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FORESTS AND PEOPLE:

**Investing in Africa's
SUSTAINABLE FUTURE**

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Forests and People: Investing in Africa's Sustainable Future

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MESSAGE TO READERS

*Bukar Tijani*¹

The present edition of *Nature & Faune* journal addresses the central theme: "Forests and People: Investing in Africa's Sustainable Future". It is a special edition to celebrate Africa's hosting of the World Forestry Congress (WFC) for the first time. This occasion gives the countries in Africa and scientists, foresters, policymakers and practitioners in forestry and related fields a chance to showcase what they are doing to move Africa forward in forestry. Thus the present edition will be unveiled at the XIV WFC, which is the world's largest and most important gathering of the forest sector, taking place from 7 to 11 September 2015 in Durban, Republic of South Africa.

Labode Popoola in the editorial to this edition considers various pathways that African forests and forestry need to take to improve their relevance and sustainability. The investment component of the central theme caught the attention of Godwin Kowero who reviews and identifies some trends and issues that need special attention regarding investing in African forestry. Dominique Endamana provides information on the reliance of rural households in three countries of Central Africa on investments made and the income generated by forest products from the forestry sector.

The forests and the people of the Congo basin in the central African sub-region occupy a central place in the forestry sector. Firstly because, as Ousseynou Ndoye puts it, "The Congo Basin is among the world's major reservoirs of biological diversity. These biological resources are exploited by 70 million persons to satisfy their subsistence needs, and as a basis for income generation and employment". Ako Charlotte Eyong and others in another article observed that the Congo Basin is the second largest tropical forest ecosystem in the world with enormous energy, food security and climate change mitigation potentials. Others of the seven articles on the Congo basin carried in this edition, include Lena llama's thoughts on how cohabitation between humans and wildlife in the forests, village lands, farming land and protected areas leads to increasingly frequent conflict situations; in which she presents a toolbox adapted to the Central African context. Jean-Claude Nguingui introduces a sub-regional strategy in response to the bushmeat crisis in Central Africa.

Several global issues are climate-related, including basic needs such as food, water, health, and shelter. Nasrallah Yahia and Keffa Abdelkrim focus on the impact of anthropization and climate change on natural resources in North Africa; specifically the case of the Nesmoth cork

oak forest in northern Saida Mountains of Algeria. Further illustrations of how climate change and variability impacts Africa are made by Shepherd Muchuru and others. They examine future climate change challenges to sustainable forest management in the Zambezi basin in southern Africa. Severin Tchibozo, Tajudeen Amusa, Paulinus Aju, Pauline Gillet and colleagues examine the impact on human nutrition of forests. Vesa Kaarakka gives a donor's perspective on forest sector development in Africa with special reference to Finnish development aid. Teapoinhi Seponh Stéphanie and Matuje Mukamwiza Jeanne d'Arc in two separate submissions from Rwanda and Côte d'Ivoire respectively give a snap shot at this point in time of the key ongoing forestry development interventions in these two countries. They relate to investment in forestry, providing indications of the scope and scale of the most important forest development interventions at present. Obtaining a snap shot of this nature in forestry sector across Africa has the potential of indicating the linkage between forestry development and climate change, food security and nutrition and poverty reduction.

August Temu explores Africa's institutional capacity to manage its forests which is a building block for sustainability of the forest resources and the people that depend upon it. Temu's treatise highlights the need for a robust institutional capacity to manage the rich resources our African forests are endowed with. Oscar Simanto further strengthens the points made in Temu's paper by proposing the establishment of an African forest enterprises connect network (AFECONET) which will play the functional role of a knowledge-based platform whose purpose is to enhance local community-based forestry businesses in Africa. The rationale for proposing this network is that locally controlled forest associations and enterprises offer particular advantages for poverty reduction. Cecilia Julve Larrubia and others assess the current situation of the participatory and inclusive management of forest resources.

The *Nature & Faune* journal will be continuing to build on the ideas expressed in these papers with another special edition of the journal to be published in December 2015 to mark the 2015 International Year of Soils.

We hope you will enjoy exploring the rich knowledge and information provided in this special edition of the *Nature & Faune* journal, a flagship publication of the FAO Regional Office for Africa, published to celebrate the first World Forestry Congress ever held in Africa.

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African forests and forestry: pathways to relevance and sustainability

Labode Popoola¹

Africa's forest sector has from time immemorial been strategic to the socio-cultural and economic well-being of the people in different settlements of the continent. Similarly, it has served strategic environmental and security purposes over the millennia. Forests remain a critical link in the transition from the Millennium Development Goals (MDGs) to the Sustainable Development Goals (SDGs) of the post 2015 development agenda. However, Africa's forests have suffered huge losses over the last half of a century due to a combination of factors, key among which are insecurity and political instability, obsolete forest laws, inadequate funding, paucity of reliable data that can help development, weak governance and weak educational and research infrastructure. These challenges have militated against sustainable management of Africa's forests, thus inhibiting their potential to significantly contribute to sustainable development in the continent. To reverse this scenario, African forest authorities will have to take advantage of emerging issues and initiatives in the sector, principal among which are: forest law enforcement, governance and trade; optimizing the benefits of forest water relations, take advantage of the huge potentials in REDD/REDD+ scheme, invest in forest-based bio-energy, Green Growth/Green Economy; encourage innovative investments and financing mechanisms as well as investing in education and research. For continued relevance and sustainability of Africa's forest sector, there is the need for sustained capacity building and strengthening as well as good governance, knowledge generation and sharing at the sub-national, national, regional and continental levels.

Introduction

Africa is the second largest continent (after Asia). Its total land surface is about 11,724,000 square miles (30,365,000 square km) (Nair, 2006). This constitutes about 20% of the total land area of the earth. Approximately 22 per cent of the continent is covered with forests, ranging from open savannah and montane to closed tropical rainforest. FAO (2001) in African Development Bank AfDB (2010) puts Africa's forest cover at 650 million hectares. This accounted for 21.8% of the total land area and 16.8% of global forest

cover. The moist tropical forests of Africa support an estimated 1.5 million species (WCMC, 2000), which in turn support the local communities in terms of their food, shelter, utensils, clothing, and medicinal needs. By far the most dominant use of woodland resources is for domestic energy needs, mainly from wood and charcoal. In Sub-Saharan Africa alone, traditional fuels accounted for 63.5 per cent of total energy use in 1997 (World Bank, 1999). Other forest and woodland resources gathered and used by households or traded informally amongst villagers include: meat, fruits and vegetables, construction and craft materials, medicinal products, and honey. In Western and Central Africa, more than 60 wildlife species are commonly consumed as bushmeat (mainly small animals and invertebrates) which are harvested from forests (FAO, 1995). In addition to such tangible benefits, forests and woodlands have been important for cultural, spiritual or religious purposes (Mwihomeke *et al.*, 1998).

The commercial exploitation of African forests and woodlands is an important source of income, foreign exchange and employment for several African countries. For example, Cameroon, one of Africa's leading producers and exporters of tropical logs and sawn timber, earned US\$436 million in 1998 from export of wood products, mainly sawnwood (FAO, 2001a). South Africa is Africa's largest producer of industrial roundwood and an important producer and exporter of pulp and paper (almost exclusively from plantations). In 1998, exports of wood products from South Africa totalled US\$837 million (FAO, 2001a). Apart from tropical hardwoods, forests provide a wide array of products that have industrial value: oils, gum, latex, resins, tannins, steroids, waxes, edible oils, rattans, bamboo, flavourings, spices, pesticides and dyes (Park, 1992). At the moment, Africa's forest sector faces enormous challenge of relevance and sustainability, yet the sector has potential opportunities to contribute to the economies of the continent and sustainable livelihoods. This paper examines some emerging issues and initiatives that can be explored to reposition the sector for relevance and sustainability.

Current Situation of African Forests

The forest cover of Africa has come under serious pressures in the last five decades. For instance, FAO (2007) estimated that the total forest area decreased from 699,361,000ha in 1990 to 655,613,000ha in 2000 translating to an annual loss of 4,375,000ha or 0.64%. This constituted about 50% of the global forest loss within the same period. Also, between 2000 and 2005 the continent's forest area decreased from 655,613,000ha to 635,412,000ha representing an annual loss of 0.62% as against the global annual loss of 0.18% within the same period. According to AfDB (2010), the current rate of deforestation in Africa is about four times the world's average.

