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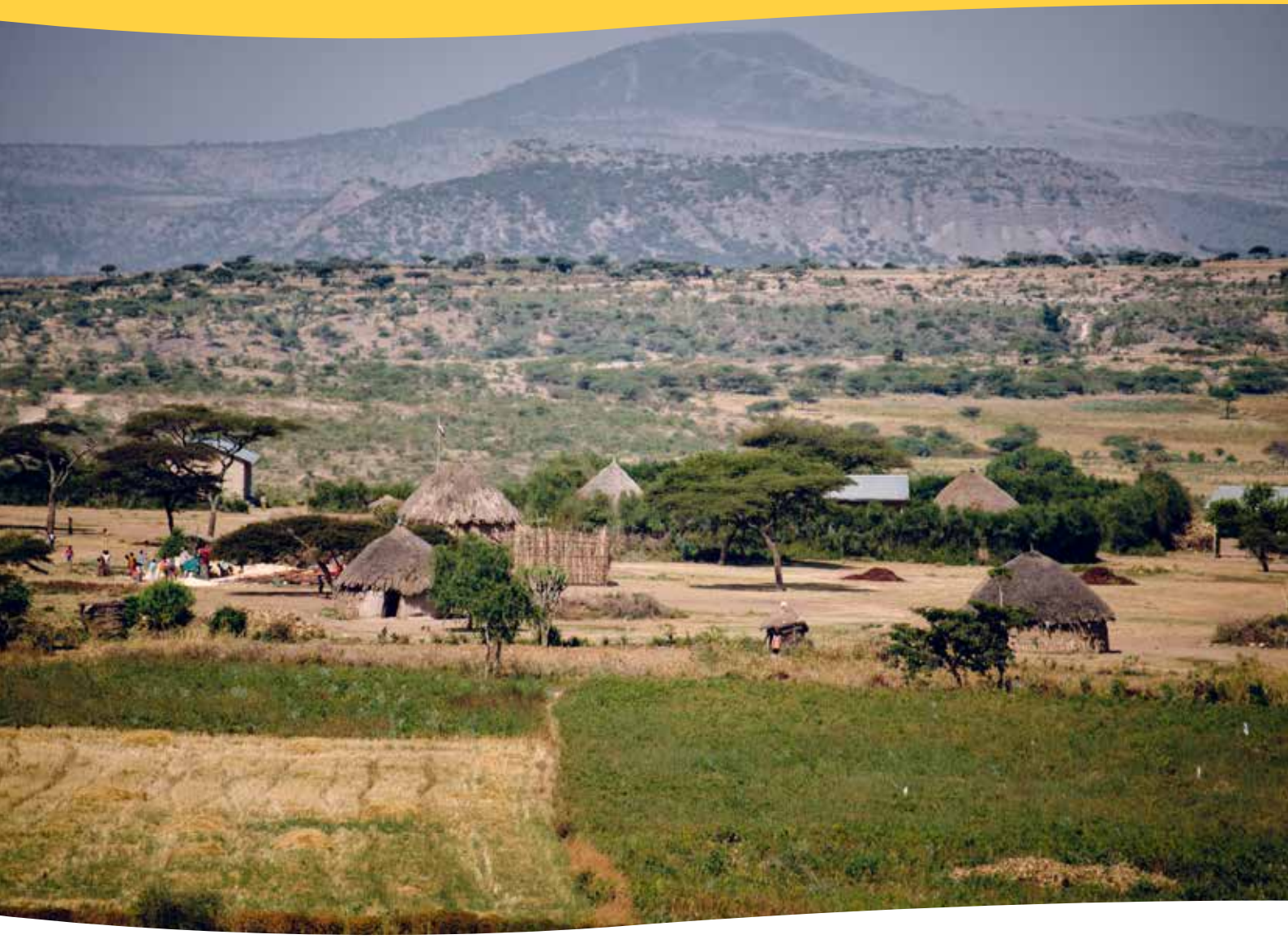

Strengthening the resiliency of dryland forest-based livelihoods in Ethiopia and South Sudan

A review of literature on the interaction between dryland forests, livelihoods and forest governance

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CIFOR

Working Paper 182

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Ethiopian landscape.

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Summary: Major findings and implications for policy, practice and future research

Dry forests account for nearly half of the world's tropical and subtropical forests and provide a multitude of ecological services. They contribute to hydrological cycles and livestock and wildlife provisioning; and host pollinators and wild plants. They are also important ecological zones for dryland agriculture and pastoral livelihood strategies that support hundreds of millions of people around the world. Dry forests cover large areas and their biomass stores carbon and helps mitigate climate change. Dry forests are particularly important to people in Africa. They provide wood for construction and energy, contribute to local diets with wild fruits, vegetables, nuts, edible insects and bushmeat. Wild, edible plants provide essential nutrients, particularly during time of food scarcity. Yet dry forests are subject to high rates of deforestation and degradation driven mainly by agricultural expansion and growing energy demands. Other challenges include limited information on dry forests (their inventories, changes over time, major drivers of deforestation and recovery, etc.), their biophysical aspects and ecosystem services and the potential roles they could play in increasing the sustainability of crop and livestock farming. Governments, development partners and communities are looking for options to better manage these resources at the landscape level.

Dry forests are complex ecosystems that are not fully understood. Scientific knowledge to better manage dry forests and sustain the livelihoods of people that depend on these ecosystems remains scanty as research to inform policy and practice is still very limited. The knowledge gap is even more pronounced in northeastern Africa, notably Ethiopia and South Sudan where these forest types are important in terms of areas coverage and in supporting rural livelihoods. Ethiopia and South Sudan share histories of political unrest and conflict that have contributed to famines; large-scale land acquisition for investment and agricultural expansion by smallholders are resulting in major and rapid land-use changes in their dry forested areas. Ethiopia's two decades of peace and stability and its experience in managing its natural resources could inform post-conflict intervention measures in South Sudan.

This study was conducted as an effort to help fill the knowledge gap in dry forest-based livelihoods through a critical review of the available literature. It used publications from CIFOR's work on dry forests and product marketing in Ethiopia and from other sources, including gray literature. The study assessed the socio-ecological context, including relevant laws and strategies, with an emphasis on the biophysical characteristics of the dryland forests of Ethiopia and South Sudan and the major causes of deforestation and forest degradation. Using livelihood systems as an analytical framework, it examined (i) major livelihood strategies; (ii) the contribution of dry forests to livelihoods; (iii) forest product markets and value chains; and (iv) forest and land governance with an emphasis on the relationship between political, economic and resource management policies and the level of degradation of dry forests and their contributions to the livelihoods of forest-dependent communities in Ethiopia and South Sudan. It also identified major threats to dry, forest-based livelihoods and key issues for policy, research and practice that need to be addressed to maintain the multifunctionality of dryland forests while also ensuring the well-being of communities dependent on these landscapes.

Major findings

i) Forest policies and strategies

Ethiopia issued its first forest policy and strategy document in 2007. The policy aims at promoting participation of farmers in managing natural forests and providing tax incentives for farmers who plant trees. In 2011, the government issued its climate resilient green economy strategy that identified forestry as one of the four pillars in building a green economy. In 2013, the government established a new Ministry of Environment and Forests to better plan, coordinate and lead the development of the forestry sector. Currently, the ministry is finalizing its 2016–2020 plan where the emphasis is on protecting existing natural forests while also promoting plantation forests by individual farmers and other actors. The plan proposes the rehabilitation of some 15 million ha of degraded agricultural and

forest lands and improved management of some 7 million ha of forest and woodlands by 2015. Participatory forest management is being promoted to improve the management of natural forests by involving communities. Ethiopia hopes to be wood self-sufficient by the mid-2040s by promoting plantation forests.

Prior to the 1983–2005 civil war, the Sudanese Government's forestry program emphasized large-scale commercial harvesting of timber for export and large-scale timber and fuelwood plantations, as well as establishment of greenbelts around urban centers. South Sudan's 2013 forest policy emphasizes the importance of small and medium enterprises as drivers of rural development and creators of income earning opportunities. Also, the country's forest strategic policy for 2012–2017 focuses on managing timber plantations (notably teak), reestablishing the infrastructure to encourage industrial-scale timber harvesting and promoting collaborative forest management with rural communities in managing natural forests.

ii) Forest and livelihoods

In and around dryland forest areas, three principal production systems exist – pastoralism, agropastoralism and sedentary agriculture, though other options such as mining and fishing also exist in certain areas. Age-old practices such as herd splitting and mobility as well as time-tested traditional institutions helped pastoralist and agropastoralist communities to better access and use lands (grazing areas and water points) in areas with high spatial and temporal variability in resource availability and to minimize conflicts in resource use. In production systems, people depend on dryland forests for products (fuelwood, building materials, food, fodder, medicines, etc.) and services although this dependence may vary with season, location and socioeconomic status of households. For some, access to forests enhances their ability to survive whereas for many it provides an economic buffer in times of difficulty and is one element of livelihood portfolios even under normal conditions.

The dimensions examined in forests and livelihoods studies include the contribution forests make to household food security and cash income; the structure of forest product value chains and the implications of value chain structures for household incomes; and the impacts of land and forest governance on livelihood outcomes and strategies.

But lack of consistency in definitions and measures of household and forest income complicates the task of identifying patterns in research findings on forest livelihoods in Ethiopia. The literature on forests and livelihoods has focused on: (i) estimating the average total forest income and the relative dependence of households on forest income; (ii) assessments of major products harvested, number of households involved in their harvest, determinants of engagement in forest products collection and marketing and the relative importance in value and volume of different products; and (iii) evaluations of the timing of forest income and the importance of such income in enabling households to bridge gaps in food or cash resources. However, the lack of consistent analytical approaches and properly defined key variables such as forest income, makes it challenging to determine whether differences exist or not across cases. To facilitate comparative analysis, the authors propose the wider use of a common analytical framework, such as CIFOR's poverty and environment network framework.

The thematic areas identified from the literature on dryland forests and livelihoods with an emphasis on contributions to household income are the following:

- **Forest dependency is strong throughout the country, but is variable in its importance across regions and across wealth categories within regions.** This demonstrates the particularly important role of forests to meet household needs for food and cash income. However, further research is needed to tease out the different circumstances under which reliance on forest products as a source of cash income is a survival strategy, a road to moderate prosperity, or a pathway to significant capital accumulation.
- **Determinants of participation in forest products collection and marketing and forest income levels are highly location-, product- and context-specific.** Access to forests, access to markets and gender differences showed varied relationships, with participation in forest product collection and in forest income levels in different areas indicating that the influences of socioeconomic factors on forest income levels are variable and site specific. Thus, interventions need to be tailored to fit site and product-specific conditions.
- **Forest-related income earning activities have gap-bridging functions that transcend their absolute or relative economic importance to household income and contribute to livelihood resiliency.**

- **Changes in climatic conditions are prompting a trend toward greater reliance on forest-related income earning activities in some areas.**

Likewise, two important areas have been highlighted as important in understanding the role of dryland forests in food security:

- **Wild edible and medicinal plants play important roles in nutritional and health status of the rural population.** They are normally not a primary source of calories but function as supplements to cultivated foods. Some wild plants are eaten even when other foods are not scarce. But the value chains of wild plants used for food are short and prices tend to be low relative to cultivated fruits.
- **Some humanitarian organizations use the types and levels of wild edible plant used as indicators of food insecurity.** As food insecurity increases, the percentage of food consumed derived from wild plants increases in many areas and households experiencing food insecurity may diversify their diets to include wild, edible plant species that they do not ordinarily eat to fill the gap in calories and nutrients.

In South Sudan, only a few researchers examined forests and livelihoods. The limited, available literature underscores the socioeconomic importance and the environmental services of forests and trees to the South Sudanese. Forest and woodlands support agriculture in general and livestock farming in particular. Numerous tree species are important food sources while some species have religious significance.

iii) Forest products markets and value chains

The following themes were identified regarding forest product markets and value chains in Ethiopia:

- **In many commercial forest product value chains, producers occupy a weak bargaining position and tend to have much smaller profit margins than actors further along the value chain.** Major challenges to be addressed are the low volume and poor quality of products offered for sale, underdevelopment of value-added processing and the weak bargaining power of producers.
- **Tenure regimes governing access to commercial non-timber forest products (NTFPs) affect forest livelihood opportunities and incentives for producers to make investments to improve their bargaining position within value chains.** Thus clarifying resource rights (land, forest, trees) is vital to encourage investment by resource users.
- **Improving forest product market governance is key to strengthening forest livelihood resiliency, but doing so in a way that supports pro-poor development calls for an integrated approach that links market, tenure and extension interventions.** The literature suggests that measures that need to be taken include: assisting producer communities in acquiring communal rights to forest management; strengthening producer cooperatives; linking producers to actors further along the value chains; providing training and resources for producers to engage in value-added activities; and taking measures that will increase the bargaining power of producers. This in turn increases rural household income and creates an economic incentive for sustainable resource management.

In South Sudan, studies on forest products and markets are even fewer. The main issues identified in the review are:

- **Forest income (in-kind and cash) is important for many South Sudanese, but the level of importance varies considerably by region and season.** The percentage of household income in 2013 derived from sales of natural resources varies from a low of 20% in Lakes state to a high of 65% in Unity state. Forest income was more important during the dry season when it makes up roughly one-third of household income for all states combined. Food insecure households relied more on income from natural resource sales than food secure households. Yet information about the degree to which refugees and internally displaced persons' (IDP's) livelihoods are linked to forest activities, their impacts on dryland forests around camps and the importance of forest activities in returnees' livelihood portfolios are scanty.
- **Markets are poorly developed and research on forest product value chains is virtually nonexistent.** South Sudan has a potential to produce and export hardwood, shea nut butter oil, gum acacia and honey. The teak plantations alone are capable of generating more than USD 100 million per year. But forest products marketing remains weak because of decades of conflict and poorly developed transportation infrastructure and marketing systems.
- **Satellite imagery analysis has considerable potential to support research aimed at understanding the environmental impacts and associated livelihood impacts of sudden and massive influxes of populations to refugee and IDP camps.** Satellite images help us to identify specific areas with high rates of deforestation or

recovery whereas key informant interviews and focus group discussions help us to discover the reasons why these changes are occurring in those areas but not in others.

- **South Sudan's forest governance institutions are in a state of flux, leading to lack of clarity over rights, weakened capacity on the part of State and traditional authorities to enforce rights and weakened capacity to manage forest resources sustainably.** Prolonged conflicts and societal changes are negatively affecting the capacity of traditional forest management institutions to enforce rules governing access to and use of natural resources. Also, changing values (from a community focused society to one that promotes the interests of families or individuals), the rapidly growing markets for forest products and government practice of issuing logging permits without consulting communities and its failure to enforce the permit conditions are changing the incentives of community members for adhering to and respecting traditional rules.

iv) Governance of land and forests

Governance of land and forest rights plays important roles in determining livelihood strategies. Ethiopia follows a federal system of governance and the regional states have considerable power in administering land and forests although they are expected to follow federal government laws and policies. As a result, forest governance has been weak. However, the establishment in 2013 of a new Ministry of Environment and Forests may alter this dynamic. The Constitution prohibits sale and private ownership of land. The Rural Land Administration and Use Proclamation No. 456/2005 states that rural land is owned by the State. But it abolished redistribution of land and provided for the issuance of land certificates to landholders. The 2007 Forest Development, Conservation and Utilization Proclamation No. 542/2007 provides for private and State ownership of forests. These two laws are important in understanding tenure incentives (and disincentives) for individual and community efforts to plant trees and protect forests. But overall, State forest enforcement capacity in Ethiopia is weak at all levels and individual incentives to comply with forest regulations are low. This results in the prevalence of open access resource regimes in natural forests, including those in dryland areas. This coupled with large-scale land acquisition by domestic and international investors and settlements by individual smallholder farmers is bringing about rapid land-use changes in dryland forested areas.

The major issues identified in the study about land and forest governance and their implications for livelihoods in Ethiopia are:

- **Land certification has been successful as a strategy for encouraging farmers to plant trees and make other land investments, but policies that provide incentives for farmers to plant native species are needed.** Farmers with land-use certificates were more likely to make land investments than those who had not obtained them and the welfare of female-headed households had improved due to ownership.
- **Participatory forest management has generally resulted in positive environmental gains but modifications to current approaches are needed to ensure that more livelihood gains are achieved and equitably distributed.** The performance of participatory forest management (PFM) projects in Ethiopia in protecting forest and in recognizing community rights' to forests has generally been positive but achievements in improving livelihood outcomes has been mixed. Areas that require attention include: strengthening the political support from the State to ensure continuity after externally funded project completion and to provide technical and legal assistance to communities managing forests; building accountability of community-based organizations and reducing elite capture by leaders; putting in place mechanisms to ensure responsible forest management practices; and linking rights devolution to market governance improvements to strengthen the livelihoods of forest dependent communities.
- **Resettlement practices have not considered the environmental or livelihood impacts on host communities and the increased social heterogeneity resulting from in-migration has impeded collective action in forest management.** Although currently government-sponsored major resettlement programs have been stopped, self-sponsored smallholders and commercial farmers are acquiring investment permits to establish farms in dryland forest areas in northwestern and western Ethiopia. CIFOR's dry forest research projects looked at how these programs affected host community environments and forest-based livelihoods. Settlers tended to clear far more land than they were legally allowed to, and earlier settlers who relied on these areas for their domestic needs and cash income were negatively impacted by the expansion, as was the forest resource. Minimizing the impacts of agricultural expansion on host communities and dryland forests requires fundamental changes

in the forest governance system at the State and community levels. The studies emphasized that if food security objectives of resettlement programs are to be met, measures that reduce the impacts of settlement on natural resources need to be incorporated into program designs. Other suggested measures include: engaging the host community in participatory planning and monitoring of settlements, matching settlers to agro-ecological environments with which they have some familiarity; and inclusion of environmental education programs and non-farm livelihood support in the settlement plans.

In South Sudan, important laws with implications for forest-based livelihoods include the Land Act (2009) and Local Government Act (2009). The Land Act recognizes community lands and provides special protection for pastoralists, stating that their communal grazing rights will not be restricted without their permission. The Act conflicts with the 1989 Forest Act, currently in force, which states that the government has control over forest land; this is creating tensions between communities and the central and State governments. In addition, unlike the Ethiopian land law, the issue of women's rights to land has yet to be clearly defined and enforced as women continue to have few rights to own or inherit land under most customary legal systems. This, coupled with the government's capacity to enforce the new laws, undermines efforts towards more equitable and sustainable land and resource management in South Sudan.

