



The significance of dry forest income for livelihood resilience: The case of the pastoralists and agro-pastoralists in the drylands of southeastern Ethiopia



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ABSTRACT

There is a growing interest to take into account dry forests in planning sustainable development in arid and semi-arid sub-Saharan Africa. A mixed quantitative and qualitative research design involving various data collection tools was employed to examine the significance of dry forest income and associated conditioning factors in the context of pastoral and agro-pastoral production systems of southeastern Ethiopia. Income from livestock and dry forests were the first and second most important components of the total household income. Dry forest income accounts 34.8% and 35.2% of the total household income and 38% and 46% of the total household cash income in the Liben and Afdher Administrative Zones of Somali National Regional State, respectively. It was the largest income compared to all other incomes added together for 45% of the respondents. Most notably, for very poor households, dry forest income contributes up to 63% of their total income. Dry forest income levels varied significantly with occupation ($P < 0.05$), pastoralists generating more income than agro-pastoralists. Dry forest income enables 24% of households to remain above the poverty line, and it reduces income disparity by 13.7%. Moreover, dry forest income has become increasingly important for households' ex-ante risk and ex-post drought coping strategies. The number of youths per household ($P < 0.001$), access to extension services ($P < 0.001$), and being member of a cooperative ($P < 0.05$) significantly affected dry forest income levels in both Zones. Findings of this study could apply to similar dryland eco-regions in the Horn of Africa and contribute to enhance promotion of sustainable management of dry forests for integrated livelihood adaptation, biodiversity conservation and combating desertification. Further research is needed to quantify the contribution dry forests make to livelihoods through livestock production and to develop options that will guide policy making process to generate additional economic incentives for communities and countries to be engaged in sustainable management and use of dry forests.

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1. Introduction

Ethiopia is an agrarian country where traditional crop and livestock production employs over 85% of the population (Ethiopian NAPA, 2007; MoFED, 2012). Crop production is the major livelihood strategy in the highlands, where rainfall is relatively high. The vast majority (over 70%) of the landmass of Ethiopia is dryland, characterized by low and unpredictable rainfall patterns (EAC, 2007). These regions are poorly developed and suffer historical political and economic marginalization (Fekadu, 2009). Traditional pastoralism and agro-pastoralism are the major livelihood strategies in the drylands, where households depend on livestock production for a significant proportion of their food, income and traction power (Dalle et al., 2005; FAO, 2009). Livestock production is not only the mainstay, but also their social pride and security. For

centuries, pastoral and agro-pastoral livelihood strategies are able to maintain diverse cultures and flexibility, where a complex indigenous knowledge system governs the management of common resource base and continually adapt to highly uncertain environments, especially climate (Brooks, 2006; Homann, 2008). Pastoralism and agro-pastoralism employ an estimated 14% of the human and over 40% of the livestock population in Ethiopia. Pastoral areas cover some 60% of the total land area in Ethiopia and the country stands fifth in the world in its pastoral and agro-pastoral population size (Bekele and Amsalu, 2012).

Despite the long-standing adaptation practices, recent trends indicate an increase in drought incidence in the dryland eco-regions in the Horn of Africa in general and in Ethiopia in particular (IPCC, 2007; Ethiopian NAPA, 2007). Increasing in frequency and intensity of drought leads to rise in the vulnerability of pastoral and agro-pastoral communities (Homann, 2008) as pastoral and agro-pastoral communities are continuously losing a significant proportion of their livestock assets (Kassahun et al., 2008). A continued severe environmental degradation, shrinking resource bases and transhumance mobility routes are

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becoming major problems facing these production systems (Fekadu, 2010, 2013). A post drought livestock re-stocking, a common phenomenon in the drylands, has become a difficult process due to protracted drought, alarming rangeland degradation and diseases (Homann, 2008). The gradual depletion of livestock assets, exacerbated by existing limited alternative coping strategies is therefore putting additional pressure on livelihood systems. According to Fekadu (2013), increase in the frequency of violence, political insecurity and a decline in the capacity of customary authority in conflict management, on the one hand and the lack of enforcement of formal institutional framework, on the other hand, gradually exacerbated the vulnerability of these communities. According to Davies et al. (2012), such complex socio-ecological problems facing the pastoral and agro-pastoral livelihoods call for informed policy interventions to achieve solutions to environmental and livelihood related challenges.

The increasingly uncertain climatic conditions and related impacts across the drylands demand for new and integrated resource management approaches that facilitate more resilient land use planning (IPCC, 2007). Promotion of sustainable forest management is a key strategy put forth in recent international and national negotiations to reduce the negative impacts of climate (CIFOR, 2005). According to FAO (2010), the role of forests in climate change adaptation and mitigation is important; the sustained provision of ecosystem goods and services can help people adapt to the local consequences of a changing climate, while the carbon stored in these ecosystems, if well managed, can contribute to climate change mitigation (Robledo et al., 2012). Forests play a vital role in the generation of income for households in developing countries (Vedeld et al., 2004). According to Babulo et al. (2008) and Mamo et al. (2007) forests hold key position in the provision of households with income that was more important than the combined income from other activities for low income groups in northern and western Ethiopia. In Nigeria, Chukwuone and Okeke (2012) emphasized the importance of forests in relation to food quality among the poorer rural population. Forests also play key roles in reducing poverty and income inequalities (Shackleton et al., 2007; Fonta et al., 2011). In addition to income, forests provide opportunities to develop new commercial products that facilitate urban–rural linkage (Alemu et al., 2012). According to FAO (2010), the role of forests and woodlands is even more important, both biologically and socio-economically, in arid lands than it is elsewhere, where rangelands, agroforestry parklands and trees outside forests play vital roles in the livelihood of communities in Africa's drylands.

