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Review of Economic Contribution of Non-Timber Forest Products (NTFPs) for Rural Livelihoods and its Potential for Sustainable Forest Management in Ethiopia

Berhanu Debela Gonfa*

Debre Tabor University, Ethiopia

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***Corresponding author:** Berhanu Debela Gonfa, Debre Tabor University, P.O. Box 272, South Gondar, Ethiopia

Abstract

This review paper focuses mainly on two major themes. First on the extent NTFPs contributes to the rural household economy and secondly the potential role NTFPs play in sustainable management of forests. NTFPs are defined to encompass all biological material that may be extracted from natural ecosystems, managed plantations, wood lands, etc., and be utilized within the household, be marketed, or have social, cultural or religious significance. NTFPs is an umbrella term, in Ethiopia covers wide range of products namely wild coffee, honey, gum and resin, spice and condiments, wild food, fodder, fuelwood, medicinal plants, construction materials, farm implements, handcrafts, household equipment, and among others. All NTFPs covered in the review are found to be plant origin except honey and represent an important element in the livelihood of the rural people. These NTFPs are used either for subsistence to be consumed at household level or sold to generate income or both. Based on the existing literatures NTFPs are essential components of livelihood activities for the rural people living in and around the forest. In quantitative terms, the level of input the NTFPs contribute to rural people is comparable with the other major livelihood activities like livestock and crop production. On top of this its share to the poor category is found to be major and highest than the better off and this shows the product is more important for the poor. This has an implication that the role NTFPs play is in the rural poor is an immense.

The importance of NTFPs is not limited to the improvement of livelihood of the rural people. But goes beyond the economy and it has environmental implication (forest development). Through commercialization of some selected NTFPs such as wild coffee and honey it is possible to protect and sustainably manage the forests. Commercializing these products increases the incomes the rural people generate from the forest without causing adverse effect and in turn contribute to Forest management. The incomes from the sale of coffee and honey serve as an incentive for the rural people and initiate them to actively participate and undertake proper management of the forest.

Keywords: NTFPs; Income; Livelihood; Sustainable forest management and commercialization

Introduction

Definition and concepts of Non – timber forest products (NTFPs)

The term 'forest product' almost immediately brings to mind timber and wood-based forest products [1]. Forests are multi-functional which are providing wide range of products to people living in both developed and developing countries [2]. However, forest products have typically been divided into two major categories: Timber and equally important are the non-timber forest products (NTFPs hereinafter) collected from the forest. At times various terms have been used to describe NTFPs like secondary, minor, special, specialty non wood and nontraditional [3]. Further, put by the authors, NTFPs are neither minor nor secondary. But, as described by Shackleton S et al. [4] a more common and widespread term is NTFPs. The term NTFPs according to Belcher [5] is a negative term and literally includes all products other than timber that comes from forest. Furthermore, Wickens [6] cited in Neumann & Hirsch [7], defined NTFPs broadly to include all the biological material that may be extracted from natural ecosystems, managed plantations, wood lands, etc., and be utilized within the household, be marketed, or have social, cultural or religious significance.

Different authors have sub-divided NTFPs into various categories, making clear the large variety of products covered by the term NTFP. The category of NTFPs is broad, encompassing many kinds of products. For instance Peters [8] categorized NTFP into three groups based on the type of plant tissue or compound exploited: reproductive propagules (fruit, nut/seed, oil seed), Plant exudates (latex, resin, floral nectar), and vegetative

structures (stem fibre, leaf fibre, root, bark, apical bud). Parratt [9] categorized NTFPs broadly in to five separate categories: namely food medicines and bioactive products, extractive products, Animal and animal products, and plant and plant products and insect and insect products.

According to Ros-Tonen & Wiersum [10] many millions of forest dwelling people depend on NTFPs both for own consumption at household level and sale to generate income. In Ethiopia the contribution of NTFPs to rural household economy is immense. Although NTFPs possess important role in the total household income of the rural people they are in most cases forgotten in the calculation of the role forests play in assessing of Gross Domestic Product (GDP). Therefore, the purpose of this paper is to review important NTFPs in Ethiopia, level of contribution to rural household economy and potential role to sustainable forest management. Finally suggest a more inclusive accounting system for future research.

Utilization of Non-Timber Forest Products in Ethiopia

As Marla & Mclain [11] stated, whenever and wherever forests and humans have occupied the same space on earth, it can be expected that NTFPs have made important contribution to people's livelihoods. Non-timber forest products are not new as they have been there as long as people have lived in and around forests and even they can be thought of as the original forest products, since people foraged for and collected non-timber forest products for food, medicine, tools and clothing long before they had the tools and technology to make use of timber [3]. More importantly, Ibaq (1993) cited in FAO [12] indicated that non- timber forest products are among the oldest traded commodities.

However, in modern times forests have been mainly seen as a source of one product: timber [13]. When one thinks of the productivity of a forest, the first thing that comes to mind is timber, the production of which is often organized and highly visible, and the market for wood is highly structured and well established [1] particularly in the more developed countries. Moreover, according to Arnold & Ruiz Perez [14] historically, interests in the productive capacity of tropical forests have been focused on timber and other wood products and the lesser value placed on other material output and this is well reflected in their designation as "minor forest products" until recently.

