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# Direct and Indirect Contributions of Forest to the Other Sector of Economy Ethiopia: Review

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**Abstract**
The forest sector contributes to economy beyond itself and extends to other sectors through direct and indirect effects. Insufficient identification of forest contribution to other sector of economy can result in the underestimation of the sector and leads to poor policy priority. The main objective of this study is to identify the contribution of forest to other sector of economy in Ethiopian. For this study both quantitative and qualitative secondary data were used. The result study showed that forest resources add different values to other sector of economy such as agriculture, food security, health, construction, energy and water, tourism, employment and income generation. However, the current system of national accounts does not fully capture the direct and indirect forest contribution to the other sector of economy. The study recommends that forest sector needs to adopting the concept of total economic value and adequately identifying both direct and indirect contribution of forest to other sector of economy. Furthermore, develop and use updated socioeconomic data, forest specialized surveys to better understanding the contributions of forests to other sector and national economy.
**Keywords:** Forest Contribution, Other sector Economy, TEV Methodology, Ethiopia
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## Introduction

Ethiopia has abundant biological resources diversity and environmental features ranging from semi-desert to mountain forests with wide range of ecological, edaphic, and climatic conditions (Thomas, and Bekele, 2003). The forest sector contributes to the economy beyond itself and extends to other sectors through indirectly (Li et.al. 2019). The government of Ethiopia has stated a strong interest in strengthening the contribution of the forest sector to achieve economic growth and to ensure the social and environmental sustainability (Umer et.al. 2019). The forest in Ethiopia directly contributes to the national economy through wood and non-timber forest products, support agriculture, provide food, maintain health and environment, tourism, employment generation, earning of foreign currency through export, savings through import substitutions (Tadesse et.al, 2012).

The Ethiopian System of National Accounts (SNA) does not fully account the contribution of the forest to economy. The SNA approach has gaps in accounting all forest goods and service because it is only based direct forest contribution and neglected the value of some forest ecosystem services. For instance, statistics from Ethiopian Ministry of Finance (MoF, 2015) show the forestry sector's contribution to be about 3.8% of gross domestic product (GDP). However, the satellite study conducted by United Nation Environmental program (UNEP) reported that Ethiopian forests generated economic benefits in the form of cash and in-kind income larger than the amount indicated by the Ministry of Finance. Furthermore, the negative impacts and consequence without forest such as the loss in plant, animal species, fuel-wood, timber, non-timber, soil erosion, deterioration of the water quality, drought, flooding, reduction of agricultural productivity and poverty are not well accounted in the SNA.

According to the UNEP satellite study, forest generated about 111.2 billion Ethiopian Birr (ETB) or 12.86% of Gross Domestic Product (GDP) in 2012-13. Of this, 2.4 billion ETB was attributed to non-market benefits based on household willingness to pay to conserve forest (UNEP, 2016). The values of some forest goods and services have no market prices (Pak, 2010). poor identification of direct and indirect contribution of forest to others sector of economy is challenging forest sector development and transformation. In addition, absence in the concept of total economic value in accounting system leads to underestimate the contribution of the forest sector to the economy. This deficiency may be due to lack of information gap on direct and indirect contribution of forest to other economic sectors. Identifying direct and indirect contributions of forest to other sectors of economy is an important dimension in policy analysis (Teketay, 2010). The total economic value approach can better help the estimation of all goods and service of forest including direct, indirect, option, and existence values of forest resources. However, no comprehensive study conducted on contribution forest to other sector of economy. Therefore, this paper clearly shows the direct and indirect contribution of forest sector to the other sectors of Ethiopian economy by reviewing different national data sets and reports.

