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Forests, people and environment: some African perspectives[§]

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Forests in Africa support the livelihoods of millions of people through provision of timber and non-timber forest products, food and nutrition, energy and payment of environmental services. However, mismanagement of forests has resulted in deforestation and forest degradation, thereby contributing to the increased emission of carbon dioxide into the atmosphere. This special issue highlights some of the research outcomes presented at a pre-congress workshop organised by the African Forest Forum and partners at the 2015 World Forestry Congress. In this issue, the main drivers of land degradation are highlighted *vis-à-vis* population growth, agricultural expansion, climate variability, drought and energy needs. Promising traditional management practices are identified including age-old farmer-managed natural regeneration and exclosures. In addition, research presented indicates that age-old systems such as native non-browse shrubs in Ethiopia are important in that they facilitate regeneration of late-successional tree species. Furthermore, opportunities for using forests to mitigate climate change are highlighted with a case study on the economics associated with carbon markets. The issue also highlights the methodological challenges of quantifying carbon in African forests. The effect of climate change on threatened forest species and biodiversity in general is discussed, and the associated human disturbances impacting on the population structure of a threatened species, e.g. *Azelia africana* in West Africa, is presented. The important role of non-timber forest products in income generation for the rural communities and the associated challenges of commercialisation is emphasised with examples from two important tree species: shea (*Vitellaria paradoxa*) and baobab (*Adansonia digitata*). Finally, the issue covers a people-centred approach in tree planting and management where studies demonstrated that there are still problems of poor participation of local communities due to poor implementation of enabling policies, lack of involvement in initial planning and subsequent lack of clear benefit-sharing mechanisms.

Keywords: African forests, climate change, forest disturbance, livelihoods, natural regeneration

Introduction

The highest deforestation and forest degradation rates in sub-Saharan Africa (SSA) occur in the dry forests and woodlands and the Sahel where the pressure for land is continuously increasing due to rampant poverty and limited livelihood options. In addition, land and forest tenure and rights of access to forest and woodland resources are either not clearly defined or are non-existent to many people in many parts of SSA (FAO 2008). The different forest types support many ecosystem services important to the people of Africa and their environment as well as to the global community. According to the Millennium Ecosystem Assessment, ecosystem services are defined as 'the benefits people obtain from ecosystems'. These are categorised as provisioning, regulating, supporting and cultural. In Africa, the local communities appear to place more weight on benefits arising from provisioning

services such as fuelwood, construction materials, water, wild foods, medicines and fodder for their livestock. In addition, some forests are protected as 'sacred forests', and in such a manner they secure the provision of cultural services such as spiritual places of worship and reflection to some of the local communities. At the national and subnational levels, larger societal interests guide the way these ecosystem services are viewed and investments in them are made. For example, socio-economic priorities dictate interests and investments in securing sustainable supplies of raw materials for the timber industry, medicinal plants for pharmaceuticals, hydropower energy and some key provisioning services. Of the cultural services, science, education and recreational experiences, for example through ecotourism, are of interest at the national level. The generation of supporting services, such

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as soil formation and nutrient cycling services, that help secure the production of all ecosystem services are also of interest at the subnational and national levels. At the global level, most of the national-level priority provisioning and cultural services from these ecosystems are of interest and feature prominently in international discourses on environment and, more specifically, those on biodiversity in forestry. In addition, the regulating services, such as carbon sequestration in order to contain global warming and declining supply of water, are now on top of many agendas globally.

It is, therefore, very challenging to manage the forests to sustainably supply these ecosystem services at all these levels, principally, because some interests conflict at various levels, and responsibilities for the different stakeholders are not properly defined and accompanied by requisite resources and accountability mechanisms. Added to these are threats to the forest and tree resources arising from adverse effects of climate change, pressures from fairly rapidly growing populations, weak public forest administrations and local communities' institutions (two key players in forest ownership and management) that cannot adequately enforce forest laws and regulations in addition to exercising good forest governance as well as reducing deforestation and forest degradation.