Although, non- timber forest products (NTFPs) have long been utilized and have provided invaluable economic resources for the rural community for generations, its importance has been over shadowed by timber products, which have been considered as major forest commodities [3,15]. Non-timber forest products have long been invisible to, or undervalued by, many government policy makers, NGOs, and scientific researchers [16]. This is due to three reasons FAO [1] pointed out. One is that of the use of these products mainly for rural subsistence or local markets. The second one is because of the division of these products, as among forestry, agriculture and horticulture by the modern Government administration. Due to the lack of clear definition between agriculture and forestry, statistics don't recognize even nationally and internationally important products as originating from forest. And the last one is because of modern forestry has favored timber and large-scale enterprise and has generally regarded these products as incidental.

Despite the fact that there is, however, growing recognition of the important economic, social and ecological values of non-timber forest products (NTFPs), and the complementary roles they can play to timber, agriculture and other land uses [16]. Arnold & Ruiz Perez [17] described three main propositions as to the reasons why NTFP have increasingly gained growing recognitions in recent times. These were the use or sale of NTFP forms important parts of the livelihood systems and welfare of very large number of people, outside as well as inside tropical forest. Its exploitation is less ecologically destructive than timber harvesting and other forest uses and could therefore provide a sounder base for sustainable forest management and finally the increased commercial harvest of NTFP will add to the perceived value of tropical forest, thereby increasing the incentive to retain the forest resource.

Forests are the most diverse terrestrial ecosystem endowed with wide array of NTFPs which have economic, social and cultural roles in the lives of many local communities. For most recorded history, many millions of people across the world have long made use of a wide variety of natural resource, or NTFPs, to meet their daily livelihood requirements: for subsistence consumption and as a source of income [7]. Ethiopia consisted of wide range of fauna and flora which is attributed to its varied agro-ecology and climatic conditions. The country has a wide ecological zone ranging from deserts to mountain rainforests and alpine habitats in highlands. Ethiopia is a home to wide range of NTFPs available in the lowlands and high land areas. In Ethiopia NTFPs covers wide range of products arising from its ecological diversity. According to UNEP [18], in Ethiopia NTFPs are diverse and the majority of them are coffee, honey and beeswax, livestock fodder, gum and resin, medicinal plants, spices (Ethiopian Cardamom or Afromium corrorima and Long Pepper or Piper capense), thatch, wild meat and wild edible plant. Moreover, few authors [19-22] also documented additional types of NTFPs such as Bamboo (Arundnaria alpine and Oxytenanthera abyssinica), Rhamnus prinioides, construction materials, farm implements and household furniture. Furthermore, Ecotourism [20]; [23] and wild palm (phoenix reclinata) [19] are also treated as important NTFPs.

The value of these NTFPs differs [21], some of which have high value those belongs to that enter in the local, regional and international markets and that of low value are utilized at household level. According to various authors (Table 1) commercially important NTFPs are coffee, honey, gum and resin, spices, bamboo, ecotourism and the non-commercial NTFPs are fodder, medicinal plants, food, household equipment, farm implements, construction materials and among others.

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NTFPs as a Source of Livelihoods and its Contribution to Rural People Living in and/or Around Forests

Sources of livelihood

As can be seen from Table 1 below across the studies forest adjacent rural households generate income not from a single source rather depend on wide varieties of livelihood activities; both cash and in kind, to meet their daily needs. Multiple sources of income are common including crop production, livestock, NTFPs and engagement in off- and non-farm activities and income from aid and remittance. About involvement it ranges from 58% to 100% which means large proportion of forest adjacent people are taking part in and depend on NTFPs activity to make living [19-31].

Contribution of NTFPs

In developing countries, NTFPs are used by many millions of people. As indicated by Shackleton S et al. [4] the most widespread use of NTFPs is subsistence gathering for direct household includes health care, nutrition, shelter and energy. NTFPs can also be used to generate income for the rural people by selling. Shackleton S et al. [4] forwarded four reasons as to why people trade NTFPs: in response to emergency, livelihood diversification, as a regular source of income and lack of alternatives. Shanley et al. [16], pointed out that NTFPs are critical to rural subsistence livelihoods in tropical forested areas and they provide communities with key subsistence resources and with a valuable means of generating cash income.

Forests are a home to wide variety of NTFPs. Resource poor households depend on a broad diversity of both plant- and animal-based NTFPs. There is important difference in the way in which NTFPs contributes to local people's livelihoods. For communities living in and/or around the forest, NTFPs play an important role in provision of three major function such as fulfilling households subsistence and consumption needs, serving as a safety nets or emergencies and risk minimization in terms of crisis when usual food stores run out in times of hard ships or crop failure and lastly providing regular cash income [1,14,32]. Nowadays, there is a growing recognition of the importance of NTFPs to the livelihoods, income generation and local economies [4] of the people living in and around the forest.

People who live in and around forest areas are dependent on forest produce to meet domestic needs of fuel, fodder, small wood, and a variety of fruits, flowers and leaves for different purposes. Ethiopia is one of the tropical countries in which NTFPs play an important role in rural livelihoods [21,33]. NTFPs collection is an integral component of diversified livelihood strategies. Many rural communities have for centuries lived in and around forest and they make use of forest resource among which, NTFPs played important role to the local economy of the local community living in and around the forest. Communities living in or near forests tend to depend in important ways on a wide variety of NTFPs. A range of studies indicated that large number of the local people depend on NTFPs to meet considerable part of their nutritional, health, construction, energy, utensils, feed and other needs. These studies were done in different regions in Ethiopia and have focused on the economic importance of NTFPs to rural household economy and made comparison between incomes from different livelihood activities with income from NTFPs. Accordingly, the findings revealed that the share from NTFPs appeared to be considerably high which indicated NTFPs plays a critical role in the lives of the people located close to the forest.

