun, 2004). As stated by Jagger and Pender (2003), small holders benefit from tree planting by producing timber and non-timber forest products for household consumption as well as for sale and both subsistence. The sale of forest products increases household income, improves their livelihood by contributing to diversifying farming systems and rising farm incomes and thereby increasing food security particularly in less favored areas of Ethiopia. Moreover, the provision of woody biomass by planting fast growing tree species such as eucalyptus over next 10-15 years could free up dung and crop residues for use in agricultural production and thus reduce land degradation (Holden, et. al., 2003; Jagger and Pender, 2003). Woldeamlak (2003) in his study (North West Highland Ethiopia, Chemoga Watershed) stated that fuel wood and cattle dung accounted for nearly 100% of the domestic energy consumption. Of which cattle dung contributing 34% of the total. Fuel wood and dung combined, per capita bio-fuel consumption was estimated at 511 kg/year, but with variations in the villages and socio-economic groups. Tree plantation at household level considerably reduces the time household member mostly women and children travel to collect fuel wood for their household use (Tenaw, 2007). It should be noted from the outset that any cash generation activity of the households from sales of farm products is part of subsistence livelihood strategy rather than pursuing of market oriented economy. Eucalyptus poles are highly regarded among certain households as an important source of cash income. It is often viewed as a living bank account that can be liquidated upon emergencies. Hence, in Ethiopia, the other alternative to fulfill such multidimensional importance, instead of growing eucalyptus seems unlikely at the present situation. Thus, this study identified eucalyptus farming and its impacts on the livelihood of households in Eza Wereda, Gurage Zone, Ethiopia.

Income Diversification

For most areas of Gurageland including the study area, Eza wereda, enset has been the main source of support of households' food consumption and this will continue so in the future. Due to high population pressure, getting other cash crops other than enset to ensure food security of the study area seems unlikely. In West Gurageland, crop production is integrated with livestock raising and the agricultural system is of a mixed type (Muluneh 2003). Livestock are equally important, not only used as source of food and social security but also as important ingredients in farm inputs and are used as a source of work force and for transportation. However, income generated from eucalypt woods are becoming equally valuable or in some case more than crop production such as cereals, pulses, fruits and vegetables .

Table 1 Households' response on income generated (200-5000 ETB) from different Sources for six consecutive years (2003-2008)

Years	Number of respondents					
	Eucalyptus	%	Food Crops	%	Off-farm Activities	%
2003	180	100	163	91	157	87
2004	180	100	167	93	170	94
2005	180	100	166	92	164	91
2006	180	100	180	100	172	96
2007	180	100	177	98	175	97
2008	180	100	176	98	180	100

Source: Household Survey (2008)

As shown is the Table 1, compared to the three income sources, income from eucalyptus is earned by all (100%) of the respondents. There are some variations in others except food crops in Koter Gedra (dega) KPA. The reason to this according to key informants is that eucalyptus compared to other income generations is time saving, less labor intensive and more secured farming. High income generated from eucalyptus is becoming a guarantee for income generation

particularly in the failure of crop production due to various factors such as climate change and crop diseases.

Table 2 Households' Response on Income sources (in rank)

Income sources	Number of Respondents by stating in rank (Multiple response)																Total	%
	1	%	2	%	3	%	4	%	5	%	6	%	7	%	8	%		
By planting enset	17																180	14
By planting hahirzaf (eucalyptus)	4	97	6	3	-	-	-	-	-	-	-	-	-	-	-	-	180	14
By planting chat	6	3	108	60	37	21	29	16	-	-	-	-	-	-	-	-	180	14
By planting fruits and/or vegetables	-	-	4	4	62	59	24	23	6	6	4	4	5	5	-	-	105	8
By growing crops (cereals, pulses etc).	-	-	3	2	10	6	63	35	46	25	46	25	12	7	-	-	180	14
By raising livestock	-	-	21	12	39	22	46	25	34	19	30	16	10	6	-	-	180	14
By engaging in more part time works	-	-	2	1	5	3	67	37	81	45	21	2	4	2	-	-	180	14
By planting coffee	-	-	-	-	-	-	3	2	14	8	22	12	43	24	98	54	180	14
	-	-	3	3	2	2	9	9	2	2	24	23	30	29	33	32	105	8