With respect to deforestation, agricultural activities explain about 80% of deforestation that takes place in Africa. With regard to forest degradation, inappropriate firewood collection and charcoal production account for the largest share (45%) in Africa, followed by timber harvesting or logging (32%), while uncontrolled livestock grazing and fires play a minor role of less than 10% (Hosonuma et al. 2012). As a result, these activities have greatly contributed to the degradation of woodlands and forests in Africa. In addition, the activities also contribute to the increased emission of carbon dioxide and other greenhouse gases into the atmosphere as the carbon sink is progressively reduced.

On the other hand, the forest sector has the greatest mitigation opportunities as net sinks of carbon dioxide and could benefit from resources made available through the global mechanism on Reducing Emissions from Deforestation and Forest Degradation (REDD+) and provisions of the Clean Development Mechanism (CDM) of the Kyoto Protocol. The Paris Agreement provides more insights on how to tap into these mechanisms in ways that enhance the functions of the forest ecosystems as carbon sinks while at the same time improving the livelihoods of forest-dependent people and national incomes.

In order to address the livelihood imperatives and to mitigate adverse effects of climate change, there is a need to identify both improved and traditional practises and/or technologies used for the restoration of degraded forests, woodland areas and parklands of the Sahel region and the remainder of SSA. Chirwa and Larwanou (2017), Chirwa et al. (2015a, 2015b) and Maisharou et al. (2015) report on some of the approaches for restoration efforts of such landscapes. For such restoration to succeed, it is important to develop an understanding of how various factors cause land and forest degradation, in addition to identifying relevant practices and technologies that are already employed in addressing such challenges. The technologies

must include both traditional forest management practices and new tree planting approaches. However, the socio-economic benefits associated with such technologies that have the potential to promote both forest land and/or restoration must be established. This must be in tandem with policies, institutional frameworks and regulatory mechanisms that support the implementation of these technologies in the broader context of sustainable forest management.

A key glaring shortcoming in Africa in achieving sustainable forest management in the different forest types is the absence of platforms for sharing relevant knowledge and experiences as well as successful stories in this regard. In order to address this gap, the African Forest Forum in collaboration with the African Union Commission, the Network for Natural Gums and Resins in Africa, the Centre for Sustainable Development–University of Ibadan, and the Forest Research Network for Sub-Saharan Africa, and with financial support from the Swiss Agency for Development and Cooperation (SDC) and the Swedish International Development Cooperation Agency (SIDA), organised a very successful scientific workshop on the theme Forests, People and Environment: Some Perspectives from Africa. The workshop was structured under the following subthemes: rehabilitation of degraded lands using trees; managing forests in the context of climate change; forest governance, marketing and trade in forest products; and socio-economic issues in forestry. This event was organised as a pre-XIV World Forestry Congress workshop on 4–5 September 2015 in Durban, South Africa. The World Forestry Congress took place in Africa for the first time in its history from 7 to 11 September 2015 in Durban, South Africa following the XIII WFC held in Buenos Aires, Argentina, in 2009. The workshop brought together African forestry stakeholders including those from national governments, civil society organisations, academia and research, in addition to important groups such as youth and women. They discussed important trends relevant to the African forest sector with a view to enhancing the roles of forests and trees in national economic development and poverty alleviation, improving food security and nutrition, and enhancing environmental stability and other forest values.

This special issue presents some of the research findings shared at the pre-congress workshop, and this article provides some highlights from the presentations.

Rehabilitation of degraded lands using trees

In this issue, the main drivers of land degradation identified include the following: population growth, agricultural expansion, climate variability and energy needs. On the positive side, a number of good practices and experiences for managing the forests, woodlands and parklands exist and were identified. Some of the approaches used in natural regeneration include complete coppice, coppice with standards and selective cutting, pollarding, pruning and lopping, all of which are the predominant form of restoration in dry forests and woodlands of southern Africa. Artificial regeneration through woodlots or farm forests is prioritised for out-growers in Uganda, while energy production in Rwanda and reforestation of bare hills in Ethiopia are the priority action areas for this approach. Exlosures are