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The challenges to sustainable forest management in the continent are numerous and similar among the regions. The major drivers of forest losses in Africa are all too well-known (farmland expansion, demand for forest products, expansion of settlements, urbanization and increased access routes into forests etc) and need no detailed examination here. However, these have been exacerbated by other secondary and tertiary drivers, which according to Popoola (2014) include:

Political instability and insecurity. Many African countries including, Liberia, Nigeria, Ivory Coast, Central African Republic, Uganda, Burundi, Sudan, Somalia, Rwanda, Egypt, Tunisia, Libya and Kenya have experienced internal political strifes ranging from civil unrests, to insurgency and outright wars in the last three decades. In many of the situations; the forests suffer serious degradation, either as camping places for insurgencies, irrationally exploited to prosecute wars or as war fields. Similarly, political instability leads to policy inconsistency, while discouraging long term investment in the forest sector.

Obsolete Forest Laws. Many African countries are still operating forest laws promulgated by the colonial masters; not suitable for contemporary forest management. Fines stipulated for offences are rather too meagre to serve as deterrent to potential future offenders. Hence

illegal logging, forest encroachment and poaching for trophies have become very rampant in many parts of Africa such as Cameroon, Nigeria, Liberia, Ivory Coast, Guinea, DR Congo,

Ghana etc. Sadly also, these weak laws are not enforced. According to Igboin (2015) when laws are not enforced consistently, it is believed that there is the tendency for people to break them with impunity, citing previous inconsistencies and favouritism. This is the scenario in the forest sector in many African countries.

Poor Funding. The Forest sector has suffered progressive neglect in the area of funding. The sector is often accorded low priority compared to food security, health, education and industrial development (AfDB, 2010). Most forestry projects supported by bilateral, multilateral and other international grants and loans have failed as a result of total neglect by governments. Rather than invest in forestry, many countries now set unrealistic and unsustainable revenue generation targets for forestry departments, ministries or commissions. This has resulted in frequent re-entries, overexploitation and unsustainable harvesting, leaving Africa's forests often degraded.

Paucity/Lack of data/information. In many African countries, basic inventory data, maps, yields and harvests records are either poorly kept or completely lacking. According to Nair (2006), most African countries have not undertaken forestry inventory for several years; hence available information is outdated. Although there have

been advances in remote sensing technologies to such an extent as to permit provision of current information, the capacity to access such information remains extremely limited. Furthermore, forest management plans are either outdated or totally lacking for many African forest reserves/estates. Thus, many forests exist only on paper with no clear boundaries. Related to this is the near absence of valuation of forest products and services. Though ecotourism has become a veritable source of forest-based revenue in a number of eastern and southern African countries, forest goods and services are still largely undervalued. Often times, forests are valued based on timber and wood products only. The numerous other goods and services which the forests supply are overlooked, while timber products are not appropriately priced. The consequence being that forest lands are placed at a competitive disadvantage against other land use alternatives; particularly agriculture and urban and industrial development.

Governance Issues. In spite of increasing global focus on the forest sector, and the several ongoing processes and activities in the sector, most African countries have not adequately addressed forest governance issues. In many African countries, forest administrations are still largely a state concern, and are thus over-centralized. Unfortunately, many of the states have over the years, demonstrated gross ineptitude to sustainably manage the forest. State authorities disregard the need to devolve forest management powers. Also, non-alignment among the tiers of government (local, state/provincial and federal/central) negatively impact synergy and effectiveness; while roles of the private sector and communities are down-played, with little or no incentive structures for those who are prepared to invest in the sector. The inability of state apparatus to check corruption has equally taken its toll on forestry development. Funds meant for plantation establishment, environmental remediation and capacity building are often diverted.

Education and Research. Most forestry institutions still operate curricula which are not in tune with contemporary realities in the forest sector, which now demand dynamic approach to curriculum development and review, as well as cutting edge research on emerging issues in sustainable forest management. According to Temu (2006), The general purpose of research is to raise the overall amount of knowledge known about a particular subject, so it feeds well into education and societal needs. Research should be part and parcel of resource development, management and utilisation. It enables us to tap strategically into natural resources for our development needs, and then enables us to re-invest in the resource to sustain its availability. Unfortunately, for many forestry institutions in Africa, this has not been the case.

Contemporary forest scenarios in Africa thus call for a complete paradigm shift to re-orientate the sector towards

the path of relevance and sustainability. To achieve this, Africa will need to start to aggressively address the many persistent and emerging issues in the forest sector and take advantage of pro-forest initiatives in the global environmental processes. Gladly, The African Forest Forum (AFF), a pan-African non-governmental organization, has been driving a new dynamic process for African forest renaissance. The AFF is an association of willing individuals who share the quest for, and commitment to the sustainable management, use and conservation of the forest and tree resources of Africa for the socio-economic wellbeing of its peoples and for the stability and improvement of its environment. Hopefully, the Forum will continue to provide a platform for creating an enabling environment for this objective. Leaders of Africa's forest sector will therefore, have to key into emerging issues/initiatives in sustainable forest management as well as the tools to address them for the sector to be relevant and sustainable.

Some Emerging Issues and Initiatives in Sustainable Forest Management (SFM)

By September, 2015, the United Nations will be adopting the Sustainable Development Goals (SDGs) in New York to replace the Millennium Development Goals (MDGs) of 2000-2015. Africa's performance in the MDGs has been questionable. So, whither African forests and forestry in the ensuing SDGs? According to Mayers (2014), forests matter in the SDGs. Forests make big targets – for both good and bad. Planting trees, or cutting down forests, has major consequences. For example, on the global quest for deep de-carbonization, outside of the energy system, a shift from net global deforestation and land degradation to net reforestation and land rehabilitation has a huge potential to make the terrestrial biosphere a net carbon sink rather than source. If we manage forests well they will give us goods and services that we cannot live without. If forests disappear we lose any prospect of sustainable development. Forests and trees are rooted in life and livelihoods. They can be grown, improved and looked after – they are renewable. It would be hard to find a simpler and more universal way of changing the world for the better than by planting and managing trees. We therefore, propose that Africa's forest authorities should key into the following emerging issues and initiatives that will make the sector relevant:

- **Forest Law Enforcement Governance and Trade (FLEGT)**

The Forest Law Enforcement and Governance and Trade (FLEGT-initiative) was initiated in 2003 by the European Commission as a comprehensive Action Plan that can set up a sustainable reform in the forestry sector, through legislation and markets and basically built upon voluntary agreements and strong commitment of producer countries. This initiative seeks to bring multi-stakeholder participation to bear in the sustainable management, promoting private-

public sector partnerships of Africa's forest and at the same time permitting civil society organizations involvement and livelihood enhancement of forest edge communities. The FLEGT has not taken roots in many African countries, and where it has, the institutional framework and support have been weak. For this initiative to be effective in Africa, Popoola (2011) advocated the need to strengthen cooperation of all stakeholders, and raise awareness about the essential role of legislation and market institutions. Certification of forest products must be recognized as a crucial asset for accessing wood markets. This intervening issue needs to be properly addressed through collaborative and strong networks working with matters related to forest law enforcement, trade and governance.

- **Forest Water Relations**

Africa is not lacking in water resources. It is however, challenged with the task of sustainably managing and distributing resources to benefit the growing population. Compounding this the scourge of climate change, the impacts of which are exacerbated by inadequate infrastructure failure to mitigate and adapt to these vagaries. Forests contribute in a number of ways to maintaining local and downstream environmental conditions. They physically stabilize the upper reaches of watersheds where rainfall is heavy and land steeply sloped and prone to earth movements (Revenga *et al.*, 1998). Tree roots "pump" water, thereby reducing soil moisture content and the likelihood of mud slides, while root structures increase the shear-strength of soil and help prevent landslides. Forests and other vegetation are also crucial in moderating water flows by soaking up precipitation and releasing it in a controlled, regular supply. Forests have historically been the preferred land use for drinking water supply catchment areas. Water is filtered and purified to some extent by its passage through foliage and forest soils. Perhaps more importantly, forested land is relatively free of water pollutants associated with livestock rearing, agriculture, or industrial activity. African States face the challenge of being proactive in the sustainable development of their water resources through Integrated Water Resources Management. To achieve this, Popoola (2011) posits that the role of forests and forestry should be recognized through reduced deforestation and massive afforestation and sustainable management of existing natural forests. There is the need to balance ecological and economic considerations in the use of forest resources for the purpose of sustainably managing Africa's water resources.

