# Assessment

Socio-economic value of forest products for rural communities in Ethiopia

**Summary** 













Ministry of Environment, Forest and Climate Change

#### Acknowledgment:

Dr. Tesfaye Yimer, a consultant and team leader at Sankofa Consultancy Service, was commissioned by UNDP to undertake this study and write this document for the UN-REDD programme in Ethiopia.

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### I. Introduction

In Ethiopia, many rural communities have for centuries lived in and around vegetation areas and they make use of timber and non-timber forest products in their livelihoods. The use of forest products adds a crucial dimension to a diversified livelihood base of most rural households that is necessary for daily subsistence, and reducing vulnerability. In line with this UNDP and UNEP believes that there is a need to assist the government efforts to ensure that there is sustainable forest resource management and development programmes in order to maintain and enhance the future flow of economic benefits to forest resources dependent people without damaging the natural resource system. This among others requires understanding the actual socio-economic contribution of forest resources to rural communities.

### II. Background to the study

UNEP and UNDP as part of the UN-REDD Programme and in collaboration with the Government of Ethiopia commissioned a study that assessed the socio-economic value of forest products and services for rural communities. This summary report presents the results of the analysis of the socio-economic survey in selected rural districts based on data collected from 3,360 randomly selected rural families from 337 samples Peasant Associations (PA) in 25 sample districts that represent five vegetation distribution stratums of Ethiopia to understand how much communities in rural Ethiopia depend on forest resources. The result of the survey fed into a study that estimated the contribution of Ethiopia's forest ecosystems to the country's GDP. It is also relevant in the development of forestry related strategies.

The survey indicated that about 11.6 million rural households (HH) in Ethiopia are relying on some aspect of timber and non-timber forest products (NTFPs) for their livelihood. According to this survey, an estimated 57 million economically active rural population in Ethiopia are engaged part time or full time in the collection of one or more of the forest products. The gross extraction of forest products and the income from support services to forestry for the survey year was Birr 10,782±451 per rural HH/yr. Rural families make use of forest products locally to a greater extent (74% of forest products) than selling them. The aggregate gross value of different forestry products and services produced by rural HH in 2014/15 were added up to Birr 130.7 billion.

Based on Ministry of Finance and Economic Development (MoFED) estimate, the contribution of the forestry sector was about 3.7% of GDP of Ethiopia in 2014/15. If the net value added of all 15 sub-categories of forest products and services from the rural economy were attributed directly to the forest sector, forestry sector provided 11.2% of national GDP in 2014/15. The gap between these two estimates suggests that the significance of forestry's sector has been underestimated in past calculations of the national GDP. The estimates in this survey included only the harvesting of forest products by rural families in Ethiopia. The gross value added of the forestry sector to the national GDP in 2014/15 if forest products that are under the boundary of the System of National Accounts (SNA) such as change in stock of cultivated forests, and extraction of forest products by other actors were included in the recalculation of the forestry sector and the national GDP.

The current study concludes that the economic contributions of forest products and services are underestimated in the national economic accounts of the country. Partially this is due to the data gap on the actual quantities and values of timber and NTFPs for MoFED that contributes for the underestimation of bamboo, wood fuel, construction wood, gums and incenses, and thatch grass, in the national accounts statistics. The survey found forestry related products and services that are not captured in national accounts, which included wood tooth brush, wild edible animals, twinning items and support services to forestry. The study found the inclusion of animal feed, wild spice, forest and semi forest coffee, natural honey, wild edible plants and medicinal plant in the system of the national account but these items are attributed to other sectors of the economy.

### III. Objectives

The main objectives of this study was to quantify the livelihood contribution of forest resources for rural communities based on the results of the analysis of the survey conducted in selected rural districts. The sample HH socio-economic survey focused on provisional services of forest products and did not cover values such as: (a) Timber and non-timber forest products (NTFP) harvesting activities implemented by commercial farms, government actors, refugees, universities, the military, etc.; (b) Regulating Services: Climate regulation, water regulation, erosion regulation; (c) Cultural Services: Recreation, aesthetic values, spiritual and religious values, cultural heritage values; and (d) Supporting Services: Soil formation, photosynthesis, primary production, nutrient cycling and provisioning of habitat.

# IV. Methodology

In measuring the value of a household's uses of forest resources (in-cash and in-kind incomes), the aggregate annual income from different sources of timber and non-timber products to a single household (y) was calculated by using the following formula:

$y=\Sigma xipi + \Sigma zjpj$
where,
y= gross annual income of a particular household from forest products
xi= quantity of forest products sold on the market
pi= unit price for that forest product
xipi= gross annual income per household associated with the sale of the extracted products
zj= quantity of forest product used directly in the household
pj= local market price for the products in question
zjpj=gross annual income from subsistence products

Then, gross value added of forest products for the household income was calculated as the difference between gross income(y) and the intermediate costs of materials and services used in extracting the products. Finally, this was used to estimate the national level economic contribution of the forest sector for the livelihood of the rural community.