prevalent in livestock farming areas where they are used to encourage rehabilitation of grazing land, for example in the Tigray National Regional State in Ethiopia. Also, in the Sahel, exclosures with different sustainable land management practices are used to protect young growing trees. In East Africa, exclosures are applied on degraded, generally open access land in many dryland areas, as a mechanism to promote natural regeneration. This is mainly for environmental rehabilitation and has resulted in very visible biophysical impacts on large parts of the formerly degraded lands (Chirwa et al. 2015b; Chirwa and Larwanou 2017). There is also increased adoption of forest and tree management practices and technologies that have the potential to promote rehabilitation and/or restoration of degraded forests, woodlands and parklands. For example, assisted – or aided – regeneration is, especially, prevalent in the Sahel where indigenous tree species are planted (enrichment planting) or seedlings from natural sources are protected and managed by land owners known as farmer-managed natural regeneration (Larwanou et al. 2006; Larwanou and Saadou 2011). Research in this area indicates that age-old systems such as native non-browse shrubs in Ethiopia are important in that they facilitate regeneration of late-successional trees species (Abiyu et al. 2017). Furthermore, farmer-managed natural regeneration is also common in some countries such as Niger, with very significant gains reported in southern parts of the country (Haglund et al. 2011).

Opportunities also exist for promoting forest restoration through tree planting for carbon markets in rural communities in the form of community-based REDD+ initiatives for sustainable forest management. Agroforestry is also recognised as an important avenue for rehabilitation of degraded areas, especially to improve soil fertility and soil conservation, and also in enhancing ecosystems services.

Natural regeneration through active involvement of local communities supported by enabling policies such as clear forest, tree and land tenure is the most successful and promising option for restoration of the large areas of degraded land. However, while policies promoting participatory natural resources management are in place in most African countries, implementation of these regeneration activities have mostly taken a pilot project-based approach, with few strategies for up-scaling by the governments. In addition, enabling policies for community-based approaches, including clear-cut land tenure and equitable benefit sharing, are still very much wanting in some countries, and they constrain investments in developing, managing and using these resources, thus impairing their full contribution to rural livelihoods, poverty alleviation and national economic development.

Managing forests in the context of climate change

The last two decades have seen considerable attention paid in Africa to issues of climate change with respect to forests and trees, and the people who depend on them (Chidumayo et al. 2011; Chirwa et al. 2015a, 2015b; Kitula et al. 2015a, 2015b; Maisharou et al. 2015). Many countries now include mitigation and adaptation measures in their forest policies, plans and activities (Kojwang and Larwanou

2015a, 2015b). There has also been noticeable awareness and adoption of various initiatives, such as REDD+, in many African countries, but less so on CDM initiatives in forestry. The challenge for forest management is, therefore, how to add and operationalise the objective on carbon sequestration (i.e. introduce a climate change component) in forest management plans, while not constraining the supply of other equally important forest products and services from all forest types. In addition, this issue highlights the concerns about the implications of strategic and practical steps taken in the context of forest-dependent communities (Ofoegbu et al. 2017). The integration of local socio-economic vulnerabilities and forest-based climate change intervention initiatives are projected to enhance resilience and adaptation to climate variability and climate change.

In this issue the gaps in knowledge and methodological inconsistencies in understanding the quantification of carbon, especially soil carbon, arising mostly from model development are highlighted, including those associated with sampling errors, measurement errors and model misspecification (Handavu et al. 2017). For soil carbon measurements, there is a need to develop a standardised framework for sampling forest soils. Also, with regard to knowledge gaps, the review emphasised the need for an integrated understanding of carbon storage dynamics and the associated implications of land-use practices and land-cover change in major carbon pools in dry forests and woodlands as a precursor to the improved carbon accounting. Furthermore, there is the need for in-depth understanding of the link between socio-economic and local forest utilisation attributes, and how these can inform better management of the forests and woodlands in ways that can enhance ecosystem functioning and ecosystem service provision, including carbon storage. This is especially important with the introduction of forest carbon trading as an incentive to forest and tree farming in Africa.