The governance of forests and forest products marketing has remained weak in South Sudan. A range of factors is leading to forest degradation and underdevelopment of forest products markets. Security issues; the presence of land mines; difficulties in accessing international markets; large-scale concessions for commercial farming; widespread illegal harvesting of forest products; underdevelopment of markets for shea nuts and gums; rising demand for charcoal in nearby towns; breakdown of traditional institutions and local authorities; and weak or absent government structures on the ground; are all factors contributing to high rates of deforestation and forest degradation.

v) Threats to dryland forests and forest-based livelihoods

The major factors that pose significant threats to dryland forests and forest-based livelihoods in Ethiopia and South Sudan are:

- **Climate change** – Changes in rainfall distribution, reducing forest/vegetation cover (particularly in areas that are likely to become even more arid) and creating water scarcity, climate change could fuel even more conflicts in dryland areas,
- **Conflicts** – Conflicts create physical and emotional insecurity, compromise people's ability to move and market their products; limit their access to agricultural and grazing lands; deplete their assets; reduce availability of labor for work; and weaken institutions of governance.
- **Population movement and growth** – Most people in Ethiopia and South Sudan will continue to live in rural areas and depend on agriculture and forests for the foreseeable future. However, there is a growing movement of people to dryland areas because of improvement in infrastructure and land scarcity in the highlands. Thus, the population in the dryland areas is growing more rapidly, increasing pressure on forest resources.
- **Large-scale land acquisitions** – Assuming that large, commercial farms could increase national food production and improve technology transfer, the Governments of Ethiopia and South Sudan are leasing large tracts of land to international and national investors. Communities have rarely been consulted about large-scale land allocations. In some cases, such as Ethiopia, the State is also financing large-scale sugarcane plantation projects. These investments have their own effects on local livelihoods and on the landscapes that are yet to be systematically evaluated.
- **Weak governance institutions** – Dryland areas in Ethiopia and South Sudan have historically had a weak State presence. There has not been formal recognition and full support for customary governance systems. The attitudes of local communities towards traditional authorities are also changing rapidly. Thus, weakened governance institutions at all levels characterize these areas.

In conclusion, given our limited knowledge about options to enhancing resilience of dryland forests and the communities dependent on these resources, additional research is needed to support informed decisions about dryland forest management in Ethiopia and South Sudan. In Ethiopia, priority areas for future research and policy reform include the following:

- Clarifying and expanding smallholder and community rights to trees and forests, including those of pastoralists and agropastoralists, as well as farmers. Particular attention will need to be paid to developing rights-strengthening approaches

that incorporate sufficient flexibility so as to not undermine mobility strategies critical for pastoralist and agropastoralists' livelihoods.
- Identifying approaches to participatory forest management schemes that promote better livelihood outcomes for marginalized forest user groups.
- Improving understanding of complex household economies as well as existing management practices in order to enhance their economic and ecological benefits. Most dry forests and woodlands have been subject to some sort of management by people even though this may not be apparent. We need to better understand how communities have been managing these resources as part of their livelihood options and how these management practices influence their socioeconomic and ecological contributions. This in turn facilitates the selection and adoption of options to improving management for better livelihood and ecological outcomes and to reduce conflicts over use of resources. For instance, highland farmers from northwestern Ethiopia are dependent on forests and woodlands in the lowland areas to graze their livestock during the cropping season. Pastoralists from as far as Western Africa occasionally visit the dry forests and woodlands of Northwestern Ethiopia in search of grazing land and they reportedly harvest certain forest products. The work of Abebaw et al (2012) and Lemenih et al (2014) indicate the complexity of household economies in dry forested areas of northwestern Ethiopia and how diversity of origin and livelihood options influence dry forest management option preferences of households, respectively. Thus the analysis of communities and their livelihood strategies is necessary as we identify resource management options to enhance economic and ecological benefits.
- Improving understanding of how benefits are distributed along forest product value chains and the approaches needed for managing the effects of forest product market development on resource access and use by communities and the private sector. Such research would need to include assessments of the contributions that dryland forests make to local livelihoods and regional and national economies through the services they provide for livestock production systems.
- Improving understanding of how major demographic shifts, land-use changes and large-scale development interventions (e.g. irrigation schemes, large-scale industrial agriculture and sugarcane plantations) affect forest resource management, the livelihoods of local communities, their dependence on forests and the use of dry forests for livestock farming by communities in both the lowlands and highlands.

In South Sudan, forest livelihoods research should prioritize studies that shed light on how post-conflict policies and investments can help hasten the recovery of forest-based livelihoods and increase the contribution of forest-based goods and services to sustainable and resilient livelihood strategies in dryland areas.

Cutting across research and policy reform areas for both Ethiopia and South Sudan are two additional priorities: (1) research in which data can be disaggregated to examine the relationships between gender and forest livelihood outcomes associated with specific livelihood and conservation policy interventions and program activities; and (2) research that explores how climate change has affected individual and household forest-based livelihood portfolios and adaptive strategies.

Approach

This study identifies key social, economic, political and ecological factors influencing dryland forest-based livelihoods and forest sustainability in northeast Africa, with an emphasis on Ethiopia and South Sudan. The study's findings draw mainly on a review of the socio-ecological systems literature. A synthesis of the literature yields a set of general observations – or themes –about the major stressors, adaptive strategies and policy interventions in Ethiopia and South Sudan that detract from or enhance forest-based livelihood resiliency. Both Ethiopia and South Sudan have been severely affected by acute political conflict in recent decades, resulting in widespread human suffering and loss of life due to warfare, famine and massive population displacement. Human conflict, sometimes in combination with drought, has in many settings had severe ecological impacts. Large-scale land acquisitions (by the private sector and in the case of Ethiopia by the government also) and land-use changes, the weakening of traditional management regimes and chronic social and economic vulnerability of individuals and households to a variety of external stressors, also threaten forest sustainability and the viability of forest-based livelihoods in both countries. The principal aim of the study is to consider how political, economic and resource management policies and programs can reduce the degradation of dryland forests and increase the contribution of forest-based goods and services to sustainable and resilient livelihood strategies.

It is not possible to consider questions of forest use, management and sustainability without taking account of how persistent political conflicts have affected the ability of forest users to manage their forests. Over the past two decades, Ethiopia has had a fair measure of success in reconstituting its political, social and resource management institutions in ways that have reduced the vulnerabilities of the rural poor associated with the policies of the Derg regime, which systematically subverted the social and ecological resilience of the population. Credit is due to government policies and programs, but also to the efforts of rural residents and communities in rehabilitating old resource management practices and inventing new ones adapted to the post-conflict context. Ethiopia's post-conflict experiences in renewing the contributions of dryland forests to livelihoods will be examined for the guidance they might give to analogous efforts in South Sudan, as it moves, however fitfully, from conflict to peace and stability.

1 Importance of dryland forests in Africa

Dry forests and woodlands are the dominant vegetation type in sub-Saharan Africa, covering over 17.3 million km^2 in a total of 31 countries (Chidumayo and Marunda 2010). Although no large, contiguous areas of tropical, dry forest are found in Africa (Miles et al. 2006), two centers of fragmented but still somewhat intact zones of tropical dry forest exist. A northern zone extends across western Ethiopia, South Sudan and into the Central African Republic, while a southern zone extends from Zambia across Zimbabwe and into Mozambique. Whether they consist of year-round marshland, small, seasonally dry ponds, or vast inland deltas such as the Sudd in South Sudan, wetlands located within or adjacent to dryland forests are key ecological zones for agricultural and pastoral dryland livelihood strategies (Scoones 1991).

Water scarcity and high levels of spatial and temporal variability in water and fodder availability are the key factors that shape and constrain human livelihoods in dryland ecosystems (Mwangi and Dohru 2008; Flintan et al. 2013). To deal with the consequences of rainfall variability, dryland inhabitants have developed a variety of risk-spreading strategies, including mobility, diversification and flexible tenure systems (Scoones 1991; Mwangi and Dohru 2008). Rural households typically pursue one of three major livelihood strategies in dryland areas: pastoralism, agropastoralism or sedentary agriculture (Niemeijer et al. 2005). In areas with sufficiently large fisheries, such as the Sudd in South Sudan, fishing is a dominant livelihood strategy for some households.

For pastoralists, a combination of herd mobility, livestock diversification and herd size adjustments are used to create livelihoods that enable them to survive in harsh conditions (Flintan et al. 2013). For sedentary agriculturalists, diversification – of crops, plot locations and income generating activities – is the linchpin of livelihood resiliency. Agropastoralists adopt elements of both pastoralism and crop farming, moving herds seasonally to maximize access to forage and browse while diversifying their resource production strategy to include agricultural crops as well as livestock. Traditionally, all of these groups have made extensive use of common property institutions and complex systems of multiple and overlapping use and access rights to build in the flexibility needed to survive in an environment with high spatial and temporal variability in resource availability (Mwangi and Dohru 2008).

Regardless of the dominant livelihood strategy, access to forest resources, which are used for fuel, building materials, food, medicines and a variety of other purposes, is critical for the well-being of most households in dryland forests (Shackleton et al. 2007). Trees provide critical ecological services (i.e. enhanced soil fertility, improved rates of water infiltration and erosion reduction) (Sanchez et al. 1997) and subsistence goods that enhance the ability of households to survive (Flintan et al. 2013). Forest resources also provide a safety net or economic buffer during times of the year when other resources are scarce, or during years when crops fail or grazing resources are insufficient (Shackleton et al. 2007). Additionally, many rural residents sell forest products in formal and informal markets to obtain cash income (Shackleton et al. 2007; Flintan et al. 2013). For many rural inhabitants, these sales provide "important buffer and insurance roles as the households struggle to maintain vulnerable livelihoods at the margins of survival" (Adam et al. 2013).

Until recently, professional foresters tended to think of trees as important primarily for their wood. This bias toward wood was reflected in the plantation forestry and woodlot programs that dominated African forestry during the 1960s through 1980s. However, foresters and rural development planners now recognize the economic and cultural importance that NTFPs forests provide. Evidence suggests that NTFPs are particularly important for "reducing vulnerability, ensuring food security, in providing cash income to some of the poorest sectors of society, and in contributing more generally to improved rural welfare, livelihood security and diversification" (Shackleton and Gumbo 2010, 76). In some contexts, high-value NTFPs have the potential to generate higher revenues than timber and may lead to rural development (Adam et al. 2013). However, because much trading of NTFPs in Africa occurs in informal markets, the full contribution of forests to rural household and national economies

is poorly understood (Shackleton and Gumbo 2010). Measuring the livelihood contribution of NTFPs is complicated by the extreme diversity of species and types of products (e.g. fruits, nuts, seeds, leaves, bark, roots, bulbs, fibers, gums, resins, oils, among others) that are harvested and the multiple ways in which they are used (e.g. food, medicines, building materials, energy, fertilizer, cosmetics, etc.) (Shackleton and Gumbo 2010).

Scientists and development practitioners working at the intersection of forests and rural livelihoods increasingly conceptualize human use and management of trees as occurring in multifunctional landscapes in which multiple and interconnected livelihood activities take place (van Noordwijk et al. 2011; Genin et al. 2013). In a multifunctional landscape approach, attention is focused not just on areas with dense tree canopies. Instead, dry forests are viewed as mosaics of land cover types, ranging from dense and extensive stands of trees to sparsely treed cropland and grazing land. As integral components of these patchy and heterogeneous landscapes, humans have played important and positive roles in making them resilient to a variety of potential shocks. Maintaining the multifunctionality of dryland forests as well as ensuring the well-being of both the social and ecological components of these landscapes is therefore considered critical to enhancing their resiliency (Gumbo and Chidumayo 2010; van Noordwijk et al. 2011).

2 Frameworks for studying dryland forests and livelihoods

Of the many analytical frameworks used to study socio-ecological systems, livelihoods analysis has been widely used over the past two decades to provide policy-relevant information aimed at improving the resiliency of household livelihoods in rural communities (Alinovi et al. 2010; Binder et al. 2013). In a comparison of livelihood approaches used by 15 development agencies, Hussein (2002, 11) concludes that, at the core of these different approaches, is the notion that improving rural lives requires understanding and acting upon "the asset limitations of the poor, the risks they confront, and the institutional environment that either facilitates or blocks them in their own endeavors to build pathways out of poverty." Alinovi et al. (2010, 6) argue that livelihoods approaches are important analytical tools because they provide a "way to order information and understand not only the nature of poverty, but also the links between different aspects of people's livelihoods." By helping researchers and development practitioners understand the complexity of livelihood interactions in changing environments, they are useful for identifying key constraints and opportunities for programs and policies aimed at enhancing individual, household and community well-being.

The Department for International Development's (DFID) livelihood analysis framework is the most widely used in livelihood studies in Africa. It defines livelihoods as follows:

> A livelihood comprises the capabilities, assets and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (DFID 1999, 1).

This definition, which is adapted from Chambers and Conway's (1992) work on sustainable livelihoods in the early 1990s, focuses attention on agency as a key element of livelihood strategies and highlights the importance of understanding the combinations of resources, skills and knowledge that people draw upon to cope and adapt to the stresses and shocks they encounter. DFID's sustainable livelihood framework is comprised of five major elements: the vulnerability context, livelihood assets, transforming structures and processes, livelihood strategies, and livelihood outcomes. A graphic depiction of the framework is included in the appendix to this report.

The **vulnerability context** consists of trends, shocks and seasonal fluctuations in factors that directly impact the assets available to individuals and households and which are often factors over which the people affected have little control. People draw on **assets** to pursue livelihood strategies and cope with shocks and setbacks. In the DFID framework, assets fall into five categories: human, social, natural, physical and financial.[1] **Transforming structures and processes** provide the social, economic and political context within which people carry out livelihood strategies. These structures and processes, which include governance institutions, social norms and political processes, among others, influence who has access to what assets as well as rates at which assets are accumulated. Livelihood analyses must take into account the multiple scales at which transforming structures and processes operate. **Livelihood strategies** are "the combination of activities that people choose to undertake in order to achieve their livelihood goals" (Alinovi et al. 2010, 7). Which strategies people chose to pursue depends upon their access to assets and the policies and institutions that affect whether and how they can use those assets. **Livelihood outcomes**, such as reduced vulnerability or improved food security, are the result of people pursuing particular livelihood strategies.

Over the past decade, livelihoods programs have sought to identify and implement interventions that will enhance the **resiliency** of individual and household livelihoods. Resiliency is defined here as "the ability of an individual, a household, a community or an institution to withstand a shock or setback of some type and recover" (Vaitla et al. 2012, 3) and involves having the capacity to

1 Some frameworks include additional types of capital, such as political capital.

manage change by adapting, learning and innovating. Focusing on enhancing people's capacity to manage change draws attention to the dynamic properties of both livelihoods and resilience and emphasizes the importance for livelihood assessments to measure changes in livelihood strategies and household asset portfolios over time (Vaitla et al. 2012).

In the next section, we summarize the results of studies on dryland forest livelihoods in Ethiopia and South Sudan, many of which make use of the livelihood analysis framework described above. We preface the livelihood analyses for both countries with a brief overview of the biophysical characteristics of their dryland forests.

3 Dryland forests, livelihoods and governance in Ethiopia

3.1 Socio-ecological context

Ethiopia has 12.2 million ha of forest and an additional 44.6 million ha of other wooded land (FAO 2010).[2] Although forests cover only 11% of Ethiopia's total land area, more than half (52%) of the country is covered with woody vegetation, including open canopy forests, wooded savannas and scrub grasslands. Table 1 lists the five major categories of dryland forest found in Ethiopia, as well as their general locations and the major disturbances affecting each category. Ethiopia's deforestation rate between 1990 and 2010 was estimated at 0.96% (FAO 2010). Water scarcity is characteristic of the most of Ethiopia's forests and woodlands.

A national livelihood analysis conducted between 2005 and 2009 (USAID 2010), identified three major livelihood strategies practiced by rural Ethiopians: crop farming, pastoralism and agropastoralism. Pastoralism is the dominant strategy in the arid and semi-arid Somali and Afar regions. In Gambela, livelihood strategies are nearly evenly split between agropastoralism and farming. Farming is the dominant livelihood strategy in Oromiya, Southern Nations, Nationalities and Peoples Region (SNNPR), Benishangul, Amhara and Tigray.

3.2 Contribution of dryland forests to livelihoods in Ethiopia

A diverse and rapidly growing body of literature on dryland forests in Ethiopia points to the importance of these ecosystems in providing the goods and services needed to support sustainable and resilient rural and urban livelihoods (Mamo et al. 2007; Babulo et al. 2008; Bekele 2011; Abtew et al. 2014; Yemiru et al. 2014). A comprehensive inventory of forest products for Ethiopia does not exist. However, research suggests that hundreds of forest products and species are derived from the nation's forests, woodlands, woodlots and home gardens (Deffar et al. 1998; Bekele 2011; Lulekal et al. 2011). The majority of Ethiopians use wood or charcoal for fuel, with natural forests being the primary source of supply for both products (Bekele 2011). Sawlogs and other industrial wood are sourced from both natural forests and industrial plantations; smallholder woodlots – planted primarily with *Eucalyptus* species – are the major source of posts and poles for housing construction (Bekele 2011).

Dryland forests provide numerous other products besides wood. Ethiopians use at least 413 different wild plant species for food and spices (Lulekal et al. 2011) and more than 600 wild plant species for medicinal purposes (Deffar et al. 1998). Ethiopia has more than a million hectares of natural bamboo forests – estimated at 7% of the global supply and the largest area of bamboo forests in Africa – and native bamboo is widely used in many rural areas for housing, fodder, furniture and food (Mekonnen et al. 2014). Ethiopia is Africa's largest producer of honey, of which roughly 80% is sold to be used in brewing *tej*, a honey wine (Legessa 2014).

Although many forest products are harvested for subsistence use, dryland forest products are an important source of cash income for many rural Ethiopians (Grebremariam et al. 2009). Most commercial forest products are traded in local and roadside markets but a few products, (wild coffee, frankincense, myrrh, gum arabic, honey and beeswax) enter national and international markets (Lemeinih 2003; Gebremariam et al. 2009; Bekele 2011). Small-scale forest enterprises, including woodlot growers, fuelwood and charcoal operations, sawmills and wood veneer plants, are major sources of off-farm employment and income for rural residents (Bekele 2011). National demand for wood products, including fuelwood, charcoal, post and poles and sawlogs, exceeds the local sustainable supply and Ethiopia is a net importer of wood (Bekele 2011). In 2012, the import bill of the country for wood and wood products rose to USD 170 million (CSA 2014).