Source: Household Survey (2008)

Household income seems largely depend on enset cultivation. Table 2 also indicates this reality. About 97% of respondents from all the three KPAs ranked enset cultivation as the most important means of livelihood. About 3 % of them reported eucalyptus as number one important source of household income. However, 60% of the surveyed households ranked eucalyptus trees as the second source of household income. Hence, income from eucalyptus exceeds what is generated from food crops and chat. Thus, eucalyptus tree farming, particularly for smallholder farmers, is the question of survival, insurance and livelihood sustenance. Income generated from crops (cereals, pulses etc.) ranked third, and followed by fruits and vegetables.

The transformation of land under food crops to eucalyptus tree plantation according to farmers is attributable to the high income obtained from fast growing and less labor intensive nature of eucalyptus tree. Particularly road side plantations are directly for the purpose of selling poles which are getting higher demands due to the growing demands for constructions in urban areas of the country in general and Addis Ababa in specific. Eza wereda is one of the four leading weredas in West Guragelnad which supplies eucalyptus poles to various towns and Addis Ababa. The other weredas are Enemor and Ener, Cheha and Gumer.

Table 3 Amount of eucalyptus poles sold in Eza wereda (2005- 2007)

Year	Number of Poles	Total price (in birr)	Total no. of poles in %
2005	175,188	2,102,256	26
2006	215,616	2,587,392	31
2007	296,472	3,557,664	43
Total	687,276	8,247,312	100

Source: Eza wereda Agriculture and Rural Development office (2008)

As Table 3 depicts, the number of poles sold from 2005 to 2007 increased by 17%. Hence, income gained from eucalyptus seems encouraging farmers more to grow eucalyptus trees. According to group discussion with key informants, farmers started buying cows and oxen particularly in dega (Koter Gedra) areas from income generated by selling eucalyptus tree products. Thus, eucalyptus tree became a day-to-day discussion agenda for small landholders' livelihood security sustenance.

Income generated from selling eucalyptus tree poles shows some variations as shown in Table 4. Thus, 13%, 23% and 21% of the respondents from the three sample KPAs earned greater than ten thousand, ten to seven thousand and six to three thousand ETB. respectively. The rest 26% and 17% earned two thousand to five hundred ETB. respectively. When we compare the KPAs, Shebraden and Koter Gedra generated much money than Zigba Boto. The reason to this

Table 4 Total Income generated from Eucalyptus Poles by Surveyed Households in last 5 years

Income (in Birr)	Number of Respondents						Total	%
	Zigba Boto	%	Shebraden	%	Koter Gedra	%		
>10,000	5	10	8	15	10	13	23	13
10,00-7,000	3	6	19	34	20	27	42	23
6,000-3000	13	26	10	18	14	19	37	21
2,000-500	20	450	11	20	16	21	47	26
< 5,00	9	18	7	13	15	20	31	17
Total	50	100	55	100	75	100	180	100

Source: Household Survey (2008)

is attributable to climatic factor. Hence, Zigba Boto is warmer KPA compared to the other two and due to this; it is less suitable for eucalyptus tree growth.

Eucalyptus Plantation as the Main Source of Fuel Wood

The amount of fuel wood source and consumption depends entirely on households' eucalypt woodlot availability. In the surveyed areas, the question of scarcity in fuel wood supply, as reported by farmers, is already solved except in negligible amount in some households. The positive effect of eucalyptus tree in this regard is that it has replaced crop residues and animal dung which are advisable to fertilize the soil than source of biofuel. It has also reduced the rate of natural forest deforestation considerably than ever as reported by key informants from the three KPAs.