However, it is important to note that different researchers followed different methodological approaches in calculating the income from NTFPs that could result in different outcomes of the share of NTFPs contribution to total household income. Moreover, it is evident that there is inclusion and exclusion of some specific NTFPs in the accounting system (Table 1) due to lack of consensuses in the definition of NTFPs and lack of market for some of the specific NTFPs. Studies on NTFPs from dry Afromontane forest, Afro-montane rain forest and dry forests were considered. On the first two types of forests the following sources were included in the review. Accordingly, Berhanu [19] reported NTFPs contributed about 23% of the total income of household where 87% of households involved in collection of NTFPs. NTFPs were found to contribute 39% of the total income [24]. According to Chilalo & Wiersum [21] NTFPs accounted nearly half (49%) of the total income of household where all sample household engaged in NTFPs collection. According to Adanech & Lema [22] NTFPs contribute 44.7% to the total household income. 98.2% of the households engaged in non-timber forest product collection as main sources of income (Table 1).

Studies conducted on dry forests of Ethiopia found that NTFPs contribute about 17% in Northwestern and southern [25], 20% in the Northern and 30% in the southern [29], 14% in southeastern [28], 34.8% - 35.2% in Southeastern [31] to the total household livelihood (Table 1). These studies demonstrated contribution of NTFPs to rural livelihoods ranges widely and their input to local household economy is significant and valuable.

In all the studies a range of key NTFPs are extracted from the forest and sold in the local market and considered in the accounting system. All NTFPs are found to be plant origin except honey. These studies clearly showed the importance of NTFPs for the local household economy and found NTFPs to be an essential income source in the total household income. In some areas the share of NTFPs income stands first and indicates most important source of household income. The income from NTFPs activity contributes also in increasing the total income.

Based on their market value these NTFPs can be grouped in to commercial and non-commercial ones. The non-commercial NTFPs are those that are not traded in the surrounding local or informal markets. These groups of NTFPs have no market value. The findings gave emphasis that coffee, honey, gum and resin and spice are the most important and marketed NTFPs and contribute more to their cash income. The level of dependence of

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the inhabitants on the forest resource and contribution of forest resource to households' income vary in the country from region to region and the type of specific NTFPs under consideration. NTFPs continue to play an important role in the livelihood of local people near forest.

Table 1: Summary of studies on sources of livelihoods and their contribution to total household income of the rural people.

Type of Forest	Study Location	Author/s	Main NTFPs	Livelihood Activity						Engagement
				NTFPs	Crop	Livestock	Agriculture	Off/Non-Farm	Aid/ Remittance	
Afro-montane Rain Forest	Southwest	Berhanu [19]	Coffee, honey, spice	23%	54%	20%	-	2%	1%	87%
Dry Afrom-ontane Forest	Central	Getachew et al. [24]	Firewood, fodder, honey and construction materials	39%	-	-	40%	20%	-	
Afro-montane Rain Forest	Southwestern	Mohamed & Wiersum [21]	Coffee, honey, spice	49%	-	-	48%	1%	-	100%
Afro-montane Rain Forest	Southwest	Adanech & Lema [22]	Forest coffee, firewood, spice, honey	44.70%	34.3	8.99%	-	11	-	98.20%
Dry Forest	NW & Southern	Busha et al. [25]	Firewood, gum & resin, medicinal plants, construction materials	17%	46.30%	27.60%	-	6.30%	2.80%	
Dry Afrom-ontane Forest	Southeastern	Muktar et al. [26]	firewood, wild food, medicinal plants, honey, utensils	10.11%			76.50%	12.40%	-	100%
Dry Forest	Southeastern	Dagim et al. [27]	Honey, fuel wood, gums and resins, hand crafts, and construction materials	18.40%	23.40%	54.50%		3.50%		
				22.90%	11.20%	63%		3.13%		
Dry Forest	Southeastern	Zenebe et al. [28]	Gum & Resin	14%	51%	32%		4%		93%
Dry Forest	Northern	Teshale et al. [29]	Gum & Resin	20%	28%	26%		26%		58%
				30%	14%	48%		9%		89%
Afro-montane Rain Forest	Southwest	Alemayehu [30]	Honey, spice, coffee	50.98%	18.70%	27.40%		2.90%		
Dry Forest	Southeastern	Adefires et al. [31]	Gum and Resins, firewood and charcoal, wood for construction and farm tools, and medicinal plants and forest food, wild honey	34.80%	6.80%	45.80%		10.70%	2.70%	
				35.20%	10.40%	40.50%		10.60%	3.30%	

Considering the wealth status, studies also revealed that the share of NFPs income contribution was different among different wealth categories of the local community (relatively poor, medium and rich) [19,22,27]. Accordingly, the NTFPs income share ranges from 4%-35%, 9%-55.5% and 31.8%-57.5% for the rich, medium and poor wealth status respectively. These researchers found the

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share in the total income of NTFPs for poor is major and highest, followed by the medium and lastly the rich (Table 2). It seems the poor gets more income. However, it doesn't mean that the poor category gets more from the forest than the other category. Because the results from the absolute values indicate different patterns that on averages the rich category gets more than the poor and medium category. This has an implication that the rich benefits more from NTFPs more than other categories. But this doesn't mean the rich depend more on income from the forest resource. The reality is even though the poor category gets fewer amounts, this group of society depends more on forest resource.