2 FAO (2010, 209) defines forest as: "Land spanning more than 0.5 ha with trees higher than 5 meters and a canopy cover of more than 10%, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use." The report defines "other wooded land" as follows: "Land not classified as "forest", spanning more than 0.5 ha; with trees higher than 5 meters and a canopy cover of 5–10%, or trees able to reach these thresholds in situ; or with a combined cover of shrubs, bushes and trees above 10%. It does not include land that is predominantly under agricultural or urban land use."

Table 1. Dryland forest types in Ethiopia.

Vegetation Type	Location	Major disturbances
Dry, evergreen, montane forest	1500 to 3400 m in central, eastern, southeastern and northern highlands	Intensive farming and grazing
Combretum-Terminalia broad-leaved, deciduous woodland	500 to 1800 m in western, northwestern and portions of southwestern lowlands	Expanding human settlements, mechanized farming, overgrazing
Acacia-Commiphora small-leaved, deciduous woodland	900 to 1900 m in southern and central Rift Valley and eastern and south-eastern lowland	Agricultural expansion, overgrazing, drought, fuelwood and charcoal trade
Lowland, dry forest	450 to 600 m found only in Gambella region and adjacent regions of South Sudan	Refugee camps/settlements, dams and large-scale agriculture
Desert and semidesert scrub intermixed with patches of *Commiphora* and *Boswellia* species	Below 900 m in Afar at the northeastern end of the Rift Valley and eastern Somali lowlands	Refugee camps/conflict

Source: Adapted from Lemenih and Woldemariam (2010, 133–4)

As one might expect, the types of products on which households are dependent varies by agroecological zone. In the *Acacia–Boswellia–Commiphora* vegetation zones in northern Tigray and Somali regional state, sales of gums and resins are the most important source of forest-related income for many households (Lemenih et al. 2003; Abtew et al. 2014; Worku et al. 2014). In the Kaffa zone of the Southern Nations Nationalities and Peoples Regional state, wild coffee is the major source of forest income (Melaku et al. 2014); in the dry, afro-montane forests in Dendi district, Oromiya (Mamo et al. 2007) and the Bale Highlands (Yemiru et al. 2010), fuelwood is a major contributor to forest income.

An estimated 12 to 15 million people live in the drylands of Somali, Afar, Oromiya, SNNP, Beninshangul–Gumuz and Gambella regions (REGLAP Secretariat 2012); most of these are pastoralists or agropastoralists practicing extensive livestock production in which trees and shrubs, as well as grasses, are almost sole providers of livestock feed (Dawson et al. 2014). Farmers in these regions rely on a "cut-and-carry" livestock production systems, in which leaves, seedpods and grasses are brought to enclosed livestock (Dawson et al. 2014). Access to grazing resources and cut-and-carry fodder is also important for pastoralists and mixed crop-livestock producers in dry afro-montane livelihood systems (Mohammed and Inoue 2012; Tesfaye et al. 2012). Researchers have identified 111 different tree species used for fodder in Ethiopia, including both indigenous and exotic species (Bekele-Tesemma 2007). Moreover, in dryland livestock systems, trees and shrubs provide the materials needed to build temporary human and animal shelters and corrals as well as medicinal plants for treating sick livestock (Lemenih et al. 2003; Worku et al. 2014).

Dryland forests provide numerous environmental services, including soil fertility enhancement and stabilization, soil moisture retention, water flow regulation, carbon sequestration and biodiversity conservation, as well as cultural services (Lemenih 2011; Sutcliffe et al. 2012). Sacred forests and ceremonial gathering sites located in forested areas enable communities to maintain cultural identities, reaffirm traditional political and religious authority and strengthen social ties (Wassie et al. 2005). Ango et al.'s (2014) work on the perceptions of smallholders in Oromiya of the environmental disservices associated with forests and trees is a reminder that forests and trees can also have negative impacts on livelihoods. Examples of perceived disservices among smallholders included crop damage from wild forest mammals and the shading out of crops and forage. Ango et al.'s study underlines the need for studies that carefully document the costs associated with particular spatial configurations of trees and forests.

3.3 Dimensions of forest livelihoods

Important forest livelihood dimensions covered in recent studies include: the contribution forests make to household and cash income; the structure of forest product value chains and the implications of value chain structures for household incomes; the role of wild edible and medicinal plants in household food security; and the impacts of governance on livelihood outcomes and strategies. In this section we identify major themes emerging from research on these four dimensions of forest livelihoods.

3.3.1 Forest income studies and livelihoods

Researchers have examined the role of forest income in Ethiopian livelihood strategies from a number of angles, including:

- calculation of average total forest income and relative dependency on forest income. These are broken down by wealth category or livelihood strategies (Lemenih et al. 2003; Mamo et al. 2007; Babulo et al. 2008; Tesfaye et al. 2011, Abtew et al. 2014; Worku et al. 2014, Yemiru 2014) or are calculated according to income from key products, such as coffee (Melaku et al. 2014); frankincense, myrrh and gum arabic (Abtew et al. 2014; Worku et al. 2014); or honey (Melaku et al. 2014);
- assessment of major products harvested, number of households involved in their harvest, and determination of the relative importance in value and volume of different products (Lemenih et al. 2003; Yemiru et al. 2010; Melaku et al. 2014);
- identification of factors associated with different levels of forest income and relative dependency (Mamo et al. 2007; Babulo et al. 2008; Yemiru et al. 2010; Abtew et al. 2014; Melaku et al. 2014) and types of forest products harvested (Abebaw et al. 2014; Gebru et al. 2014);
- evaluation of the timing of forest income and the importance of such income in enabling households to bridge gaps in food or cash resources (Yemiru et al. 2010; Abtew et al. 2014).

A key goal of forest income studies is to identify the demographic and socioeconomic factors that reliably and consistently drive forest income levels, forest income dependency and harvest behavior. However, coming up with meaningful generalizations about key relationships, such as the links between wealth categories or livelihood profiles and forest income for Ethiopian households, is challenging. In part, this is because the extreme bio-cultural diversity that characterizes Ethiopia, as well as the diversity of products harvested from forests, makes it unlikely that "one-size-fits-all" explanations exist for drivers of dryland forest livelihood strategies. Importantly, the bio-cultural diversity present in Ethiopia stems in part from the long history of human manipulation of the landscape (Wassie et al. 2005; Wiersum 2010), suggesting the need to pay attention not only to how people harvest products, but more generally how they manage forested landscapes (Stellmacher and Mollinga 2009; Bharucha and Pretty 2010). Bekele (2003) argues that the supposedly pristine natural forests of southwestern Ethiopia were managed by people in earlier times. Even currently, collecting forest coffee is not simply harvesting what exists but requires management by farmers.

Comparative case studies, such as Abtew et al.'s (2014) study on the livelihood contribution of gums and resins in Sudan and Ethiopia, underline how context-specific factors interact to create different livelihood outcomes within a market sector. Similarly, context-specific variables within the bamboo sector, such as access to markets and tenure regime can influence whether and to what extent rural households benefit from commercial bamboo production (Endalamaw et al. 2013). Lack of consistency in definitions and measures of household and forest income complicates the task of identifying patterns in research findings on forest livelihoods in Ethiopia. For example, some studies use per capita income (i.e. Mamo et al. 2007; Yemiru et al. 2010) while others use household income (i.e. Yemiru et al. 2010; Abtew et al. 2014; Worku et al. 2014). Some researchers measure and report on total household income (i.e. Abtew et al. 2014; Worku et al. 2014), while others measure and report on cash income only (i.e. Melaku et al. 2014).

Even with these challenges, the following themes are discernible in forest income and livelihoods studies in Ethiopia.

Theme A-1 - Forest dependency is strong throughout the country, but it varies in terms of its importance across regions and across wealth categories within regions.

A significant percentage of average total household income (i.e. subsistence and cash value) among rural Ethiopian households is attributable to forest products. Average forest income dependency ranged from a low of 20% among sedentary mixed crop-livestock producers in northern Tigray (Abtew et al. 2014) to a high of 39% among mixed crop-livestock producers near the Chilimo National Forest in Oromiya region (Mamo et al. 2007). In studies reporting on total household cash income dependency, the low figure for average household dependency on forests products for cash income was 31.9% in Somali Regional State (Lemenih et al. 2003) while the high was 53% in Bale zone, Oromiya (Yemiru et al. 2010). These findings underline the particularly important role of forests in household efforts to meet their needs for cash income.

Within regions and communities, forest income dependency varies considerably. In general, lower income households are more dependent on forest income than higher income households. For example, among pastoralists in Liben zone, Somali Regional State, average forest income dependency was just under 20% for households in the wealthiest quartile and just over 60% for households in the poorest quartile (Worku et al. 2014). In Bale zone in Oromiya (Yemiru et al. 2010), wealthier households were somewhat more forest dependent (24%) than their counterparts in Liben while the poorest households were somewhat less forest dependent (52%).

Although poorer households on average depend more on forest income than wealthier ones, the absolute value of their forest income is often lower (Mamo et al. 2007; Yemiru et al. 2010; Worku et al. 2014). One possible explanation is that wealthier households have the resources (e.g. labor, capital, equipment) and market connections to harvest and sell a disproportionate share of forest resources (Abtew et al. 2014). A second, not mutually exclusive explanation, is that wealthier households are more likely to be involved in extracting higher value resources or derive their forest income from activities taking place at more lucrative points in forest product value chains. Indeed, in the gum and resin sector, Abtew et al. (2014) reported that wealthier households in study sites in northern Tigray and Sudan tended to be traders rather than collectors. However, we found no studies that provided detailed breakdowns on differences in household participation along product value chains and how that might relate to forest income dependency or absolute values of forest income.

There are many exceptions to the rule that wealthy households have higher absolute forest incomes than their poorer counterparts. Abtew et al. (2014) found that wealthier households in a sedentary crop-livestock producing community in Tigray had higher absolute income from gums and resins, but in Borena (Southern Nations Nationalities and Peoples Regional State) poorer households' cash income from gums and resins was nearly twice that of the richest households. The researchers attribute this pattern to regional differences in access to resources and markets. In the Tigray community, access to gum and resin trees depended upon being a cooperative member, trees were managed intensively through tapping and the market for gums and resins was well developed. In Borena, gums and resins were located in *de facto* open access woodlands, only natural oozes were harvested and markets were poorly developed. Abtew et al. conclude that richer households were more likely to become involved in NTFP harvesting when the products have a higher value or when barriers to entry are higher. They argue that better-off households have greater access to the resources and marketing connections needed to participate effectively in heavily commercialized products.

Tesfaye et al. (2011) argue that a middle path exists between the reliance on NTFPs as a basic survival strategy versus using NTFPs as a means of accumulating capital and becoming more prosperous. In their study of forest income in the Dodola area of Oromiya Regional State, they grouped households into five livelihood types based on the activities from which the households derived the majority of their income. Households in the "forest-based" cluster derived an average of 80% of their income – nearly twice the average for any other clusters – from forest activities. Although the forest-based group's overall per capita income was less than that of households pursuing crop-based strategies, their total per capita income was roughly 15% greater than households adopting livestock-based or diversified strategies. Based on these results, Tesfaye et al. posit that in the Dodola area, specialization in forest products is neither a poverty trap nor a pathway to wealth, but a path to moderate prosperity.

Research is needed to tease out the different circumstances under which reliance on NTFPs as a source of cash income is a survival strategy, a road to moderate prosperity, or a pathway to significant capital accumulation. Comparative mixed-methods approaches, such as that used by Abtew et al. appear to be most useful for shedding light on the social and ecological dynamics that make NTFP harvesting a mere survival strategy in one set of circumstances, but a means to improving household or individual asset bases in other circumstances.

Theme A-2 – Determinants of forest income dependency, forest income levels and participation in forest production activities are highly context-specific

A number of forest income studies have used econometric analyses to tease out the major determinants of forest income dependency, forest income levels and participation in specific types of forest production activities. However, the results of these analyses are inconsistent so it is challenging

to draw any conclusions from the data. Mamo et al. (2007) and Melaku et al. (2014) both found a negative relationship between forest income dependency and market distance, but Yemiru et al. found a positive relationship. The relationship between forest income dependency and distance to forest was positive in Borena, SNNPR but not statistically significant in Abergelle, Tigray (Abtew et al. 2014) and negative in Dendi district, Oromiya (Mamo et al. 2007) and Kaffa zone, SNNPR (Melaku et al. 2014). Forest income dependency and household size were positively associated in Borena, SNNPR but did not have a statistically significant relationship in Abergelle, Tigray (Abtew et al. 2014) or in Kaffa zone (SNNPR) (Melaku et al. 2014).

Gender differences in forest income dependency and participation on forest production activities varied greatly among the studies. In Liben, for example, female-headed households earned less total income from forests than male-headed households (Worku et al. 2014). However, in neighboring Afdher, there was no difference between male- or female-headed households in terms of their forest income. However, in both areas, women relied more on forests for cash income than men did. Also in the gum and resin sector, Gebru et al. (2014) found that male-headed households were more likely to be involved in gum and resin collecting in Tigray and Amhara, but found no difference in Oromiya where women were described as "actively involved" in the collection of such products. Gender was not a significant determinant of per capita forest income or forest income dependency in Dendi district, Oromiya, nor in coffee or honey production in Kaffa zone, SNNPR (Melaku et al. 2014). However, forest dependent households in northern Tigray were more likely to be headed by women (Babulo et al. 2008). In short, these results confirm Abtew et al.'s (2014, 972) conclusion that the influences of socioeconomic factors on households' NTFP income is "variable and site specific and cannot be generalized to all NTFPs, or to all socioeconomic and environmental conditions." The lack of consistency in factors associated with forest income dependency suggests that programs and policies to improve forest-based livelihoods in Ethiopia need to be tailored to fit locale-specific and product-specific conditions.

The work described above suggests that greater use of in-depth interviews with a subsample of households coupled with greater integration of qualitative data into household income dependency studies would do much to improve understanding of the circumstances under which key socioeconomic characteristics influence forest income dependency or participation in forest product sectors. Additionally, current inconsistences in analytical approaches, concepts measured and definitions of key variables, make it challenging to determine if differences exist or not across cases. Greater use of a common analytical framework, such as CIFOR's Poverty and environment network framework,[3] as well as greater consistency in definitions and measures of key variables, would enable researchers to more easily sift out patterns.

Theme A-3 – Forest-related income earning activities have gap-bridging functions that transcend their absolute or relative economic importance value to household income and contribute to livelihood resiliency.

In some areas of Ethiopia, such as the mixed crop-livestock economy studied by Babulo et al. (2008) in the Tigray highlands, reliance on forest products for income or subsistence is viewed as a "last resort" option; households with adequate credit and land preferentially expand their land under cultivation rather than harvesting and selling forest products. However, in areas with high-value commercialized NTFPs that are available at times of the year when demands for labor from agriculture or livestock are low or nonexistent, NTFP collection is viewed more positively (Abtew et al. 2014; Worku et al. 2014).

Studies that track seasonal changes in the relative contribution of different livelihood activities to household income reveal that in some areas, forest products contribute to livelihood resiliency by enabling households to bridge normal and reoccurring resource deficit periods. For example, Yemiru et al. (2010) found that forest cash income enabled 31% of households in a study site in Bale zone, Oromiya to acquire cash to pay for agricultural expenses during the first and second quarters of the year – a time when cash income from other sources was scarce. During that same period, the percentage of households relying on wild vegetables as a dietary supplement was also much higher (85 to 88%) compared to later in the year (50 to 68%). However, poorer and moderately well-off households were more dependent than the wealthiest households on the sale of forest products as a coping strategy during times of income crises.

3 For a description of this framework, see: http://www1.cifor.org/pen

In the gum and resin producing forest zones in northern Tigray and in Somali Regional States, income earned from harvesting or trading gums and resins is high enough to make participation in the gum and resin harvest a viable alternative to dry season out-of-area migration (Abtew et al. 2014). In this case, not only does the gum and resin harvest provide households income during the off-season, but it also improved social cohesion by keeping communities intact all year-round (Abtew et al. 2014). In-depth qualitative household studies appear to be most suited to shedding light on the ways in which forest activities enable households to bridge critical resource gaps.

Theme A-4 - Changes in climatic conditions are prompting a trend toward greater reliance on forest-related income earning activities in some areas

In gum and resin producing forest zones, scholars have observed a trend toward greater reliance on forest-related income earning activities. Worku et al. (2014, 56) describe this shift as follows:

> Dry forest income is now becoming essential before, during and after the occurrence of drought. The number of households engaged in forest product collection in order to accumulate income before the on-set of droughts is on the rise…in areas where livestock production suffers from climatic or security related challenges, these cash savings can help reduce further damage to livelihood.

Worku et al. 2014 argue that by earning cash from collecting gum and resins, pastoralists can avoid selling livestock during droughts and thus are able to maintain their herds. As fodder and water sources for livestock become scarcer, women in particular see gum collection as an attractive option for earning cash income. Gum collection's lower entry costs also make it preferable to farming, which has higher entry costs in terms of knowledge, labor and cash. For agropastoralists, access to gum and resin income makes it feasible for them to store crops when prices are low so that they can sell them at a later date at a higher price.

3.3.2 Forest product markets and enterprises

Efforts to understand dryland forest livelihoods need to consider the nature of the markets in which forest products are sold, as well as where and how households intersect with the value chains of the products they harvest and sell. Wiersum et al. (2014, 6) state, "The income potential of NTFPs greatly depends on how, where and what value is added: at the source by managing wild resources or by domesticating NTFPs in cultivation systems and/or further along the value chain through processing and marketing." Their assertion applies not just to NTFPs but to all forest products, including fuelwood, sawlogs and charcoal, among others. The small but growing literature on forest product markets and enterprises in Ethiopia provides some preliminary but important insights on the structure and processes of forest market governance that shape how the benefits of commercial forest products are distributed among actors along specific value chains.

Recent "state-of-the-knowledge" reports exist for the wood products sector (Bekele 2011), the charcoal sector (Bekele and Girmay 2013) and small and medium forest enterprises (Gebremariam et al. 2009). Value chain analyses of varying degrees of thoroughness have been completed for the following products:

- bamboo (Gebremariam et al. 2009; Endalamaw et al. 2013; Mekonnen et al. 2014);
- Ethiopian cardamom (Meaton et al. 2013);
- gums and resins (Gebremariam et al. 2009; Kassa and Lemenih 2011; Gebru et al. 2014);
- honey (Gebremariam et al. 2009; Legesse 2014);
- timber (Gebremariam et al. 2009);
- wild coffee (Shumeta et al. 2012).

Of these products, important export markets exist for wild coffee (export value of more than USD 200 million in 2005) and gums and resins (export value of USD 4.1 million in 2005) (Gebremariam et al. 2009).

