

Review

The Role of Forest for Rural Livelihood Diversification in Ethiopia

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Forest resource is believed to diversify rural livelihood by driving a range of products and services. However, until recently evidence in the forest literature supporting these perceived benefits has been scarce. Thus the current review paper brings together a series of scientific papers from around Ethiopia to address recent findings on rural livelihood diversification contribution of forest. Forest diversifies rural livelihoods living in and around the forest surrounding through supplying direct products such as fuel wood, wild fruit, honey, and timber and by selling and consuming other woody and non-woody products. In addition, forests also generate formal and informal employment opportunities and provide environmental services that support the sustainable operation of other sectors. From the dryland forests of Ethiopia, households earn a significant amount of income for their livelihoods improvement and considerable employment opportunities. The level of forest use and the degree of reliance on forest products differ across the wealth and gender status of the households. Forest income was found more important for poor households than for medium and rich households. Female members generated about four times more forest income than male members in the Jelo Afromontane forest. The current review paper result also shows woody and non-woody products of forest provide natural insurance to rural communities in the form of alternative sources of income and subsistence in times of unexpected shocks e.g. floods, drought, and economic misfortunate. Forest income also helps some of the rural households to remain above the poverty line. Generally, forest diversifies the rural livelihood condition and should be considered in policy decision making.

Keywords: forest, gender empowerment, income, livelihood diversification, poverty alleviation

INTRODUCTION

Forest resources in the Ethiopian context comprise natural high forests which are characterized by woodlands, bush lands, plantations and on-farm trees (Keenan *et al.*, 2015). Recent data on the forest resources (Keenan *et al.*, 2015) documented in FAO's Forest Resources Assessment (FRA), places Ethiopia among countries who have forest resource cover ranging between 10 to 30% and estimated to cover close to 12.4 million hectares or 11.5 % of the country's total land area. Those forest resource in Ethiopia, diversify rural livelihoods particularly to the poor households living in and around forest area by providing direct products such

as, fuel wood, wild fruit, honey, construction materials, timber (Tadesse *et al.*, 2014; Fikir *et al.*, 2016; Yasin *et al.*, 2018), crafts, gum and resin, etc (Lemenih *et al.*, 2003). Forest also play significant role in rural livelihood diversification through supplying environmental services like soil and water conservation (Woldie and Tadesse, 2019). In the current review paper, rural livelihood diversification shall be defined as individuals or households activities to find the better ways to increase income and reduce environmental related risk, that differ by the degree of freedom of choice to diversify for the reversibility of the outcome (Liu & Liu, 2016) and increase

means of gaining a living (Alobo 2015) through diversifying their income from forest in this review paper context. In this regard, the study by (Fikir *et al.*, 2016) in Hammer district and (Asfaw *et al.*, 2013) in the Jelo Afromontane forest in eastern Ethiopia, show that forest products contribute 21.4% and 32.6% of the total annual household income respectively in the studied areas. From dryland forests of Ethiopia, households also earn a significant amount of income for their livelihoods improvement (Lemenih & Teketay, 2004) and considerable employment opportunities from the forest resource (Eshete *et al.*, 2005)

The level of forest use and the degree of reliance on forest environmental products, however, differ across wealth status of households (Babulo *et al.*, 2008) and gender status (Asfaw *et al.*, 2013). In line with this, forest income was significantly ($P < 0.05$) more important for poor households (47.3%) than for medium (30.5%) and rich (20.2%) households in eastern Ethiopia (Asfaw *et al.*, 2013). This is because, poor households since do not have enough farmland or other assets for capital reserves to build up enterprises based on the production and harvesting and marketing of NTFPs once or twice a year (Wood, 2007), they will use and utilize the forest resource as the source of additional land. Regarding the role of forest income in gender participation importance, a study by (Asfaw *et al.*, 2013) the Jelo Afromontane forest reported that female members generated about four times more forest income (77%) than male members (23%): indicating that forest products play an important role for female headed households. Female households also engaged and benefited by earning forest income through collecting and selling charcoal and fuel wood from the Menagesha Suba forest in the Oromiya region (Duguma *et al.*, 2015)