Table 2: Summary of contribution of NTFPs incomes to total household income by wealth category.

Author/s	Location	NTFPs Income Share by Wealthy Categories		
		Rich	Medium	Poor
Berhanu [19]	Southwest	15%	23%	28%
Adanech and Lema [22]	Southwest	35%	55.50%	57.50%
Dagim et al. [27]	Southeastern	16%	24.80%	32.40%
Muktar et al. [26]	Southeastern	4%	9%	36%
Busha et al. [25]	North Western & Southern	9.90%	15.50%	31.80%

Contrary to the above, other findings [25,26] showed that both absolute value and the income share for the poor increased as compared to the other wealth category. This indicates that the poor gets more than the rich which implies the poor depends more on the forest resources. This can be explained probably because of lack of access to alternative resource of income such as livestock, land and the like.

To sum up according to wealth category the findings indicated that NTFPs play an important role in the life and economy of all wealth status of the communities. But these products are more important for poor groups of the community. The products serve as dominant sources of subsistence and cash incomes for the poor. For the rural poor without other economic resource, NTFPs are a common option. Therefore, the dependence on NTFPs is greatest among the poor.

According to the study findings, the local communities engaged in NTFP are mainly for household consumption or subsistence to directly meet household needs for food, medicine, energy, construction materials etc., or income generation from products such products as coffee, honey, spice and gum and resin or both.

However, it is important to note that all the studies did not exhaustively include all the available and utilized NTFPs in the accounting system. Had it been the case, the contribution of non-timber forest products to the total household economy would have been more than what is shown. Because there are a lot of NTFPs utilized at household level providing substantial contribution to the household total income but were not considered in the household income calculation. The non-commercial NTFPs such as medicinal plants, construction materials, hand crafts, fuel wood, forest grazing and forest foods were not included in most cases. Rather, due consideration was paid to the few commercialized ones (Table 1) probably because of the difficulty of finding equivalent monetary value to those not commercialized. As Lacuna-Richman [34] pointed out on his study in the Philippines, it is difficult for the respondents to put monetary value or equivalents on the non-commercialized NTFPs collected and utilized at home in contrast to the ease of assigning the cash value or monetary value of commercialized NTFPs. This is due to the reason that these products are not either sold or bought in the nearby local markets.

However, there is a possibility of using equivalence of these products to goods that can substitute it and assign it with a monetary value. For instance, in the case of forest ropes, nails and other types of ropes that are bought and sold in the local markets can serve as a substitute. In the same way, for medicinal plants, it is possible to use the costs of modern medicine or the cost the user households save because of the use of this traditional medicine. This results in the complication of valuations because there is different size of nails and also the durability of these products differs, and they cannot be equal. This holds true also for medicinal plants and others too, which needs in-depth investigations.

Therefore, taking the equivalence value may yield unreliable result. Considering only the products, which are commercialized in the local market, the studies put the contribution of NTFP income to the different categories of the community. That is not to say that other NTFPs are without value, on the contrary they may be very important for farmers livelihood, but they are not quantified in all the studies. Therefore, the estimate of the contribution of NTFPs to the total household income indicated is based on only few numbers of products.

Contribution of specific NTFPs

Coffee: Coffee arabica is an endemic shrub plant and still grows wild and found in its original birthplace in southwest Ethiopian remnant forest. According to Petit [35] Ethiopia is the largest coffee producer and exporter country in Africa and being a cash crop, it plays crucial role in sustaining an estimated of 7-8 million people associated with coffee growing [35,36]. According to Fissaha Asmalesh [37] about 25% of people in Ethiopia depend on coffee for their livelihood.

Various studies [19,37] indicated that coffee beans and leaves are mainly used for drinking and the dried branches and leaves are also used as firewood. Further it is demonstrated by these authors that coffee has medicinal value and socio-cultural importance where during coffee ceremony ideas are discussed.

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Large proportion of coffee is used for consumptive purpose. According to Petit [35] 40% of total coffee produced is consumed at household level. Moreover, coffee is also a good source of income to local farmers. According to the study in Yayu forest reserve by Adanech & Lema [22] forest coffee accounts for 74.9% of NTFPs income. According to studies done by USAID in three zones of SW Ethiopia income from coffee sale ranges from 750-10,000 ETB [35,38]. The study finding indicates that poor and very poor groups' gets less from coffee sale while the better of gets more. Coffee harvesting and processing involves labor intensive activity and provides source of income for large number of rural poor [35].