- **REDD/REDD+**

This initiative offers a mechanism for placing a market value on the carbon stored in forests, thereby providing an incentive for conservation in developing countries. It equally offers potent and viable options for reduced exploitation impacts on forests. Some African countries are currently

implementing REDD+ activities at different stages, few among them have signed up, been through first review and have presented the implementation progress reports. A couple of countries have shown their readiness to adopt REDD+ in their respective countries. However, there are still common, but differentiated constraints in optimizing the benefits of REDD and REDD+ generally. They include politics and policies, institutional, different agenda of actors, inadequate capacities, governance, benefit sharing and ownership and common property issues. Considering the great potentials for African forests in the REDD and REDD+ schemes, countries will need to embark on urgent reforms that will enhance financial, technical, including research and administrative capacities that will ensure the realization of the full advantages of the various forest types in the scheme (Popoola, 2013).

▪ **Forest-Based Bio-energy**

Biofuels have been attracting increasing attention worldwide in the last few years as substitutes for petroleum-derived (fossil) fuels to help address energy cost, energy security as well as global warming concerns associated with fossil fuels (UNCTAD, 2008). Biofuel production in a number of African countries has been on the rise in the last few years. However, many of the countries in the continent are still at the early stages of production process, which involves only the cultivation of biofuel crops. *Jatropha* and sugar cane are the two main feedstocks that have attracted the most attention for biodiesel and bioethanol production respectively. There are also reports of small-scale biofuel projects where biofuel (usually straight *Jatropha* oil) is produced and used locally for rural electrification and power generation purposes. In most of the countries, firewood and charcoal seem to be the major traditional biofuels for meeting domestic cooking energy needs. In view of the importance of biofuels as veritable energy sources, Popoola (2014) advocates the need for coordinated efforts within, and among African countries to ensure sustainable production of forest-based biofuel crops, particularly on marginal lands in ways that will minimize conflicts with other land uses. Land classification and land use reforms (where they do not exist) to ensure easy access to land for large scale biofuel crop production should also be considered.

▪ **Green Growth/Green Economy**

Globally, there is a growing traction for a Green Economy concept that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. However, while the desirability of moving to a Green Economy is clear, the means of doing so is still a work in progress. Forests are a critical link in the transition to a Green Economy as they promote sustainable development and poverty eradication. Managing forest sector in Africa for Green Economy will require innovative approaches. Popoola (2015) proposes

the following pathways: Community Based Forest Management, Advancing The Practice Of Agroforestry, Sustainable Biotrade, Promotion Of Offset Market, Payment For Environmental Services, Promotion Of Forest- Based Tourism, Reduced Impact Logging, Forest Certification and Forest Governance.

▪ **Innovative Investment and Financing**

Poor funding has been identified as one of the banes of sustainable forest management in Africa. As stated earlier, over-centralization of forest authorities in Africa stifles participatory financing and management. Yet, participatory financing holds great prospects. Popoola and Ajewole (2002) and Popoola (2005) studied various aspects of participatory Forest Finance in Nigeria. In all cases, indications were that citizens were willing to participate in financing forestry projects, provided that the funds would be judiciously, transparently and accountably utilized. African states will need to decentralize forest authority to enhance fund inflow from communities and the private sector. Transparency and accountability must be accorded top priority to enhance sustainable forest investment and financing

▪ **Education, Research and Technology**

Curriculum development and review in line with global dynamics in the forest and environment sector are *sine qua non* to success. Investing in research is very similar to, and complementary to investing in education. The former generates knowledge while the latter is a tool for sharing knowledge. In an ideal situation, the two are mutually supporting. In a survey of forestry education in Africa, (Temu, 2006) concluded that there was (and I guess there still is) a crying need for foresters to be competent in:

- linking tree/forest management to actions and strategies to achieving social and economic development goals,
- managing tree and forest resources in a broader context of sustainable natural resources and environmental conservation,
- innovating in the wide areas of agriculture, forestry and natural resources
- Stimulating entrepreneurship in community and private forestry, and
- Strengthening linkages and synergy among natural resource sectors and between them and agriculture.

In other words, the technical substance of forestry education must be contextualized in the African situation, solving African problems and fitting the social, cultural and economic settings, while at the same time being sensitive to the global society and environment. This is to a large extent true for education in forestry and in other renewable natural resources in Africa. African governments must deliberately address these. Related to this is the need to develop capacities in negotiations in the several ongoing international forest and environmental processes to ensure that Africa is not disadvantaged.

The way Forward

The emerging issues and initiatives in sustainable forest management outlined above largely cover the economic, social cultural, resilience and ecosystem benefits derivable from the African forest sector. Unfortunately, the latent potentials remain largely untapped. Achieving success would require:

1. Clarity of vision, focus and goals which will indicate Africa's commitment and direction to sustainable forest management within the context of global forest and environmental processes.
2. General overhauling, updating and domestication of forest policies and laws should be in concordance with the realities of the current situations. According to Igboin (2015), when law reflects the people's culture, its enforcement is less cumbersome. The extent to which the laws reflect the culture, morals and civilization of the community, determines the extent to which they are readily enforced/obeyed.
3. Funding for sustainable forest management, forestry education and research is urgently required. Funding initiatives must come from the various stakeholders including multinational corporations, governments, communities and development agencies.
4. There is the need for closer monitoring and enforcement of international conventions and treaties. Related to this is the need for African countries to build capacities for international negotiations.
5. Decentralization of forestry authorities to involve the communities and other stakeholders will enhance joint development of forestry development projects and programmes. This will engender buying-in and ownership which will in the long term reduce cost and optimize returns.
6. Africa must take advantage of the opportunities that technology now offers in all aspects of forestry, ranging from raising of propagules, land preparation, forest maintenance, harvesting, dendrology, remote sensing/geographical information system as well as processing and utilization.

Conclusion

Much is still required to be done to boost Africa's forest sector towards the path of sustainability. Building and strengthening capacities at the sub-national, national, regional and continental levels will enhance best practices in knowledge generation and sharing, which are basic in the drive towards sustainable forest management. Africa should strive towards continued democratization, good governance, regional cooperation and integration to harness the huge opportunities in the forest sector.

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Investing in African forestry: a few observed trends and issues to watch

Godwin Kowero¹

The environment in which forestry business has been transacted in the last two decades has changed considerably. A few trends from within and outside the sector have become more pronounced, and several new ideas and initiatives that are specific to the sector or are related to the sector have emerged. As regards the latter Africa continues to report considerable forest loss from deforestation and forest degradation; the African youth population continues to rise and its effects are much more felt; the private sector, local communities and civil society are increasingly becoming key actors in forestry; illegal harvesting and trade in forest products continues to increase and receive more attention. With respect to the former, new ideas and initiatives like REDD+, landscape approaches, and green economy are the latest additions to the sector, while the Sustainable Development Goals and the new international arrangement on forests are a close next. The practice has been to add, piecemeal, such ideas and initiatives to the sector. Given these increasing demands and actors in the sector a much more holistic examination of the sector would be appropriate, if the forest resources are to sustainably meet the increasing demands on them.

Introduction

African countries are continually accommodating new and emerging issues and initiatives from the global and the African regional and sub-regional levels. These include, for example, green economic development, climate change impact, and private sector-led and market oriented economic development. The Sustainable Development Goals will be at the centre of national plans for many years to come.

In the African forestry sector there have been considerable policy and structural changes in response to some of these issues and initiatives, but these have been mainly confined to the macro-organisational level; there is no significant attention and resources to facilitate action at the meso- and micro-levels. In addition the sector has also to deal with the perennial problems of illegal harvesting and trade in forest products, in addition to containing deforestation (unwise) and forest degradation.

This opinion paper intends to shed light on a few positive and negative observed trends and issues, that are gradually defining the future development of forestry in Africa; the

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positive trends also create opportunities that hold potential for increasing the contribution of African forests to local livelihoods, national incomes and environmental stability.

The evolving trends

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

Two typologies of private sector entities characterise forest ownership and forest management activities in Africa. The first is the small holder farmers that establish woodlots and agro-forestry schemes on their land, usually on a small scale for subsistence consumption and for trade in the local and domestic markets. The second are the big commercial forestry enterprises that operate in forest plantations and target both domestic and international markets. Big private investments in commercial forestry enterprises are also being promoted through public-private partnerships (PPPs). PPPs can support the participation of private sector in forest management, the taking up of new and improved forest management technologies, the emergence of small and medium scale enterprises for forest and tree resource management, and they can lead to a high rate of return on investments in forestry in Africa.

Civil society organisations are also largely responsible for facilitating small holder farmers in growing trees; managing natural forests, either by the local communities on their own, or in partnership with other actors; as well as supporting these communities in taking up new initiatives like REDD+; and facilitating marketing and trade of timber and non-timber products. For example, in a study of 115 REDD+ demonstration activities in Africa, Asia and Latin America, the private sector and non-governmental organisations (NGOs) were running respectively 36% and 35% of the projects; with the governments running 8% of the projects. The remaining 11% were run by governments with other partners, while the remainder had no clear information on who was running them (Nhantumbo and Carmago 2015).