The state-of-the-knowledge reports on wood and charcoal are national in scope, although they also include some regional data and "snapshots" of market channels in towns outside of Addis Ababa. Gebremariam et al.'s overview of small and medium forest enterprises examines enterprises located in Tigray, Amhara, Oromiya and SNNP Regional States; each value chain they explore focuses on one of the four regions (timber from Oromia, gum resins from Tigray, honey and beeswax from SNNP and bamboo from Oromia). Other value chain studies focus on single regions (e.g. Shumeta et al. 2012; Meaton et al. 2013) or compare value chains operating in two or more regions (e.g. Endalamaw et al. 2013; Gebru et al. 2014).

In all sectors, informal enterprises dominate, especially at the lower ends of the chains (Gebremariam et al. 2009). The timber sector is characterized by a large number of sub-sectors, including fuelwood, charcoal, construction wood, poles for scaffolding and furniture. Although precise figures are unavailable, researchers believe that small-scale forest product processing is among the largest sources for rural off-farm employment for both men and women (Bekele 2011). Women, for example, are involved in the fuelwood supply chain as collectors and small-scale traders; men are more likely to be involved in the making, transportation and distribution of charcoal (Gebremariam et al. 2009). Wood processing in the timber sub-sector is dominated by small sawmills and the use of daily laborers to harvest and process timber (Gebremariam et al. 2009). Poles, which are widely used as scaffolding for building construction, are sourced primarily from Eucalyptus plantations, most of which are located on private land or industrial plantations (Bekele 2011). In northern Ethiopia, private companies with gum and resin concessions rely on daily laborers as tappers; on concessions held by cooperatives, smallholders who are members of the cooperatives do the bulk of the collection (Gebru et al. 2013). Smallholders with traditional hives are the dominant suppliers to the honey market, although a number of initiatives are underway to modernize honey production (Gebremariam 2009). The timber, gum/resin and honey values chains, as well as those for bamboo, coffee and other commercial NTFPs typically include a number of actors along the chain, such as buyers, transporters, sorting yards (in the case of poles, logs and bamboo), processors, wholesalers, retailers and exporters (Gebremariam et al. 2009; Shumeta et al. 2012; Gebru et al. 2014). Studies to date have focused on livelihood contributions of producers; relatively little is known about actors operating at other points in value chains or the contributions that they make to rural livelihood resiliency. Key themes appearing in forest product value chain studies in Ethiopia are summarized below.

Theme B-1 – In many commercial forest product value chains, producers occupy a weak bargaining position and tend to have much smaller profit margins than actors further along the value chain.

With a few exceptions, studies of forest product value chains in Ethiopia indicate that actors closer to the forest end of the market chain, whether they are individuals, cooperatives, or small firms, tend to have a weak position with respect to actors further along the chain (Gebru et al. 2014; Mekonnen et al. 2014; Shumeta et al. 2014). For most products this translates into relatively low prices for producers, as well as substantially lower profit margins relative to other actors in the value chain. Coffee producers in Oromiya, for example, had profit margins of between 13–14%, substantially lower than the 51% profit margins for exporters. Access to market information appeared to be a major factor in the prices coffee producers were able to obtain – producers in areas with good access to market information were able to get substantially higher prices than those in areas where access to market information was poor (Shumeta et al. 2012). Producers who could shorten the market channel also obtained much better prices. In the gum and resin sector, for example, cooperatives that sold directly to exporters had higher margins (28%) than those cooperatives that sold through intermediaries (under 12% margins). In the bamboo sector, where demand is quite high and competition among buyers is high, producers located in areas with good road networks to major towns and cities were able to command substantially better prices than those located in remote areas (Endalamaw et al. 2013). Poor quality of products offered for sale and limited use of value-added processing, are major impediments to producers' ability to obtain higher prices for their products (Meaton et al. 2013; Mekonnen et al. 2014; Shumeta et al. 2014).

Theme B-2 – Tenure regimes governing access to commercial NTFPs affect forest livelihood opportunities and incentives for producers to make investments with potential to improve their bargaining position within value chains.

Comparative studies in northern and southern Ethiopia indicate that the tenure regime governing access to gum acacia, frankincense, myrrh and other valuable resins affects the degree to which producers benefit from participating in the gum and resin trade (Abtew et al. 2014; Gebru et al. 2014). In areas where the gum and resin sector is well developed, the State issues short-term tapping concessions to companies and cooperatives. The trees in areas covered by concessions are managed as a semidomesticated resource and access to the trees is limited to either tappers working for companies holding the concessions or by cooperative members. By contrast, in southern Ethiopia's gum and resin producing forests, *de facto* open access prevails. Since the resin is open to harvest by anyone, there is little incentive to tap the trees and instead harvesters

in the south collect resin that oozes from the trees naturally (Gebru et al. 2014). Since there are no concession fees to pay in the southern forests or tapping systems to set up and enforce, the barriers to entry are lower for harvesters than in the north. The returns to investment are higher for tapped trees, so smallholders who can afford to belong to producer cooperatives in the north can earn more than their southern counterparts. Similarly, research on bamboo value chains suggests that bamboo producers manage bamboo more intensively on private lands than stands located on *de facto* open access State lands and earn substantially more income by doing so (Melaku et al. 2014)

Theme B-3 – Improving forest product market governance is the key to strengthening forest livelihood resiliency, but to support pro-poor development we need an integrated approach that links market, tenure and extension interventions.

Various initiatives are underway in Ethiopia to facilitate restructuring of commercialized forest products markets to enable producers/collectors to obtain a larger share of their value (Gebremariam et al. 2009; Endamalaw 2013; Meaton et al. 2013). For example, the EU-supported NTFP-PFM project works with households in SNNP Regional State to help them engage more profitably in the *korerima* (Ethiopian cardamom) value chain (Meaton et al. 2013). International NGOs and agro-industrial companies have provided support for producer cooperatives and introduced modern honey production techniques in the Kefa zone of SNNP Regional State (Gebremariam et al. 2009). NGOs working with the Federal Micro and Small Enterprise Development Agency have provided bamboo producers in Amhara and SNNP Regional States with training in cultivation and marketing techniques (Endamalaw et al. 2013).

The assumption driving these initiatives is that increasing the power of producers within the value chain will have positive social and ecological outcomes by increasing rural household income and creating an economic incentive for sustainable resource management (Meaton et al. 2013). Typical interventions include: developing or strengthening producer cooperatives; linking producers to actors further along the value chain; providing training and resources for producers to engage in value-added activities; offering extension services aimed at helping producers to shift from harvesting "wild" products into either semi-wild forms of management or cultivation; and assisting producer communities in acquiring communal rights to forest management. However, researchers caution that increasing the commercial profitability of forest products risks having unintended negative effects on poorer households if higher prices lead to privatization of communal resources or transform biodiverse forests into mono crop woodlots (Meaton et al. 2013; Abtew et al. 2014). Research that sheds light on gender roles in the harvest, processing and trade of forest products and that provides a better understanding of the ways in which households of different wealth categories engage in value chains, for example, is likely to be needed to avoid unforeseen negative impacts of interventions that increase the value of forest products (Meaton et al. 2013).

3.3.3 Wild edible and medicinal plants in household economies

Wild plants have always played crucial roles in enabling rural households around the world to cope with food insecurity (Bharucha and Pretty 2010) and gain access to low-cost medicinal products (Srivastava et al. 1996). In Ethiopia, where food shortages are both chronic and widespread, interest in evaluating the contribution wild plants could make toward alleviating food insecurity emerged during the 1990s (Asfaw and Tadesse 2001) and intensified in the 2000s (Lulekal et al. 2011). Ethnobotanical research in Ethiopia covers a variety of aspects of wild plant use, knowledge and management. Key topics covered by wild, edible plant researchers include:

- species and parts of wild plants used as foods (Asfaw and Tadesse 2001; Balemie and Kebebaw 2006; Feyssa et al. 2011a; Ocho et al. 2012; Bahru et al. 2013);
- species and uses of plants with medicinal qualities (including veterinary medicine) (Feyssa et al. 2011b; Mesfin et al. 2012; Bahru et al. 2013; Kidane et al. 2014a);
- individual and household characteristics associated with levels of use, preferences and knowledge of wild edible plants (Balemie and Kebebaw 2006; Feyssa et al. 2011a, 2011b; Bahru et al. 2013; Tebkew et al. 2014);
- comparative studies of indigenous knowledge about wild plants (Teklehaymanot and Giday 2010; Tebkew et al. 2014);
- nutritional and/or toxicity values of edible species (Fentahun and Hager 2009; Addis et al. 2013);

- threats to wild edible or medicinal plant populations (Balemie and Kebebaw 2006; Feyssa et al. 2011a; Tebkew et al. 2014);
- local management and conservation practices for wild edible and medicinal plants (Bahru et al. 2013; Kidane et al. 2014b; Tebkew et al. 2014).

In a recent review of ethnobotanical studies of wild, edible plants, Lulekal et al. (2011, 77) characterized the state-of-knowledge on wild edible plants in Ethiopia as "very limited and fragmentary" as well as strongly biased toward the central and highland areas of Ethiopia.

Theme C-1 – Wild edible plants: Supplements and safety nets for food security

A common thread found in wild, edible plant studies in Ethiopia is that wild plant foods are normally not a primary source of calories. Instead, they function as supplements to cultivated foods except during the direst circumstances or in the most remote areas with limited agriculture (Asfaw and Tadesse 2001). Many households consume wild plants to bridge seasonal gaps in their food supply or use them as a reserve during prolonged food shortages (Guinand and Lemessa 2001; Ocho et al. 2012). Although most households consume relatively small amounts of wild plants during times when food is plentiful, some wild plants are eaten even when other foods are not scarce because they are rich in nutrients that are absent or limited in locally cultivated crops (Fentahun and Hager 2009). However, assessing the benefits of wild plants in terms of their nutritive value or their risks in terms of toxins is challenging as little data is available on their chemical composition (Lulekal et al. 2011).

As noted earlier, ethnobotanists have documented the use of more than 400 species of wild, edible plants in Ethiopia. However, recent studies suggest that a small number of species provide the majority of wild plant foods (Bahru et al. 2013; Tebkew et al. 2014) and that fruits are the dominant type of wild, edible plants (Asfaw and Tadesse 2001; Lulekal et al. 2011). Preferred species vary by locality, even over relatively short distances (Tebkew et al. 2014). Many wild plants provide a range of products that help fulfill household needs and in some cases, their value as food sources may be incidental to other values (Asfaw and Tadesse 2001). Maintaining adequate long-term supplies of wild plant foods can be problematic if the tree species they are sourced from are harvested for their wood.

Age and gender influence the extent to which households and individuals collect and consume wild foods, with children being the most frequent collectors and consumers of wild foods followed by women and then men (Lulekal et al. 2011). Household wealth is another determinant of reliance on wild plants for food, with poorer households both collecting and consuming wild plants for food more frequently than wealthier households (Ocho et al. 2012). In some areas and among some cultural groups, wild plants are considered a "low-status" food and are eaten only in dire emergencies (Asfaw and Tadesse 2001; Ocho et al. 2012). In Benishnagul Gumuz Region, western Ethiopia, bushmeat is commonly consumed alongside wild plants (Getaneh 2013) although detailed studies that systematically documented its importance are lacking.

The few studies of wild plant food markets in Ethiopia suggest that value chains are short and prices tend to be low relative to cultivated fruits (Feyessa et al. 2011a; Kidane et al. 2014b). Some wild plants sold for food in markets include fruits from *Z. spina-christi*, *X. Americana*, *Opuntus ficus indica*, *Vangueria madagascariensis* and *V. doniana* and *C. spinarum*, among others. Some plants that are widely commercialized in other parts of Africa, such as baobab and tamarind, are "under-used" in Ethiopia (Lukelal et al. 2011), indicating that potential exists for developing local and possibly export markets for such plants.

Theme C-2 –Use of wild, edible plants as food security indicators

Researchers affiliated with humanitarian organizations have investigated the use of wild plant consumption behavior as an indicator of food insecurity (Guinand and Lemessa 2001; Ocho et al. 2012). Ocho et al. (2012) have proposed a "traffic light" system in which wild plants used for food are grouped into three categories: wild plants eaten in normal periods; wild plants used for food when the volume of household foods start to become insufficient and wild plants used for food only when food reserves or other assets are no longer available. Because wild plant availability varies by geographic location and food preferences vary by cultural group, Ocho et al. (2012) call for additional research to develop wild edible plant "traffic light" systems that are locale-specific.

During the early 2000s, the UN Emergencies Unit for Ethiopia and researchers at the University of Pennsylvania developed a prototype web-based,

updateable database for wild, edible plants (WEPs) as a tool for enhancing food security (Guinand and Lemessa 2001). An accompanying "famine food" field guide described the roles that WEPs play in Ethiopian livelihoods and explained how WEP consumption behavior could serve as an indicator of levels of food insecurity. Project scientists envisioned that humanitarian assistance planners and researchers would contribute data based on their field experiences, creating a national inventory of wild edible plants at relatively low cost.

Although this early attempt at crowdsourcing otherwise difficult-to-obtain data did not lead to an enduring database, the field guide remains available on the internet. With the advances that have occurred in interactive web-based collection technologies, a crowdsourcing approach to building an easily accessible and updateable nationwide knowledge base on wild, edible plants is worth reinvestigating (Guinand and Lemessa 2001).

Theme C-3 – Locating wild edible plants within forest-agricultural landscape mosaics

Data on the specific types of habitats in which WEPs are gathered is scarce. To develop a rough estimate of WEP habitats, Asfaw and Tadesse (2001) supplemented their review of ethnobotanical studies with a species distribution analysis based on published flora distribution data and materials stored in Ethiopia's National Herbarium. They found that WEPs were more likely to be the species reported as occurring in forest or woodlands, but they also occurred with some frequency in grasslands, bushlands, on dry rocky sites, in cultivated areas and along roads. Wild and semidomesticated food plants were also collected and managed in home gardens (Abebe et al. 2013), but little information is available about these landscape niches in the Ethiopian context. A few recent wild edible and medicinal plant studies have sought to improve our understanding of the source habitats for WEPs, but their geographical coverage is limited (Feyessa et al. 2011a; Tebkew et al. 2014). Research on WEPs that incorporates spatial analyses (e.g. where precisely on the landscape do specific types of harvesters source their products? How have source locations changed over time and in response to what factors?) has strong potential to improve the design of community and smallholder forest management projects. Only by understanding where WEPs are sourced from in forest-cropland mosaics (and by whom), is it possible to determine how interventions aimed at changing land-use management practices are likely to affect households' access to these resources (Schumsky et al. 2014).

3.3.4 Land governance and forest livelihoods

Land governance institutions and policies greatly influence how costs and benefits of resource allocation are distributed and therefore are key determinants of which livelihood strategies are likely to be successful. Under Ethiopia's federal system of governance, the national government establishes the legal and policy framework for land and forests, but the country's nine semi-autonomous regions have considerable leeway in how they adapt and implement the national laws and policies. Until recently, Ethiopia lacked a national institution dedicated to forest administration and responsibility for managing the nation's forests was divided between the Ministry of Agriculture and the Ethiopian Wildlife Conservation Agency. However, a newly established Ministry of Environment and Forestry is now responsible for managing Ethiopia's forests (Lemenih et al. 2014).

Two laws are important in understanding tenure incentives (and disincentives) for individual and community efforts to protect or plant trees. Under Ethiopia's Rural Land Administration and Use Proclamation No. 456/2005, smallholders' rights include lifelong, inheritable and transferable rights of use for land as well as to trees planted on their land (Abza 2011). Although rural land is still owned by the State, the 2005 law abolished forced redistribution of land and provided for the issuance of land certificates to landholders. Four of the regional states (Tigray, Amhara, Oromiya and SNNP) adopted the law shortly thereafter. Ethiopia's national law governing forests, Forest Development, Conservation and Utilization Proclamation No. 542/2007, provides for private and State ownership of forests. Article 4.3 of the proclamation authorizes the State to give State forests to communities or associations to manage, provided that a management plan has been developed and approved. However, the law provides no guidance on how such transfers are to take place. This law is being revised to include ownership by communities. Experiments with devolved forest governance, known in Ethiopia as participatory forest management (PFM) have been tried out in several states, but only Oromiya formally recognizes locally managed forests (Mohammed and Inoue 2014).

State forest enforcement capacity in Ethiopia is weak at all levels and individual incentives to comply with forest regulations are low, leading to the prevalence of open access resource regimes susceptible to unsustainable levels of harvest (Beyene and Koch 2013). Additionally, revenues generated from

forest use fees and concessions are deposited to the national treasury where they are then allocated to the forestry sector during the annual national budget development process (Bekele 2011). In practice, this means that local forest districts do not benefit from revenues generated locally and these resources will not be available for improving forest management in the district (Bekele 2011).

During the past decade, government policies that have had particularly significant and potentially long-lasting impacts on dryland forest livelihoods including:

- a shift toward forest governance devolution for smallholdings through large-scale land certification initiatives (Jagger and Pender 2003; Jagger et al. 2005; Giri et al. 2010; Mekonnen and Damte 2011; Tsegaye et al. 2012; Gebreegziabher and van Kooten 2013; Sisay and Mekonnen 2013; Bezu and Holden 2014; Lemenih and Kassa 2014; Matthies and Karimov 2014);
- a shift toward devolving forest governance to community-based forest management entities through participatory forest management initiatives, primarily in Oromiya and SNNP Regional States ((Tesfaye et al 2012; Ameha et al. 2014a; Ameha et al. 2014b (EE); Gelo and Koch 2014; Lemenih and Kassa 2014);
- implementation of large-scale government-sponsored resettlement programs (Abebaw et al. 2012; Yonas et al. 2013; Kassie et al. 2014; Lemenih et al. 2014).

Government policies favoring large-scale land acquisitions for industrial agriculture developments have also had a major impact on forest livelihoods. We address these impacts in Section V (Threats to dryland forests).

Theme D-1 – Land certification has been successful as a strategy for encouraging farmers to plant trees and make other land investments, but policies that provide incentives for farmers to plant native species are needed.