Honey: It is mentioned that Ethiopia has long tradition of beekeeping and it is stated to be a deep-rooted household activity [39]. Honey is one of the main NTFPs used as a cash crop for most rural people (especially in forested and wood land areas). Forest beekeeping entirely depends on forest and woodlands consisting of enormous number of species of plant that produce surplus pollen and nectar year-round to foraging bees [23,40]. Fayera et al. [41] documented 32 different plant species that are used as a source of honeybee flora. Berhanu [19] reported the forest provides three main functions for beekeeping where as Fisseha [37] reported two of them, namely forests as the main sources of pollen and nectar, beekeeping site or placement of hives and lastly, provision of raw materials for the construction of beehive. In addition to the above Freerk Wiersum & Tefera Belay [42] mentioned more functions like source of vegetative material for smoking and fumigation of hives, provision of shelter and by so doing protect bees from adverse climatic conditions. Therefore, the practice is totally dependent on the forest and wood lands regardless of the time and labor invested; the raw materials for this activity are obtained from the forest directly. According to Mohammed Adil et al. [23] out of the total honey produced more than half of (50-60%) is used in the production of local beverage or tej (honey wine), 20% is consumed at household level used as table honey and only a small portion of the product is marketed. Cash generated from the sale of honey provides an opportunity of supplementing income earning for the farmers [43]. Nuru [44] indicated that honeybee and their products provide direct cash income for beekeepers.

Findings show that Forest beekeeping is the most important NTFPs in the southwest bio-diverse forest in Ethiopia. Teklu Gebretsadik & Dinku Negash [45] reported beekeeping accounts for 15% of total household income in Gedio area of south Ethiopia. Awraris Getachew et al. [46] reported forest beekeeping contributed 50% of household income of the people involved in the activity where Mohammed Adil et al. [23] reported that in the south western parts of Ethiopia on average households own 20-30 beehives where from a single hive 5-6kg can be harvested and annually households get 100-200kg of honey. Study conducted in dry afro-montane forest found in the central part of Ethiopia [47] found that forest resource constitutes about 39% of the total income and out of this proportion 2% is contributed by honey. Finding from dry forests [27] indicated honey accounts for 49% of NTFPs contribution to total household income which is unusually reported as compared with forest from southwest and southern areas endowed with high natural forests.

Fenet Belay Daba & Alemayehu Oljirra Wolde [48] stated Beekeeping is believed to play a significant role and one of the possible options to the smallholder farmers in order to sustain their livelihood. It does not only provide input to the economy of the rural people as a source of additional income, but it plays diverse roles through contributing to health as a medicine to cure different disease such as cold, stomach discomfort and wounds [37], nutrition and social issues through reinforcing local institutions through sharing of brood during harvesting of honey [19]. In addition to serving as a source of income and food for local people beekeeping also serves as an employment possibility along honey value chain: input provision, production, processing, and marketing [39].

Gum and resin: According to Teshale Woldeamanuel [49] most forest resources in Ethiopia are found in dry wood lands in the lowlands. Dry lands cover about 75% of Ethiopia and these forests hosts valuable fauna and flora species [2]. These dry forests are reported to be rich in ABC species [50]. Teshale Woldeamanuel [49] reported that about 35 ABC species has been identified as potential gum and resin producing species. Even though dry forests provide wide diversity of NTFPs such as wood for construction, firewood, charcoal, farm tools, household furniture and utensils, fodder and shade for their animals, wild fruit, wild meat from hunting, medicines, recreation, bee forage for honey production [49,50] accounting system considered only the most commercially important and popular NTFPs collected from dry forest: gum and resin. These economically important products are naturally produced by various forest species of Acacia, Boswellia, and Commiphora (ABC species). Gum and resin bearing tree species are found in almost all regions: Tigray, Amhara, oromia, Gambella, Somali, Benshengul gumuz, SNNP and Afar. Gum and resin are among widely used and the most economically valuable NTFPs obtained from dry forests of Ethiopia that contributes to livelihoods of local communities living in and near it [51]. Adefires Worku et al. [31] reported that gum and resin collection is mainly to get cash income.

Studies at different regions showed that gum and resin contributed about 32% [50], 14% [28], 20%-30% [29], 6% [27], 39.9% [25] to total household income which indicates gum and resin plays an important role in the livelihood of the rural people. This means the local people obtain considerable amount of income from these resources. In quantitative terms, the level of input the gum and resin alone contribute to rural people is comparable with the other major livelihood activities like livestock and crop production. In most studies the input of gum and resin comes next to livestock. Therefore, based on the existing literatures gum and resin is an essential component of livelihood activities for the rural people in the dry land areas.

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In addition to cash income from the sale of gum and resin, studies revealed that [23,52] the collection, taping and grading of gum and resin demands large number of labour. Therefore, it provides seasonal job opportunity for rural people.

Spices and condiments: According to Jansen [53] spice and condiments are plant or plant products that are used to flavor foods or beverages before, during or after their preparation. Further the author stated that from spice Aframomun corrorima (commonly known as Korrorima) and Timiz (Long Pepper) and from condiments Rhamnus prinoides (commonly called Gesho) are among the most common spice and condiments found in Ethiopia.

Range of sources indicated spices collection and trades are common in South, western and southwestern parts of Ethiopia [19,21,30,37,54]. According to Fissiha Gebreyesus [55] the capsule of Korarima is wildly collected from the forest. Afromomum corrorima and Timiz are consumed at household level used in the daily dishes of most Ethiopians and also considered as a cash crop which represents an important part of farmer income. They are commercial NTFPs most commonly collected and sold by local inhabitants. It represents an important livelihood supporting activity to the local people [23,54].