The increasing involvement of rural communities as small holder farmers, as well as that of the private sector and civil society could significantly influence how forests are managed in future; and with it new systems of forest and tree management will emerge. This trend also 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 adding, marketing of the produce, and lobbying for favourable policies. Added to this is the challenge of quality supply of germplasm for tree planting from various sources to dispersed farmers; as well as economically

feasible harvesting and processing of wood from individual farms where trees are interspersed with agricultural crops, livestock enclosures and human dwellings.

2.2 Promotion of a holistic management approach of African forests

Following the Rio+20 Summit in June 2012 (UN 2012), the global community is increasingly turning its attention and focus towards a “green growth” pathway (UNEP 2011, 2012). To mainstream this in the forestry sector requires a holistic management approach in the way African forests are managed, so that the sustainable utilization and conservation of forests will be exercised in ways that maintain and/or enhance forest ecosystem services that can eventually support green growth by generating co-benefits from the conservation of biodiversity while simultaneously securing forest based livelihoods of local communities. The increased global interest in forest management and the green economy offers opportunities for resource mobilization from both public and private sources to support forest management in Africa. Added to green growth is the need to take into account, in forest management, the Sustainable Development Goals (SDGs)² and the international arrangement on forests (IAF)³. In essence initiatives like green growth, landscape approaches, IAF, and the SDGs will expand the scope for planning forestry activities both in terms of actors in the sector and their increasing demands, and therefore well beyond the realm of conventional forest management.

2.3 Managing forests in relation to climate change

The last two decades has seen considerable attention paid to issues of climate change with respect to forest resources and the people who depend on them. Many countries now include mitigation and adaptation practices in their forest policies, plans and activities. There has been noticeable awareness and growth of various REDD+ initiatives in many African countries (Nhantumbo and Carmago 2015), however less so on CDM initiatives in forestry. Attention to climate change has considerably increased the funding available to forestry, in addition to enhancing the profile of the sector. While this may be positive, care should be exercised that attention in and support to the forestry sector is not drawn from that available to some otherwise very important activities of sustainably managing forests and trees. The challenge for forest management is therefore how to add and operationalize the objective on carbon sequestration (i.e. introduce a climate change component) in forest management plans, while not to constraining the supply of other equally important forest products and services from all forest types.

² <https://sustainabledevelopment.un.org/topics/sustainabledevelopmentgoals>

³ <http://www.un.org/esa/forests/international-arrangement-on-forests.html>

2.4 Increased focus on the large youthful African population and increased attention to gender

Africa has a young population (about 65% of the total population is under 35 years of age⁴) and a fairly rapidly expanding middle class (more than 34% of the continent’s population in 2011⁵) that contributes to the growing demand for forest products and services. Many young people in rural areas are unemployed but have the potential to be engaged in agricultural farming and forestry given the right support and policy environment (Brooks et al., 2013). Such an enabling environment could support and engage the youth in undertaking forestry development activities thus assuring them of employment and livelihood support. Already tree nurseries, operated mainly by youth, are characteristic of many African urban areas. These socio-economic growth points need to be better understood and nurtured with the support of good policies.

Equally important are enabling policies that target women because women are not only the custodians of forest and tree resources in much of rural Africa, but because they often bear the highest burden in terms of long hours spent collecting wood fuel, and suffer from diseases arising from indoor pollution due to high usage of wood fuel, in inefficient stoves, for domestic energy.

2.5 Technological factors

Improvements in technologies can serve to increase efficiency in the extraction of wood and non-wood products through advanced techniques for harvesting, transportation and wood processing. Technologies such as remote sensing and ICTs can also usefully support forest conservation through improved monitoring and cost-effective data collection. Telephone banking, through systems like M-Pesa in East Africa, is facilitating investments in many areas where bank facilities are scarce. M-Pesa was developed in Kenya in 2007 as a method of micro-finance loan payment by phone. However, it is now also widely used as a money transfer system. By 2013 about 17 million Kenyans used it, and it accounted for about 25% of the Kenya’s gross national product⁶. Also cellphones are facilitating exchange of marketing and trade information in several countries. Farm forestry could gain considerable momentum through the support of these new technologies. In many cases small farmers’ activities require small sums of money that can quickly be handled this way.

2.6 Rehabilitation of degraded lands using trees

There is increasing emphasis on using forest management practices and technologies that have the potential to promote rehabilitation and/or restoration of degraded

⁴ <http://www.africa-youth.org/>

⁵ <http://www.afdb.org/en/news-and-events/article/africas-middle-class-triples-to-more-than-310m-over-past-30-years-due-to-economic-growth-and-rising-job-culture-reports-afdb-7986/>

⁶ <http://www.economist.com/blogs/economist-explains/2013/05/economist-explains-18>

forests and woodlands. Some of the methods used to encourage natural regeneration in forest restoration programmes in dry forests and woodlands of southern Africa include complete coppice; coppice with standards and selective cutting; followed by pollarding, pruning and lopping. Farmer Managed Natural Regeneration (FMNR) is also common in some countries, for example in southern Niger by 2005 about five million hectares are reported to have been regenerated this way and the rehabilitated land contributed an additional half a million tons of food per year (Reiji et al., 2009). Enclosures to protect emerging seedlings are prevalent in livestock farming areas where they are used to encourage the rehabilitation of degraded grazing lands, for example in the Tigray in Ethiopia. Artificial regeneration in woodlots or farm forests is often prioritized for out-growers in Uganda, for energy production in Rwanda and reforestation of bare hills in Ethiopia (Chirwa et al., 2015). Agroforestry is also recognized as an important avenue for rehabilitation of degraded areas, especially to improve soil fertility and soil conservation, and to enhance ecosystems services such as carbon sequestration.

All these processes could combine to increase the supply of forest and tree products and services; as well as making more land available for joint production of agricultural and tree crops.

2.7 Continued deforestation and forest degradation

Nearly all issues in the forestry debate of today revolve, directly or indirectly, around deforestation and forest degradation; and these two processes define practically all support to activities and interventions to the sector. It is through these two processes that in many developing countries forest resources continue to be made available for human use and at the same time forests are destroyed or their ecosystem capacity impaired. Sustainable forest management (SFM), complemented by tree planting and agroforestry, is the best approach for addressing deforestation and forest degradation while at the same time meeting growing human needs for forest products and services. How Africa implements policies that entrench SFM will determine the future availability of forest products and resources and their continued role in supporting practically all forms of life on land in the continent.

Although current data shows a decrease in net forest loss in Africa, **deforestation** (FAO 2015) still remains a key challenge in Africa, which accounts for over 50% of net recent global deforestation (FAO 2010). **Forest degradation** (FAO 2015) is also of major concern in Africa; studies have shown that small holder agriculture expansion, inappropriate fuelwood collection and charcoal production, and, to a lesser extent, uncontrolled livestock grazing in forests, are the most important drivers of forest degradation in large parts of Africa (Hosonuma et al., 2012) Studies show that in terms of

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 uncontrolled fires play a minor role of less than 10% (*ibid*).

However, fuelwood will continue to be the major energy source for the majority of the people in Africa for a long time; its provision should be well organized, formalized and sustainably managed. Activities related to the provision of firewood and charcoal hold great potential for increasing employment and income to the sector and national governments.

2.8 Increasing intra-African trade in forest products

Available records on intra-African trade in forest products indicate that the volumes traded have been very small. However, there are potentially big unrecorded, and possibly very significant, illegal sales of forest products across national borders (Lescuyer et al., 2012; Forest Monitor, 2007; Chevallier and du Preez, 2012). While it is right to condemn such trade, it is also important to understand how this trade is evolving, its contribution to socio-economic development, and how it could be formalized and well organised so that it contributes to broader policies of economic integration in Africa⁷, where trade is key.

Some concluding remarks

The observed trends will continue to increase demands on the forestry sector, and this has potential to give the sector good opportunities for socio-economic development and environmental stability as well as present it with considerable challenges. A more holistic planning for the sector over the coming years will be indispensable.

The issues profiled in these trends contribute to strengthening the relevance of the forestry sector in socio-economic development and stability of the environment; in other words its relevance to human, animal and plant survival on the African continent; in addition to helping countries achieve the SDGs.

Curbing illegal harvesting and trade in forest products is very important. It is advisable that the evolution of illegal trade is better understood and mechanisms for transforming it to legal trade identified. This could facilitate such trade to contribute to strengthening the forestry sector, providing employment and incomes at various levels of national economies, and also contribute to broader policies of economic integration on the continent.