Also reported in this special issue is an evaluation of the expected returns by investors in these resources made for products from various tree species at their rotation age (the time of their harvesting) and taking into account forest carbon offsets in the compliance and in the voluntary markets as explored in eastern Africa. The observed decline in the price of carbon to very low prices will no doubt constrain investments that could come with initiatives such as REDD+. This is already creating challenges to forest managers on how to optimise the joint production of timber, enhance carbon sequestration, and possibly, produce other non-timber benefits (Olschewski and Benitez 2010; Oeba et al. 2017). In this issue, it was demonstrated that, overall, revenues expected to be realised from sale of carbon were lower than those from sale of wood. Consequently, forest carbon prices in voluntary and compliance markets need to be competitive and attractive in order for the forest owners to give up some timber returns in exchange of carbon income or modify forest management regulation in order to increase carbon sequestration (Oeba et al. 2017).

The effect of climate change on forest species has also been reported. The importance of forests in Africa cannot be over-emphasised with respect to biodiversity, consumptive (food, fibre, fuel, shelter and medicine) and non-consumptive (ecosystem services and the economically important tourism

industry) uses. Forest fragmentation as a result of human disturbances, such as tree logging and conversion of natural forests to agricultural lands, alters the ecological processes and changes the floristic composition of plant communities (Assogbadjo et al. 2017). Given that climate is a primary determinant of species distributions and ecosystem processes, many communities will be vulnerable to the effect of climate change on forest tree species (Opere et al. 2011). Certain ecosystem types will be particularly vulnerable: ecotones (transition areas between different ecosystems, with high species and genetic diversity), which are important for adaptation to climate change, are highly threatened by climate change, especially in semi-arid drylands prone to desertification. The woodlands and savannas have also been reported to be very vulnerable where species diversity and endemism are particularly high and where there is an extraordinary threat of loss of species or habitat. In this special issue, some insights on these aspects are given from a study of one tree species that assessed how disturbance and climatic variability impact the population structure of the threatened species *Azelia africana* Sm., a tree species that is widely distributed in West Africa (Assogbadjo et al. 2017). The findings demonstrated that climatic variability, compared with disturbance gradient, exhibited a greater effect on species population fitness; tree density, basal area and tree height were mostly influenced by the climatic variability, as was the regeneration density of the species.

From many of the workshop presentations, discussions and literature reviewed, it is increasingly becoming apparent in many countries that forest-related development and economic undertakings, new policies, research and education programmes, conservation efforts, etc., tend to be conceived with some justification on how they take into account climate change mitigation and adaptation. While this may be positive in that it puts a new focus on forests, and attracts previously unheard amounts of funds for 'forest-climate' initiatives, it also has drawbacks. The most problematic one is that the focus on climate change takes attention away from the enormously important current and potential roles of sustainably managed forests and trees as drivers of economic development and poverty alleviation, or the much more immediately important needs of conserving forests for biodiversity protection and hydrological enhancement. However, there are many positive signs today that funders of various REDD+, carbon credit and climate mitigation projects realise that without putting economic and 'conventional' conservation effects in the foreground, it will not be realistic to achieve major positive impacts on climate through 'forest-climate' programmes. To this end, there is increasing recognition that REDD+ can bring climate benefits not only through adaptation and mitigation activities but also beyond carbon. So, in designing and implementing climate change strategies and plans, this dual character of benefits needs to be taken into account so that non-carbon benefits are also incentivised.

Increased participation of the private sector and civil society in forest management

The key players in forestry business are national governments, local communities, the private sector and civil

society. Presently, there is an observed increasing involvement of rural communities, as small-holder tree farmers and in forestry issues, as well as the private sector and civil society; this could significantly influence how forests are owned and managed in the future.

The private sector is especially important in harvesting of timber from natural forests and in establishment of forest plantations. The sector is also prominent in the processing of timber, its marketing and trade. It is also important in the harvesting, processing and marketing of non-timber forest products (NTFPs). These attributes give the private sector a central role to play in the future of sustainable forest management and use in Africa. The private sector has also a key role in the governance and use of these resources and establishing responsible relations with local people and communities. However, in many countries, the sector continues to be characterised by many uncoordinated small players, does not feature in national plans, lacks investment and a champion for its cause, and remains largely informal. However, in some countries large private investments in commercial forestry enterprises are being promoted through public-private partnerships (Chirwa et al. 2015).