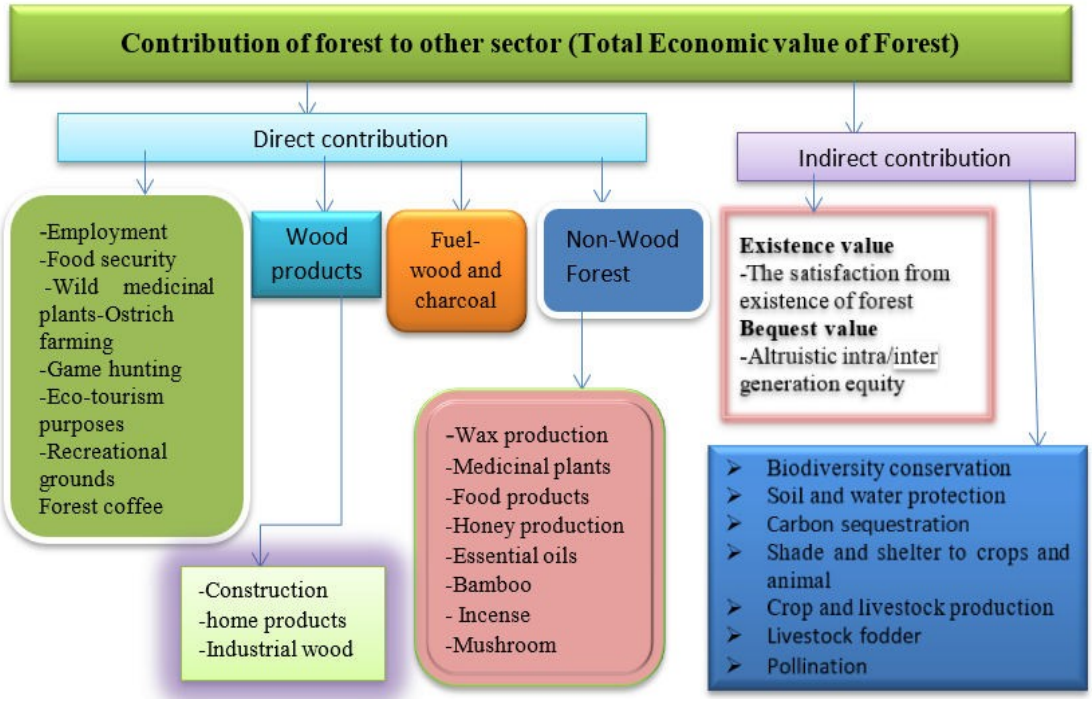
## Methods

Both developing and developed countries in all climatic zones, communities that live within and near the forests rely directly on forest for their livelihoods and income generation (UNEP, 2020). However, developing countries

like Ethiopia faced market failure in many sectors particular in forest. The local market failure and global market failure are the two kinds of market failure that occur in many economic sectors including forest sector (Rosales et.al. 2005). Local market failure relates to incapability of markets to capture some of the local benefits of forest resources. The Ethiopian forest sector exhibited much local market failure and some benefit streams derived from forest in the informal sectors and ecosystem services is not accounted in the GDP. The global market failure concept related to the fact that forest yields external benefits to people outside the boundaries of the nation. The benefits forest provided for local peoples and international community are not well captured due to market failure. The failure to capture such benefits underestimates the contribution of forest sector to national economy.

Methodology used by researcher does mater the total contribution of forest resources. For stance, FAO (2011) estimates the contribution of forest sector to national economy in terms of employment, value-added, value of forest products exports and imports. However, forestry contributions range from their protective environmental functions such as the maintenance and restoration of soil fertility, erosion control biodiversity food production missed. For this total economic value conceptual framework methodology was employed to review direct and indirect contribution forest sector. This methodology was selected because of it is useful to look at the roles and opportunities of forests resources in economic development and poverty alleviation, improved food security and enhanced environmental stability. Furthermore, it consists of its use and non-use value (Adger et.al., 1994). Moreover, Krieger, (2001), recommend total economic value methodology to measure and quantify all economic value forest resources. This developed the conceptual framework methodology that can capture direct and indirect contribution forest to the economy and other sectors (see figure 1 below).