Over the past decade, Ethiopia has made a concerted effort to encourage smallholders to plant woodlots and plantations as a way to stabilize hillsides and increase the supply of fuelwood and building materials. Studies of household tree planting behavior in the early 2000s identified lack of tenure security and the challenges of obtaining permission to harvest products from household woodlots as a major impediment to more widespread tree planting (Jagger et al. 2005). A pilot land registration project was initiated in Tigray in 1998; when this proved successful, land registration was expanded to Amhara in 2002 and Oromiya and SNNP in 2004 (Bezu and Holden 2014). By 2013, more than 90% of farm households in those four regions had obtained first stage land certificates (Bezu and Holden 2014). The first-stage certificates were meant to be followed by a second-stage certificate in which the land would be surveyed using GPS equipment and the holder would be provided with a map of the parcel. However, interest among farmers in obtaining second-stage certificates appears to be very weak (Bezu and Holden 2014).

Designers of the first-stage land certification program theorized that possession of written certificates attesting to the holders' long-term use rights to the land would provide farmers with a greater sense of security. Greater certainty about their rights to the land would, it was hoped, give farmers greater incentive to make long-term investments that would enhance the productivity of their land. The program had both ecological and livelihood improvement objectives. Trees planted on degraded hillsides, for example, would help stabilize soils and prevent further erosion. Farmers would have rights to harvest the trees, thereby reducing pressure on natural forests for building materials and fuelwood. Additionally, farmers would benefit from being able to rent out their land. In short, households would gain financially by having new sources of cash income, as well as benefiting from higher crop productivity.

Subsequent studies (Deininger et al. 2009; Holden et al. 2009; Holden and Ghebru 2011; Mekonnen and Damte 2011) have found that farmers with certificates were more likely to make land investments than those who had not obtained them. Holden and Ghebru (2011) found that the welfare of female-headed households had improved by 7% for each year of ownership. Land certification is strongly and positively associated with tree planting, with Eucalyptus species being the most commonly planted trees in many areas (Gebreegziabher and van Kooten 2013). A strong economic incentive exists for farmers to plant short-rotation trees, such as Eucalyptus, because the domestic market for wood products is expanding rapidly (Bekele 2011).

Matthies and Karimov (2014) provide an instructive analysis of financial returns associated with eucalyptus woodlots. They calculated net

present value as well as internal rates of return on four scenarios on the use of eucalyptus trees on smallholdings. The scenarios included: sell only the wood, use the wood only to construct buildings to rent out, construct buildings on the homestead and sell the remaining wood and use some of the wood for fuelwood and sell the rest. They found that the returns from *Eucalyptus globulus*, the most commonly planted species in the study area, were mostly positive. Of the four scenarios, constructing rental buildings was the most profitable (289% return on investment); the other three scenarios had a much lower, but still respectable, return of about 78%. They concluded that, rather than being an income earning activity of last resort, eucalyptus woodlots provide a base for smallholders to achieve a better and healthier standard of living:

> These results support the observation that eucalyptus is not always a substitute for declining agricultural yields. Instead, it is used as a means of increasing household living standards using limited land resources. Many households described using profits from *E. globulus* to send their children to primary, secondary, and post-secondary schooling. They were not financially capable of doing this without the additional income provided by growing eucalyptus. Households indicated eucalyptus provided them the means to build detached cooking huts. This reduced the exposure of family members, particularly women, to smoke inhalation. Further home improvements included thatched, rather than mud floors and the ability to separate livestock and family living areas. Eucalyptus also acted as a way of saving for the household when formal bank accounts were not available. The trees reduce the exposure of the household to political and economic household risks including regime changes and inflation.
>
> (Matthies and Karimov 2014, 481)

Jembere et al.'s (2011) finding that in some areas the high rate of return for eucalyptus has led some smallholders to convert agricultural land to woodlots confirms Matthies and Karimov's assessment about the potential livelihood improvements associated with eucalyptus. Although not advocating a prohibition on the planting of eucalyptus, Lemenih and Kassa (2014) question the long-term viability of Ethiopia's heavy reliance on a small number of exotic species. They point out that policies prohibiting the harvesting and transportation of wood from high value indigenous trees provide a disincentive for farmers to plant native species, even when their value might be greater than that of exotic species. One avenue for future research in this area would be to investigate the relative profitability of indigenous and exotic species and their potentials for contributing to asset accumulation strategies.

Theme D-2 – Participatory forest management has generally resulted in positive environmental gains but modifications to current approaches are needed to ensure that livelihood gains are achieved and equitably distributed.

In the late 1990s, Ethiopia began experimenting with participatory forest management programs aimed at devolving some authorities over natural forests held under State ownership to local resource user groups. An estimated 668,000 ha of forest land are now managed by 556 forest user groups and 123 forest user group cooperatives in Oromia and Southern Nation and Nationalities People Regional States (Ameha et al. 2014a). Plans are underway to scale the PFM program up to the national level, with new projects planned for Amhara and Benesahngul Gumuz (Ameha et al. 2014a). The performance of PFM projects in Ethiopia with respect to improving livelihood outcomes is mixed. A general pattern is that forest user groups with rights to harvest commercial timber on community-managed forests tend to do much better than those who only enjoy commercial rights for NTFPs (Tesfaye et al. 2012; Ameha et al. 2014b). Other important factors associated with improved livelihood outcomes include:

- provision of extension services to forest user group members aimed at improving market linkages for NTFPs (Gelo and Koch 2014; Tesfaye et al. 2014);
- provision of complementary livelihood assistance such as agricultural credit or revolving loan funds for small business development (Gobeze et al. 2009; Ameha et al. 2014a);
- formation of smaller forest user groups (Lemenih and Kassa 2014);
- allocation of rights to larger and more intact forests (Tesfaye et al. 2012; Ameha et al. 2014b)

An important lesson from these initiatives is that PFM programs that accord rights to valuable resources as well as rights to harvest resources commercially are likely to provide stronger support for sustainable livelihoods than those that focus only on low-value resources or subsistence use rights (Tesfaye et al. 2012; Ameha et al. 2014b).

Linking rights devolution to market governance improvements also appears to be a critical strategy for strengthening livelihoods (Gobeze et al. 2009; Gelo and Koch 2014).

Despite these successes, a consistent pattern observed in Ethiopia's PFM projects is that livelihood benefits are rarely evenly distributed within forest user groups. In general, wealthier members capture a much greater share of the benefits while incurring fewer costs (Ameha et al. 2014b; Mohammed and Inoue 2014). In part, poorer households benefit less because they own less land and depend more on raw materials from the forest for meeting their domestic needs. They also are more likely to sell fuelwood sourced from community forests in order to earn cash income. Consequently, when forest user groups impose restrictions on harvesting logs and fuelwood, which they typically do, poorer households are more likely to be negatively affected than others.

Additionally, in many PFM schemes, group leaders distribute a disproportionately large share of revenues obtained through sales of collective resources (generally timber) to wealthier and better-connected members (Gobeze et al. 2009; Mohammed and Inoue 2012). Wealthier members also benefit more from training opportunities (Mohammed and Inoue 2012). In areas where forest user group members are a mix of recently arrived households and households with long-standing traditional claims to forest resources (e.g. wild coffee) and hive hanging rights, PFM schemes suffer from problems with distributional inequities as traditional owners end up benefiting more than newcomers (Ameha et al. 2014a). In general, the evidence suggests that PFM projects, like other tenure interventions, will have differential impacts on households' livelihood strategies depending on factors such as wealth, education, gender and prior resource claims. Research that uncovers these differential impacts is therefore critical for the design of programs that do not leave poorer households worse off.

Despite the inequities associated with PFM projects, community members involved in them generally see them as useful. Some communities consider PFM schemes in a positive light because they provide more secure access to forest products and grazing areas (Ameha et al. 2014a). However, in other communities, PFM projects are valued for reasons quite different than those touted by the NGOs who provide support for the projects. For example, in Kaffa, SNNP, a major wild coffee producing area, farmers valued the PFM project primarily because it enabled them to deflect government efforts to allocate land to industrial coffee growers (El Ouaamari and Cochet 2014). In other communities, farmers see PFM projects as a means by which they can effectively keep the government from allocating forest land to settlers through government-sponsored resettlement schemes (Ameha et al. 2014a).

An issue that many PFM projects have encountered is the lack of political support from State and district level officials (Gobeze et al. 2009; Ameha et al. 2014a). As a result, in areas where State-sanctioned rights to manage forests communally are not recognized, or where forest user groups do not have official cooperative status, PFM schemes run the risk of collapsing once external support is removed or may experience ongoing conflicts with non-members harvesting in the forest. In some areas, forest user groups with fewer resources have had trouble with district forest officers who refused to recognize their legal right to harvest products commercially (Gobeze et al. 2009; Mohammed and Inoue 2012).

Equally important is the lack of State support for technical assistance once external funding is gone. For example, the government agreed to carry out forest monitoring every 2 years for the Bonga PFM, but it only monitors intermittently (Gobeze et al. 2009). Local authorities lack the capacity to provide technical and legal assistance and few monitoring plans are revised on schedule (Ameha et al. 2014a).

To address these shortcomings, Lemenih and Kassa (2014) call for the development of PFM approaches that are better tailored to local conditions so that they can continue to function once external support disappears, as well as the establishment of clearer rights. Bekele (2011, 49) echoes this recommendation, and highlights the importance of technical capacity building:

> The existing PFM practice can only be effective if supported by an effective and enforced legal framework, and tangible benefits to, and capacity building of, stakeholders. Ownership rights must be legally recognised and assisted by building capacity of the beneficiaries to plan and implement forest management plans, to assess available resources, and to develop marketing information and strategies.

Another shortcoming of prevailing approaches to PFM projects is that they do not typically consider what the impacts of restricting access to forests in one part of the landscape will have on forested

areas – and the people who depend on them – elsewhere. For example, Beyene and Koch (2013) found that the presence of active community forest institutions on communal forests was associated with an increase in fuelwood collection from open access lands. Lower income households, who had no woodlots from which to source their wood, were hardest hit as the open access areas tended to be located further away. This suggests that a piecemeal approach to PFM can shift pressure on community-managed forests to areas remaining as *de facto* open-access forests. Research that documents where forest use takes place and how the spatial distribution of activities of different users is affected by use restrictions is an important step to the design and implementation of landscape approaches to develop PFM projects that improve both forest conditions and livelihood opportunities in socially equitable ways.

Theme D-3 - Resettlement policies do not take into account the environmental or livelihood impacts on host communities and the increased social heterogeneity impedes collective action in forest management

Dryland forest livelihoods in Ethiopia's lowlands are affected by new settlers migrating in large numbers from the densely populated highlands, many as part of government-sponsored resettlement programs. Three waves of migration have occurred in recent history, each successively larger than the first. Roughly 120,000 individuals were resettled prior to the Derg regime and another 600,000 moved between 1974 and 1990 (Lemenih et al. 2014). In response to chronic food shortage during the late 1990s and early 2000s, the Ethiopian Government sponsored a third and even more ambitious resettlement program that suggested the need for mass migration of more than 2.2 million people between 2003 and 2008 (Lemenih et al. 2014).

The areas targeted for resettlement in the latest round of government-induced migration are the country's dry and less populated lowlands which policy makers view as underpopulated or less utilized lands (Flintan et al. 2013; Yonas et al. 2013). From the standpoint of the pastoralists and agropastoralists who have long-standing traditional claims to these areas, however, the land is not underutilized at all. Rather, these areas are key spaces in extensive livestock production systems that rely on herders being able to access resources intermittently over large area as a means of coping with the region's extreme variability in rainfall (Flintan et al. 2013).

Research on how these programs affect host community environments and forest-based livelihoods is rare, but a handful of researchers have recently begun to explore these interactions (Abebaw et al. 2012; Yonas et al. 2013; Kassie et al. 2014; Lemenih et al. 2014). These studies reveal that resettlement programs have the following ecological and livelihood impacts.

- Government rules restricting the land allocation amounts for participants in resettlement programs are poorly enforced and newcomers tend to clear far more land than they are legally allowed (Lemenih et al. 2014). As a result, the negative impacts on grazing resources and forest product availability tend to be much greater than anticipated.
- Agricultural expansion by newcomers typically occurs in areas that the host community has treated as a commons for grazing, fuelwood collection and similar activities (Yonas et al. 2013; Lemenih et al. 2014). Households who relied on these areas for their domestic needs and cash income are negatively impacted, as are herders who rely on having access to these areas periodically as part of their mobility strategy. Pressures on adjacent forested areas increase as collectors and herders seek other sources of supply. In one host community in SNNP, pressures to privatize lands formerly held as communal holdings increased as the original inhabitants sought to fend off encroachment (Yonas et al. 2013).
- Many of the newcomers originate in places where annual rainfall is considerably higher and conditions are much more favorable for agriculture and have little understanding of how to make a living in a much drier environment (Yonas et al. 2013; Kassie et al. 2014; Lemenih et al. 2014). In some areas, as many as half the participants return home (Kassie et al. 2014).

Minimizing the impacts of resettlement programs on host communities and the dryland forests in which they reside is unlikely to happen without fundamental changes in the forest governance system, at both state and community levels. Yet so far governance capacity by state forestry offices is limited, placing the burden for taking up the slack on community institutions. However, local informal institutions are also hard-pressed to cope with the presence of a large influx of newcomers, many of whom do not understand the rules or have social ties in the host community that would lead them to adhere to local rules (Yonas et al. 2013). Moreover,

the influx of new settlers, who in many cases are not from the same area, typically results in a much more heterogeneous population with a diversity of social norms, beliefs and values (Lemenih et al. 2014). Generating sufficient agreement for collective action is doubly challenging since not only are social ties between the hosts and newcomers weak, but often, social ties are weak within the migrant community as well (Lemenih et al. 2014).

Lemenih et al. (2014, 316) found that "…there is a clear lack of "win-win" strategy between poverty alleviation through (re)settlement and responsible forest management." They conclude that if food security objectives of resettlement programs are to be met, then measures that reduce the impacts of settlement on natural resources need to be incorporated into program designs. Yonas et al. (2013, 115) came to a similar conclusion, observing that "…resettlement was likely to exacerbate and complicate situations, not only be creating crises in environmental conditions but also by disrupting the adaptive capacity of the host community" to deal with climate change. Recommendations for minimizing the negative environmental and social impacts of resettlement include: engaging the host community in participatory planning and monitoring of settlements (Yonas 2013), matching settlers to agroecological environments with which they have some familiarity (Kassie et al. 2014), inclusion of non-farm livelihood support in the settlement package (Kassie et al. 2014) and environmental education and provision of tree seedlings and extension advice about tree planting (Lemenih et al. 2014).

4 Dryland forests, livelihoods and governance in South Sudan

4.1 Socio-ecological context

South Sudan has a land area of 619,745 km^2 of which roughly one-third is forested (USAID 2007). Annual rainfall is highest in the Imatong Mountains near the country's border with Uganda and decreases as one moves north and down in elevation. Table 2 summarizes the rainfall and vegetation types characteristic of South Sudan's five major ecological zones. More than half the country is covered with wooded savanna. High rainfall savanna receiving an average annual rainfall of 800 to 1500 mm is located towards the south; the low rainfall savanna with an average annual rainfall of 400 to 800 mm is found in the northern part of the country. The far southeastern region near the Kenya border consists of semiarid woody desert scrub with an average annual rainfall of 75 to 400 mm.

An extensive inland wetland known as the Sudd occupies a large swath through the center of the country within the White Nile and Sobat River basins. The Sudd is an integral component of many pastoralists' livelihoods as it serves as a dry season grazing ground for South Sudan pastoralist groups who graze their livestock in dryland wooded savanna and grassland zones in the wet season (USAID 2007).

Prior to the 1983–2005 civil war, the Sudanese Government's forestry program emphasized large-scale commercial harvesting of timber for export and large-scale timber and fuelwood plantations, as well as establishment of greenbelts around urban centers (USAID 2007). The greenbelts and some of the plantations experienced heavy exploitation during the war years. This was especially the case for teak plantations located in more easily accessible areas, such as Central and Northern Bahr el Ghazal States. Teak plantations in Western Equatoria State and softwood plantations in the Imatong Mountains remained intact due to their inaccessibility during the conflict. Forest reserves make up roughly 20% of South Sudan's land area (USAID 2013) Pressure on natural forests with commercially valuable timber species decreased during the war years in many parts of South Sudan due to the closure of all major sawmills and the difficulties of transporting large quantities of wood out of remote areas that were experiencing conflict (USAID 2007). Reliable deforestation rate data is nonexistent. A study by Silva conducted in 2005 found that between 1982 and 1999, vegetation cover in much of what is now South Sudan was either "improved" or "much improved" (USAID 2007).

The USAID Famine Early Warning Systems Network (Muchomba and Sharp 2013) categorizes South Sudan into 11 major livelihood zones (see Box 1).[4] Broadly, these can be collapsed into seven lifeways: agriculturalists, agropastoralists, pastoralists, forest product harvester-farmers, fisher-agropastoralists, mixed farming/livestock keeping and oil industry workers who also rely on subsistence farming and livestock keeping. Livelihood zones marked with an asterisk in Box 1 are at high risk for food insecurity. High-risk zones have a high likelihood of production failure, limited opportunities for poor households to earn income and difficulties accessing markets. Widespread cattle raiding and/or political conflict are chronic in all five high-risk zones.

Important new laws with implications for forest-based livelihoods include the Land Act (2009) and Local Government Act (2009). The general thrust of this legislation is to provide communities with stronger legal rights over land and natural resources (World Bank 2014a). Additionally, the Land Act provides special protection for pastoralists, specifying that their communal grazing rights cannot be restricted without their permission (World Bank 2014a). Although the 2009 Land Act specifies that community lands include lands that

4 In South Sudan, USAID used a household economy assessment framework which it describes as Livelihood Zoning "Plus". Livelihood zones are defined as "areas within which people share broadly the same pattern of livelihood" (p. 1), by which they mean a combination of production systems and patterns of trade and exchange (http://www.feg-consulting.com/resource/practitioners-guide-to-hea/2%20Livelihood%20Zoning.pdf). The authors define livelihoods as "the sum of ways in which households obtain the things necessary for life, both in good years and in bad" (p. 1). In developing the livelihood zones for South Sudan, USAID took into consideration geography, production, markets/trade and consumption patterns. The "plus" aspect of the framework involves taking into consideration how wealth affects livelihood patterns in a zone.

Table 2. South Sudan's ecological zones.

Ecological zone	Average annual rainfall	Common tree species
Montane	Up to 2500 mm	*Khaya grandifolia*, *Chlorophora excelsa*, *Entrandrophrangma angolense*
Flood region	Variable	Dominant vegetation is *Cyperus papyrus* (papyrus sedge) and *Typha dominguensis* (cattails)
High rainfall woodland savanna	900 to 1300 mm	*Khaya senegalensis, Isoberlina doka, Vitellaria paradoxa*
Low rainfall woodland savanna	400 to 800 mm	*Acacia seyal, Acacia senegal, Balinites aegyptica, Tamrindus indica, Commiphora* spp., *Combretum* spp.
Semidesert with grasslands and shrubby woodlands	75 to 400 mm	*Acacia tortillas-Maerua crassifolia, Acacia mellifera-Commiphora and Acacia glaucophylla-Acacia etbaica* desert scrub

Source: Adapted from USAID (2007)

Box 1. Livelihood zones in South Sudan.