Results are based on a survey of 3,360 rural households from 337 Peasant Associations (PAs) in 25 sample districts (Woredas) selected randomly from the five vegetation distribution stratums in Ethiopia. The sample country enumeration districts, PAs and Households (HHs) were selected randomly based on Probability Proportion to Size (PPS) method. In order to collect data, focus group discussion (FGD), key informant interview (KII), household interview, observation, and secondary data review methods were employed. To quantify the impact of the forest sector, two key statistics were measured: volume of timber and Non Timber Forest Products (NTFP) collected, and; the associated gross value of output of the forest products to the household livelihood and the national economy.

Provisional services of forest and vegetation areas were valued and estimated in monetary terms. Before the actual assessment started, local volume units were standardized to standard international units through weighing and measuring of all units for all major products. Valuation was in most cases done by reporting 'collectors' level prices; however, average selling price of timber and NTFPs was determined based on secondary sources and rapid market assessment at local level or distance and adjacent markets if 'own reported values' not available. Selling timber and NTFPs is a common way in most rural households even though some of them (e.g. wild animal) are illegal activities. The proportion of households who engaged in selling one or more of the products ranges from 0.3 % to 14 %. The survey indicated that local markets exist for most of the products extracted from the wild. Price of close substitute had been used in some cases. For example, price of poultry and domestic ruminants was used to value wild bird and wild ruminants. Each respondent household was asked about any costs incurred while gathering forest related products. The data on cost of production at HH level helped to calculate net direct-use values of extracted forest products at household level.

Both quantitative and qualitative analysis methods were used to analyze data. The data gathered through the participatory qualitative methods was analyzed by using triangulation, concepts and opinions interpretation. SPSS software version 18 and excel spreadsheet package were used for quantitative data analysis.

During data collection, the current definition of forest in Ethiopia; which is defined as "All areas dominated by vegetation ranges from 0.5 hectare to large size vegetation with a canopy cover of greater than 20 % and a height exceeding two meters" was used. Values of forest related income were measured in 2007 (2014/15) market prices in Birr (Ethiopian currency). The survey period covered year 2007 Ethiopian calendar (Meskerem 1 to Nehase 30).

# V. Key Findings

# 5.1. Employment and income associated with timber and NTFP for the actual collectors in rural Ethiopia

The importance of timber and NTFPs to the livelihood of the rural communities can be clearly seen when the employment and benefits obtained by the actual collectors<sup>1</sup> is analyzed. The HH survey indicated that about 11.6 million rural households in Ethiopia rely on the collection of some aspect of timber and NTFPs for their livelihood. Furthermore, focus groups in all surveyed vegetation distribution stratums indicated the participation of all economically active family members (part time or full time) including school children in the collection of one or more timber and NTFPs. In sum, an estimated 57 million<sup>2</sup> rural population in Ethiopia were engaged in the extraction of one or more of the forest products.

<sup>&</sup>lt;sup>1</sup> The term actual collectors in this survey includes rural people who engaged in the collection, production, extraction, and harvesting of timber and NTFPs in rural Ethiopia

<sup>&</sup>lt;sup>2</sup> Based on FGD participants in all five vegetation distribution stratums, rural families in Ethiopia are engaged in mixed activities such as crop, livestock, trade, timber and NTFP to generate income for their livelihood. Therefore, the forestry related employment in rural Ethiopia; which is estimated at 57 million is presumably part time job.

#### Rural employed population by type of forest products and services

The magnitude of dependency on forest-related activities varies among participants. That means, people may rely on a specified share of their income (partial or total income) from forest products and services for their livelihood. Therefore, wider definition of forest based employment that has fulltime or part-time employees were adopted in the study.



Figure 1.Promotion of rural HHs engaged in forest product and service production activities

Almost all respondents (99.9%) reported their participation in the production and/or marketing of one or more of the 15 sub categories of rural forestry sub-sectors (figure 1). When it comes to the specific timber and NTFPs, the majority (98.5%) of the sample households participated in wood fuel collection activities. In terms of engaging more families in the extraction of forest related products, fuel wood was followed by activities on wood for tooth brush (82%), livestock forage (76%), construction wood (59%) and forest related traditional medicine (22%) collection. The bottom five sources of forestry related rural employment were bamboo, support services to forestry, incense and gum, wild animal food, and wild spice (figure 1).

As indicated in figure 1 above, bamboo engaged relatively low number of rural HHs when compared to other forest related sub-sectors. However, it deserves attention as it provides employment to 232,888 rural HHs with an average gross annual income of Birr 500 per collecting household.

#### Summary of gross direct use value of forestry products and services per actual collectors

In terms of engaging more rural households in forestry sub-sectors, forest related coffee was at the eighth level in rural Ethiopia (figure 1). However, coffee provided high average annual income to the actual collectors when compared with other forest related activities (figure 2). The number of rural households involved in development and extraction of bamboo in the survey period were relatively low when compared with families engaged in other forest related activities but bamboo provided an average of Birr 500 per household per annum income to the actual collectors; which was higher than an average income generated by thatch grass, traditional medicine, wild plant food, twinning material, and woody tooth brush collectors.