Source: Own developed framework

Based on the developed methodology the data on forest direct and indirect goods and services to other economic sectors were obtained from the recent forest inventory by Ministry of Environment, Forest and Climate Change (MEFCC), Food and Agriculture Organization (FAO), Ethiopian Forest sector review, National forest sector program and regional forest sector documents and other relevant data sets. Different published and an unpublished document produced by forestry and other sectors that describes the contribution of forest resources to other economic sectors was analyzed. We characterized and described the contribution of forest-derived benefits to other economic sectors using available quantitative and qualitative empirical evidences. The contributions of forest sector to employment opportunity in Ethiopia were also assessed. Detailed meta-analysis was conducted to get the result on the contribution of forest resources to other sectors of the country's economy.

## Result and Discussions

### Contribution of forest to agriculture, health and food security sector

Forests resources interact with agriculture, health and food security in several ways. The agriculture, health and food security sectors are only positive with the existence of forest because the absence of forest could lead to unnecessary negative impacts these sectors (FAO, 2014). Forest and agricultural production systems often

overlap to varying degrees; sometimes they overlap completely, as in agroforestry. Around 40% of global agricultural land has more than 10% tree cover (Zomer et al., 2009). Nearly a quarter billion people live within 5km of a forest in Africa which represents one-fifth of Africa's population and includes many of the extreme poor who typically rely directly on the goods and services that forests and trees provide. For forest-adjacent communities in many African countries, forests contribute more than 20% of household income, in many cases as much as agriculture (Angelsen et al., 2014). Generally, forest is the backbone of agriculture since sustainable development and viability of agriculture sector is highly correlated to forest sector (Gogoi, et.al. 2020; FAO, 2011).

Forest support ecological functions in agriculture such as stabilizing the soil, preventing erosion, enhancing the land's capacity to store water, and moderating air, soil temperatures, pollination, soil quality, nutrient cycling, biogeochemical cycling, reduced risk of drought, conserving biodiversity, maintain higher intra-species genetic diversity control flood and climate change regulation (Watson et. al., 2018). Forests also provide farmers with a local supply of agricultural inputs (e. g. fodder, fibre and organic matter), thereby reducing the costs and negative externalities of producing and transporting such inputs from more distant locations. Forests have an important role in agriculture as the natural habitats of wild pollinators (Tibesigwa et al., 2019). The benefit from proximity to the forest for pollinator- depend on distance between the forest and the farm. In developing countries like Ethiopia households, the source of farm tools and implements is directly from the forest. For example, traditional plough, neck yoke (jungle), Kudali, handle of sickle, plough shaft, plough share, plough, beam and handle of Axe. It also important in-house utensils such as baskets, mate, dyes, beehives, for *houses,* furniture, bed, chair, shelf, desk, *kitchen utensils and* fences.

FAO (2009) defines food security as a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Based on this definition, food security is understood to have four dimensions: availability, access, utilization and stability. Food from trees and shrubs, within and outside forest in the form of fruits, nuts and leaves play an important role in food security and nutrition (Teketay et al. 2010). Forest contributes to all four dimensions of food security through the provision of nutritious food, income, employment, energy and ecosystem services (FAO, 2013). In addition, forests and trees support food availability by providing fodder for livestock, either as browse or as animal feed. The contributions of fodder to food availability are twofold: livestock are a source of meat and milk, and also support agricultural production by providing draught power and manure, which can increase farm productivity. The direct interaction of forest and food security is high, especially in situations of strong seasonal cycles of food scarcity and crop destruction due to erratic climate or other factors (Sunderland et.al, 2013).In the Ethiopia, pastoralist's area coping to drought and food shortages depends on availability of products from natural forest and woodlands (FAO, 2003). For example, nuts, fruits, mushrooms, natural honey and beeswax, ostrich farming and condiments such as ginger, nutmeg, cinnamon, and cardamom under-utilized and are not well accounted (Melese, 2016). In many contexts, the contribution of forests to dietary diversity is not easily replaced by higher incomes. In places where forests were converted to commodity crops leading to increased household incomes, there have been negative consequences for nutrition and dietary diversity (Ickowitz et al., 2016).