SDD1	Equatorial maize and cassava
SSD2	Ironstone Plateau agropastoral
SSD3	Highland forest and sorghum
SSD4	Western groundnuts, sesame and sorghum
*SSD5	Eastern semi-arid pastoral
*SSD6	Eastern plains sorghum and cattle
*SSD7	Greater Bahr-el-Ghazal sorghum and cattle
*SSD8	Nile basin fishing and agropastoral
SSD9	Oil resources, maize and cattle
SSD10	Northeastern maize and cattle
*SSD11	Northern sorghum and livestock

* indicates high food insecurity risk zones

communities hold, manage or use as community forests, agriculture or grazing, it conflicts with the 1989 Forest Act, currently in force, which states that the government has control over forest land (Deng 2014). The lack of clarity over who controls the revenues from non-reserved forest lands has become a major source of tension between communities and the central and State governments (Deng 2014).

While the new land laws and policies are an important step towards the creation of more equitable and sustainable land and resource institutions, the government's capacity to develop enacting legislation and enforce the new laws is limited (Deng 2014). The issue of women's rights to land is particularly contentious as women have few rights to own or inherit land under most customary legal systems in South Sudan (Mennen 2012), yet an estimated 45–50% of women returning to their homes post-conflict are functioning as heads of households (Maxwell et al. 2012). Land reforms, such as the registration of community lands under a proposed Community Land Act and ensuring that land and natural resource rights of minority groups, women and IDPs are protected are deemed critical to the success of conflict-reduction efforts (World Bank 2014a).

4.2 A note on the state-of-the-knowledge about forest livelihoods in South Sudan

Research on present day dryland forest livelihoods in South Sudan is extremely limited because of prolonged civil war and lack of even basic educational facilities and supporting infrastructure and institutions. Gray literature technical reports and project documents published by international aid organizations and humanitarian relief agencies, as well as reports and statistical data published by the Government of South Sudan provide some information about human-forest interactions but are limited in depth and geographic scope. Internationally funded food security programs are the most reliable sources at present for current and historical data on livelihoods and food security. The following three programs are the most visible international food security programs and have a nationwide presence:

- The Food Security Cluster, which is co-led by the Food and Agriculture Organization and the World Food Programme, posts current and historic livelihoods-related data on its South Sudan website (http://foodsecuritycluster.net/operations/south-sudan). The Food Security Cluster's mission is to coordinate food security operations during humanitarian crises.
- The World Food Programme's Food Security Monitoring System (https://www.wfp.org/

countries/south-sudan/home) in South Sudan is the only source of up-to-date systematically collected data on the consumption of wild edible plants and sales of natural products. Data is collected twice yearly from survey locations in each county.
- The Famine Early Warning Systems Network (http://www.fews.net/east-africa/south-sudan) monitors the food security situation. Funded by USAID, it provides maps and descriptions of South Sudan's major livelihood zones, as well as food security updates and price bulletins for staple crops.

Although a few researchers have investigated topics related to forest livelihoods in South Sudan (e.g. Ashamu 2010; Deng 2011; Maxwell et al. 2014), none of these studies or the food security program reports described earlier include in-depth treatments of the forest-related aspects of livelihoods or tenure systems. Indeed, only a handful of publications touch in any depth on forest use, forest management practices, or forest governance institutions in South Sudan is limited to a handful of studies (e.g. USAID/University of Missouri 2004; Robinson 2006; Muga et al. 2009; Bloesch et al. 2013; Gorsevski et al. 2013; UNEP 2013). In the next section, we summarize the main themes emerging from these studies. We supplement the discussion with findings from a few studies carried out in the South Kordofan and Darfur regions of Sudan, which have applicability to South Sudan as well.

4.3 Contribution of dryland forests to livelihoods in South Sudan

Dryland forests provide a wide and diverse array of goods and services that are essential to rural and urban South Sudanese inhabitants. Trees provide timber for houses and granaries and wood for making farm and household utensils (Robinson 2006). Fuelwood and charcoal are the primary cooking fuels in South Sudan, supplying roughly 80% of the nations' fuel (MAFC and RD 2012). Important NTFPs include wild edible plants, gums and resins, honey and medicinal plants (Ashamu 2010[5]). Trees are also important to the South Sudanese for the shade they provide, as well as for erosion control, soil moisture retention and a variety of other environmental services. Some trees have religious significance, providing connections to ancestors or serving as clan or family totems (Ashamu 2010). Numerous tree species are important food sources, including *Balanites aegyptica*, *Zizyphus spina-christi*, *Grewia* spp., *Ximenia americana*, among others (Robinson 2006). Forests and wooded savannas are also a source of fodder for livestock for pastoralists, agropastoralists and sedentary mixed crop-livestock producers (Ashamu 2010).

Decades of conflict and poorly developed transportation infrastructure have left South Sudan with a very weak commercial forest product sector. Markets for most commercialized products tend to be highly localized due to the high levels of insecurity present in most regions. In consequence, South Sudan considers reconstruction and expansion of its forest products markets as a key element of economic recovery in post-conflict context. In its forestry strategic policy (MAFC and RD 2012), the South Sudan Government highlights the export revenue-generating potential of teak, which it estimates at USD 5 million per year. A land governance assessment by the World Bank estimates that once rehabilitated, the nation's teak plantations have the potential to generate more than USD 100 million per year. Other potential export products identified in the new policy include shea nut butter, oil, gum acacia and honey.

Of the potential export markets for forest products, the gum acacia export market is the most functional at present. South Sudan's gum forests are vast, stretching from Eastern Equatoria State across Jonglei, Upper Nile, Warrap, Unity, Lakes, Central Equatoria, Western and North Bahr Ghazal States and covering 46% of the country's land area (Muga et al. 2009). In 2008, South Sudan produced an estimated 6417 metric tons (t) of gum arabic, making it the world's fourth largest producer, with Upper Nile, North Barhl El Gazhal and Eastern Equatoria States providing most of the production (Muga et al. 2009). A market analysis sponsored by SNV (Muga et al. 2009) estimated that South Sudan had the potential to produce between 6500 and 15,600 t of gum arabic per year, which in 2008 would be worth between USD 12.4 and USD 25.8 million. Although substantial, these figures pale in comparison with the revenues generated from oil exploitation and large-scale industrial agriculture.

5 Ashamu E. 2010. Post-conflict forest governance in southern Sudan. Unpublished manuscript, New York: NY. On file with authors.

4.3.1 Forest income and livelihoods

Major themes identified in a review of publications addressing topics related to forest livelihoods in South Sudan are summarized in the section that follows.

Theme 1 – Forest income (in-kind and cash) is important for many South Sudanese, but the level of importance varies considerably by region and season.

Data collected by the World Food Programme's food security monitoring program highlight the importance of forest income for many South Sudanese. As indicated in Table 3, the percent of household income derived from sales of natural resources varies from a low of 20% in Lakes state to a high of 65% in Unity state.

Natural resources sales are much less important in states where income diversity is higher (i.e. Lakes, Western Equatoria, Central Equatoria and Warrap). The share of household income attributable to forest resources fluctuates over the course of the year, with forest income being more important during the dry season when it makes up roughly one-third of household income for all states combined (WFP 2013).

A common coping strategy used by households experiencing food stress is to increase their reliance on WEPs (WFP 2013). For example, only 13% of households included in the food security monitoring survey in February 2012, a time when food security was relatively good. The following February, when worsening insecurity decreased food availability in Jonglei, the percentage of households increasing their reliance on WEPs for foods had more than doubled to 28% (WFP 2013). Food insecure households were much more likely to rely on income from natural resource sales than food secure households (52% versus 18%), leading report authors to characterize natural resource sales as a "distress activity." However, findings from recent studies (see Box 2) in neighboring Sudan suggest that equating natural resource sales with distress activity is overly simplistic and obscures the multiple roles of such sales in household activity. Other than the food security reports, little information is available on the importance of forests to household livelihoods in South Sudan. Two particularly important topics related to forest dependence for which very little information is available include the degree to which internally displaced persons' livelihoods are linked to forest activities and the importance of forest activities in returnees' livelihood portfolios.

Table 3. Household dependency on natural resources sales in South Sudan.

State	Percent income from sales of natural resources
Unity	65
Western Bahr el Ghazal	46
Upper Nile	42
Eastern Equatoria	39
Northern Bahr el Ghazal	39
Jonglei	35
Western Equatoria	21
Warrap	21
Central Equatoria	21
Lakes	20

Source: World Food Programme (2013)

Box 2. Non-timber forest products (NTFPs) and livelihoods in South Kordofan, Sudan.

Recent studies on NTFPs and livelihoods in an area just across South Sudan's northern border provide insights on household forest income dependency that are relevant to South Sudan. Salih and Ali (2014) found that household dependence on the sale of wild fruits varied greatly among villagers in South Kordofan, Sudan. The contribution of wild fruits to total annual family income was less than 15% in one village, 29% in another and more than 50% in three villages. The availability of domesticated fruit species was a major factor affecting reliance on wild fruit sales – households in villages with mango orchards were much less likely to earn income from selling wild fruits.

A related study in the same area (Adams et al. 2014) found that fruits from three tree species (*Adansonia digitata*, *Ziziphus spina-christi* and *Balanites aegyptiaca*) contributed between 26% and 51% of average household cash income. Households used the cash from sales of wild fruit primarily to pay for food, schooling and health care, although a few households were able to accumulate sufficient income from the sale of wild fruits to purchase tools, improved seeds, or livestock. Adam et al.'s research suggests that reliance on NTFPs for income is not necessarily a "distress" activity and under certain conditions can enable households to accumulate the capital needed to improve the overall stability of their livelihood portfolio.

4.3.2 Markets, value chains and livelihoods

Theme 2 – Markets are poorly developed and research on forest product value chains is virtually nonexistent

South Sudan has extensive natural forests and a number of legacy teak plantations that were established before the civil war. However, the lack of roads or other reliable transportation infrastructure, as well as ongoing security issues, the presence of landmines and difficulties accessing international markets has constrained the development of more than very localized markets (Deng 2014). As of 2010, two concessions had been granted by the South Sudan government for large-scale commercial harvesting and processing of wood from legacy teak plantations and most processed timber products were imported from neighboring countries (World Bank 2010). The teak plantations have important livelihood implications, as companies are required to provide communities affected by the plantations with a lump sum payment of between USD 100,000 and USD 200,000 (Deng 2014). However, lack of transparency in how these revenues are disbursed makes it difficult to determine household-level impacts. South Sudan's 2013 forest policy emphasizes the importance of small and medium-enterprises as drivers of rural development and creators of income earning opportunities and a recent World Bank assessment of the land governance sector states, "Forest-based industries, including saw mills, furniture and construction materials, provide significant sources of off-farm employment for rural South Sudanese" (Deng 2014, 80). Despite the policy rhetoric supporting small and medium enterprise development, it is unclear what support programs exist or how effective they are (Deng 2014). Illegal harvesting of forest products is reportedly widespread (Deng 2014). However, we were unable to locate any statistics measuring the geographic extent or magnitude of unpermitted harvesting.

We located only two studies, both in the gray literature, with detailed information about forest products markets or value chains. In 2004, researchers from the University of Missouri International Agriculture Programs used a participatory learning and action approach to conduct an inventory of shea tree stands in Yei County, Central Equatoria State (USAID/University of Missouri 2004) and assess the importance of the shea nut harvest to the livelihoods of the surrounding villagers. Traditionally, shea trees were protected under customary law and farmers nurtured shea seedlings and protected mature trees in their fields. Although community members value the nuts and oil as food, at present, there is only limited market demand for those products. There is, however, a thriving market in shea wood, which is a preferred species for making charcoal and a demand for more cropland. As a result of economic pressures to expand agricultural production and cash income, together with the breakdown of traditional authority in the area, the harvest of mature trees by community members and outsiders has increased.

Muga et al. (2009) completed a sustainability analysis of the gum arabic markets in Upper Nile, Western Bahr el Ghazal and Eastern Equatoria States in 2009 for SNV Netherlands Development Organization. The market is most extensive in Upper Nile State, where producer cooperatives have existed for some time and relationships with northern traders have been maintained since the 2005 Cooperative Peace Agreement. An intensive management approach in which trees are tapped is utilized. Gum collection is a dry season complement to agricultural and livestock production and is a supplemental rather than primary source of income. In Upper Nile State, participation in the gum sector is quite high (estimated at 75% of the households in gum-producing areas). In recent years prices for charcoal have gone up while prices for gum have dropped. This poses a major threat to the gum industry as individuals can make more from selling *Acacia seyal* to charcoal makers than they can make by tapping them for gum. Most of the harvested gum is exported, with the majority going to Sudan where there is a strong local market as well as a strong export market. Some gum is exported legally through Kenya and Uganda and there is an illegal trade with Ethiopia as well. Muga et al. (2009) conclude that the capacity for engaging in gum markets is low for most actors along the value chain and that improving the sector will require enactment of a new Forest Act, clarification of land tenure, implementation of quality control systems and tax reform. Given that insecurity in South Sudan is ongoing and widespread, research that sheds light on how local NTFP markets and international markets have been strengthened in similar contexts is much needed.

4.3.3 Land cover change analyses as a means to understand impacts on livelihoods

Theme 3 – Satellite imagery analysis has considerable potential to support research aimed at understanding the environmental impacts and associated livelihood impacts of sudden and massive influxes of populations to IDP camps or previously isolated areas removed from conflict.

As of December 2014, South Sudan had an estimated 1.4 million IDPs and upwards of 400,000 citizens living as refugees in neighboring countries. This massive movement of the population inevitably has environmental consequences. Hagenlocher et al.'s (2012) study of the environmental impacts of an IDP camp in Northern Darfur, Sudan and Gorsevski et al.'s (2013) research on conflict-related land use changes in the Imatong Mountains of South Sudan illustrate some of the likely impacts of such camps on the surrounding environment. Both studies also demonstrate the value of integrating satellite imagery analysis in studies of forest cover change and in the case of Gorsevki et al.'s work, on livelihoods.

In the area surrounding the camp they studied in Northern Darfur, Hagenlocher et al. documented a 68% decrease in forested and semi-forested land between 2002 and 2008, a time when the camp experienced a dramatic increase in its population. Field surveys normally used to compile information on changes in forest conditions were costly and required researcher to go into areas that were remote and unsafe. By using high-resolution satellite images, Hagenlocher et al. were able to both identify changes in forest conditions and depict the extent of the changes in a visually compelling way. They concluded that use of spatial analyses was useful for evaluating the consequences of land cover change on ecosystem integrity. If combined with interview data, such analyses could also be used to improve our understanding of how changes in forest cover affect food and livelihood security in areas around IDP camps.

Gorsevski et al. used satellite imagery analysis to compare the impacts of conflict on two heavily forested areas along South Sudan's border with Uganda in Eastern Equatoria State. They complemented the satellite imagery analysis with focus group discussions and key informant interviews with inhabitants of the study areas. The image analyses were helpful in identifying specific areas undergoing deforestation and recovery, but the interview and focus group data was critical for understanding why changes occurred in some areas but not in others. Additionally and unexpectedly, through the interviews, it became apparent that the inhabitants of the study area were opposed to the central government's desire to open up the area to industrial logging and plantation establishment after the cessation of hostilities. Community members said that the government plantations had greatly undermined their ability to make a living from the forest, while providing few lasting benefits.

4.3.4 Land governance and livelihoods in South Sudan

Theme 4 –South Sudan's forest governance institutions are in a state of flux, leading to lack of clarity over rights, weakened capacity on the part of state and traditional authorities to enforce rights, and weakened capacity to manage forest resources sustainably.

South Sudan's forest strategic policy for 2012–2017 is strongly oriented toward rebuilding the nation's teak plantations and reestablishing the infrastructure needed to harvest those plantations and support industrial-scale timber harvesting (MAFC and RD 2012). It also places a strong emphasis on collaborative forest management with rural communities. However, as noted earlier, lack of clarity over ownership and management responsibilities for the nation's non-reserved forests has created considerable tension between the central and state governments and rural communities (MAFC and RD 2012). South Sudan's Constitution states that the land belongs to the community, a provision that communities have interpreted to mean that they should receive a share of revenues from forests located on communal lands, a claim which the federal government does not recognize (MAFC and RD 2012).

We located a handful of field studies that touch on issues that have a direct bearing on current capacity of traditional governance institutions to manage forest resources. Among these are the USAID/University of Missouri (2004) inventory of shea tree stands in Yei County and the SNV sustainability analysis of the gum arabic sector in Upper Nile, Western Bahr el Ghazal and Eastern Equatoria States (Muga et al. 2009), both of which are described earlier in this report. A UNEP-funded South Sudan Pilot Community Forestry Project in Central and Eastern Equatoria also provides relevant insights (UNEP 2013).

A thread running through these three studies is the negative impact that prolonged conflict and societal change has had on the capacity of traditional forest management institutions to enforce rules governing access to and use of community resources. For example, traditional rules prohibit the felling of live shea trees in Yei County and live *Acacia seyal* trees in Upper Nile State. Both species are in now in high demand for charcoal making and community members are increasingly ignoring the rules and either cutting them or allowing outsiders to cut them as a way of earning income. The UNEP pilot study found a similar situation in Eastern and Central Equatoria. Speaking of Ifwoto Payam in Eastern Equatoria, an area where the traditional forest governance system is still relatively intact, they described the traditional system as in the midst of gradual disintegration in response to outsiders ignoring cultural norms and weak state enforcement of formal rules:

> Cultural norms prohibit cutting some trees in particular due to their importance to the community, but rapid urbanisation is taking a toll on these traditional forest management structures and practices largely because people from urban areas do not respect traditional norms and practices. In addition, the legal framework pertaining to forest management is weak and people are taking advantage of legal loopholes to overexploit forest resources (UNEP 2013, 8).