*Figure 2. Mean gross direct use value of timber and NTFPs per actual collectors*<sup>3</sup> *of forest related products (Birr/HH/yr)* 

The top eight rural forestry sub-sectors that provided better gross in-kind and in-cash income to the actual collectors (above Birr 1,000 per HH per annum) were coffee (Birr 6,873/yr), livestock feed (Birr 5,844/ yr)<sup>4</sup>, support services to forestry (Birr 4,412/yr), wood fuel (3,013/yr), construction wood (Birr 2,320/yr), incenses and gums (Birr 1,819/yr), natural honey (Birr 1,803/yr) and wild animal food (Birr 1,603/yr). The bottom three sources of income were wood tooth brush (Birr 23/yr), twinning item (Birr 146/yr) and wild plant food (Birr 216/yr).

<sup>4</sup> Animal feed is used in the livestock production system, and animal feed extracted from vegetation areas is an output of the forestry sector, and intermediary consumption to the livestock sector. In the current survey, the volume and the gross direct use value of annual feed extracted from vegetable areas(DM/HH/yr) was calculated by using: (a) average TLU/HH(e.g: 5.1 on average at national level); (b) the gross annual DM requirement per TLU in ton/yr(1.825 for maintenance); (c) price of air-dry grass hay at local level or adjacent and distance market (Mean price=Birr 1,903/ton of DM; Min. price=Birr 800/ton of DM in Maokomo Woreda; and Max. price=Birr 4,000/ton of DM in Ewa Woreda); (d) information on the proportion of animal feed harvested from forest resources (e.g: 33% on average at national level); and (e) amount and gross value of forage sold by sample HHs.

<sup>&</sup>lt;sup>3</sup> In this survey, gross direct use value is defined as a "flow concept" that determines the value of a specific forest product extracted, collected, harvested or produced during a particular year.

The HH survey indicated that the annual average income of the actual timber and NTFPs collectors varies across the vegetation distribution stratums. Variation in availability, access, level of extraction, and market price of the specific timber and NTFP are the major contributing factor for the observed income differences in among the stratums. For example, rural families in stratum II and V did not generate income from coffee in the survey year because the resource is not available in these areas. Whereas, the average income per annum per forest related coffee dependent rural HH in stratum I was approximately two times higher than that of stratum III. The partial explanation for this difference is that the volume of extracted coffee and its price is higher in stratum I than in stratum III.

#### Analysis of subsistence use and trading of timber and NTFPs per actual collectors

Local people harvested forest related products to meet their two demands including for subsistence and generating income by selling timber and NTFPs. The collectors' level analysis indicated not only the importance of timber and NTFPs to the livelihood of the forest dependent people but also most of the forest sub-sector products are used locally (table 1).

Forest related	Mean gross direct use value of timber and NTFPs per actual collectors						
product and		Birr/HH/yr	Proportion of HH value				
services	In-kind	In-cash	Sum	Share of in-kind income	Share of in-cash income		
Livestock forage	5,795	49.3	5,844	99%	1%		
Twinning items	139.5	6.5	146	96%	4%		
Wood tooth brush	21.2	1.7 22.9		93%	7%		
Wild animal food	1,457.6	145.7 1,603		91%	9%		
Thatch grass 417		57.5 474.5		88%	12%		
Bamboo	426.7	73.1	499.8	85%	15%		
Wood fuel	2,458.2	554.5	3,013	82%	18%		
Wild plant food	168.3	47.6	215.9	78%	22%		
Wild plant based traditional medi- cine	244.7	103.3	348.0	70%	30%		
Construction wood	1,345.8	974	2,320	58%	42%		
Wild spice	298.5	360.4	658.9	45%	55%		
Natural honey	707.3	1,095	1,803	39%	61%		
Incenses & gums	172.2	1,647	1,819	9%	91%		
Organic coffee	534.7	6,338	6,873	8%	92%		
Support services to forestry		4,412	4,412	0%	100%		

*Fuel Wood:* Almost all (98%) of the sample households involved in the production, collection as well as consumption and/or selling of wood fuel with a mean annual collection of 11.7 M3 per producer HH per annum of BLT and round/split wood and 1.4 Qt per producer HH per annum charcoal, resulting in an annual mean gross direct-use value of about Birr 3,013 per HH(N=3,298, SE=72, SD=4,128), ranging from Birr 57 to 107,575 with significant differences between study stratums(p< 0.001). The collectors consumed about 82 % of their harvest, and the balance was sold for other consumers mainly for urban dwellers. That means rural communities used the highest proportion of their output for their own consumption.

*Construction wood:* Focus groups mentioned diverse use of woody construction items. House construction requires huge amount of wood in most part of Ethiopia except in some parts of Tigray and Amhara that uses stone and mud. Maintenance works done throughout the country at least every three years to replace obsolete parts of main house and kitchen. Wood is used almost every year for replacing worn-out 'Digger' (Am) as well as, repairing, expansion and new construction activities like pastoralists mobile houses, animal barn, and fencing of residential and farming sites. Rural communities also use forest products for making furniture and utensils that have variable service life ranging from more than a decade (e.g.: Mukecha) to less than a year.