⁷ <http://www.thecitizen.co.tz/News/illegal-cross-border-timber-trade/-/1840340/2669316/-/view/printVersion/-/hgt3s/-/index.html>

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Africa's institutional capacity to manage its forests

August B. Temu¹

Institutions play key roles in the formulation and implementation of policies. They can also serve as centres for innovation and thereby spur development. Therefore having well organized forestry institutions of the right capacity and size will enable sustainable forest management and effective contribution of forestry to development and climate change mitigation/adaptation. In this brief note, I share some views on the typology and state of African forestry institutions. Right from the beginning I have to admit that with 54 diverse countries in Africa few statements would apply to each country. Nonetheless, we can agree on the general situation and trends and that is how this note should be understood. For convenience, in this discussion we identify six categories of institutions:

Typology	Comment on capacity
Public administration institutions	Generally set as departments within large ministries and with very limited staff. Hard to influence policy or resource allocation. At district and lower levels it is often one-person offices.
Forestry education institutions	Very few universities confer forestry a faculty status. It is more often than not given departmental status which does not permit expansion to accommodate all the branches of forestry. This limits staffing and development of degree programmes. At lower training levels financing is so poor that they sometimes close down or do not take in students for a whole year.
Forest research institutions	Generally tucked under ministries and they experience very low staffing and low budget. Research experiments suffer from intermittent funding with disastrous impact on long-term experiments.
Private forestry sector	Generally large and well-staffed, especially if involved in harvesting and processing. There are many small and medium forest product enterprises
NGOs and civil societies in forestry (including professional associations)	They vary enormously in size and capacity. Many are involved in tree planting and conservation efforts. Some NGOs often lack the support of forestry professionals because the latter are too few.
Regional and international forestry institutions	The recruitment of foresters for positions in these organizations is extremely low. Quite often they make decisions on forestry-related subjects in complete absence of professional advice.

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The boundaries between the categories are porous and I also recognize that in some countries several categories of institutions may be lumped together, or combined with other non-forestry institutions. With regard to size, rather than providing absolute figures in terms of sub-departments budget level and personnel, I use other sectors (especially agriculture, environment and energy) within the same country as relative indicators.

Public administration institutions

In much of Africa, natural forests are under public ownership. Private ownership of forests is on the rise, but mainly for forest plantations. Overall forest administration is vested in ministries responsible for forestry. There are huge differences between countries in the way forestry is placed. Only in few cases is forestry considered as important enough to be given its own ministry, as in Congo Republic (*Ministère de l'Économie Forestière*) and in Côte d'Ivoire (*Ministère des Eaux et Forêts*). One would expect all countries endowed with large natural forests to have standalone forestry ministries! Generally, forestry is combined with one or more of the following sectors: Agriculture, Water, Environment, Natural Resources Management and Fisheries. In some countries fishery professionals complain about this arrangement. Relative to other sectors the forestry administration units in these combined ministries are very small. In such situations forestry is often treated as inferior (especially when combined with agriculture) and therefore poorly funded. The national forestry office can be reduced to just a single office room with one or two officers to advise the ministry on forestry matters! This government administrative structure is often replicated at regional/provincial district/county and even municipal levels.

The Francophone countries inherited fully the colonial structures where forest services are embedded in ministries responsible for forests, wildlife and inland water management. However, there is no evidence of increased budgetary allocation to boost the forestry sector. So there too forestry is quite small, especially in budgetary terms.

In recent years, new arrangements have emerged to establish forest authorities as semi-autonomous bodies responsible for forest administration. In Uganda, Kenya, Tanzania and Ghana they have Uganda Forestry Authority (from 2004), Kenya Forest Service (from 2007), Tanzania Forest Service (from 2011) and Ghana Forestry Commission respectively. In Côte d'Ivoire, SODEFOR (Société de Développement Forestier) was established as an autonomous body active in investment operations and economic exploitation of forest resources (<http://www.tfs.go.tz/about/category/history-background>). Along with these developments, some countries have established national forest funds. These are helping to keep the forestry sector financed. Time will tell on the benefits of the new arrangements. In Zimbabwe the forestry sector has always operated as a semi-autonomous commission from the colonial times.

Independent of the above structures, there are efforts in various African countries to promote the participation of local communities in forest management. This does not involve full devolution of authority, and there are no specific models in use. So far, the experiences show mixed results, with benefits as well as challenges. One of these challenges is the temporary nature of the governments in power and also the management of local communities. With food insecurity, poverty and competing demands for education and health investments in forestry at the community level are very low.

It is important to recognize the role of forestry in human development in order to appreciate the type and size of forestry administration needed. The following reasoning can be used to convince governments to raise the profile of forest administration institutions:

- Relating to industry and economy: Every household and institution depends on wood for construction, energy, power and telephone transmission poles. In the case of energy, for most countries the total calorie consumption from wood by far exceeds the oil, gas and electricity calories combined! In this sense, forestry is forestry ministries [should be larger than ministries of energy!]
- Education would have been difficult without the paper and pencils which are forest products.
- Regarding the conservation of natural resources and biodiversity, forests hold the current and future sources of food, fodder, medicines, spices etc. Protection of water sources is of utmost importance, especially for agriculture and health.
- The role and place of forests are also significant and provide balance in the distribution of land resources. If it were not the presence of forest parks in many West African countries the pilfering of land resources would have been far quicker and today landscape would have been remarkably different
- The issues of environment and climate change dominate public discussions and investment. It is abundantly clear that forests play a big role in the mitigation and adaptation to climate change and sustaining ecological integrity.

The bullets above paraphrase a long list of arguments that should reinforce the importance of forests and forestry. The way forests contribute to so many sectors (agriculture, food, energy, water, education, health, land regeneration and environmental conservation) suggests that the size and capacity of forestry administration institutions should be raised to fitting levels.

Forestry education institutions

In many countries in Africa, formal technical training in forestry started in the nineteen thirties under colonial authorities. Professional (degree level) training started in the nineteen sixties and thereafter, under the then independent

governments. The institutional settings for technical colleges were and still remain under the direct control of ministries responsible for forestry, while professional education is under ministries responsible for higher education.

Right here we encounter the challenge of streamlining technical with professional education. Universities are usually autonomous institutions and are less constrained by civil service bureaucracy. Technical colleges are quite different in that the operational mode follows the ministry protocols and directives. Further, appointment of instructors is controlled by ministries. This has sometimes created challenges as persons seen as difficult or incompetent are pushed to go teach at colleges. This undermines the academic capacity of the colleges. With the introduction of college boards this problem is being partially addressed. The biggest challenge in technical education is that it is very slow in responding to changes as ministries have to approve the curricula and the bureaucratic processes are often quite tedious. As a consequence, most colleges still teach traditional forestry curricula which are geared at producing foresters to manage public forests and forest institutions.

A few colleges have managed to transform and expand the scope of their courses to include programmes in agroforestry, bee-keeping, fisheries and wood technology and some aspects of natural resources management. These new areas have attracted privately sponsored students and opened the colleges to wider public and private interest. Nyabyeya Forestry College in Uganda is one such example. Their strong programmes in agroforestry and beekeeping are particularly cross sectoral and attractive.

At the professional level the key challenges are two: In some universities forestry education has been established under Agriculture and this stifles the full development of forestry education to meet the broad objectives of forestry as elaborated above. Second, the enrolment capacity is kept quite low, usually guided by the demand in the civil services and a bit of private sector forest industries. There is a lot of room for improvements here. Good examples of expanded professional forestry education exist in Ethiopia, Morocco, Nigeria, Tanzania, Uganda and Zambia, among others. Note that in the case of Nigeria the expansion has been realised through the establishment of forestry education programmes at 12 colleges and universities, bringing in the much needed variety of programmes and positive competition.

A few universities have significant graduate education capacity in forestry (e.g. Cameroon, Cote d'Ivoire, Ethiopia, Ghana, Kenya, Mali, Nigeria, Senegal, Sudan, South Africa Tanzania and Uganda). A regional regional post graduate forestry programme in West Africa, ERAIFT (École régionale post-universitaire d'aménagement et de gestion intégrés des forêts tropicales - translating to Regional Post-graduate Training School on Integrated Management of Tropical Forests and Lands) is a good example to give of capacity boosting arrangement. ERAIFT operates under the aegis

of UNESCO and located at the University of Kinshasa, Democratic Republic of the Congo. (<http://unesdoc.unesco.org/images/0018/001836/183698e.pdf>).