However, it is not just a case of urban residents transgressing rural rules. As the researchers go on to describe, the expansion in markets for forest product previously used primarily to meet domestic needs has fundamentally changed residents' incentives for adhering to traditional rules:

> [The] traditional and customary system of forest resource management in the payam worked well in the past when the community harvested forest resources solely for their own needs. However, those resources are now in much greater demand. The payam is easily accessible by road and so the payam's resources are within reach of the people of Torit and the markets of Torit are within reach of the people of the payam. The traditional form of forest management is being increasingly weakened as people harvest forest resources for income generation and sale with little regard for the traditional norms and practices. (UNEP 2013,11)

The situation in Lainya Payam in Central Equatoria is somewhat different as the traditional system is virtually no longer functional. Community members attribute the breakdown in the traditional authority system to the government's practice of issuing logging permits without consulting landlords or community leaders and then failing to enforce the permit conditions. However, the study team argued that the situation is more complex since landlords and other community members are equally likely to ignore the traditional rules. Further, they argue that the undermining of traditional and governmental authorities may be linked to a fundamental shift away from a communal-focused society to one in which the individual and family take precedence over the larger community's welfare:

> Indeed in the absence of effective controls over the exploitation of the forest, the majority of the residents, especially the young, are said to have abandoned cultivation and taken up the trade in forest based products instead. The larger analytical point here then is that perhaps the breakdown of control of the forest is a symptom of a change in the forms of life of the people in this community and the society of which it forms a part. Belief in *the commons* as a concept may be being eroded as that society becomes more aspirant and more focussed on the individual person rather on than broader social networks to which that person belongs (UNEP 2013, 71).

None of these pilot studies investigated the relationship between the decline in traditional authority over forests and impacts on livelihoods of community members or outsiders coming in to harvest products. Nor have any systematic studies examined the livelihood impacts of IDP camps on host community members or their impacts on traditional land governance systems. Also lacking are studies that explore how traditional governance systems are impacted by the return of large numbers of people who have spent much of their lives elsewhere. Studies such as these constitute an important starting point for investigations of dryland forest livelihoods and factors that contribute to their resilience in South Sudan.

5 Threats to dryland forests and livelihoods in Ethiopia and South Sudan

Five factors pose significant threats to dryland forests and livelihoods in Ethiopia and South Sudan: Climate change, violent conflict, population movement and growth, large-scale land acquisitions and weak governance institutions. In this section, we outline the key dimensions of each of these factors and briefly describe the ways in which they threaten forest conditions and livelihood resiliency in Ethiopia and South Sudan.

5.1 Climate change

Evidence from Ethiopia suggests that the amount of rainfall hasn't fallen significantly as a result of climate change (Nyssen et al. 2009). Indeed, McSweeny et al. 2012 suggest that rainfall will increase, but will come in the form of more intense rainfall that will be distributed with greater irregularity than present. Changes in rainfall patterns linked to climate change impact forest-based livelihoods by reducing the area in forest coverage as farmers seek to spread risk by converting forests to cropland and pastoralists shift into farming as a diversification strategy (Flintan et al. 2013). Additionally, climate change can lead to increased dependence of forest resources and hence higher degradation as rural residents seek to earn income from collecting and marketing forest and tree products or expand subsistence harvest of WEPs to offset declines in crop and livestock productivity. Forest conversion is particularly problematic when lands that are used by pastoralists as key fallback zones during dry periods are converted to cropland, reducing the mobility of pastoralists and increasing their vulnerability to variability in rainfall (Flintan et al. 2013).

Climate change is one of the driving forces in the Sudan conflict (Chavunduka and Bromley 2011), as well as the conflict that emerged in South Sudan in 2014. Weather shocks, drought, desertification reduce the availability of productive farmland, forage and access to water, exacerbating the probability of interpersonal violence (Maystadt 2014). Indeed, Maystadt et al. (2014) argue that 26% of violent events in South Sudan appear to be associated with climate change related temperature variations between 1997 and 2009. Maystadt et al. (2009, 4) conclude that areas that are now semidesert or low rainfall zones in South Sudan are likely to become even more arid and that "the vulnerability of semi-arid areas to climatic stresses and shocks is more likely to intensify in the decades to come." When faced with failed crops and livestock ventures, many rural South Sudanese turn to forest products as a source of income and/or food.

Chavunduka and Bromley's (2011) study in Sudan on the importance of retaining flexible ownership boundaries in the context of climate change and overlapping land claims offers some useful insights for thinking about how to approach communal land registration in Ethiopia and South Sudan. The study examines how the climate change-induced shifts southward by nomadic pastoral groups into the Abyei area has led to conflicts with settled communities in Southern Kordofan about rights to valuable resources. The area is one in which nomadic pastoralist groups had historical claims to grazing grounds, but which they had not been able to access during the prolonged civil war. A government-sponsored program to title communally held lands was implemented in the area between 2006 and 2009, but quickly stalled when communities were unable to agree over fixed boundaries. Additionally, it was unclear how the claims of newcomers, including both nomads and displaced persons, fit within the proposed titling program. The nomads in particular considered boundary demarcation as a threat to their ability to move herds (and sometimes entire villages) around to cope with variable rainfall patterns. Chavundunka and Bromley maintain that flexible boundaries are more appropriate in agropastoral economies that face chronic risk and uncertainty. They argue that flexible strategies call for "the establishment of institutional settings and processes for the enhancement of complementary relations and for working out nascent conflicts between farmers and nomads" (Chavundunka and Bromley 2011, 915). The importance of incorporating flexibility into programs aimed at providing clarity over land and resource rights cannot be overstated given the likelihood that population displacement linked to climate change and conflict will occur.

5.2 Conflict

Conflict within and between countries has significantly affected and continues to impact forest-based livelihoods in Ethiopia and South Sudan. The region has experienced multiple types of conflicts over the past 50 years including chronic large-scale conflicts, such as the decades-long civil war in Sudan; episodic large-scale conflict; and localized conflicts, such as cattle raids and local disputes over land and grazing resources.

The civil war of Sudan was the longest war in modern African history. It affected the livelihoods of tens of millions and left over 2.5 million people dead. Forest-based livelihoods in South Sudan have been severely constrained by the ongoing and widespread violent conflict associated with decades of civil war. Indeed, few South Sudanese can remember a time when war and the physical and emotional insecurity that accompanies war was not a part of their daily lives. Interethnic conflicts continued in many parts of South Sudan after it declared independence in 2011, erupting into a new civil war in late 2013. More than 1.8 million South Sudanese have fled their homes since December 2013, including 1.4 million IDPs and 440,000 refugees in the neighboring countries of Ethiopia, Uganda, Sudan and Kenya (UNHCR 2014c).

Conflicts in neighboring countries, including Somalia, Eritrea, Sudan and South Sudan have had significant impacts on Ethiopian communities. Ethiopia currently hosts an external refugee population of more than 729,000 (UNHCR 2014a). Additionally, Ethiopia has upwards of 320,000 IDPs, including individuals displaced during the border war between Ethiopia and Eritrea in the late 1990s and more recent displacements linked to ongoing interethnic internal conflicts in Gambela region and a counterinsurgency in Somali region (UN-OCHA 2014).

The following quote on the Food Economy Group's website[6] summarizes the deep and pervasive effects of prolonged or frequent episodic conflict on livelihood assets:

> In conflict situations, people's access to grazing or agricultural land (natural capital) is compromised; shifting alliances make previous networks of sharing and entitlement uncertain (social and political capital); livestock and food stocks (physical capital) are looted; national hard currency reserves are quickly depleted with concomitant changes in exchange rates (financial capital); and productive household members are recruited into armies or killed (human capital).

Effects of conflict in Ethiopia and South Sudan on forests and livelihoods include the following:

- degrading forest conditions around refugee camps as inhabitants seek fuelwood for personal use and sale (Bloesch 2013);
- increased vulnerability of pastoralists and agropastoralists to drought as their mobility is inhibited and intensified pressure on dryland forest forage resources in areas free of conflict (Flintan et al. 2013);
- a decline in trade in insecure areas, making it difficult for dryland forest residents to bring products to markets and decreasing the resilience of their livelihood strategies (Deng 2014);
- decimation of wildlife populations as the government's ability to protect conservation zones declines and small arms become more available. However, paradoxically, violent conflict can have positive impacts on wild populations and other forest conditions (Robinson 2006; Hanson et al. 2009). If conditions are sufficiently dangerous, there is less resource use in affected areas, as has been the case in some parts of South Sudan.

Importantly, the effects of conflict, particularly prolonged and violent conflict, on forests and livelihoods continue long into the post-conflict phase. At the cessation of prolonged conflicts, governance institutions are often weakened, public revenue-generating capacity is limited and what revenues are available are typically needed to rebuild roads and communication systems, reestablish education and public health facilities and other tasks, with correspondingly fewer resources available for forest conservation or sustainable livelihoods programs (Hanson et al. 2009).

5.3 Population growth and large-scale movement of people[7]

High population growth rates coupled with large-scale movements of people place additional stresses on dryland forest ecosystems and livelihoods in

6 Food Economy Group. http://www.feg-consulting.com/core_issues/conflict

7 Data for the population section is from: World Bank. 2014b. *World development indicators.* http://data.worldbank.org/sites/default/files/wdi-2014-book.pdf

Ethiopia and South Sudan. Ethiopia has 94 million inhabitants, the vast majority of whom (83%) live in rural areas. Its annual population growth rate is 2.7% (CSA 2014), leading to significant pressures to convert forests into cropland and reduce fallow periods. Ethiopia's annual rate of urbanization is also high (4.1%). Urban demand for charcoal and construction wood places additional pressures on forests, particularly those located along major transportation routes leading to large urban centers. Government policies aimed at moving large numbers of people out of Ethiopia's densely populated highlands have accelerated forest land conversion and fragmentation rates in the less-sparsely populated lowland areas targeted for resettlement. Yonas et al. (2013) argue that resettlement not only creates environmental issues, but also disrupts the host community's capacity to adapt to the impacts of climate change. The influx of refugees from South Sudan, Sudan, Somalia and Eritrea adds yet another layer of pressure on forest resources, as residents of IDP camps seek wood for fuel and construction.

South Sudan has roughly 10.8 million inhabitants. Its population growth rate was estimated to be 4.12% for 2014, the third highest in the world.[8] However, the estimate occurred prior to the latest outbreak of violence in South Sudan, which has resulted in hundreds of thousands of people leaving the country. As a result, the population is likely either remaining steady or declining slightly. As in Ethiopia, the vast majority (82%) of South Sudanese live in rural areas. The rate of urbanization is 5.4% and is concentrated primarily in and around Juba, the capital city.

As of December 2014, roughly 1.4 million internally displaced persons were living in 168 settlements in South Sudan; mostly concentrated in Unity, Upper Nile and Jonglei states (UNHCR 2014b). In addition, about 247,000 persons from other countries had taken refuge in South Sudan, the majority of these were from Sudan, with a smaller number from Democratic Republic of Congo, Ethiopia and Central African Republic (UNHCR 2014b). Prior to the most recent conflict there was a large influx of skilled and unskilled foreign workers who were seen as competitors for employment and resources by many South Sudanese (Maxwell et al. 2012). How many foreign workers remain in South Sudan at the present time is unknown.

Many of the camps which house foreign refugees and domestic IDPs are on the border of Sudan and there have been marked clashes between local populations and settlers over resources. Long-time residents often feel their resources are being pilfered with no benefit to their villages. The need for water, pastoral and agricultural land, NTFPs, building materials for shelter and latrines and wood or charcoal for cooking, heating and lighting are permanent and high (Bloesch 2013). The demand for resources and access to grazing lands leads to deforestation, overgrazing by livestock (which IDPs/refugees brought with them) and a high level of stress on the ecosystem as a whole around the refugee camps (Bloesch 2013). Desertification, land degradation, unsustainable groundwater extraction and groundwater pollution have also been reported surrounding many camps (Hagenlocher et al. 2012). Decisions made during the emergency phase of camp establishment often result in lasting impacts on the surrounding ecosystems and thereby on the livelihoods of the host population, contributing to resentments or new tensions between groups (Bloesch 2013)

Aside from refugees and IDPs, South Sudan experienced a general movement of people from rural to urban centers, especially Juba, which doubled its population from 300,000 in 2008 to 600,000 in 2013 (USAID 2013). This has been an unplanned and unregulated shift and has had environmental consequences in the city, notably widespread tree cutting to supply charcoal and building materials, as well as the outlying provinces (USAID 2013).

5.4 Large-scale land acquisitions

Large-scale land acquisitions (LSLA) have accelerated during the past decade in both Ethiopia and Sudan (Cotula et al. 2009). Interest among foreign and domestic investors in acquiring rights to large areas of land in Ethiopia can be traced to the government's shift toward policies favoring industrial agricultural-led development during the early 2000s and the subsequent demand for large tracts of land suitable for industrial-scale farming operations. Initially LSLAs in Ethiopia involved domestic investors, but following the 2007–2008 global food crisis, the federal government approved a national policy that allowed foreign investors to acquire long term use

8 Maxwell et al. (2012) attribute the high growth rate in South Sudan to the adaptive advantages of larger families during times of conflict. Larger families can pool resources and labor, enabling them to perform more varied livelihood activities and engage in a broader array of coping strategies.

rights to agricultural lands (Abbink 2011). Between 2007 and 2010, the Ethiopian government leased out 1.17 million ha of land; it anticipated leasing nearly 3 million ha to investors, mostly consisting of foreign companies (World Bank 2010). In Ethiopia, the majority of LSLAs have occurred in the more sparsely populated lowlands, areas the federal government conceptualizes as empty wasteland (Abbink 2011). However, these seemingly empty lands are typically important elements of pastoralists' mobility strategies or agriculturalists' shifting cultivation systems.

A similar situation prevails in the dry, montane forests of SNNP regional state where wild coffee is an important cash crop for smallholders (El Ouaamari and Cochet 2014). Smallholders in coffee growing zones typically harvest coffee as well as other products from both "thin" forests on the edges of their farm fields and "thick" forests located further away and nominally managed by state forestry department. The dense forests in particular have become targeted for development by agro-industrial coffee growers, who have acquired concessions from the government for large tracts of land. Smallholders lose access to the more productive coffee land, resulting in declining incomes. To fend off coffee concessions, some smallholders have begun to convert more of their "thin" forest land to cropland, reducing both forest cover and biodiversity.

Behnke and Kerven (2011) compared the relative profitability of cotton plantations, sugar plantations and pastoral livestock production in the Awash Valley in northeastern Ethiopia. They found that pastoralist livestock keeping is more profitable than farming cotton and that sugarcane was less profitable in three years out of four. They conclude that "there is no evidence of consistently higher economic returns per hectare to sugarcane rather than pastoralism" (Behnke and Kerven 2011, 33). Moreover, both sugarcane and cotton farming were far more damaging to the ecology than pastoralism.

LSLAs emerged somewhat later in South Sudan following the Comprehensive Peace Agreement (CPA) in 2005 and cessation of two decades of civil war (see Box 3). As in Ethiopia, the South Sudanese Government is relying on an industrial agriculture model of development to increase food security and expand its economy. Rising food prices during the mid-2000s, together with growing interest among investors in acquiring land for biofuels production, carbon rights and forestry projects, have continued to fuel demand for large tracts of land in South Sudan despite the unstable political climate (Deng 2011).

Because most of the projects associated with large-scale land acquisitions in South Sudan have yet to be implemented, the effects they will have on forests or livelihoods of members of the communities owning the land or resource users with secondary use rights to those lands are unclear. However, despite its sparse population, there is no land in South Sudan that has no owner and the chances are high that even relatively small LSLAs will significantly reduce one or more resource user groups' access to land and resources. Robinson (2006) found that local populations perceived large-scale land acquisitions, agricultural expansion and commercial exploitation of forests as potential threats to fruit-bearing trees.

Box 3. Large-scale land acquisitions in South Sudan

In a baseline study for Norwegian People's Aid of 28 land acquisitions across South Sudan, Deng (2011) found the size varied from as little as 560 ha to as much as 2.2 million ha and lease terms ranged from 25 to 99 years. The amount of land affected is substantial: including domestic and foreign investments, land investors had sought or acquired more than 5 million ha, or nearly 8% of South Sudan's land area as of 2010.

Of the post-CPA agreements, roughly 25% of the land was acquired for forestry projects, such as teak plantations and carbon credit schemes; the remaining 75% was acquired for agricultural projects. Although most of the land leased was held under community ownership, the signatories to the agreements were either the state governments or national government and communities were rarely consulted. Interestingly, domestic investors were much more likely to consult with communities than were foreign companies.

As of 2010, none of the investment projects, most of which were still in the design phase, had led to forced evictions. However, the larger projects encompass lands and natural resources used by tens of thousands of people and loss of access to those lands would have significant negative impacts on their livelihoods.

5.5 Weakened traditional governance institutions

Forest governance systems in Ethiopia and South Sudan are characterized by weak to nonexistent state capacity to support forest management activities or enforce forest. Although customary governance systems continue to operate in parts of both countries, in many cases traditional authority to manage and regulate forest resource use has been seriously undermined (Bekele 2011; UNEP 2013; Deng 2014).

During the late 20th century, the Ethiopian Government created a number of "protected" forests, mostly from lands previously managed as common property by local communities. The state lacks the resources to police these areas but in most areas does not recognize the authority of local leaders to enforce traditional rules governing their use, thereby creating large areas that are now *de facto* open access (Bekele 2011). The PFM projects described earlier are attempts to rebuild viable local-level forest authority structures, but progress remains slow. The lack of formal recognition of customary rights to land and resources for pastoralists has been particularly problematic as government officials perceive many seasonally occupied grazing grounds as "unoccupied" and therefore subject to use for government-sponsored resettlement schemes (Flintan et al. 2013; Yonas et al. 2013).

In South Sudan, governance institutions at all levels have been seriously weakened as a result of widespread and decades-long violent conflict (Deng 2014). Numerous communities are overwhelmed by IDPs, many of whom are not from the area and are unaware of or do not recognize the authority of local governance institutions. The ongoing conflict has also undermined the authority of elders in the minds of many younger men (USAID/University of Missouri 2004). The following quotation from a study in which shea forests in Yei county were inventoried (USAID/University of Missouri 2004, 16) illustrates how the undermining of traditional authorities has affected traditional forest management and dryland forest livelihoods

> There is less adherence to the decisions made by a community's traditional leaders and the laws protecting shea trees are not abided [by]. In the past, every household had the obligation of giving part of the shea nuts collected to the village chief, landlord or rainmaker in exchange for the traditional and management functions these leaders perform. This practice is being abandoned nowadays as young people, with little respect for village leaders, ignore their duty.

The changing attitude towards traditional authorities is attributable to the breakdown of family and village structures during the war. Widows now head many households in villages in which a large portion of the citizenry are either dead or displaced. Social norms, beliefs and customs have been altered with the breakdown of family and village structures. Traditional knowledge has been lost and continues to be lost as young males migrate to urban centers and choose to stay there, "largely because of difficulties accessing land in rural areas and readapting their livelihoods after having lived in urban areas for so long" (Maxwell et al. 2012, 6).