About 59% of respondents involved in woody (round wood, split wood and BLT) construction item extraction as well as consumption and/or selling in the survey year. The importance of harvesting of this timber product to the livelihood of the rural communities can be clearly seen; therefore, when the benefits obtained by the actual collectors (N=1,958) are analyzed. Actual collectors harvested on average 6.3M3/HH/yr of woody construction materials both for subsistence and sell in the year 2014/15 that was equivalent to a mean annual gross direct-use value of Birr 2,320/HH/yr. The collectors consumed about 58 % of their harvest, and the balance was sold for other consumers mainly living in urban centers.

*Woody tooth brush:* About 99.4% (N=2,704) of survey respondents used tooth brush made out of woody twigs from trees. About 38 pieces of woody twigs tooth brush were collected by the actual user households (N=2,687), and the mean annual gross direct-use value of these items for these households was Birr 23/HH/yr (7% of the product was traded).

*Bamboo*: Bamboo is one of the economically significant NTFP. Local people harvested bamboo to meet their two demands including for subsistence (material for constructing and renovating houses, fences, basket, beehive, waking stick, house furniture, and utilities) and generating income by selling unprocessed bamboo culms. As reported in the livestock forage section, bamboo shoot is also used as animal feed. Actually, bamboo production was reported in 11 out of 25 sample Woredas that are distributed in five regional states-Oromia (Anchar, Delomena, Yayu and Jarte), Amhara (Qara and Farta), B.Gumz (Maokomo), Gambella (Dima), and SNNP(Bursa, KindoKoisha, Tocha). About 2 % of all sample households involved in extraction of bamboo in the survey year, and the contribution of this NTFP for the HH economy was found to be high for the collecting households. On average, one household in among the collecting HHs (N=67) extracted approximately 73.3 culms of bamboo per year. The annual, direct-use value of this harvest was about Birr 500 per using HH. The collectors consumed about 85 % of their harvest, and the balance was sold for other consumers mainly for urban dwellers that engaged in value addition activities.

*Animal feed:* About 76% of the sample households reported access to forest based animal feed for use by their livestock (about 41% of their livestock annual feed requirement) and/or marketing with a mean annual gross extraction of 4.53 ton per beneficiary HH per annum. The aggregate mean gross direct use value of the extracted animal feed at collectors' level was calculated at Birr 5,844.3 per household per annum (approximately 1% of the harvest was traded). That means the highest proportion of the output was used to address the nutritional requirement of own livestock.

*Forest related coffee production:* Coffee production is associated with other plant species which serve as shade trees. Rural communities collect coffee bean from the forest coffee, the semi-forest coffee and the garden coffee production systems that are dependent on shade from large indigenous trees such as the Cordia Abyssinica and the Acacia species. Application of any chemical fertilizers and pesticides was not reported by the HH survey respondents, and as a result coffee production in these systems are regarded as organic coffee. The current study indicated that about 18 % of the sample rural households have coffee either from forest, semi-forest and their garden. In sum, about 2.1million rural families in Ethiopia are relying on some aspect of coffee production for their livelihood from which on average 250 Kgs of coffee were harvested per household per annum. The annual, mean gross value of coffee production in among coffee harvesting farmers was Birr 6,873/HH/yr. The actual collectors consumed only about 8% of their coffee production. The remaining 92% is sold for income generation, and this NTFP can be considered as cash crop.

*Wild plant based traditional medicine extraction:* Focus group discussions disclosed wider use of traditional medicines by large number of rural communities. However, only around 22% of sample HHs reported collection, local consumption and trading of traditional medicines from wild indigenous plants. According to community group respondents, this lower rate was reported partially due to the reduction on the availability of supplies from forest sources and high reliance of end users on cultivated traditional medicines. In addition, rural communities are also dependent on the service of urban center traditional healers. On average, one household in among the collecting HHs accessed raw materials that were enough to get about 14 rounds of treatments per annum. The annual, mean gross direct use value of the plant medicine in among the actual collecting rural families was Birr 348/HH/yr ( about 30% of the harvest was traded). That means actual collectors used the highest proportion of their output for healing their own family health problems.

*Natural honey:* Forest products are relevant for apiculture as they provide the basic nutritional requirement for survival, reproduction and honey production. Therefore, honey production in rural Ethiopia is partly or fully dependent on forest related honey source plants (e.g.: Hygenia abyssinica, coffee arbica, Acacia, etc.). Honey production was reported in the majority of the sample Woredas( 24 out of 25). Based on the current study, about 19 % of rural HHs involved in extraction of natural honey, this will make the number of beekeeping dependent rural families at about 2.2 million. The contribution of this NTFP for the HH economy was found to be high for the collecting households. On average, one household in among the collecting HHs extracted approximately 34.6 Kg of natural honey per annum. The mean gross direct value of this extracted honey for only collecting families was Birr 1,803 HH/yr. The collectors marketed 61 % of their harvest to generate cash income, and the balance was consumed at collectors' level.