The above-mentioned different goods and services provided by the forest can be a means of poverty alleviation during resource shortages together with agricultural crop production particularly for poor rural households through diversifying their livelihood conditions (Yemiru *et al.*, 2010). In times of economic misfortunate, forests can serve as reserve areas for agricultural conversion, sources of emergency cash income (as a safety net), and a foraging resource (Noack *et al.*, 2015). Research conducted on the economic contribution of forests resource use to rural livelihoods in Northern Tigray (Babulo *et al.*, 2008), shows incorporating forest environmental incomes in household accounts significantly reduces measured rural poverty and income inequality. Furthermore, (Yemiru *et al.*, 2010) also confirm that forest income helps 20% of the population to remain above the poverty line and forest income derived from diversified products and services alleviates poverty. Despite forests significantly contributing to rural livelihood diversification roles, its resource have been seriously undervalued, their livelihood importance is still overlooked in national policy, and management is

focused more on humid forests (Woldie and Tadesse, 2019) and even little attention is given to the multiple benefits that forests provide other than timber products. Just by illustrating the importance of forest resources either directly or indirectly, to rural livelihood diversification one can reflect the true social costs to reduce market distortions and reduce the welfare losses of forest ecosystem degradation. Even the benefits of conservation can be more adequately represented in the process of making trade-offs by both private land managers and public policymakers. In addition, forest livelihood diversification valuation would have the potential to reduce the conflict between development and conservation goals. Failure to disseminate that information could result in, not using the full potential of forest resources as an effective approach to sustainable production and ecosystem service delivery. Then, success stories of forest resources for local community livelihood diversification become localized just not written up or widely published. Therefore, the general purpose of this review paper is to evaluate the role of forests in rural livelihood diversification. The paper also specifically seeks; the contribution of forests to rural livelihood income diversification, its importance to female empowerment, forest benefit as a safety net during resource shortage, and poverty alleviation.

Literature review

Concept and definition of rural livelihood diversification

There have been different definitions and concepts of rural livelihood diversification in the existing literature. In the current review paper, rural livelihood diversification is defined as individuals' or households' activities to find the better ways to increase incomes and reduce environmental related risk, that differ by the degree of freedom of choice to diversify for the reversibility of the outcome (Liu and Liu, 2016) and increase means of gaining a living (Alobo 2015). According to (Martin and Lorenzen, 2016) livelihood diversification is conceptualized as rural households engaging in a diverse portfolio of activities and capabilities of social support in their struggle for survival and improvement in their standard of living. In defining the word livelihood diversification, we need to refer again to livelihood strategies which are the combination of activities that people choose to undertake to achieve their livelihood diversification goals (Ellis and Allison, 2004). Whereas, Livelihood activities are actions taken by the household to obtain household income. There are different methods of identifying livelihood strategies; but most commonly, economists group households' livelihood strategies by shares of income earned from different sectors of the rural economy (Brown *et al.*, 2006).

The reason for rural household livelihood diversification

as described by (Kassie 2017) is self-insurance against risk, farmers' livelihood diversification where there are incomplete product markets, and households' inability to specialize due to incomplete factor markets. (Gebru and Beyene, 2012) added better incentives for allocating labour to non-farm activities, and inadequate farm output, leading to a need for non-farm income source diversification to purchase farm inputs. Households could also diversify their livelihood to respond to the lack of capital assets or food through processes that drew on more readily available capital assets (Manlosa *et al.*, 2019). In this support, previous empirical study conducted by (Alobo 2015) reports that rural households across developing countries share 30–40% of their total income from non-farm sources. In Ethiopia, also empirical studies indicated that non-farm income accounts range from 40–45% of the average household's income (Aababbo and Sawore, 2016). In non-farm income sources of livelihood diversification, forest resource products play a significant contribution and are being considered as a part of this review paper.