Israel Petros [54] on the review of Socio-economic and Environmental Values of Korarima pointed out that Korarima provides wide array of benefits to communities such as including importance for food preparation and spice to flavor coffee, food, and butter; medicine for human and livestock; and the dried seeds and capsule for sale to generate income for the rural people.

Timiz too is an important spice in Ethiopia and grows naturally in the forest almost the same habitat as natural coffee according to Fisseha Asmelash [37]. According to Timiz is plays a central role in the life of farmers and represent 10%-60% income of the farmers. Accordingly, presents an important part of income for various people. Thus, it is a good source of income. This same source found that Timiz is used as a medicine to treat both human and Animal disease; importance for the cuisine of Ethiopia being serving as an ingredient during producing berbere, mitmita, awaze and to spice coffee, tea and butter [53].

Various studies [19,37,53] demonstrated that Rhamnus prinioides is an important spice in Ethiopia used to make local beverages such as "Tella", "Tej" and "Arekie". In addition to consumption at home it was reported [19] that small amount of sales income is also coming to few numbers of households from Rhamnus prinoides. They sell these products to local beverage makers.

Construction materials, farm implements, furniture and hand crafts: With regard to construction, NTFPs play paramount role in rural areas to construct and maintain house or hut, fence, storage materials (made up of bamboo, lianas and small sticks) and among others. Fisseha Asmelash [37] reported lianas, climbers, vines and small poles are very important NTFPs used for house and fence construction. Lianas substitutes and perform the purpose of a nail in house construction specially while constructing traditional huts. Thatches are used to cover the roof of traditional hut. According to Berhanu [19] and Fissaha Asmalesh [37] natural fibers produced from forest plants are reported to be forest ropes, basketry, carpets, bags and woven mats. Forest ropes play an important role to construct houses (hut) of the rural people and make traditional beehives. Amount or quantity of ropes needed varies depending on the size of 'hut to be constructed. The wealthier groups of the community constructs big house with quality tree species while the poor small ones. Depending on the types of tree species used and quality of hut constructed, maintenance take place either in short or longer interval of time.

If termite resistant tree species are used and well-constructed in the very beginning, maintenance is carried out on average after four years which otherwise take place less than the time stated. The quantity of forest ropes used will become quarter of the amount used at the beginning. The weight of single bundle was estimated or weighed to be five kilograms when it is freshly cut. This is the usual amount a person can cut and bring from forest. Moreover, forest ropes and climbers are also used in making fence, cover to the beehives, tying beehives to the tree during placement and tying domestic animals.

Reports on sale of construction materials, handicrafts, farm implements and household equipments are rare. This doesn't mean these NTFPs are not used. The products are utilized, remained un-estimated. But Dagim et al. [27] found that 6% of the forest income was represented to be contributed by construction materials and handicrafts while Mamo et al. [47] reported 21% of forest income contributed by construction materials for houses, storage facilities, fences, furniture, and farm implements.

For Ethiopia farm implements are basic elements and play an important role in crop production. As reported by Fisseha Asmelash [37] various types of wood are used to make farm implements. A set of traditional farm implements used in Ethiopia and produced from certain species of trees consists of Mofer, Erf, Degri, Qechil, Qetert and yolk.

Energy: In terms of energy, the roles of NTFPs as a source of energy occupy a central part for large majority of people in Ethiopia. Since more than 85% of the country residents live in the rural areas where there is absence of other alternatives energy sources for cooking the last option they have is to entirely depend on biomass energy (firewood, dung and crop residue). Wood collected from nearby forest plays an important role in filling the energy gap. Fuel wood still remains the most dominant domestic sources of energy needs and continues to be important for the foreseeable future and is one of the most important NTFPs mainly used for cooking, heating and boiling water. Finding of study conducted at Bale eco-region [56] indicated that large majority (81.1%) of people depend on firewood, charcoal and leaf for cooking. Not only for rural people is it also key sources of energy for urban people. In addition to its subsistence use at household

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level there are reports that indicate firewood and charcoal being used as a source of income and common practice in most parts of the country.

For instance, study conducted in forest found in the central part of Ethiopia showed that forest resource constitutes about 39% of the total income out of which the major proportion (59%) is contributed by firewood which stand first in comparison to other NTFPs. Dagim et al. [27] reported fuel wood as second most important income source of NTFPs which accounts about 39% of forest income. Bush et al. [25] and Adanech & Lema [22] reported that fuel wood accounts 57.8% and 22.9% to NTFPs income respectively. According to Muktar et al. [26] collection and sale of firewood is reported to be an important part of the livelihood of the rural people. Charcoal making to generate cash income is also reported [31]. These finding provides clue that fuel wood is used by most rural households and it plays important role in the lives of the rural people. It is utilized for both home consumption and to some extent for income source.

Grazing: According to Dagim et al. [27] in the dry forests where livestock production is the dominant livelihoods the sole source of feed for livestock is the surrounding forest which provides grass and/or woody plants year-round. The studies (e.g. [27-31]) didn't report the crucial role dry forests play in supply of feed for their livestock year-round.

In the afro-montane forests none made report in the accounting of grazing and fodder except Getachew et al. [24]. The authors reported that fodder contributes 18% of NTFPs income in which fodder stand 3rd in the share of NTFPs income. Grazing is the most important NTFPs most widely used by almost all rural people adjacent/near to the forest [19] but remained un estimated or unaccounted. This results in the undervaluation and provision of distorted information on the contribution of NTFPs.