*Frank-incenses and other gums/resins:* The importance of incense and gum to the livelihood of the rural communities can be clearly seen when the benefits obtained by the actual collectors is analyzed. Free collection of incense and gum was reported only from 5 of the 25 sample Woredas. About 2.7 % of rural HHs in Ethiopia involved in incense and gum tapping both for subsistence and sell providing them with an average 50.3 Kg/HH/yr of this NTFP that was equivalent to Birr 1,818.9/HH/yr. The collectors consumed about 9 % of their harvest, and the balance was sold for other national consumers and the export market.

*Twinning items extraction:* Twinning materials are used to make items like ropes and strings, and they are extracted from climbers ('Harege'), grass spices, sisal, and the bark of a variety of plant species. These products are used infrequently and/or in relatively small quantities but are very vital complementary items to construction wood during house and animal barn construction as well as fencing of residencies and crop farms. The importance of twinning items extraction to the livelihood of the rural communities can be clearly seen when the benefits obtained by the actual collectors is analyzed. About 17 % of the respondents involved in twinning item extraction both for subsistence and sell in the survey year providing them with an average 10.3 roll/HH/ yr of this NTFP that was equivalent to a mean annual gross direct-use value of Birr 146.1/HH/yr. The collectors consumed about 96 % of their output, and the balance was sold for other consumers.

*Wild edible plant food:* The economic valuation of wild plant food is usually viewed under two main categories as the commercial use and the domestic use of wild edible plan, which may or may not attract a market value. Wild plant food was reported in most of the sample Woredas (24 out of 25). The exception was a sample Woreda from Somali regional state. About 14% of rural households involved in harvesting of wild plant food in the current survey year. On average, one household in among the collecting HHs extracted approximately 48 Kg of wild plant food per annum. The mean gross direct use value of this extracted forest resource for only collecting families was Birr 215.9 HH/yr (share of cash income was 22%).

*Wild animal food:* Informal discussions with focus groups and respondents revealed 3.5 % of the sample households in the sample sites consumed and/or sold wild animal food in the survey year. About 31.1 Kg/HH/ yr bush meat were collected by the user households, and the mean annual gross direct-use value of these items for these households was Birr 1,603.3/HH/yr (about 9% of the total was sold to generate cash income).

*Spices:* Scarce and rare spices like Long Pepper (Timiz) and Cardamon (Korerima) are mainly accessed by families who have forest coffee in areas like Billo Nopa. DryThyme (Tosign) is found in all corners of highland Ethiopia and accessed by many householders both for domestic use and as animal feed. About 5.2% of rural families in Ethiopia involved in extraction of spice from the wild in the current survey year. On average, one household in among the collecting HHs extracted approximately 20 Kg of spice per annum. The annual, gross direct-use value of this harvest was about Birr 659 per annum per using HH. The collectors consumed about 45% of their harvest, and the balance was sold for other national consumers and the export market.

*Thatch grass:* Maintenance works of thatched houses are done at least once every three years to replace the old thatch. House construction (new and main building) is done on average every 10 years but the trend shows more of constructing corrugated iron sheet houses.

Thatch grass is also used for constructing animal shelter and latrine. In addition, there is also communities' practice of using thatch grass roofed store (e.g.: store for wood fuel and food items). Thatch grass is still contributing much to the economy despite the observed diminishing trend on the relevance of using this NTFP as roofing. About 17.5% of the rural families in Ethiopia used and/ or sold thatch grass in the year 2014/15. About 414.8 Kg/HH/yr thatch grass were collected by the user households, and the mean annual gross direct-use value of these items for these households was Birr 474.5/HH/yr( about 12% of the thatch grass was sold to generate cash income).

*Employment and income to families engaged in support services to forestry:* In addition to providing timber and NTFPs, the forest industry has also created service related employment and income opportunities to rural communities. Eight types of forest related services were reported-forest guard, tree seedling nursery worker, logging, carpentry, broker, tree seed selling, transportation service, and loading and unloading. 2.4 % of the sample HHs reported their participation in support services to forestry; which enabled them to generate an average cash income of Birr 4,412/HH/yr.

# 5.2 Household level analysis of forest products extraction per forest dependent and non-forest dependent households

The household level values from both forest resource collectors and non-collectors were used to estimate the gross annual direct use value of forest products to the national economy. The mean household level finding is useful to estimate per capita forest related income in rural Ethiopia Data collected from all sample respondents that included forest resource collectors and non-collectors were aggregated to arrive at average annual gross direct use value from timber and NTFPs per household both at vegetation distribution stratum and national levels.

# Aggregate gross annual direct use value of forest products and services per collectors and non-collectors at rural household level

As shown in figure 3 and figure 4, the mean per annum gross direct use value of forest products and services (both in-kind and in-cash) for the survey year was Birr 10,782  $\pm$  451 per rural house-hold at national level (calculated both for collectors and non-collectors; employed or not employed in support services to forestry). However, the magnitude of the mean per annum gross direct use value of forest products and services varies between stratums (Figure 4). For instance, communities in stratum II generated a much greater mean direct use value (Birr 16,928  $\pm$ 1,080 per household) from forest products when compared with other stratums. The majority (94%) of this value in stratum II came from extraction of animal feed (73% of the total income) and fuel wood (21% of the total income).