The role of forest for rural livelihood income diversification

Forest resources in the Ethiopian context comprise natural high forests which are characterized by woodlands, bushlands, plantations, and on-farm trees (Keenan *et al.*, 2015). Recent data on forest resources (Keenan *et al.*, 2015) documented in FAO's Forest Resources Assessment (FRA), places Ethiopia among countries that have forest resource cover ranging between 10 to 30% and cover close to 12.4 million hectares or 11.5 % of the country's total land area. Those forest resources diversify rural livelihoods by generating formal and informal employment opportunities and by providing environmental services that support the sustainable operation of other sectors. In addition through supplying direct products such as, fuel wood, wild fruit, honey, and timber and with other woody and non-woody products, forests play a significant role in rural livelihood diversification in Ethiopia, particularly to the rural communities living in and around forest surrounding (Yemiru *et al.*, 2010). In this regard, the study by (Fikir *et al.*, 2016) in Hammer district and (Asfaw *et al.*, 2013) in the Jelo Afromontane forest in eastern Ethiopia, show that forest products contribute 21.4% and 32.6% of the total annual household income respectively in the studied areas. According to, the former author, the major products in the studied forest of Hammer district were honey, fuel wood, gum and resin, and crafts and construction materials, each contributing 49%, 39%, 6%, and 6% of the total forest income, respectively. Rural households living in and around the Bonga forest also collect poles, lianas, timber, firewood, fodder, wild coffee, source materials for furniture and farm implements, the traditional medicine, to diversify their livelihood (Kassie,

2017). In this forest some of the households gather grasses from the forest, through a cut-and-carry system and feed their animals mainly during the dry season. A similar study by (Adilo, 2007) in South Western Ethiopia, reported that forests contribute to local communities with an income of 96.33 USD per household from the different non-timber forest products. This is because, households responded to the lack of capital assets or food through processes that drew on more readily available capital assets (Manlosa *et al.*, 2019)

However households diversify their income from the forest, and various socioeconomic and contextual factors were found to influence forest income and forest product use dependency (Fikir *et al.*, 2016)

Similar to other forest areas in Ethiopia, in Shedem Peasant Association in the Goba district the study by (Andargatchew, 2008) also shows 47% of the annual cash income contribution of bamboo as non-timber forest product. (Mamo *et al.*, 2007) in Dendi District, reported that forest income contributed 39% of the average sampled household income, i.e. just almost equal to the agriculture income contribution of 40% to the same size of surveyed households. From dryland the forests of Ethiopia, households also earn a significant amount of income for their livelihoods improvement

(Lemenih and Teketay, 2004) and local people also get considerable employment opportunities from forests (Eshete *et al.*, 2005). Household asset base, market access, culture, and resources endowment of the forests in terms of stock and quality of non-timber forest product makes variation in gaining forest income to rural communities in Ethiopia (Mohammed and Inoue, 2012). Despite its multiple and varied forest benefits roles, forests have been seriously undervalued, their livelihood importance is still overlooked in national policy, and management is focused more on humid forests (Woldeamanuel 2011) and even little attention is given to the multiple benefits that forests provide other than timber products.

Benefits of Forest for Poor Rural Communities and Women's Participation

Forest environmental resources provide substantial contributions to the well-being of many poor rural dwellers by providing different forest products and service opportunities to diversify their livelihoods. The level of forest use and the degree of reliance on forest environmental products differ across households (Babulo *et al.*, 2008). For instance, forest income was significantly ($P < 0.05$) more important for poor households (47.3%) than for medium (30.5%) and rich (20.2%) households in eastern Ethiopia (Asfaw *et al.*, 2013). A study shows that households with lower total annual income depend more on forest resource products than the higher counterpart (Fikir *et al.*, 2016). In Dendi District, Ethiopia, forest income represents 59% of the total household income for

the poorest quintile and the contribution drops to 34% in the case of the wealthiest households (Mamo *et al.*, 2007). The higher the forest income contribution to poor households than the other counterpart as reported by (Wood, 2007) poor households do not have enough farmland or other assets and no capital reserves to build up enterprises based on the production, harvesting, and marketing of NTFPs once or twice a year, they will use and utilize the forest resource as the source of additional land. On the other hand medium and rich households may have enough agricultural production to support them and see forest maintenance as a way of diversifying their income-generating opportunities to reduce their risks (Wood, 2007). Rural household's economic reliance on a particular economic activity in general and forest environmental resources in particular also vary depending on the resource endowment of the household, the household's demographic and economic characteristics, and exogenous factors such as markets, prices, and technologies (Babulo *et al.*, 2008). Poor rural local communities living in and around the Bale Highlands forest, Southern Ethiopia had also gained an important sources of forest cash income and diversified their livelihoods (Yemiru *et al.*, 2010). However, household characteristics such as the age of the household head and possession of cropland together with geographical factors like altitude and distance from the market were found to be the most important determinants of livelihood strategy choices for forest resource use in the mentioned area (Yemiru *et al.*, 2010)