In addition to the contributions of forests and trees to agriculture and food security forest also encompasses an enormous range of plant, animal and microbial material with known or potential medicinal values vital for human health. These substances are not only of local importance but are also commercialized on national and international markets or used as models to synthesize new medicines (the majority of active compounds that were originally derived from forest plants are now produced in laboratories). More than 28, 000 plant species, many of which are found in forest ecosystems, are currently recorded as being of medicinal use (Willis, 2017). Medicinal plants used for traditional medicine play a significant role in the healthcare of the majority of the people in Ethiopia (Admasu and Yohannes 2019). The local practitioners provided various traditional medications to their patients' diseases such as stomach-aches, asthma, dysentery, malaria, evil eyes, cancer, skin diseases, and headaches. Stream/riverbanks, bush lands, forested areas and their margins, woodlands, grasslands, and home gardens are major habitats of medicinal plants. Further, essential oils have been used for thousands of years as perfumes, detergent, medicines and food flavoring (Lemenih, and Teketay, 2003). Traditionally, pure oil is prepared for medicinal purposes, hunting meat, for tanning leather and wood, and for greasing the hair and body (Tadesse and Mbogga, 2004). Medicinal and aromatic plants from forest have, for centuries, constituted an inseparable aspect of the African traditional culture of health. For example, moringa uses to purify drinking water (Delelegn et.al, 2018). Balanites aegyptiaca fruits contain saponins, which are used to kill both the snails that host bilharzias and the water fleas that host the guinea worm (Okia, 2010 and Chikamai et.al. 2004).

**Contribution of forest to energy and water sector**

Throughout history, wood was the most important source of energy for human beings until petroleum became widely available during the last 100 years. In many of the world's poorest countries, wood remains the most

important source of energy for heating and cooking (Kilawe, and Habimana, 2016). Over 80% of energy for households in sub-Saharan Africa relies on fuel wood and charcoal. Wood fuels and charcoal is the largest contributor to the income of rural communities (Angelsen et al., 2014; Jagger and Shively, 2014). Wood fuels harvested for subsistence use are by far the highest value commodity rural households extract from forests. As a critical source of bioenergy forest resources play an essential role in creating options for affordable and clean energy in developing countries. The production of charcoal and fire wood is also an important socio-economic activity in sub-Saharan Africa (liyama et.al. 2017).

In Ethiopia, fuel wood and charcoal are the dominant source of energy obtained from forest (Alem et. al., 2010). About 96% of the population depends on round wood as source of energy for cooking (Gebreegzihabiher et.al., 2012). Forest resources account about 90% of current primary energy use. Urban area charcoal is a basic source of energy and 65% of the population uses as a source of energy (Geremew et.al. 2014). The rural household in Ethiopia use charcoal production as one livelihood obtained income from the sale of charcoal. The forest sector could play a still more significant role energy supply and others seize the opportunity to use wood fuel products for cooking and support the wider adoption of modern wood energy.

Water is among the most vital for human welfare which depends on forest (Birgé et al., 2016). Forested catchments supply a large proportion of all water used for domestic, agricultural and industrial needs. About 75% of the world accessible freshwater for agricultural, domestic, industrial and environmental uses comes from forests, with 90% of the world's cities relying on forested watersheds for their water supply (FAO, 2015). The importance of forest to water supply includes improvement of water cycle, reduction of runoff, improving the replenishment of the water table, filtration of water pollutants, control of floods and regulation of storm water (Ekhuemelo et.al. 2016). While forests can provide tremendous environmental, social, and economic benefits to nations, they also affect the hydrologic cycle in different ways. However, the contribution of forest for water sector and the secondary effects in production of agriculture is not well accounted and considered in the system of national accounting in the most of developing countries particular in Ethiopian SNA.