The weakening of traditional governance structures in Ethiopia and South Sudan highlights the emerging importance in these countries, as elsewhere in the world, of hybrid, polycentric forms of governance in which decisions over resource use and management are increasingly influenced by actors from multiple societal sectors (i.e. government, civic society, private sector) working together at multiple scales (i.e. local, national, regional, international) to achieve objectives held in common. The increasing complexity and inter-scalar nature of resource governance institutions brings with it the need for traditional governance authorities to adapt to rapidly changing socio-ecological conditions if they are to remain relevant**.** At the same time, policies that support functional local governance institutions – whether they consist of traditional institutions or hybrids of old and new institutions – are crucial, as the conditions needed to support sustainable forest-based livelihoods are unlikely to exist in the absence of viable local governance structures and processes.

6 Implications for further research and policy reforms

Drawing on lessons learned from recent forest livelihoods research in Ethiopia and South Sudan, we have identified a suite of research priorities for each country that show promise for contributing to policy reforms and other initiatives intended to increase resiliency and reduce vulnerabilities of small-scale forest product users and producers. Two additional research priorities – gender impacts and climate change adaptation strategies – cut across the other priority areas for both countries.

6.1 Research and policy reform priorities in Ethiopia

In Ethiopia, a strong need exists for further research and policy reform in the following focal areas: smallholder and community rights to trees, in order to improve or enhance management practices, participatory forest management governance approaches, forest product market development impacts and demographic shifts and their impacts on forest-based livelihoods, forest management and forest cover.

1) Clarifying and expanding smallholder and community rights to trees and forests in order to make reforms that lead to improved or enhanced tree planting activities and improved forest and woodland management practices. Recent experiments with tree and forest rights expansion in Ethiopia suggest that providing smallholders and communities more extensive and more secure rights to trees and forests can result in positive and widespread ecological and livelihood outcomes. However, additional research (as outlined below) is needed to ensure that rights expansion policies are pro-poor and provide adequate incentives for smallholders and communities to incorporate native species into their tree planting and protection activities.

- Investigation of the relative profitability of indigenous and exotic species and comparison of their potentials for contributing to asset accumulation strategies of poor individuals and households,
- Investigation of the role that commercial rights to forest products, particularly fuelwood and timber, play in whether participatory forest management schemes achieve positive livelihood and ecological objectives.
- Exploration of legislative and policy options for expanding smallholder rights to native tree species and expanding the range of communal rights devolution options beyond the existing types of participatory forest management schemes.

2) Identifying approaches to participatory forest management schemes that promote better livelihood outcomes for managing communities in general and marginalized forest user groups in particular while also ensuring enhanced management of forests. Participatory forest management schemes have enjoyed considerable success in improving forest livelihoods in some areas of Ethiopia. However, research indicates that some groups, notably households with lower incomes and limited asset bases, women and pastoralists are less likely to benefit from such schemes and in some cases, their ability to access critical forest resources is severely constrained. Examples of research that can inform pro-poor livelihood and conservation policies are:

- investigations that disaggregate the benefits and negative effects of PFM such that the relative impacts on women, pastoralists, agropastoralists and other frequently marginalized groups are more easily identified, along with characteristics of successful pro-poor PRM governance systems;
- assessments of the impacts on women and other forest users of integrating PFM schemes with small and medium forest enterprise development programs tailored to provide support preferentially to women and other typically marginalized groups.

3) Improving understandings of how benefits are distributed along forest product value chains and how to manage the effects of forest product market development on resource access and use by communities and the private sector. Recent research on forest product value chains reveals that forest livelihood benefits vary considerably depending on how such value chains are structured and where individuals and households are situated along those chains. Studies also indicate that increasing the

commercial profitability of forest products, notably NTFPs, may have unintended negative consequences for individuals and households with limited asset bases. Additional research is needed to clarify how positioning along value chains affects the profitability of forest-based livelihoods and to identify policies and programs that support pro-poor changes in market governance structures and processes. Some examples of research needed are outlined below.

- Studies that tease out the different circumstances (i.e. proximity to markets, nature of the products and the structure of their market governance, household asset base, etc.) under which reliance on forest products is primarily a survival strategy, a road to moderate prosperity, or a pathway to significant capital accumulation. Such studies need to be accompanied with research that identifies pro-poor policies that permit households to derive greater benefits from forest-based livelihood activities.
- Exploration of gendered roles in the management, harvest, processing and trade of forest products with the aim of identifying policy interventions and program activities that can strengthen women's bargaining power within forest product value chains.
- Exploration of the social and ecological impacts of increasing the commercial profitability of forest products, focusing on how poorer households are affected, both in terms of continued ability to access resources and their capacity to participate in forest product trade, when the value of products they depend on increases.
- Studies that examine the impacts of payment for ecosystem services policies and greenhouse gas emissions reduction activities, such as REDD+ and the clean development mechanism projects, including associated large-scale land acquisitions for tree plantations and reforestation schemes, on forest-based livelihoods

4) Improving understanding of how major demographic shifts, land-use changes and large-scale development interventions (irrigation schemes, large-scale industrial agriculture, sugarcane plantations, etc.) affect forest resource management, the livelihoods of local communities, their dependence on forests and the use of dry forests for livestock farming by communities in both the lowlands and highlands. Recent forest livelihood studies in Ethiopia highlight the existence of complex relationships between forest livelihoods and recent demographic trends and development intervention policies. Seasonal migration, for example, may decrease household labor availability for harvesting and processing forest products, but the loss in potential income may be offset by remittances from migrating household members. Large-scale migration in the form of resettlement programs may increase the profitability of forest livelihood activities for in-migrants, while simultaneously undermining forest livelihoods of host community members. Development interventions, such as irrigation schemes and large-scale commercial farms, may provide wage employment for nearby communities, but those gains may not offset negative impacts on livestock production or forest product income. Increased local demand for forest products linked to rapid urbanizing areas may initially have a negative impact on forest incomes, but if demand is sufficiently high, it may prompt forest users to adopt semi-wild or domestication strategies that ultimately provide them with higher incomes.

- Exploration of the relative importance of seasonal and permanent migration of household members in forest-based livelihoods, together with assessments of the impacts – both negative and positive – of migration on livelihood asset bases.
- Investigation of the impacts of resettlement on the forest livelihoods of host community members, with a focus on understanding impacts on pastoralists and agropastoralists.
- Exploration of how urbanization is affecting demand for forest products, value chain governance structures and processes and the impacts of both on forest-based livelihoods of urban and rural residents.
- Investigation to help improve understanding of the livelihood trade-offs associated with land-use changes linked to large-scale development interventions, such as irrigation schemes and large-scale commercial farming, emphasizing how such schemes affect the use of dry forests for livestock farming in both highland and lowland ecosystems.

6.2 Research and policy reform priorities in South Sudan

Studies of forest livelihoods in South Sudan are few in number and all point to a need to prioritize research supporting the development of post-conflict policies and investments that help hasten the recovery of forest-based livelihoods and increase the profitability of incorporating forest-based goods and services into livelihood portfolios. If South Sudan continues to experience chronic conflict, research

should most productively focus on documenting the impacts of conflict on forest-based livelihoods in order to structure humanitarian aid programs in ways that mitigate negative impacts as much as possible. Examples of research that can inform post-conflict recovery programs or humanitarian aid programs in the midst of conflict are included below.

- Explorations into the roles subsistence use and sales of forest products play within urban and rural household economies in general and within IDP or post-conflict returnee adaption strategies in particular.
- Studies of how traditional and State forest governance systems have been affected by chronic conflict and, where relevant, by the establishment of IDP camps and/or the return of large numbers of people post-conflict who have spent much of their lives elsewhere. An important element of such research would include an assessment of how conflict and post-conflict conditions have affected forest structures and processes and forest-based livelihoods of community members, forest users from other communities and refugees.
- In areas with large-scale private or state plantations, investigations comparing the ecological impacts and relative economic importance of small and medium forest enterprises in household and community economies, with large-scale forest enterprises. This research would also include an assessment of the effectiveness of existing policies and programs supportive of small and medium forest enterprises, as well as suggestions for how they can be improved or expanded to reach a broader population.
- Studies of how South Sudan's policies promoting large-scale land acquisitions and oil and mineral development have affected forest conditions and household and community economies of forest-dependent communities (Threats – Large-scale land acquisitions).
- Research investigating strategies for rehabilitating or developing pro-poor forest product markets in conflict and post-conflict contexts.

A comparative analysis of Ethiopia and South Sudan holds promise for generating unique insights into how to structure post-conflict forest livelihoods and conservation strategies. Ethiopia's post-conflict experiences in enhancing the contributions of dryland forests to livelihoods can provide a foundation for guiding analogous efforts in South Sudan, as it moves, however fitfully, from conflict to peace and stability.

6.3 Cross-cutting priorities: Gender and climate change adaptation

Cutting across research and policy reform areas for both Ethiopia and South Sudan are two additional priorities: (1) research in which data can be disaggregated to examine the relationships between gender and forest livelihood outcomes associated with specific livelihood and conservation policy interventions and program activities; and (2) research that explores how climate change has affected individual and household forest-based livelihood portfolios and adaptive strategies.

7 Conclusion

Our synthesis of the literature on dryland forest-based livelihoods in Ethiopia and South Sudan yields a set of general observations about the major stressors, adaptive strategies and policy interventions that detract from or enhance forest-based livelihood resiliency. Major stressors of dryland forest ecosystems in Ethiopia and South Sudan include climate change, conflict, large-scale movement of people, large-scale land acquisitions and the weakening of traditional systems of forest governance. These stressors exacerbate the uncertainties associated with the region's high level of temporal and spatial variability in rainfall and plant productivity. To manage these uncertainties, forest-dependent households use a variety of risk-spreading strategies, with diversification (of crops, plot locations, livestock and income-generating activities); mobility (of livestock and people); and flexibility in resource use and access rights being particularly important. However, the chronic social and economic vulnerability and limited asset endowments of many forest users, together with the major stressors identified above, threaten forest sustainability and frustrate efforts by individuals and households to pursue sustainable investment and development strategies.

In Ethiopia, policy interventions aimed at enhancing forest-based livelihoods include land certification programs, forestry extension (linked to the land certification initiative), participatory forest management schemes and small enterprise development assistance, among others. Some of these interventions, notably land certification and the accompanying forestry extension activities, have enjoyed widespread success in terms of both social and ecological outcomes in the areas in which they have been piloted. Other interventions, such as the participatory forest management pilot projects, including projects linked to REDD+ or Clean Development Mechanism funding, have had mixed results and may require additional reforms to address their shortcomings.

Prior to the outbreak of violent conflict in 2014, the nascent state of South Sudan had taken steps to develop legislation and policies potentially supportive of forest-based livelihoods, including customary tenure rights recognition and small- and medium-sized forest enterprise development programs. However, the extent to which these policy interventions have been implemented on the ground and their impacts on forest livelihoods is unclear. Both the Ethiopian and South Sudanese Governments have put into place other policies that tend to undermine forest-based livelihoods of the rural poor, such as the issuance of large land, oil and mineral concessions in dryland forest areas, without consultation with local communities. In Ethiopia, the implementation of resettlement programs without considering what the impacts will be on host community livelihoods and ecosystems has similarly undermined forest-based livelihoods in some resettlement zones.

Given the complex socio-ecological relationships and dynamics that characterize Ethiopian and South Sudanese forest livelihood contexts and adaptive strategies, a solid foundation of research that sheds light on those dynamics and relationships is critical if policy interventions and program activities are to be effective at enhancing the resiliency of such livelihoods and the forested ecosystems in which they are embedded. Priority areas for research and policy reform in Ethiopia center on clarifying tenure rights to trees and forests, supporting pro-poor PFM approaches, strengthening the bargaining power of poor forest users in forest product value chains and improving our understanding of the impacts of demographic shifts on forest-based livelihoods. In South Sudan, the priority is on sifting out the impacts of conflict and post-conflict social dynamics on forest-based livelihoods and identifying post-conflict policy incentives and reforms for enhancing forest-based livelihoods while conserving forested ecosystems. In both countries, research needs to incorporate analyses of the gendered impacts of forest livelihoods programs and policies and provide insights into how climate change has affected the resiliency of forest-based livelihoods and the structure of livelihood portfolios.

Recent scholarship examining the interactions between dryland forests, sustainable livelihoods and governance suggests the need for research that is transdisciplinary, combines multiple methods

(e.g. case studies, quasi-experimental designs, participatory rural appraisals, etc.) and provides both cross-sectional and longitudinal data. Additionally, emerging socio-ecological systems research highlights the importance of understanding both spatial and social relationships between elements of these dynamic, complex systems.

If conducted at landscape scales, spatial analyses of changes in forest use associated with policy interventions can help distinguish whether interventions have resulted in an overall improvement in forest conditions or whether they have merely displaced forest degradation to other areas. They can also provide cost surfaces useful for calculating the cost to households and individuals of changes in access linked to PFM schemes or other policy interventions. Landscape-level spatial analysis of forest cover and composition over time linked with forest income and dependency studies can also serve as a tool for exploring the links between land-use changes, tenure and forest livelihoods in contexts of rapid urbanization, large-scale resettlements and land acquisitions, or conflict and post-conflict situations. Social network analysis is another useful tool that can be productively integrated into forest livelihoods research as a means of clarifying the roles and relative importance of bonding and bridging capital within and across communities in enhancing forest-based livelihood resiliency.

The research outlined above will contribute to the literature on forest use strategies and the contribution of forests to overall livelihoods sustainability in Ethiopia and South Sudan. Additionally, it will contribute to a better understanding of the links between forest governance arrangements, land-use change and forest-based livelihoods resiliency, thereby supporting the development of evidence-based policy interventions that enhance social equity while maintaining or improving forest conditions.

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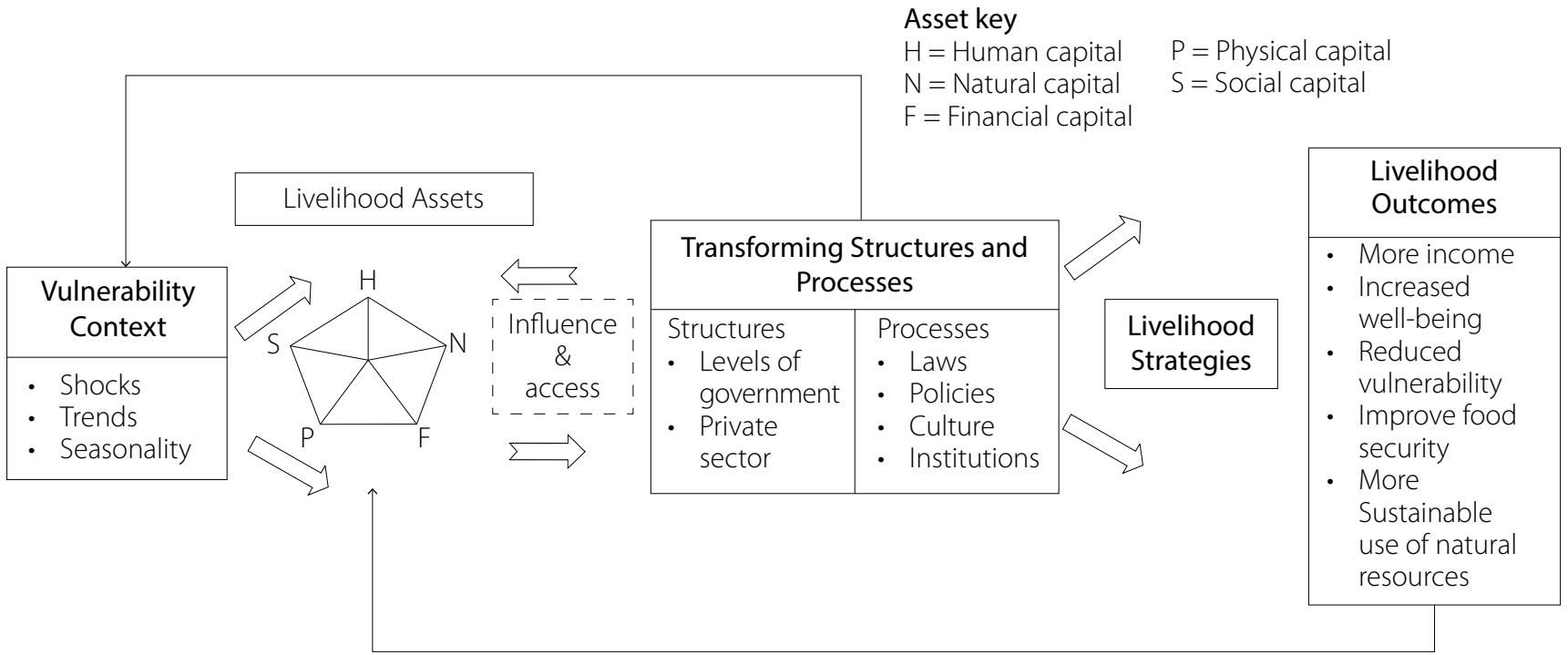
Appendix 1. Livelihoods analysis framework

Figure 1 – Sustainable livelihoods framework



Source: Alinovi et al. (2010, 7)

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This literature review explores how political, economic and resource management policies and programs can reduce forest degradation and increase the contribution of forest goods and services to sustainable livelihood strategies. In Ethiopia, studies indicate that forest dependency is strong throughout the country, but the importance of forest income varies across different regions and wealth categories. Research suggests that improving forest product market governance is key to strengthening forest livelihood resiliency. Recent experiments with forest governance devolution have shown mixed results in terms of improving forest conditions and livelihoods. Smallholder land certification has met with considerable success, whereas participatory forest management schemes have positive ecological outcomes but fall short in terms of livelihood gains. In South Sudan, civil war has limited the depth and scope of research on dryland forests and livelihoods. Food security analyses indicate that the importance of forest income varies by region and season. Markets are poorly developed and forest governance systems are weak in many parts of the country. Key threats to forest livelihoods in both countries include: shifting climatic conditions, large-scale population movements, large-scale land acquisitions and weakened governance institutions; and in South Sudan, continuing violent conflict. In Ethiopia, research and policy reform should focus on the relationship between forest rights devolution, livelihoods, forest management practices and forest conditions as well as on the impacts of demographic change on forest-based livelihoods, forest management and forest cover. In South Sudan, research should focus on documenting the impacts of conflict on forest-based livelihoods with an view to structuring humanitarian aid programs in ways that mitigate the negative impacts.

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