*Figure 3. Summary of the mean gross direct use value disaggregated by sub categories of forest products and services per collectors and non-collectors of forest related products in rural Ethiopia (Birr/HH/yr), 2014/15* 



Relatively low aggregate gross direct use value per household per annum was reported in stratum IV (figure 4), and the major factor contributed for this variation was relatively low availability and access to forest products when compared with other stratums. Stratum IV is the highland, vegetation deficient area of Ethiopia where the livelihood of the people mainly depends on crop production.



*Figure 4. Average gross direct use value of forest products and services both for collecting and non-collecting respondents by vegetation distribution stratum in rural Ethiopia (Birr/HH/yr)* 

At national level and in stratum II, III, IV and V the top three forest related source of in-cash and in-kind income for rural HHs were animal feed, fuel wood and construction wood. For rural HHs in stratum I, extraction of timber and NTFPs from five types of forest products enabled them to acquire about 96% of their forest related income—animal forage (33%), forest related coffee (25%), wood fuel (22%), construction wood (12%) and honey (4%).

#### Household level analysis of Costs of forestry products<sup>5</sup>

Costs of collection ranges from Birr 0 to 8,165 HH/yr with significant difference (p<0.001) among vegetation stratums, extraction and marketing of timber and NTFPs. For example rural communities in stratum V harvested forest products with an average cost of Birr 40 per HH per annum, and stratum I households with Birr 327 per HH per annum. The overall mean cost of collection was Birr 211 HH/yr for all stratums that results in about 2 % cost of collection(=Birr 211/HH/yr cost of collection divided by annual gross direct use value of Birr 10,782/HH/yr forest related income).

#### Net annual direct-use value of forest products to rural households

The mean gross direct use value of forest products and services was estimated at Birr 10,782 per annum at national level. Then, the net annual direct use value of forest products and services for the household income was calculated as the difference between gross annual direct value per household and the intermediate costs of materials and services used in extracting the products. The aggregate mean net direct use value of forest products (both in-cash and in-kind) and the income from support services to forestry employment for the survey year was Birr 10,571  $\pm$  193 per rural household per year after deducting costs of collection.

# 5.3. Macro level analysis of annual direct-use value of forest products to the economy

This section provides summary of macro level statistics on the volume and value of forest products and services.

#### Gross value added of forest products and services to rural economy

According to the survey results, the aggregate gross values of different forestry products and services produced by rural households in 2015 were added up to Birr 130.7 billion (table 2).

<sup>&</sup>lt;sup>5</sup>Direct costs incurred in the production, collection and marketing of timber and NTFPs in the form of inputs, durable items and cost of transport were accounted. Labour costs both in-cash and in-kind are costs to households engaged in the forest production business but are treated in the HH survey as incomes generated for the forest sector under support services to forestry sub category of products and services. Exclusion of labour cost from intermediate consumption is in-line with SNA (2008) and helps to avoid underestimation of the overall contribution of the forestry sector to the whole economy. For our purpose, no attempt was made to calculate opportunity costs of family labour.

Products and	Estimates of gross value of forestry products and services in rural Ethiopia economy, 2015 (Birr in Millions)						
services	Stratum I	Stratum II	Stratum III	Stratum IV	Stratum V	National aggre- gate	
Animal feed	9,423.30	15,410.72	11,615.16	20,709.83	652.41	57,811.42	
Wood fuel	6,208.54	4,393.73	6,488.08	16,435.62	672.63	34,198.59	
Construction wood	3,405.36	371.32	3,058.91	8,121.90	36.52	14,994.01	
Coffee	7,001.32	-	1,358.23	5,622.01	-	13,981.56	
Honey	1,242.55	6.96	1,033.13	1,658.98	-	3,941.63	
Support ser- vices	166.25	186.5	167.33	704.03	4.98	1,229.09	
Thatch grass	69.45	211.37	141.22	551.91	4.3	978.24	
Traditional medicine	181.24	285.97	154.68	325.45	1.29	948.63	
Animal foods	141.72	-	253.16	243.66	-	638.53	
Incenses and gums	-	-	607.24	26.15	0.12	633.51	
Spice	233.37	-	82.34	77.23	-	392.94	
Plant foods	20.7	105.68	94.02	128.71	0.18	349.29	
Twinning items	80.45	40.78	41.99	124.52	4.1	291.85	
Tooth brush	18.09	33.61	37.4	92.13	14.21	195.44	
Bamboo	24.6	-	46.7	42.08	-	113.38	
Total	28,216.94	21,046.64	25,179.59	54,864.20	1,390.75	130,698.11	

Table 2. Aggregate of gross annual value of the forestry sector to the rural economy disaggregated bysub categories of forest products and services

Source: Analysis using data on: (a) mean gross direct use value of forestry outputs per HH; and (b) number of rural HHs by vegetation distribution stratum( estimated based on CSA's rural population projection of 72,617,000 for the year 2015 and average HH size of each stratum calculated by the current survey)

#### Net value added of forest products and services to rural economy

The net value added of each sub-category of forest products and services can be calculated after deducting intermediary costs (i.e. 2% cost of collection as per this survey) from the gross values in table 2 above. The net value added of 15 sub-categories of forestry products and services (only from the rural Ethiopia economic activities) totaled Birr 128.1 billion in 2014/15, an increase of about 201% when compared with the GVA of the forestry sector in 2014/15. About 96% of the net value added was collected from five forest products-animal forage (44.2%), fuel wood (26.2%), woody construction item (11.5%), coffee (10.7%) and natural honey(3%). 10 of the 15 sub categories of forest products and services in rural Ethiopia provided only 4% of the aggregate gross value added of the forest sector.