National governments handle forestry work through their forestry authorities/departments. These have important roles of oversight, policy and law formulation and implementation, and setting in place an enabling environment for sustainable forest management so that rural people/local communities and the private sector can invest in forests and trees and benefit from their products and services. National governments are also major owners of natural forest resources (Dlamini et al. 2015).

The civil society organisations are emerging as key players in forestry. They fill some gaps left by national governments in Africa when they move away from doing forestry business to becoming custodians of policy and enforcers of forest laws and regulations. More specifically, non-governmental organisations (NGOs) are also very crucial links to local communities, who are also increasingly owning and managing these resources. They also feature very prominently in handling new issues in forestry, as can be seen from their visibility in facilitating and undertaking, with local communities, REDD+ activities and community-based forest management. Civil society organisations also facilitate many activities related to marketing and trade of timber and non-timber products (Nhantumbo and Camargo 2015). Unfortunately, their effective coordination within the forestry sector is in many countries not adequate, in addition to the required support (in terms of capacity and skills building, finances, etc.) to deliver on their mandates.

The local communities are at the core of local governance, provided they have secure tenure, access rights, responsibilities and resources. They are increasingly taking on responsibilities for forest and woodland management through devolved rights and responsibilities. Rural people use tree and timber products for many diverse purposes, and are increasingly entering the market with tree and timber products. Rural people are organising themselves into, for example, associations and village committees, in order to exercise their rights and responsibilities on the resources. However, this comes with several challenges, including how to strengthen individual farmers as groups or

associations so that their voices can be heard, especially in soliciting credit for investment, product value addition, marketing of the products and lobbying for favourable policies. Furthermore, the situation becomes even more complicated when consideration is given to supply of quality germplasm for tree planting to dispersed farmers, putting in place economically feasible harvesting and processing mechanisms for wood from individual farms where trees are interspersed with agricultural crops, livestock enclosures and human dwellings.

So far, studies on the achievements of involving local communities in participatory forest management practices, specifically in terms of contribution to forest conservation, tree plantation and management, and the improvement of standards of living of local populations, have been poorly documented. Most studies highlight the problems of poor participation of local communities due to either poor initial planning or subsequent lack of clear benefit sharing mechanisms (Phiri et al. 2012; Senganimalunje et al. 2015). The findings of a study from Benin on the reforestation programme in Wari-Marou Forest Reserve, through the involvement of local communities, aimed at improving forest productivity and reducing human pressure (Gandji et al. 2017), showed that plantation establishment did not succeed well. Nevertheless, plantations of exotic species exhibited better structural characteristics than those planted with native species. In addition, the perceptions of the local communities on participatory forest management varied among respondents and were more linked to their socio-economic aspects rather than biological ends. On the other hand, a study from Oyo State, Nigeria (Azeez et al. 2017) demonstrated the benefits of the taungya system in the promotion of tree planting and forest conservation.

Marketing and trade in forest products

Africa has a dominance of 'energy' wood products, i.e. fuelwood and charcoal, on its menu that makes about 76% of the wood products it consumes (Owen et al. 2013). Given that they are mostly consumed outside than inside the formal market economy, no accurate statistics on them are recorded. With the exception of firewood and charcoal, which are locally produced, Africa consumes more processed wood products than it produces. A key development agenda in Africa relates to the regional integration of its national economies, with one of the expectations being that this will increase trade across national borders and also its subregions. The logic is that through such intra-African trade, economic activities that will bring socio-economic growth in the individual countries, the subregions and the continent as a whole will be generated. The forest sector has therefore a role to play in this. Available records on intra-African trade in forest products indicate that the volumes traded have been very small (Chipeta and Kowero 2015; Maisharou and Larwanou 2015). Africa's wood industries have a very high proportion of informal and small-scale operators, and a few of them are players at the subregional, continental or global levels. Furthermore, the subregions that are rich in natural forests (Central and West Africa) have a weakly developed wood-processing industry; in fact, there is virtually no paper or paperboard

manufactured in these two subregions despite abundance of wood raw material for the same.