Table 5 Households' Response on whether there is Shortage of Fuel wood in their KPAs or Not

Response	Number of Respondents						Total	%
	Zigba Boto	%	Shebraden	%	Koter Gedra	%		
Yes	2	4	4	7	5	7	11	6
No	48	96	51	93	70	93	169	94
Total	50	100	55	100	75	100	180	100

Source: Household Survey (2008)

As shown in Table 5, 94% of the respondents from the three KPAs reported that there is no shortage of firewood supply. Only about 6% indicated there is shortage in lesser amount. Hence, the role eucalyptus plantations play in household fuel energy supply is very immense.

The households' experience of using mirt midija ("modern stove") is almost none as reported by farmers. The use of fuel gas for cooking except for lightening is not common. Hence, the dependency on eucalyptus woodlot for fuel wood dominated all other means of fuel energy.

Table 6 Households' Response on whether they are using Modern Stove or Not

Response	Number of Respondents						Total	%
	Zigba Boto	%	Shebraden	%	Koter Gedra	%		
Yes	5	10	7	13	-	-	12	7
No	45	90	48	87	75	100	168	93
Total	50	100	55	100	75	100	180	100

Source: Household Survey (2008)

In the surveyed KPAs the use of mirt midija ("modern stove") for household consumption as indicated in the Table 6 is very low and accounts for 7%. Thus, 10% and 13% of the surveyed households in Zigba Boto and Shebraden reported that they are using this technology. The reason for using the technology by those in Zigba Boto and Shebraden according to respondents is due to their easy access to towns such as Agena, Gubre and Emdibir. Farmers have to use

this technology since its role in substituting fuel wood is very high. The advantage of using mirt midija also leads to wise use of fuel wood plantation particularly that of eucalyptus woodlot.

Table 7 Households' Response on Fuel wood Collection participants in the three KPAs

Participants	Number of Respondents								Total	%
	Husband	%	Wife	%	Sons	%	Daughters	%		
Number of participants	165	92	118	66	180	100	130	72	593	82
Non participants	15	8	62	34	-	-	50	28	127	18
Total	180	100	180	100	180	100	180	100	720	100

Source: Household Survey (2008)

Most family members participate in fuel wood collection in the surveyed KPAs. As indicated in the Table 7, from the total 180 sample households 92%, 66%, 100% and 72% of, husbands, wives, sons and daughters respectively participate in fuel wood collection. The lower percentage observed in wives and daughters are due to their additional home management burdens. Supportive participation of the household members increased after eucalyptus became the main source of fuel wood. Before the expansion of eucalyptus, males were collecting fuel wood from forests, which is not practiced and advisable for females due to security issues.

Table 8 Households' consumption of Eucalyptus fuel wood per day in bundle in the three sample KPAs

Type of Bundle	Number of Respondents										Total	%
	Branches					Logs (splitted)						
	½	1	2	3	%	½	1	2	3	%		
Man bundle	-	180	-	-	100	180	-	-	-	100	360	33.34
Woman bundle	-	-	180	-	100	-	180	-	-	100	360	33.34
Child bundle	-	-	-	180	100	-	-	180	-	100	360	33.34
Total	-	180	180	180	100	100	180	180	-	100	1080	100

Source: Household Survey (2008)

As indicated in the Table 8, households consume 1, 2, and 3 bundles of man, woman and child respectively per day if they use eucalyptus branches. However, they use ½ (half), 1 and 2 bundles of man, woman and child if they consume splitted logs. This is the average household fuel energy consumption. That means all households may not consume equally. When there is high need of fuel wood consumption the amount of bundle may increase up to four and above bundles of branches and two and above bundle of splitted logs.

The average weight of bundle (branch) as checked by the researcher is about 12kg. whereas that of splitted logs is about 14 kg. per day. When we compare these much amount of consumption with availability and expansion of eucalyptus in the area, it might not be admirable.