#### Summary of volume of forest products extracted by rural households in 2014/15

Rural households in rural Ethiopia generated Birr 130.7 gross value of outputs from fifteen sub-categories of forestry products and services, and this was possible through extracting both the natural and cultivated forest stocks. Table 3 summarizes the aggregate volume of the harvested timber and NTFPs by rural households.

Type of product	Unit	Estimates of volume of forestry products extraction in rural Ethiopia, 2015( in Thousand per unit of measurement)					
		Stratum I	Stratum II	Stratum III	Stratum IV	Stratum V	National level
Bamboo	Culms	3,390	-	8,889	4,677	-	16,956
Tooth brush	Pieces	30,726	67,264	87,296	160,177	14,217	359,680
Twinning items	Roll	3,708	2,039	3,852	22,390	205	32,195
Wild plant foods	Ton	3	5	10	44	0.01	63
Wild spice	Ton	5	-	1	5	-	12
Incenses/gums	Ton	-	-	17	1	0.002	18
Wild animal foods	Ton	3	-	5	5	-	12
Traditional medicine	Frequency	5,764	2,213	11,510	11,984	4	31,475
Thatch grass	Ton	82	109	104	505	1	800
Natural honey	Ton	20	0	28	29	-	77
Forest related coffee	Ton	260	-	25	218	-	503
Construction wood	M3	9,324	1,243	10,257	19,876	116	40,815
Wood fuel	M3	27,547	21,137	25,756	60,213	1,901	136,553
Animal feed	M3	8,646	3,854	9,277	15,492	816	38,084

Table 3. Summary of the total amount of forestry products extracted in rural Ethiopia disaggregated by subcategories of forest products, 2014/15

#### 5.4 Key findings of the study that have policy implication

# The majority of timber and NTFPs are consumed locally and not provide cash income to rural HHs

The household level assessment indicated that the majority of forest products are used for daily subsistence (74%), and are consumed locally (figure 5). However, there is variation in the magnitude of in-cash and in-kind income depending on the type of product and service. Income from forest service employments are generated in-cash. For coffee, incense and gum, honey and spice the share of in-cash income is higher than the in-kind income; indicating that these products are a cash crop for rural HHs. whereas, the other timber and NTFPs are mainly used for subsistence at local level (table 1).



*Figure 5. Proportion of in-kind and in-cash income from forest products and services (HH level analysis)* 

#### NTFPs have significant contribution in rural livelihood

The gross direct use value of forest products for each household can be measured as the aggregated value of timber, NTFPs and support services to forestry. Comparison of these values showed that rural families in Ethiopia accessed more value from NTFPs at about 59% of total value, and less from timber and support services to forestry at about 40% and 1% respectively (figure 3).

# Despite their significant contribution, animal feed from vegetation areas are not attached as input to the livestock production in the existing national accounts of Ethiopia

The study indicates high values of extraction of animal feed from vegetation sites (figure 3). The relative contribution of animal feed for rural livelihood was calculated to be 40 % of Birr 10,782/HH/yr aggregate mean gross direct use value of forest products, and it was followed by wood fuel, wood construction items, and coffee at the rate of 27 %, 13 % and 12 % respectively. This high value on animal feed was attained at the expense of extracting huge amount of natural products within vegetation areas (at mean volume of 3.35 ton/HH/yr), and because of high market value of this product that ranges from Birr 800 to Birr 4,000 per ton of DM in the sample Woredas. However, the contribution of vegetation areas as input for the live-stock sector has received relatively less attention from researchers and the national accounts over time. The national accounts statistics included about Birr 7 billion animal feed in 2011/12 as input cost (MoFED, 2014) but all costs were attached to 'prepared animal feed' such as crop residue. In sum, this cost estimate did not include natural pasture as input to the livestock production. The GVA of livestock in 2011/12 was Birr 45. 806146 billion at current prices; however, this contribution should presumably be lower if all of the intermediate costs of livestock production like animal feed from vegetation areas were included<sup>7</sup>.

<sup>&</sup>lt;sup>7</sup>The natural growth of animal feed is not counted as production but extraction of this free resource is under the production boundary of SNA (SNA, 2008, p.7) as it involves human labor, input (e.g: food to the animal caretaker, rope, etc...), and durable asset (e.g: sickle): (a) for tending livestock while they are grazing and browsing; and/or (b) for collection of leaves and grass in a cut and carrying system both for own livestock consumption or selling.