Regarding the role of forest income in gender participation importance, a study by (Asfaw *et al.*, 2013) in the Jelo Afromontane forest reported that female members generated about four times more forest income (77%) than male members (23%): indicating that forest products play an important role for female-headed households. It has also been reported that the women groups in Bonga participatory forest management (Kassie, 2017) who previously bought fuel wood from the local market for high cost, were created a relief for their livelihood because of the existence of the forest. The same author stated that regardless of ethnic belongingness, individual households in the Bonga forest were equal with others in decision-making, benefit sharing, membership right, voting and participation in forest and other development activities. The special benefit of female groups from the forest resource is that of fuel wood collection was normally allowed in the community forest as long as the wood was dry (Woldie and Tadesse, 2019). Female households also engaged and benefited by earning forest income through collecting and selling charcoal and fuel wood from the Menagesha Suba forest in the oromiya region (Duguma *et al.*, 2015).

Contribution of Forest to safety nets and food security

The role of forests in the provision of goods such as fuel

wood, food like fruit, medicinal plant, fodder, timber, selling woody and non-woody products of forest, etc to rural communities could help their wellbeing and food security during unexpected risks of drought and famine (Palmborg-Lerche 2002). Research in developing nations shows that those forest products provide “natural insurance” in the form of alternative sources of income and subsistence in times of post shocks e.g. floods, fires, pests, and economic misfortunate (Dokken and Angelsen 2015). In Ethiopia during the drought-stricken years of 1966–1969, locally referred to as “Kifu Qen” meaning wicked days the Konso people in the Southern region coped by increasing the consumption of wild food plants from the natural forest (Guinand and Dechassa, 2000). Many rural people in the country have been also reliance upon wild food plant consumption during famine and drought for survival (Balemie and Kebebew 2006). In addition to this, forests' wild edible fruits also provide vitamins, flavourings, and compounds of nutritional, gastronomic, and social importance which may be lacking in the normal agricultural product of a country (Heywood, 1999) and critically important as buffers during periods of scarcity and as nutrition for the cash poor as safety nets (Arce 2019). In support of this fact, the study by (Fentahun and Hager 2009) in the Amhara region revealed a total of 44 wild fruit species rich in valuable nutrients and is accessible year-round with significant overlap at times of acute food and nutrient scarcity. However, lack of capital, poor infrastructures, and less access to credit service, and marketing services have been some of the challenges that face rural households not to diversify their livelihood (Kassa, 2019).

Forest resources as a safety net for rural communities could also help by selling different forest woody and non-woody products. In line with this, two-thirds of the surveyed respondents' households in the Bonga forest (Gobeze *et al.*, 2009) were not vulnerable during food insecurity time because of they generate 582 ETB and 394 ETB per household per annual from selling wild coffee and honey respectively. On the other hand, the authors also reported that the surveyed respondents gain annual income from charcoal 318 ETB and firewood 612 ETB respectively which could help to cope with food insecurity. In the Blue Nile basin, found that smallholder farmers who have a non-farm source of income were less likely to depend on food aid and liquidate their assets in times of climate-induced shocks (Deressa *et al.*, 2010). Though empirical findings have underlined the importance of non-farm income, a very small proportion of farmers in Ethiopia has access to non-farm income source because of different factors (Spielman *et al.*, 2010). Besides to direct benefit of the forest to rural communities, their indirect services to watershed management, soil stabilization, and rehabilitation of degraded lands, and as providers of shade and shelter, is even more fundamentally important than their multiple productive roles (Arce, 2019). Furthermore, community

and state forests found on the hillsides of Tehulederi District in South Wollo provide soil and water conservation as well as serve as natural habitats for wild animals. This notion of associating the availability of fodder, fuel wood, and construction wood as a result of land rehabilitation was common among youth, men, and women groups during resource shortages (Woldie and Tadesse, 2019)