Forestry managers and professionals recommend integration and responsible management of the currently marginalized dry forests in Africa (FAO, 2010; Lemenih and Kassa, 2011). There are various socio-economic, ecological and political reasons for Ethiopia to sustainably manage its dry forests. For instance, value added commercialization of gums and resins produced from dry forests would offer access to additional income for the drought prone pastoral and agro-pastoral households and the national and regional economy at large (Lemenih and Kassa, 2011; Worku et al., 2011). Demonstrating the ways through which dry forests contribute to increasing income and reducing poverty, would lend additional weight and relevance to forest management initiatives that also contribute in combating desertification (FAO, 2010; Lemenih et al., 2011). However, despite their values, dry forests are caught in a spiral of deforestation, fragmentation, and degradation (FAO, 2010). Until recently, dry forests in Ethiopia and elsewhere in the Horn have had less attention in the national as well as regional planning, their potential to enhance the local and national economy has been overlooked, and their contribution to sustainable environmental management has not been recognized (FAO, 2010; Lemenih and Kassa, 2011; Worku et al., 2011).

Much of the debate on the importance of forests is based on the lessons from the humid tropics, with little information on dry forests and woodlands that cover large areas and host hundreds of millions of Africans (Shackleton et al., 2007; FAO, 2010; Asfaw et al., 2013).

Recent professional discussions reveal that progress towards integration of dry forests has been hindered, partly by a shortage of empirically based knowledge on their socio-economic significance (FAO, 2010; Lemenih and Kassa, 2011). Studies on dry forests so far have focused on bio-physical and ecological aspects (Eshete et al., 2011), while the few existing socio-economic studies have targeted farming households in which private and regulated forest management regimes are predominant and where the relative market integration of forest produce is high (Tesfaye et al., 2011; Dejene et al., 2012). The contribution of dryland forest resources in terms of income provision, poverty mitigation and drought coping in the context of the pastoral and agro-pastoral production systems, where dry forests are a common resource and market performance is poor has not been surveyed systematically, and hence it is usually undermined in the process of drylands development planning (Lemenih et al., 2011; Asfaw et al., 2013). Despite the accumulated knowledge on determinants of forest dependence (e.g. Coulibaly-Lingarni et al., 2009; Timok et al., 2010; Kar and Jacobson, 2011; Abebaw et al., 2012), little empirical evidence exists on the pastoral and agro-pastoral areas of Ethiopia. Such knowledge gaps restrict the advice available to policy-makers that would enable them to effectively incorporate dry forests into development planning and minimize their marginalization and conversion to other lands (Teketay, 2004–5). The objectives of this study were to examine the significance of dry forest income and identify factors conditioning dry forest income dependence in the pastoral and agro-pastoral production system of Somali Regional State in Ethiopia.

2. Materials and method

2.1. The study area

The pastoral and agro-pastoral areas of Ethiopia are estimated to cover some 60% of total land area and are inhabited by 14% of the population. This study was conducted in Somali Regional State (SRS), in the south-eastern drylands of Ethiopia (Fig. 1). Organized into nine political administrative zones, SRS accounts for 53% of the country's pastoral and agro-pastoral areas and has a population of over four million. Arid landscapes are the pre-dominants in the region (60%), followed by semi-arid (20%), dry sub-humid (10%) and barren land (10%) (WBISPP, 2004). Mean annual rainfall, temperature and evapotranspiration values range between 150 and 600 mm, 27 and 42 °C and 1750 and 2000, respectively (Zerfu et al., 2010). SRS has become one of the most heavily drought stricken regions of Ethiopia and desertification is of great concern. Traditional pastoralism and agro-pastoralism are the two major livelihood strategies in the region. The region supports the country's largest dry forests, predominated by diverse high value tree and shrub species, including those that produce frankincense, myrrh, opopanax and gum arabic (Lemenih et al., 2003). According to the woody biomass assessment report (WBISPP, 2004), the region own a total of 13,199,662 ha woodland (45%) and 5,384,022 ha (20%) shrub land of the total woodland and shrub land of the country.

2.2. Sampling procedure and data collection

Nested sampling was employed to select study villages and respondents. Two administrative zones (Liben and Afdher) out of nine zones were selected based on their accessibility, dry forest endowment, history of forest products trade and relative availability of prior studies on dry forests. Liben zone is mainly characterized by pastoral livelihoods, whereas Afdher is predominantly agro-pastoral. Two districts from each zone (Filtu and Dolo Ado from Liben and Chereti and Dolo Bay from Afdher) and three villages from each district were randomly selected (Fig. 1). A total of 137 households (i.e. 70 households from villages in the Liben zone and 67 households from villages in the Afdher zone, covering 5 to 25% of village residents), were randomly selected for a household survey. In addition, 12 households and 28 key informants

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