**Contribution of forest to construction industry**

Forests are the main source of building materials in Ethiopia (FAO, 2003, MEFCC, 2017). The construction materials such as poles, thatch for roofing on traditional houses, traditional ropes, etc., are sourced from forest. The booming construction sector in Ethiopia use input from forest and transported to the city from thousands of farms in the surrounding countryside (Tadele et al. 2014). Forest sector is source of raw materials for economic activities that depend on the production of goods and services. For example, the commercial activities are dependent on the production of wood fibre, i.e., production of industrial round wood, sawn wood and wood-based panels; pulp and paper; and wooden furniture. In addition, the large and medium wood processing sector needs forest products as a raw material. The sector has increased over the past years, mainly driven by the consumption of paper products and steady expansion of the furniture sector (MEFCC, 2017).

Forests also supply a wide variety of household items, including beds, brooms, and pancake discs, cooking spoons, handles, mats, mortars, stools, trays, baskets, walking sticks and clubs. Handles for tools form the largest portion, followed by trays and baskets. Customs, beliefs, lifestyles of the ethnic groups tend to influence the use of forest products. Examples are the big Jimma chairs made of one-piece of trunk, or the less voluminous ones made in Gurage zone. The economic contribution forest in the construction at household level is accounted in the informal sector. Therefore, the construction sector of Ethiopia strongly depends on forests existence and significantly save import of wood products and construction materials from abroad. However, forest contributions are less well-documented and need to consider the importance of forest sector and systematic accounting system of forest in construction sector. The contribution of forest to construction sector is also highly affected by the illegal trade. It is estimated that 30% to 50% of Ethiopian construction and furniture timber production is based on illegal harvesting (MEFCC, 2017). As a result, the contribution of forest to construction sector is underestimated, even though its contribution is highly significant.

**Contribution of Forest to Employment and Income generation**

Forests resources are vital part of both developed and developing countries' economies. Forests provide more than 86 million green jobs and support the livelihoods 880 million people (FAO and UNEP, 2020. From the same source, about 90% of the people living in extreme poverty are depending on forests for at least part of their livelihoods. Forest is very important in poverty alleviation and safety nets in times of income crisis and reduces income inequality (Yimeru et.al. 2010). It contributes immensely to the subsistence, daily life, multiple livelihood benefits and welfare of people (Aiyeloja and Ajewole, 2006, Shackleton and Pandey, 2014).

The majority of population from Sub-Saharan Africa relies on forest resources for subsistence uses, cash income, and as tools of tackling poverty (Timko et.al. 2010; Endamana et al., 2016; Pandey et al., 2016; Suleiman et al., 2017). In the rural areas of Ethiopia, the households' income from forest is important as they have relatively unrestricted access to forests. Poverty and inequality analyses needs to incorporate forest incomes

and employments in household accounts to significantly reduce the measured rural poverty and income inequality (Bedru et.al. 2009). As in many other developing countries, forest in Ethiopia has contribution in the livelihood improvement and poverty alleviation (Gadisa, 2019).

The forest industry has also created employment opportunities and income to rural communities in Ethiopia. Ethiopian forest sector created about eight types of forest related employment services like forest guard, tree seedling nursery worker, logging, carpentry, broker, tree seed selling, transportation service, and loading and unloading (UNDP Ethiopia, 2017). For example, women are involved in basketry and in commercializing forest products at the village level, whereas men are responsible for woodcarving and selling forest products outside the village, in both rural and urban markets. Other people are engaged in gathering fruits, vegetables industrial plant oils waxes, frankincense, gum myrrh, natural honey and beeswax, bamboo, mushrooms and medicinal plants, animals and animal's products, processing and selling as alternative income sources (UNDP Ethiopia, 2017; FAO and UNEP, 2020).Most forest-based income and employment is following seasonal patterns, but important in periods of hardship when cash is scarce, crop failure and during off-agricultural activates. Even though, there is wide variation in the estimates of total economic contributions of forests, FAO estimates that formal forest industries producing more than 5,000 types of wood-based products, generate annual gross value added of just over US$ 600 billion (about 1% of global GDP) (UNDP Ethiopia, 2017; FAO and UNEP, 2020).