Forest research institutions

Like technical colleges, forest research started in countries in Africa in the nineteen thirties. Research institutions also fall under the ministries responsible for forestry. They are usually quite small, often with less than ten senior scientists (PhD+ level). These are probably the poorest financed forestry institutions. For some of them the scientists simply get their monthly salaries and very little additional funds to undertake research. Most research institutes have poorly equipped laboratories (often with very old or moribund equipment). Transport facilities are inadequate and field visit budgets are very low. For those undertaking research the majority of their work is in silviculture, forest management, gender, wood technology and more recently climate change. Some research institutes are linked to the national universities, thereby pooling talents and generally they seem to perform better in achieving results. This arrangement also supports postgraduate students.

Despite the grim outlook, there are shining examples of research institutions or individual scientists who forge links with external partners and secure donor funds to carry out research. Generally speaking such institutions have been able to upgrade their facilities, ensure global networking and also improve scientific skills. Good examples include the Forest Research Institute of Nigeria (FRIN), Kenya Forest Research Institute (KEFRI) and Forest Research Institute of Ghana (FORIG). The key success factors are the human resource capacity (with variety of specializations) funding and research facilities.

There are regional and sub-regional agricultural research institutions whose mandates include forestry. They are: the Forum for Agricultural Research in Africa (FARA), the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), the West and Central African Council for Agricultural Research and Development (WECARD/CORAF) and the Centre for Coordination of Agricultural Research and Development (CCARDESA). However, none of these institutions has experts in forestry. No wonder the forestry research output in Africa is extremely low. This is a very serious shortcoming which needs immediate attention. We also have Forestry Research network in sub-Saharan Africa (FORNESSA) FORNESSA which is networking forestry research institutions and experts. Forestry research capacity needs immediate attention and capacity building. Linking it with postgraduate education may also be beneficial.

Private forestry sector

Private institutions dominate the wood processing industries, especially sawmilling, poles/timber treatment, pulp and paper, fibre board and chip board production. Ownership of forest industries is mixed; large mills are often foreign owned or have combined foreign and government ownership. Some are parastatal institutions. There is a growing movement towards small and medium private tree growers in the region. The medium and small scale units are generally locally owned. Across the board there are challenges such as inefficiency, corruption, (especially under-pricing of stumpage), practices which lead to landscape degradation and illegal logging. Some industries have their own forest plantations and therefore plan for sustainable supplies of raw materials. This is typical in South Africa (Mondi and Sappi Companies) and Zimbabwe and the model is being adopted elsewhere as well.

Generally, private institutions should carry out or support research and education in order to get good products and also competent graduates. This is practiced in South Africa but there is little evidence of it in the other countries. There is a need to promote it in all countries.

NGOs and civil societies in forestry (including professional associations)

There are very many NGOs and CBOs that deal with forestry issues, even if they may not be called *forestry institutions* as such. Their main areas of interest are conservation, agroforestry and tree planting. Some are specialized on supporting indigenous forest communities. Through support from such NGO and CBOs there are numerous groups of entrepreneurs (especially women) working on a large variety of tree-base products. These are probably the most effective institutions in terms on having a positive impact on local livelihoods.

Professional forestry organizations exist in many countries but due to poor funding they meet intermittently and are yet to have a strong voice. Nonetheless there is evidence that in Uganda the forestry association managed to halt the conversion of a natural forest into a sugar plantation, and in Tanzania the association did manage to stop a fraudulent sale of a teak plantation. These are excellent examples of local action with international impacts. In the case of Tanzania the teak sale was to a foreign company. National forestry associations are very important instruments for instilling professional discipline among foresters, lobbying for better financing of forestry and also leveraging government efforts to assist private sector and local communities to practice good forestry. Raising the capacity of such associations will boost overall status of forestry and good practices.

Regional and international forestry institutions

All the regional economic communities (ECOWAS - Economic Community of West African States, WAEMU - West African Economic and monetary Union, EAC-East African Community, IGAD- Inter Governmental Authority on Development, COMESA - Common Market for Eastern and Southern Africa, and SADC - Southern Africa Development Community) have agenda that touch on forestry, and some have even established forestry/natural resource positions in their offices. COMESA and ECOWAS have very comprehensive forest policies. The African Union commission has a forestry officer under its commissioner for Agriculture and Rural Economy. Within NEPAD-AUC the Comprehensive African Agricultural Development Programme (CAADP) includes a companion document on forestry. All these offices and policies/programmes indicate some awareness of the importance of forestry. However, very little of this awareness is currently translated to support forestry work on the ground.

The African Forestry and Wildlife Commission (AFWC), established by FAO in 1959 (<http://www.fao.org/africa/afwc/en/>) is especially important as it is linked to the FAO through the Committee on Forestry (COFO). There are sub-regional organizations such as the Conference of Ministers in charge of Central African Forests (COMIFAC), the Conference on Central African Moist Forest Ecosystems (CEFDHAC), the Congo Basin Forest Partnership (CBFP), Permanent Inter-States Committee for Combating Drought in the Sahel (CILSS) and African Timber Organization (ATO). These help to incentivise member countries to implement agreed actions in forestry. In West Africa, the involvement of CILSS, WAEMU and ECOWAS in forestry and overall environmental issues has been a strong reality and tradition. Both WAEMU and ECOWAS have their environmental policy document and ECOWAS has a forestry policy document; they are now developing a partnership in forestry whose action plan is being developed in detail through a number of thematic groups since early May 2015.

There are some effective regional networks in forestry, such as ANAFE and RIFFEAC promoting and supporting forestry education, the African Forest Forum (AFF) supporting international negotiations, policies and research, NGARA promoting entrepreneurship on non-timber forest products. These have played a big role in the areas on policy development, international negotiations and forestry education improvement.

There are also some international organizations and agencies that support forestry in Africa and whose links with local institutions are highly productive and leverage forestry activities at local, national and regional levels. In the areas of research, The World Agroforestry Centre (ICRAF) is

supporting research and development in agroforestry, Center for International Forestry Research (CIFOR), International Union of Forest Research Organizations (IUFRO) and International Foundation for Science (IFS) support forest research in general. International Timber Trade Organization (ITTO) supports research and development in timber trade, FAO supports forestry related development programmes and activities in general. In the development arena we have the International Union for the Conservation of Nature (IUCN) and the United Nations Environment Programme (UNEP), among others. These are independent institutions and their mandates are global, so their presence in a given country is not necessarily permanent. They shift their presence and agenda according to their own priorities and funding.

Conclusion

Relative to the roles of forestry in social and economic development, and in nature conservation, forestry institutions in Africa are small, have low capacity and are often poorly organized. Therefore they find it difficult to meet the challenges of forestry now and in the future. The challenges of forestry are growing rapidly, stretching from management of forest resources for economic and ecological sustainability to climate change mitigation/adaptation, nature conservation, sustaining agricultural productivity and meeting rural and urban energy needs. Effective management of public, private and community forests require strong human and institutional capacity.

With the rising number of stakeholders in forestry there is an increasing demand for foresters to take action at regional and global scales especially with regard to conservation of biodiversity, stemming deforestation and forest degradation and mitigating/adapting to climate change. This is a tall order to few, small and inadequately funded forestry institutions.

As a first step, I would propose that all countries establish strong ministries of forestry; proportional to the size of the forestry estate. The ministries responsible for forestry should have at least one professional and ten technicians for every 10,000 ha of forest. These would be spread out in the country according to the administrative structure. Regarding education, each country should have at least one faculty of forestry with appropriate departments that cover the wide range of forestry mandates (e.g. silviculture, management, wood technology, economics, conservation, wildlife, agroforestry, Non-timber forest products). A similar arrangement is also needed for research institutions. A merger of education with research would most likely be beneficial. I have already covered the benefits of forestry associations and NGOs. These require financial and organizational support to enhance their roles and effectiveness.

African countries are slowly realizing the importance of their forests and this offers great opportunities to raise the profiles of forestry institutions. At continental and sub-regional levels NEPAD should do more to support such trends. For each country there is a need for major reviews of forestry institutions with the goal of raising their capacity.

Further reading

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A DONOR'S PERSPECTIVE ON FOREST SECTOR DEVELOPMENT IN AFRICA: THE CASE OF FINNISH DEVELOPMENT AID

Vesa Kaarakka¹

The guiding objectives of Finland's development policy are the elimination of extreme poverty, the strengthening of the position of the poor, and the reduction of inequality. (formin.finland.fi/public/default.aspx?contentid=318860&nodeid=49273&contentlan=2&culture=en-US#4). Development co-operation in the forest sector also shares these objectives. The main themes of forest cooperation are: (1) rights for use, decision-making and equitable benefit-sharing; (2) forests as a source of fuelwood, charcoal and energy; (3) forest sector value chains, sustainable production and use; (4) national forest programs and good governance; (5) the role of forests in mitigating climate change; and (6) forests as a part of the environment, rural areas and the land-use mosaic.