Construction and Eucalyptus Plantation

Now a days, due to fast population growth, there is immediate need for construction of various types. In the study area and the whole Gurageland, the style of house construction is different from the other parts of the country. The Gurage house consumes large amount of eucalyptus and other indigenous tree products. Due to lack of enough indigenous trees in smallholder farmers' possession and their costly nature, the need for eucalyptus poles and logs became the only accessible raw materials. Eucalyptus products cost lesser amounts of currency than the others. It is also available at farmers' woodlots or the nearby villages and markets.

Red eucalyptus (*Eucalyptus camaldulensis*) is more preferable than white eucalyptus (*Eucalyptus globules*) by farmers. Their reason to this is that the red one is strong and cannot be easily damaged by termites, its pink color which makes the house beautiful and it is straight than the white eucalyptus tree. In Shebraden and Zigba Boto KPAs, farmers use red poles and logs of eucalyptus without mixing juniperus procera, whereas, households in Koter Gedra mix both eucalyptus and juniperus procera due to the availability of the latter. As noted in the previous sections, the style of fencing in Gurage area and the study region is quite different from other parts of the country. Homesteads and horticultures

including enset are fenced with eucalyptus logs. Other land uses which are far away from home area are fenced with eucalyptus twigs and branches. All these kinds of large amount of wood consumption may possible only through eucalyptus woodlots, which are available if not in small holders' woodlots, in the village or market. Thus, trees of indigenous or exotic origin at present situation may not replace the role eucalyptus play for construction purposes in the study area according to surveyed households.

In Gurageland including the study area, style of local bridges is different from most parts of Ethiopia. These duty bridges are well constructed by using huge logs and poles for crossing humans and in some areas animals. Since Eza wereda has numerous rivers and streams, there is a need of eucalyptus logs and poles in large amount particularly in rainy (summer) season. To some up, in the area of study, construction undertakings and eucalyptus plantations are not separable since it is fast growing, multipurpose, less labor and capital intensive, and coppice itself in large quantity in a short period and sustainable way.

1. Social merit of Eucalyptus

In addition to fuel wood for daily consumption, construction, and market demand, eucalyptus has great role in Meskel Celebration.

As understood by many people, the attachment Gurages have with Meskel Celebration is strong. It lasts from 20th of September to 10th of October yearly in Gregorian calendar. Households start cutting and splitting the logs of the tree from June or July. The admiring situation is that they consume much splitted logs from the time of Meskel Celebration up to December without interruption (mixing other fuel woods). Farmers' reason for the high consumption of the fuel wood is that Meskel celebration without splitted eucalyptus logs is meaningless. Hence, the ritual behind this is very strong. Getting enough fuel wood in available amount for such impressing national celebration other than eucalyptus seems unlikely.

2. Eucalyptus Tree Plantation and Time Saving

The role played by eucalyptus tree plantation in terms of time saving to collect fuel wood is great. According to key informants from the three KPAs, before 20 and 30 years ago, they were traveling 3 to 4 hours to collect fuel wood from forests while at present it is not more than 1 hour in average. The reason to this is attributable for the availability of eucalyptus tree plantation in the farmers' own land holding or purchasing from the nearby villages. Table 9 clearly shows this reality.

Table 9 Average time spent for collecting Fuel wood in different periods (in minutes)

KPAs	Current time spent (in minute)	Time spent before 20 Years (in minute)	Net hour saved
Zigba Boto	30	300 (5 hours)	280 (4:30 hours)
Shebraden	45	358 (6 hours)	313 (5 hours)
Koter Gedra	40	243 (4 hours)	203 (3 hours)
Average	38	300 (5hours)	265 4hours)

Source: Household Survey (2008)

Conclusion

Economic factors are the most important catalysts of eucalyptus tree expansion to cope with fuel wood, construction, and financial shortages for various social and governmental duties. Before twenty or thirty years, using eucalyptus as construction materials was very scanty particularly in woinadega areas of the study area. Two ways of selling eucalyptus products is possible, i.e. to the nearby town (market); and to Addis Ababa and other towns near to the area. However, due to shortage of indigenous tree products in farmers' landholdings and markets, eucalyptus tree became the dominant source of construction. The main reason to this is that eucalyptus is fast growing and ubiquitous than other farm trees.