When a transaction affects two or more sectors, the recording is based on the principle of quadruple entry accounting (SNA, 2008, p.21). When a free access animal feed is extracted from vegetation areas, the stock of natural pasture declines but balanced by increased financial asset to the forestry sector. For the livestock sector, the same transaction enhance the gross value of livestock output that offset consumption of the animal feed. The crop sector uses livestock power and by-products but this consumption should be balanced by the increased crop production. In sum, the liability of one sector is mirrored in a financial asset of the other sector (SNA, 2008, p.50). Intermediate consumption consists of the value of the goods and services consumed as inputs by a process of production to produce outputs (SNA, 2008, p96). Animal feed from forestry sector is an input or 'intermediate cost' to livestock production. Valuing forestry related animal feed in the ENSA increases

#### Minor products and services

Thatch grass, wild plant based traditional medicine, wild animal food, wild spice, twinning materials, wild plant food, woody tooth brush and bamboo with value of output of less than one % each to the household economy can be considered as minor forest products. However, in financial terms they provide an average Birr 287 per household per annum; which is equivalent to Birr 3.4 billion per annum value of output to the national economy. The income from support services to forestry at household level (about 1% of the aggregate income or Birr 101/HH/yr) is also found to be low in the current survey. However, its contribution is very high when it is aggregated at national level (Birr 1.2 billion per annum)

## 6. Conclusion

Ethiopia's vegetation areas have provided a number of benefits such as construction wood, energy/ fuel wood, traditional medicine, animal forage, human food and additional income to the local communities; however, most of the benefits are largely hidden from official statistics and not properly accounted. This is partially due to unavailability of reliable data on the volume and value of products like bamboo, fuel wood, construction wood, gums and incenses and thatch grass. The survey found forestry related products and services that are not captured by Ethiopian System of National Accounts (ESNA), which included woody twig tooth brush, wild edible animals, twinning items and support services to forestry. This survey also indicated the inclusion of wild edible plants, wild spices, animal feeds, forest and semi-forest coffee, honey, medicinal plant in the system of the national account but these items are attributed to other sectors of the economy.

Existing methods of collecting data by Central Statistics Authority (CSA) that is based on international standard classification systems such as the ISIC was established when environmental issues were not policy priorities. It might not be possible to initiate big change in CSA's National Occupational and Industrial Classifications (NOIC), and have a separate major industrial category to forestry. However, as the SNA has room for special interest accounting– as satellite accounting approach- regular discussions with CSA, Ministry of Finance and Economic Development (MoFED), and other appropriate stakeholders can address the existing gaps in showing the total economic contribution of the forest industry to the wider economy. Data requirement for monitoring progress of implementation of the post-2015 development agenda also provides an opportunity for better measurement of forest benefits.

the production costs of livestock and this amendment in the national accounts enhances the GVA of the forestry sector. However, valuing animal feed will not diminish the contribution of the livestock sector to the national GDP if the principle of quadruple entry accounting is implemented. The GVA of the forestry and livestock sectors increased by 5 % (from 3.7% to 8.7%) and 2.3 % (from (9.4% to 11.7%) respectively when some adjustments was made on the 2014/15 GDP estimate of MoFED. If the net value added of all 15 forest products and services in this survey were attributed directly to the forest sector (Birr 130.7 billion minus 2% cost of production= Birr 128.1 billion), forestry sector provided 11.2% of national GDP in 2014/15(=Birr 128.1 billion divided by Birr 1.14 trillion). Likewise, the GVA of the livestock sector increases further when the outputs of the sector in the areas of in-kind income (animal dung, animal manure, transportation service, animal draft power, crop threshing power, food, hide and skin, animal hair and change in stock); as well as in-cash income (selling of live animals and animal products like milk, hide and skin, hair) are properly valued and/or directly attributed to the livestock sector. These in-kind and in-cash values of the livestock sector are compatible with production boundary of SNA, and they are captured in GDP estimates which attempt to determine the total value of production which 'is understood to be a physical process ... in which labour and assets are used to transform inputs of goods and services into outputs of other goods and services' (SNA, 2008,p6).

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#### End notes

<sup>1</sup>Stratum I-comprised of the natural forest, plantation, and bamboo lands, and found within any altitude range of the country, regardless of the livelihood of the rural communities; Stratum II- composed of the North and South Eastern woodland ecosystem mainly Acacia Comiphora woodland of Somali, SNNPRs and Afar regions; Stratum III- Represented the woodland ecosystem mainly, Termilania-Comberatum of North and South Western woodland parts of the country. Populations' livelihood is characterized by agriculture in western part of Tigray, Amhara and central Benishangul Gumz; Stratum IV- dominated by diverse human activities and patch of evergreen afromontain forest, mostly in the middle altitudes of Ethiopia (1500 to 2500masl) and higher altitude of Ethiopia; Stratum V- referred to the desert and arid parts of Ethiopia where their elevation range is found below 500masl and characterized by arid and semi-arid scrublands, where human activities are very limited.