Let us not lose sight of sustainable forest management

The Forest Law Enforcement, Governance and Trade (FLEGT) programs and the related voluntary partnership agreements can reduce illegal harvesting and timber trade. Benefits of the FLEGT process include legal and governance reforms and regulatory simplification; less lost revenue and taxes; and greater voice for individuals and communities. Other outputs include increased multi-stakeholder participation in decision-making. The long-term aim of the FLEGT process must also be sustainable forest management.

In Kenya, Finland supports the forest sector reform process. Good results have been achieved through the use of the forest sector governance assessment, adapting the World Bank's governance framework to local conditions. One result is a set of "traffic lights" on development obligations for the organizations in charge of various governance tasks.

Recent reporting from Tanzania, Kenya, Nicaragua and Indonesia suggests that some communities are embracing REDD+ (Reduced Emissions from Deforestation and Degradation of Forests) above and beyond income derived from carbon finance. But many bottlenecks remain unresolved especially at the practical implementation level. REDD+ has yet little influence on forest tenure. The framework itself has strong safeguards, including community land tenure, but how are these safeguards effectively applied in planning and implementation of REDD+ programs? REDD+ targets can only be achieved with secure forest and land rights.

The new climate focus of forests also attracts interest and funding. While this is positive development, we should be careful to ensure that it does not divert attention from the present and potential future roles of sustainable management

of forests as drivers of economic development and poverty alleviation on one hand, and from the immediate needs of conserving forests for biodiversity protection and hydrology enhancement on the other.

Participatory forest management needs upgrading

In many countries the progress in participatory forest management (PFM) has slowed down despite early success and enthusiasm. It has not delivered livelihood benefits for rural people. The funding has mostly been through bilateral projects of 3-5 years after which the government was assumed to take over the responsibility.

Communities seriously questioned the value of such PFM. True sustainability requires initiatives to be self-sufficient, generating enough revenues to cover all costs and sufficient profit to cover for the desired social outcomes. It also requires large enough investment, including for sales and marketing and production of demand-based products. Products will not fly off the shelves just because they come from community forests.

A Finnish-supported agribusiness and forestry program in Southern Tanzania now draws on the experiences of two Tanzanian NGOs in improving forest productivity and income generation from timber and other forest products. This is enabled through the preparation of land use plans which identify agriculture and forest areas and other land uses. The village can then legally trade and harvest timber from its forests according to the approved management plan quota. Revenues from 20,000 to 70,000 USD per village have been obtained so far in other similar areas in the country.

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COMMUNITY BASED REVENUE SYSTEMS:

Since 2013 the Lindi and Mtwara Agribusiness Support Program in Tanzania together with local government and two local NGOs (Mpingo Conservation and Development Initiative and MJUMITA) has been helping forest communities to generate income from timber and other forest products and support household livelihoods. To date 13 of the 24 communities around Angai forest have gained full legal ownership and management responsibility of forests with the total area of 94,000 ha. Five communities have entered into contracts with timber buyers and two of them are already implementing harvesting plans. Communities have decided to use the forest revenues to fund village development and social projects. In the Angai area the villages can earn an average of 50,000-60,000 USD per year. Improved forest governance has potential to reduce and eventually eliminate illegal logging and forest degradation.

Plantations can reduce pressure on natural forests

Establishing forest plantations is important for protecting Africa's dwindling natural forestland.

There are potential and suitable areas for plantations that do not threaten food security, biodiversity or availability of water. These plantations can provide a means to improve living standards and reduce poverty when established together with communities, smallholders and other local entities.

There has been a clear shift in commercial tree production towards farms and communities. As a result of increased demands for timber, farmers in many countries have realized the potential of investing in tree growing for sale as a source of tangible income. This production is increasingly carried out through out-grower schemes between farmers or farmer groups and forest industries. The products will be sold to local sawmills, as poles to construction firms or as charcoal for urban users.

To respond to this call, a bilateral private forestry program has been launched between Tanzania and Finland, aiming at increasing rural income in the Southern highlands of Tanzania. This is done through developing sustainable plantation forestry and value addition, including employment creation in the entire production value chain from quality seeds to quality products in markets.

Planning requires accurate forest information

Available information on forest areas and resources and their use in Africa is often unreliable. The data is based on submissions of country statistics from (some) countries that have not, or only partly, carried out systematic forest inventories. In addition, significant share of the cutting of

wood and use of wood-based products are not captured in official statistics. A substantial volume of wood is in trees that grow outside forests.

Forest inventory and information systems constitute the single most important component of Finland's forest sector co-operation. The demand for such systems has increased due to the shift towards results-based monetary compensation systems, and when countries report on their achievements on REDD+.

FOREST INFORMATION SYSTEMS:

Sustainable forest management can be achieved only if forest policy and management decisions are based on a monitoring system which produces up-to-date and statistically robust evidence on forest resources and their changes. Thus, support for development of national forest inventory and monitoring systems is an important contribution towards achieving sustainable development goals.

A Forest Information System (FIS) is a key component of every successful forest inventory. Not only does it allow efficient collection and safe storage of high quality data sets, but it is also fundamental for related analysis and sharing of the inventory results.

To guarantee long term sustainability of the inventories and related information systems, it is important to base their development on open access components to facilitate national capacity development. Furthermore, open access to data and results should be applied when possible. In such a way, investment in the development of inventories and forest information systems becomes also an investment in transparency, good governance and anti-corruption.

Finland's own forest inventory has a good international reputation, and this know-how is applied in enhancing the capacity of developing countries' own assessments. At present Finland supports forest and other natural resource inventories bilaterally or jointly with FAO in Tanzania, Zambia, Kenya, Vietnam, Nepal, Ecuador and Peru.

Large investments in inventories and information systems can only be justified if that information is made available to all present and potential users at global, national, sub-national and local levels. Standardization and transparency of forestry data and information is paramount. A good example to achieve this is Open Foris, a set of free and open software tools facilitating flexible and efficient data collection, analysis and reporting (www.fao.org/forestry/fma/openforis/en/). Information on forests, carbon and biodiversity need also to be integrated with tenure, poverty and other socio-economic parameters.

KEY ONGOING FORESTRY DEVELOPMENT INTERVENTIONS IN RWANDA AND CÔTE D'IVOIRE

Investment must be made an integral part of sustainable forest development in Africa. Information to support investment and even on amount and focus of investment is however not readily available. Rwanda and Côte d'Ivoire were invited to provide information on interventions and investment in forestry and the submissions from the two countries are reported below. The data are a snap shot at this point in time of the current scope, scale and source of investment in the forestry sector. The hope is that this article will spur other countries to also share their information on major ongoing forestry interventions in order to provide a better view of ongoing efforts in forestry development on the continent. Providing a snap shot of this nature in the forestry sector across Africa has the potential of showing the relative emphasis in investment for forestry development to forest products and services but also the attention paid to matters of climate change, food security and nutrition and poverty reduction.

In the tables given below, the cost figures have been intentionally left out given that the information on physical targets already gives an indication of inputs and expected impacts. It has been deemed useful to also include who the collaborating and implementing partners are - whether it is only the Departments of Forestry, or there are farmer organizations, forestry nongovernmental organizations and external development partners involved.

Nature & Faune proposes that consideration be given to setting up a Blog or some website page, where other countries can to post their information. The appropriate and willing Organization to lead this initiative is to be determined and the Blog/website page could be called "Inventory of Investment Projects in Forestry in Africa". Information extracted from such a source could be a regular feature of subsequent editions of Nature & Faune journal

KEY ONGOING FORESTRY DEVELOPMENT INTERVENTIONS IN RWANDA		
Country: RWANDA		
Title of Key ongoing forestry development interventions	Programme/Project Scope and Partnerships	Three most important projected achievements
Programs and projects funded mostly by government budget		
Bamboo project	<ul style="list-style-type: none"> • Bamboo propagation and plantation; • Bamboo processing; • Local capacity building in bamboo technology 	<ul style="list-style-type: none"> -Masaka Bamboo Training Centre was established; -393 farmers trained on bamboo propagation and 221 youth trained on bamboo processing;
	Government of Rwanda in Partnership with the Government of China. Chinese experts made available by the Government of China Among other key partners who are involved in the project implementation are: <ul style="list-style-type: none"> -Local Cooperatives -MINISTRY OF NATURAL RESOURCES / Rwanda Natural Resources Authority / Department of Forestry and Nature Conservation (MINIRENA/RNRA/DFNC) -MINISTRY OF FINANCE AND ECONOMIC PLANNING(MINECOFIN) -Small and Medium Enterprises. 	<ul style="list-style-type: none"> -1 green house established for bamboo germoplasm multiplication and 4932 ha are planted across the country.