There are potentially large unrecorded, and possibly, very significant illegal sales of forest products across national borders (Chipeta and Kowero 2015). While it is right to condemn illegalities in such trade, it is also important to understand how this profitable trade is evolving, its contribution to socio-economic development, and how it could be formalised and well organised so that it contributes to broader policies of economic integration in Africa, where trade is key.

Africa's largest wood-processing industry is charcoal production and trade, and it is already larger than paper and paperboard manufacture. Scant attention is paid to this reality. Charcoal is a staple energy source for millions of Africans in urban and semi-urban areas and is also slowly creeping into rural areas. There are no significant visible alternatives for charcoal for the majority of the people who use this energy in the short to medium term. The key problems with its production and trade are its disorganised and destructive nature. Africa had better make the charcoal subsector 'a legitimate, dynamic and fully legalised, mainstreamed and modernised activity – anchored on sustainable raw material provision and better organised production and trade' (Chipeta and Kowero 2015: 123).

In this special issue, the role of NTFPs in the savanna and tropical moist forests of Ghana and Nigeria, respectively, in generating incomes for the rural and vulnerable communities are highlighted. For instance, in Ghana, and indeed the whole savanna belt of West Africa, the shea butter tree (*Vitellaria paradoxa* C.F.Gaertn.) is an important wild and naturally growing indigenous species. The shea butter industry has been identified as a potential contributor to the economic empowerment of women (Kent and Bakaweri 2010; Kent et al. 2014; Kombiok and Agbenyega 2017). However, commercialisation of shea butter has been reported to be hampered by poor financing mechanisms and inadequate production and marketing capital for shea butter processing (Kombiok and Agbenyega 2017). The study assessed the financing schemes and the financial delivery mechanisms available for the production and marketing of shea butter in the Northern Region of Ghana with a view to determining the impacts on its processing and marketing. As observed in other studies, this study found that when there was some form of external financing extended to them, shea butter producers do not have control over the sale and price of their products. The women, who are the main producers, perceived that the existing contractual financial arrangements did not allow them to enjoy high financial returns.

While shea butter and a few other NTFPs, such as *Adansonia digitata* L., can be commercialised, the general perception on NTFPs is that they are non-attractive as a source of good income due to the nominal prices offered along their whole marketing chain (collection, processing and selling). In addition, there are other factors that affect full commercialisation, such as resource distribution within the forest, seasonal and annual fluctuations in quantity and quality of NTFPs production, which often lead to over-exploitation (Akinnifesi et al. 2006; Chirwa et al. 2008). Finally, as alluded to by Kombiok and Agbenyega (2017),

the relationship between collectors and traders is exploitative and therefore does not move the custodians of the resource out of poverty. Similar to those obtained in Ghana, the findings by Amusa et al. (2017) demonstrated the existence of several market constraints, including seasonality, insufficient and poor transportation services, poor road network, lack of storage facilities, lack of training or skills for product transformation, and lack of market information. In combination, these factors adversely influence trade in NTFPs. In both cases, improvements in commercialisation of NTFPs can be achieved through good and effective policies that promote empowerment of the relevant local communities through micro-financing, skills development on value addition and marketing of the products.

Conclusion

The studies in this issue underscore the importance of forests to the livelihoods of African people both in rural and urban areas through the ecosystem goods and services highlighted. The studies also emphasise the need to recognise traditional forest management practices, institutional frameworks and ecological manipulation of the forest species in order to contain degradation through forest and tree restoration, and promote favourable mitigation and adaptation approaches to climate change. The studies call for increased research in order to understand the ecological processes involved during forest restoration following forest disturbance and for the standardisation of measurements for carbon as well as securing measures to include forest carbon in the menu of other forest products in order to increase the viability of trade in forest carbon. The need to rapidly increase the pace and scope of timber and NTFPs processing and trade within and between Africa and the rest of the world is also emphasised. Finally, poor participation in the management of the forest resource, weak policies on land tenure, and lack of capacity and skills for value addition and marketing have to be addressed in order to encourage local communities to become viable custodians of the forest resource for future generations.

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