Beyond income diversification: the contribution of resources for poverty alleviation

The different goods and services provided by the forest can be a means of poverty alleviation during resource shortages together with agricultural crop production particularly for poor rural households through diversifying their livelihood conditions (Yemiru *et al.*, 2010). This is because in times of economic misfortune, forests can serve as reserve areas for agricultural conversion, sources of emergency cash income, and a foraging resource (Noack *et al.*, 2015) Research conducted in developing countries shows that forest products contribute between 20% and 40% of total household income in forest areas, and found poor households tend to be dependent on forest resources to overcome poverty (Vedeld *et al.*, 2007)

Similarly in Ethiopia, in the Bale highlands forest income contributes to 34 and 53 of household per capita income and per capita cash income, respectively (Yemiru *et al.*, 2010). The same author also confirms that forest income helps 20% of the population to remain above the poverty line and forest income derived from diversified products and services alleviates poverty. Households living around the Menagesha Suba forest in Oromiya Region receive below 1.25 US\$ a day (Duguma *et al.*, 2015) also engage in the production of charcoal, and over 66% of the household draw monthly income from charcoal. In addition, 35% of surveyed households also reported to earn income by selling honey from these forests. Study (Hailu & Hassen, 2012) indicated that in rural Ethiopia if there had not been other sources of income including forest resources apart from agricultural production, the land scarcity by the farmers coupled with agricultural risks could not generate enough income to feed household members and they cannot fulfill household needs

Research conducted on the economic contribution of forest resource use to rural livelihoods in Northern Tigray (Babulo *et al.*, 2008), also shows incorporating forest environmental incomes in household accounts significantly reduces measured rural poverty and income inequality. In the Amhara region also honey-selling helps the diversification of the incomes of farmers. Some farmer beekeepers of the region reported earning up to 3000 Birr (about US\$ 353) annually from honey-selling and contributing the largest portion of their annual incomes. Despite today forests play a significant

contribution to poverty alleviation, a considerable magnitude of forest is encroached on due to factors arising from outside the forest landscape. This is because of the different investment schemes that take part in the forestlands and the urban and peri-urban wood demand impacts that often create an indirect pathway of influencing forests (Duguma *et al.*, 2015)

CONCLUSION AND RECOMMENDATION

According to this review paper forest income diversifies rural livelihoods, particularly to the rural communities living in and around the forest surrounding through supplying a range of benefits. Rural households earn a significant amount of forest income for their livelihood improvement and considerable employment opportunities. The level of forest use and the degree of reliance on forest products differ across the wealth status of households and gender status. Forest income is more important for poor households than for medium and rich households. Forest products play an important role in livelihood diversification for female-headed households. Incorporating forest incomes in household accounts significantly reduces rural poverty and inequality and makes some rural households to remain above the poverty line.

To end poverty and diversify household livelihood government would give due attention and put the right policy measures in place that support factors affecting forest livelihood diversification as part of national job creation for saving the life of many poor rural people. Governments would also need to further develop policies that secure equal benefit sharing for the poor and vulnerable, including indigenous people, landless farmers, rural women and youth. These policies should facilitate access to markets and better prices by accessing the formal economy, payment for ecosystem services (PES), credit, and other sources of financing, for the better livelihood improvement of forest to households.

REFERENCES

- Aababbo YE, Sawore AM (2016). Assessing determinant factors of income diversification among rural farm households in Ethiopia: The case of Leemo and Anileemo districts, Hadiya Zone, South Nation Nationalities People Region. *Int. J. Sci. Res.*, 5(12), 100-110.
- Adilo M (2007). The contribution of non-timber forest products to rural livelihood in Southwest Ethiopia. M. Sc. Research paper. Wageningen University, Netherland.
- Alobo LS (2015). Rural livelihood diversification in sub-Saharan Africa: a literature review. *The J. Dev. Stud.*, 51(9), 1125-1138.
- Andargatchew A (2008). Value chain analysis for bamboo originating from Shedem Kebele, Bale Zone. *MBA*.