Eucalyptus for a given household means a living bank account that can be used during shortage of money for different duties. The immediate source of money for all these expenses now a days come from the sale of eucalyptus poles and logs in addition to food crops such as enset, vegetables, cereals and pulses; and cash crops including chat and coffee. Contribution of eucalyptus tree farming in the region towards rural livelihood is very considerable. Compared to other income generations; it is time saving, less labor and capital intensive, more secured in terms of climatic change and more profitable than the other food crops. Thus 3% and 60% of the surveyed households have ranked eucalyptus tree as first and second source of their income. Hence eucalyptus tree has dominated all other food corps, chat and coffee

Belay and Muluneh 117.

next to enset. Thus, eucalyptus tree farming, particularly for small holders is the question of survival, insurance, and livelihood betterment. The transformation of food crops to eucalyptus, therefore, is attributable to the high net income obtained from the later. The number of poles sold from 2005 to 2007 has increased by 17%.

The role eucalyptus tree play in stabilizing peasant livelihoods' income diversification is immense. Cost-profit analysis of the product compared with other food crops and cash crops such as chat and coffee is much better. Thus, farmers should use their lands in appropriate and sustainable way in order to create multipurpose production in different seasons and years. Hence, appropriate land use or site selection, that means, allocating eucalyptus farming/plantation to rugged areas that are not conducive for crops seems the best land use policy. Thus, the government and other concerned bodies/stakeholders should work collectively to insure environmental and livelihood sustenance of the community/the small landholders in the wereda and other similar land diminutive and population prone areas of the country.

References

- Davidson J. (1995). Eucalyptus Tree Improvement and Breeding. Ministry of Natural Resources Development and Environmental Protection, Addis Ababa.
- Eza Wereda Agriculture and Rural Development Office (2008). Working Document 36p.
- Holgen, P. and Svenson, M. (1990). Loss of inorganic nutrients by whole tree Utilization for firewood in Ethiopia. Swidish University of Agriculture Sciences. International Rural Development Center, Working Paper 150p. Uppsala.
- Jagger P. and J. Pender (2003). The Role of Trees for Sustainable Management of Less favored Lands; the Case of Eucalyptus in Ethiopia. In: MA Jbbar, J. Pender and S. Ehui (eds) Policies of Sustainable Land Management in the Highlands of Ethiopia. EPTD. Workshop Summary Paper No. 99, 44-49 IFPRI Washington D.C. USA.
- Muluneh W. (2003). Impacts of Population Pressure on Land Use/ Land Cover Change, Agricultural system and Income Diversification in West Gurageland, Ethiopia. PhD Dissertation, Department of Geography, Faculty of Social Sciences and Technology Management, Norwegian University of Science and Technology, UTNU, Trondheim, Norway.
- Newcomb J. (1989). An Economic Justification for Rural Afforestation: The Case of Ethiopia. Energy Department Paper No. 16 World Bank Energy Department, the World Bank Washington DC.
- Reijntjes C, Havecort B. and Waters Bayer A. (1992). Farming for the future: An Introduction to low-external-input and Sustainable Agriculture. ILEIA, Leusden. The Netherlands.
- Selamyihun K. (2004). Using Eucalyptus for soil and water conservation in the Highland Vertisols of Ethiopia. PhD Dissertation Wageningen, The Netherlands.
- Tenaw G. (2007). Forestry as an Emergent Economic Strategy and Its Implication on Rural Livelihood, Land Uses, and Ecology: A Case of Koga River Catchments Area, Mecha Wereda, and Western Gojjam Zone, MA Thesis Addis Ababa University Unpublished.
- Woldeamlak B. (2003). Household Level Tree Planting and its Implication for Environmental Management in Northwestern Highlands of Ethiopia: case study in the Chemoga Watershed, Blue Nile Basin. Land Degradation and Development In Press.
- Yongfang S. (1992). Utilization of Eucalyptus in China. *Appita* 45(6):382-393