In addition, studies on montane rainforest regions (also called forest coffee) of Ethiopia (Sheka, Bonga, Yayu and Harenna) by Fayera Senbeta et al. [41] identified shrubs and tree species that are used to be fodder plants. Trees and shrubs are sources of protein, vitamins and minerals during dry season. It is also clear that there are many varieties of grasses and herbaceous plant species that are serving as fodder. However, there are lots of researches that were done on the area without including fodder in the accounting system.

Medicinal plant: In Ethiopia the collection and use of medicinal plants both for humans and livestock is a common practice among people in the rural areas especially in the remote and forested areas where modern medication is quite un accessible because of cost and lack of infrastructure and facility. The forests are endowed with very rich plant species from which traditional medicine are used to be derived. Again, even though, there is no accessibility problem because of cost and effectiveness the rural people prefer to use plant parts [19]. The author further pointed out that forest serve as good source of medicinal value plant parts such as bark, leaves and roots. Varieties of plant species and its parts are used to cure different disease. Feyera Senbeta et al. [41] reported a total of about 50 plant species those have medicinal uses. Endalew Amenu [57] identified eighty-nine plant species used as a source of medicine. The source further noted that traditional medicinal plants provide 40% of human health service and more than 50% of livestock health service. In a biodiversity hotspot, Bale Mountains National Park in the South East Ethiopia 337 medicinal species were identified and turned out to be a medicinal plant hotspot [58]. Adefires Worku et al. [31] also found that the importance of dry forest as a source of medicinal plants to treat human and livestock disease. Medicinal plants used in the estimation of NTFPs income [25,26].

Food: Forest and woodlands supply considerable amount of edible plant materials and plays a significant role in the livelihoods of rural people. variety of foods obtained from the forest and wood lands include fruits, seeds, leaves, bulbs, mushrooms, honey, beverages, bush meat, fish and among others. Forest foods give relief to the rural poor and children during shortage. Feyera et al. [41] identified over 35 wild plant species that are considered by local people as source of food. Berhanu [19] demonstrated that some plant species from forests are used as food especially during hard times. It is also stated that children most commonly use these edible plant species. Traditional uses of wild edible plants are especially during hunger periods because of drought when crops fail and shortages. Study in northwestern by Tariku & Eyayu [59] documented about 77 wild edible plant species and indicated the most plant parts used are fruits, leaves, roots and tubers and rhizomes (decreasing order). Ermias et al. [60] on their review of wild edible plants in Ethiopia documented about 413 wild edible plant species which only covered 5% of districts in the country. The study of this review summarized that wild edible plants of Ethiopia are used as supplementary, seasonal or survival food sources.

Potential of NTFPs for Sustainable Forest Management

NTFPs provision is not only for livelihoods of the rural people near forest but also have environmental importance. According to Pancel [61] tropical forests are endowed with diverse numbers of NTFPs that have different roles: namely for conservation, sustainability and economy. Falconer [32] indicated that the growing recognition of the importance of NTFPs with the increasing awareness of tropical forest problems and destruction. In recent years, a growing body of scientific research has suggested that NTFPs can help communities meet their needs without endangering the forest ecosystem and offer a basis for managing forests in more sustainable way [1]. According to Hunt (undated) NTFPs are often considered to be the black box of integrated forest management. Hence, these products represent a way to meet environmental objectives [15]. This is through increased income from the trade in NTFPs, which is thought to provide a stimulus for protecting their forests and manages them sustainably through participatory forest management [62]. Since it is believed that the extraction of NTFPs can usually be accomplished with minimum damage to the forest and also keeping the forest intact than

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alternative land uses [10,61]. Ros-Tonen [62] pointed out that the extractive reserves were proposed as a combined strategy both to secure forest peoples' rights to forest resources and to promote environmental protection simultaneously.

Although various studies earlier has shown the importance of NTFPs for the local communities, Ros-Tonen & Wiersum [10,62] argued that it is not an easy task to serve simultaneously ecological, economic and social objectives through a sustainable extraction of NTFPs which lead to doubt about potential of NTFPs harvesting from natural forest to contribute to forest conservation [62]. This is due to the reason pointed by the same author that any livelihood gains from NTFPs to forest communities are not without certain ecological cost. That is why the idea of conservation through commercialization has triggered criticism since any commercial harvesting of NTFPs does have a number of ecological impacts, including gradual reduction in the vigor of harvested plants, decreasing rates of seedling establishment of harvested species, potential disruption of local animal populations and nutrient loss from harvested material [8].

Arnold & Ruiz Perez [14] also argued that the exploitation of NTFPs has a differentiated effect, depending on the types of species and the parts being harvested. However, as compared with logging or conversion of forest to other land uses, these impacts are viewed as minimal [62]. This same author further indicated that though most NTFPs are locally used, NTFPs even contribute to a country's export earning, because some of them find their way in to international markets which indicates that this economic importance of NTFPs has important implications for natural tropical forest management and the planning of land use in tropical rain forest areas. One of the peculiar characteristics of NTFPs is that its ability to serve as income opportunities from forest that do not involve cutting down trees for wood products [63].

Even though there is a dilemma on potential of NTFPs as a conservation tool, it is important to mention that in forest performing important environmental functions it is important to consider NTFPs as a part of participatory forest management strategy [10,62].