- Faculty of Business and Economics, School of Graduate Studies Addis Ababa University.
- Arce JJC (2019). Forests, inclusive and sustainable economic growth and employment. Paper presented at the Background Study Prepared for the Fourteenth Session of the United Nations Forum on Forests; United Nations: New York, NY, USA.
- Asfaw A, Lemenih M, Kassa H, Ewnetu Z (2013). Importance, determinants and gender dimensions of forest income in eastern highlands of Ethiopia: The case of communities around Jelo Afromontane forest. *For. Policy Econ.*, 28, 1-7.
- Babulo B, Muys B, Nega F, Tollens E, Nyssen J, Deckers J, Mathijs E (2008). Household livelihood strategies and forest dependence in the highlands of Tigray, Northern Ethiopia. *Agric. Syst.*, 98(2), 147-155.
- Balemie K, Kebebew F (2006). Ethnobotanical study of wild edible plants in Derashe and Kucha Districts, South Ethiopia. *J. Ethnobiol. Ethnomed.*, 2, 1-9.
- Brown DR, Stephens EC, Ouma JO, Murithi FM, Barrett CB (2006). Livelihood strategies in the rural Kenyan highlands. *Afr. J. Agric. Res. Econ.*, 1(311-2016-5503), 21-36.
- Deressa TT, Ringler C, Hassan RM (2010). Factors affecting the choices of coping strategies for climate extremes. The case of farmers in the Nile Basin of Ethiopia IFPRI Discussion Paper, 1032.
- Dokken T, Angelsen A (2015). Forest reliance across poverty groups in Tanzania. *Ecological Economics*, 117, 203-211.
- Duguma L, Atela J, Minang PA, Mbow C (2015). 'We love to have the forest but we have no alternative': Unpacking the realities behind deforestation and forest degradation. Paper presented at the xiv world forestry congress, South Africa.
- Ellis F, Allison E (2004). Livelihood diversification and natural resource access. Overseas Development Group, University of East Anglia.
- Eshete A, Teketay D, Hulten H (2005). The socio-economic importance and status of populations of *Boswellia papyrifera* (Del.) Hochst. in northern Ethiopia: The case of North Gonder Zone. *Forests, trees and livelihoods*, 15(1), 55-74.
- Fentahun MT, Hager H (2009). Exploiting locally available resources for food and nutritional security enhancement: wild fruits diversity, potential and state of exploitation in the Amhara region of Ethiopia. *Food security*, 1, 207-219.
- Fikir D, Tadesse W, Gure A (2016). Economic contribution to local livelihoods and households dependency on dry land forest products in Hammer District, Southeastern Ethiopia. *International Journal of Forestry Research*, 2016.
- Gebu GW, Beyene F (2012). Rural household livelihood strategies in drought-prone areas: A case of Gulomekeda District, eastern zone of Tigray National Regional State, Ethiopia. *J. Dev. Agric. Econ.*, 4(6), 158-168.
- Gobeze T, Bekele M, Lemenih M, Kassa H (2009). Participatory forest management and its impacts on livelihoods and forest status: the case of Bonga forest in Ethiopia. *International forestry review*, 11(3), 346-358.
- Guinand Y, Dechassa L (2000). Indigenous food plants in southern Ethiopia: reflections on the role of 'famine foods' at the time of drought. United Nations Emergencies Unit for Ethiopia (UNEUE), Addis Ababa, 7.
- Hailu R, Hassen A (2012). Livelihood diversification among the agricultural land scarce peasants in the Central highlands of Ethiopia. *Int. J. Agric. Sci., Res. Technol. Ext. and Educ. Syst. (IJASRT in EES)*, 2(1), 1-8.
- Heywood VH (1999). Use and potential of wild plants in farm households: Food & Agriculture Org.
- Kassa WA (2019). Determinants and challenges of rural livelihood diversification in Ethiopia: Qualitative review. *J. Agric. Ext. Rural Dev.*, 11(2), 17-24.
- Kassie GW (2017). The Nexus between livelihood diversification and farmland management strategies in rural Ethiopia. *Cogent Economics & Finance*, 5(1), 1275087.
- Keenan RJ, Reams GA, Achard F, de Freitas JV, Grainger A, Lindquist E (2015). Dynamics of global forest area: Results from the FAO Global Forest Resources Assessment 2015. *For. Ecol. Manag.*, 352, 9-20.
- Lemenih M, Abebe T, Olsson M (2003). Gum and resin resources from some *Acacia*, *Boswellia* and *Commiphora* species and their economic contributions in Liban, south-east Ethiopia. *J. Arid Environ.*, 55(3), 465-482.
- Lemenih M, Teketay D (2004). Integrategrating Natural Gum and Resin Production with Biodiversity Conservation and Desertification Control and Adapting to Climate Change in Drylands of Ethiopia. Conservation of Genetic Resources of Non-Timber Forest Products in Ethiopia, 41.
- Liu Z, Liu L (2016). Characteristics and driving factors of rural livelihood transition in the east coastal region of China: A case study of suburban Shanghai. *J. Rural Stud.*, 43, 145-158.
- Mamo G, Sjaastad E, Vedeld P (2007). Economic dependence on forest resources: A case from Dendi District, Ethiopia. *For. Policy Econ.*, 9(8), 916-927.
- Manlosa, AO, Schultner J, Dorresteijn I, Fischer J (2019). Capital asset substitution as a coping strategy: practices and implications for food security and resilience in southwestern Ethiopia. *Geoforum*, 106, 13-23.
- Martin SM, Lorenzen K (2016). Livelihood diversification in rural Laos. *World Development*, 83, 231-243.
- Mohammed AJ, Inoue M (2012). Drawbacks of decentralized natural resource management:

- experience from Chilimo Participatory Forest Management project, Ethiopia. *J. For. Res.*, 17(1), 30-36.
- Noack F, Wunder S, Angelsen A, Börner J (2015). Responses to weather and climate: a cross-section analysis of rural incomes. World Bank Policy Research Working Paper (7478).
- Palmberg-Lerche C (2002). Forest genetic resources: international and Australian perspectives. Paper prepared for a Keynote Address, presented at the 40 Years Jubilee Celebrations of the Australian Tree Seed Centre, Canberra, Australia, 22 August 2002. Forest Genetic Resources Working Papers (FAO).
- Spielman DJ, Byerlee D, Alemu D, Kelemework D (2010). Policies to promote cereal intensification in Ethiopia: The search for appropriate public and private roles. *Food policy*, 35(3), 185-194.
- Tadesse G, Zavaleta E, Shennan C, FitzSimmons M (2014). Prospects for forest-based ecosystem services in forest-coffee mosaics as forest loss continues in southwestern Ethiopia. *Appl. Geo.*, 50, 144-151.
- Vedeld P, Angelsen A, Bojö J, Sjaastad E, Berg GK (2007). Forest environmental incomes and the rural poor. *For. Policy Econ.*, 9(7), 869-879.
- Woldeamanuel T (2011). Dryland resources, livelihoods and institutions: Diversity and dynamics in use and management of gum and resin trees in Ethiopia: Wageningen University and Research.
- Woldie BA, Tadesse SA (2019). Views and attitudes of local people towards community versus state forest governance in Tehulederi District, South Wollo, Ethiopia. *Ecological Processes*, 8, 1-20.
- Wood A (2007). Through whose eyes? Understanding stakeholders' perspectives on potential forest income, as the basis for successful PFM. PARTICIPATORY FOREST MANAGEMENT (PFM), BIODIVERSITY AND LIVELIHOODS IN AFRICA, 19, 1.
- Yasin H, Kebebew Z, Hundera K (2018). Woody species diversity, regeneration and socioeconomic benefits under natural forest and adjacent coffee agroforests at Belete forest, southwest Ethiopia. *Ekológia*, 37(4), 380-391.
- Yemiru T, Roos A, Campbell BM, Bohlin F (2010). Forest incomes and poverty alleviation under participatory forest management in the Bale Highlands, Southern Ethiopia. *Int For. Rev.*, 12(1), 66-77.