**Contribution of forest to Recreation and Tourism sector**

There is growing evidence that exposure to forest and tree has positive impacts on human physical and mental health across all socio-economic strata and genders, particularly in urban areas (Triguero-Mas et al., 2015). Forest provides benefits such as recreation, residential amenities, tourism, hotels and restaurants, travel and communications and public administration (Escobedo et.al. 2011). Many people and communities, and particularly indigenous peoples, have long, multigenerational links with specific forest areas; they derive not only direct benefits from the forest but also intangible benefits resulting from a deep spiritual relationship with forested landscapes and native species, expressed in beliefs, customs, traditions and cultures (Fritz-Vietta, 2016).Forests are an important source of mental and spiritual welfare as well. Nature-based tourism is a rather wide concept that covers activities that people do while on holiday and which focus on engagement with nature and usually includes an overnight stay (Ahtikoski, et.al, 2011). Forest or tree may reduce mental fatigue by inspiring unconscious cognitive processes that require little or no effort (Kaplan and Kaplan, 1989). Urban residents associate wilder green spaces with vulnerability, which emphasizes the need for careful planning of urban green spaces (Jorgensen, Hitchmough and Dunnet, 2006). Visiting to forest also appear to have positive physiological effects, such as reduced blood pressure and pulse rate (Tamosiunas et al., 2014).

Forest also provides religious and cultural ecosystem services (Daniela et.al. 2011*)*. Ethiopia, churches are usually built within forested areas that remain protected throughout ages. Many remnant forests of Ethiopia are surrounding compound of churches or sanctuaries (ADF, 2012). Specific beliefs are attached to the forests and trees in Ethiopia. Examples, southwest Ethiopia, Gomma district have a belief in a spirit in a big tree, adbar (Matsumura 2005). The Majangir, a Surmic group living in the south western forests, think that a spirit lives in a forest and influences the fate of people (Sato 2005). The tree of qiltu (ficusvasta) has a special function in Village B. During difficult times (e.g., rain shortages, severe drought, unknown disease, conflicts), both Muslim and Christian community members would gather under the tree, talk about their problems, and pray to their God. The function of trees as a meeting place can be seen in other places in Ethiopia. For the Oromo, the Odaa tree (the holy sycamore tree), which is shown in the flag of the Oromia Region, is well known for their Gadaa System, assemblies for socio-political and religious purposes (Hinew 2012). Forest or tree contributes to urban green areas to the quality of urban life and the environment (Konijnendijk, and Gauthier, 2006). Forest has shown significant contributions to the quality of urban life and the environment, together with other types of comprehensive green-space planning and management concepts. Forestry, as a large industry, has significant impacts on the quality of nature-based tourism landscapes. Tourism is highly important locally and regionally, especially in Ethiopia and forest for national parks have positive impacts.

**Conclusion and Recommendation**

Ethiopian forest resources contribute to different economic sectors. This contribution is in the form of direct and indirect effect that enhances the production in different non-forest sectors in the country. There is insufficient study conducted on the contribution of forest sector to other economic sectors, resulting in underestimation of the value of forest sector and poor policy priority. This study is conducted to solve this problem with the main objective to identify the contribution of Ethiopian forest to enhance the production in other sector of economy. The total economic value technique was used to collected both quantitative and qualitative data. The study result shows that forest sector contributed different values to sectors like agriculture, food security, health, construction, energy and hydrogen, tourism, employment and income generation. In addition, Ethiopian systems of national accounts do not capture all direct and indirect contribution of forest resources to other sector economy. The study

recommends the adoption of new accounting procedure that captures both direct and indirect contribution of forest resources to the economy and other sectors. This can enhance the policy makers to emphasize on the development of forest sector.

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