In the context of Ethiopia, the concept of conservation through commercialization may effectively work on few selected NTFPs exploitation (especially honey and wild coffee). For instance, traditional honey production is mostly done in the forest in non-destructive manner so that the forest keeps on providing substantial amounts of income benefits to the local communities which the income obtained serve as an incentive in conserving the forest. Beekeeping in Ethiopia has recently getting attention because of its potential conserve forests [24]. According to ITO [43] beekeeping can be considered as a potential product that involves no clearing of forests as usually done to produce crops, rather the rural people need to protect forests to maintain the continuity of honey production. Because the forest is endowed with a variety of plant species that serve as source of honey bee flora and it is relatively intact and forms different vertical layers, viz. grasses, herbs, shrubs and trees that merge in to one another [19] and in combination with its suitable climate makes it potentially convenient for honey production. The forests serve as the main sources of pollen and nectar.

Beekeeping can be potential NTFPs that provide the rural people an incentive to conserve the forest [43]. Gidey & Mekonen [64] cited in this source also indicated that beekeeping is an environmentally friendly activity that can be used in forest conservation. Moreover, Ajabush Dafar [39] suggested that beekeeping provides an economic incentive for the local people and be an ideal activity to conserve forest. Furthermore, experiences from southwestern Ethiopia are documented by Lowore et al. [65] shows that forest beekeeping provides protection of forest from being overexploited which means if the forests are there; there will be abundant bee forage which in turn implies much honeybee production. The authors concluded and put that the income generated from forest honey by forest beekeeper motivated the local communities to act to maintain the forest. Hartmann [66] cited in Awraris Getachew et al. [46] and Mohammed Adilo et al. [23] suggested that beekeeping activity is a conservational system as income is generated through honeybee flora which in turn helps to maintain the forests. Commercial honey, according to Lowore & Wood [67] reduces forest conversion to other land uses and forest degradation. CIFOR [68] cited in Lowore & Wood [67] also mentioned that there is a strong link between traditional beekeeping and forest management that if rural people get enough amount of money from the business it serves as incentive for forest management. When beekeeping commercialized, it becomes economically valuable NTFPs leaving the forest intact without affecting its structure and function and addressing conflicting objectives of forest management [69] cited in Lowore & Wood [67]. According to Mengistu [70] cited in Ajabush Dafar [39] beekeeping reduces pressure on land. Therefore, the local people will not encroach into forest in search of acquiring new land for agricultural activity.

Mohammed Adilo et al. [23] suggested that forest honey obtains the name organic honey and commercialized have the potential to be used as an incentive for forest management. Provided that forest beekeeping is supported with strong market the livelihood of the rural people can be sustainable while protecting the forest. Therefore, the activity is environmentally friendly and economically sustainable. According to Tefera Belay [42] the rural people involved in beekeeping are involved in various forest management and forest protection activity such as protecting and preserving big trees, tending and protection of young trees and planting activities. It is reported by this author that 97% of beekeepers in southwestern Ethiopia were involved in one or other above-mentioned forest management practices. Moreover, this source indicated that 34% rural people reported as willingly worked for the conservation of the entire forest through consensus building through local discussion.

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Other NTFPs which fits with forest management is coffee. Even though the scholars in the field agrees on the negative effects of coffee on forests, studies also showed that traditional coffee production in Ethiopia maintained high biodiversity in the system [23]. The authors further stated that coffee being produced in the forest can get the brand name of organic coffee which will help in the commercialization of the product which in turn leads to sustainable management and utilization of the forest coffee ecosystem.

The promotion and commercialization of NTFPs (specifically honey and coffee) improves the livelihood of the people living inside and near the forest through creating more income opportunities which proves to provide major incentive for the local people to sustainably manage the forest resources. When these NTFPs are commercialized the rural households gets more income from the sale of coffee and honey production. This leads to protection of the forest from being further degraded and lost through reduction of pressure by the local people. These two products: honey and coffee, must be worked on and promoted as organic food so that they be treated as a specialty product [71-74].

Conclusion

In Ethiopia, NTFPs is an integral part of livelihood activity and play a central role to the rural people living in and around the forest. The local communities are engaged in NTFP mainly either for household consumption or subsistence to directly meet household needs for food, medicine, energy, construction materials etc., or income generation from products such products as coffee, honey, spice and gum and resin or both.

In quantitative terms, the level of input the NTFPs contribute to rural people is comparable with the other major livelihood activities like livestock and crop production. On top of this its share to the poor category is found to be major and highest than the better off and this shows the product is more important for the poor. Commercialization of NTFPs (specifically honey and coffee) improves the livelihood of the people living inside and near the forest through creating more income opportunities which proves to provide major incentive for the local people to sustainably manage the forest resources. When these NTFPs are commercialized the rural households gets more income from the sale of coffee and honey production. This leads to protection of the forest from being further degraded and lost through reduction of pressure by the local people. These two products: honey and coffee, must be worked on and promoted as organic food so that they be treated as a specialty product.

The non-commercial non-timber forest products such as medicinal plants, construction materials, hand crafts, fuel wood, forest grazing and forest foods are not included in the accounting system. Had it been the case, the contribution of NTFPs to the total household economy would have been more than what is appeared. Therefore, attempts should be made to exhaustively include all the available NTFPs in the estimating the value of the NTFPs.

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