Programs and projects funded mostly by government budget

<p>Rwanda Sustainable Woodland Management and Natural Forest Restoration Project</p>	<ul style="list-style-type: none"> • Forest inventories; • Woodlands management and promotion of species for non-timber forest products; • Restoration of degraded natural forests. <p>Donors: Congo Basin Forest Fund (CBFF) and African Development Bank (AfDB)</p> <p>Implementing partners include:</p> <ul style="list-style-type: none"> -Districts -Service Providers (Operators) -MINIRENA/RNRA 	<ul style="list-style-type: none"> - Forest inventories carried out on 1 500 ha of state forests and district forests; - 8 000 000 agroforestry seedlings produced to distribute to the farmers and 800 ha of forest plantations established in 8 districts of the project area; - 1500 ha of degraded natural forests restored.
<p>Support Project to the Reforestation in Rwanda (PAREF II-Be/Nl)</p>	<ul style="list-style-type: none"> • Reforestation 	<ul style="list-style-type: none"> - 8000 ha of forest plantations established in 15 districts representing the area of the two projects;
	<ul style="list-style-type: none"> • Forest inventories and forest management, <ul style="list-style-type: none"> • Capacity building for stakeholders in key areas of the forest sector (forestry training schools, charcoal for wood energy, etc...). <p>Donors: Government of Belgium and Government of Netherlands</p> <p>Implementing partners include:</p> <ul style="list-style-type: none"> -MINIRENA/RNRA/DFNC -MINECOFIN - Districts -University of Rwanda –College of Agriculture and Veterinary Medicine -Service Providers (international consulting companies and local organizations) - Local Farmers cooperatives for participatory forest management -Farmer Field Schools (Groups of farmers) -Vigilance committees (For protection of roadsides plantations) 	<ul style="list-style-type: none"> - Forest Management Plans developed for state forests and forest districts located in the 15 districts. <ul style="list-style-type: none"> -A national forest inventory conducted and a forest register established for all state forests and forest districts located in the 15 Districts.
<p>Forest Monitoring Systems and National MRV (Measurement, Reporting and Verification) project, Phase II</p>	<ul style="list-style-type: none"> • Development of forest inventories-based on estimates of biomass and carbon; •Development and updating greenhouse gas inventories involved in forestry sector ; <p>Strengthening the implementation of the REDD + process in Rwanda.</p>	<ul style="list-style-type: none"> -The R-PP (Readiness Preparation Proposal) developed in the 1st phase of the project consolidated and adopted; - The reporting to UNFCCC of Greenhouse Gas emissions from forestry sector improved
	<p>Partners: Commissions des Forêts d’Afrique Centrale (COMIFAC) and FAO;</p> <p>Other implementing partners include:</p> <ul style="list-style-type: none"> -RNRA/DFNC - Food and Agriculture Organization of the United Nations (FAO) -Service Providers (National consultants) <p>Donors: Congo Basin Forest Fund (CBFF) and African Development Bank (AfDB)</p>	<ul style="list-style-type: none"> - Action Plan for the implementation of the forest monitoring and MRV developed.

Among other ongoing projects funded mostly by development partners, there is an important one titled "Enhancing the contribution of non-timber forest products to food security in Central Africa". It is funded by Congo Basin Forest Fund (CBFF) and African Development Bank (AfDB). Implemented by Commissions des Forêts d'Afrique Centrale (COMIFAC) and Food and Agriculture Organization of the United Nations (FAO)

Programs and projects funded by the private sector

<p>Investment private sector project for the operation and restoration of buffer plantations bordering Nyungwe National Park</p>	<ul style="list-style-type: none"> • Timber harvesting and wood processing; to invest and establish a series of manufacturing industries (sawmills and modern joinery, producing charcoal, electric poles, etc...). • Restoration by planting exploited areas with selected forest species; • Management of forest plantations established including infrastructure works (forest roads). <p>Operator: New Forest Company Other implementing partners include:</p> <ul style="list-style-type: none"> - MINIRENA/RNRA/DFNC -New Forest Company -Districts -Local people who have forests around Nyungwe buffer zone. <p>Some terms of the contract:</p> <ul style="list-style-type: none"> -Surface concession: over 11 000 ha - Contract duration: 49 years renewable - Payment to the government a guarantee - The company is authorized to exploit 150,000 m³ per year and pay the government a stipulated amount of fund per m³. 	<ul style="list-style-type: none"> -Exploited woodland areas reforested; -Plantations established are well managed including infrastructure works agreed; - The sum of money agreed in the contract is paid regularly into the coffers of the state.
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KEY ONGOING INTERVENTIONS FOR FORESTRY DEVELOPMENT IN CÔTE D'IVOIRE

COUNTRY: CÔTE D'IVOIRE

Title of key forestry development interventions	Programme/Project Scope and Partnerships	Three most important projected achievements
Programmes and projects mainly funded by the government budget		
Reforestation conducted by schools through the "One school, 5 hectares of forest" project	Promote 6,000 ha of forest plantations in schools and universities to instill in children and students sustainable development through green citizenship; and meet the teaching, material and financial needs of learning communities.	<ul style="list-style-type: none"> -In 2013 and 2014, 166 schools planted 436 ha of forest. -Implementation of teaching and educational activities on green citizenship - Establishment of 79 ha of agroforestry plantations in partnership with individuals
Reforestation of mountainsides in the Tonkpi region -	The project aims at restoring forests and soils in the western mountainous regions of Côte d'Ivoire in order to contribute ultimately to reducing greenhouse gases.	<ul style="list-style-type: none"> -Sensitization et capacity strengthening of the project stakeholders - Reforestation of 5,000 ha of land and mapping of the forest stands constituted -Development of income-generating activities through intercropping of forest seedlings.
Human-Wildlife conflict management	The project aims at sustainably preserving biodiversity through the improved management of conflicts created by animals (presence of dangerous, endangered animals, damages to crops)	<ul style="list-style-type: none"> -Transfer endangered and dangerous animals to appropriate sites. Thus, a first group of nine elephants of the rural estate in Daloa (central-west region of the country) have been transferred to the Azagny National Park (south) with the technical assistance of South Africa. A transfer of animals is planned from a swampy area close to the Felix Houphouët Boigny international airport to an appropriate site. - Sensitize and train communities on techniques for the removal of dangerous animals -Strengthen the technical skills and physical capacity of agents for the capture and removal of animals
Programmes and projects funded mainly by development partners		
Developing Samba and Cashew cloning and Tiokoué propagation by cuttings	Implemented in partnership with ITTO, the project aims at diversifying propagation techniques for plantation species in Côte d'Ivoire.	<ul style="list-style-type: none"> - Establishment of clonal tests and conservatory plots -Establishment of stock plants parks - Creation of 210 ha behavioral plots for the three forest species

Natural resources conservation in Côte d'Ivoire	- The project aims at strengthening the capacity of project management in the areas of monitoring, management and natural resources conservation in Côte d'Ivoire.	- Restore the authority of the State in 90 Reserved forests by involving riparian and infiltrated communities through improved contractualization in partnership with cocoa private sector cocoa companies
Operational implementation of the national information system for sustainable forest resource management	-With ITTO's support, it is planned to computerize national forest data management in a context of sustainable resources management	- Put in place a computerized system to be used by all stakeholders (loggers, wood industrialists, timber traders and exporters, forestry and financial administration) to improve forestry statistics
		-Improve the monitoring, management and protection of ecosystems using efficient tools including a satellite monitoring system and a management and monitoring-evaluation system for programmes and projects
		- Support the development of a sustainable natural resources production chain by improving public-private partnerships in the forestry sector.
		- Adapt and organize statistical information collection methods by management centre
Programmes and projects funded by the private sector		
Constitution of wood resources of the ME region located southern part of Côte d'Ivoire	Purchase of 6,000 ha of the rural forest estate by an industrial logging company Public-Private partnership management of a 21,565 ha reserved forest and management of fourteen 617,767 ha logging schemes.	- Study project on forest management and reforestation through the enrichment of a 6,000 ha rural forest area under emphyteutic lease and implementation of the results in the BESSO Reserved Forest (21,565 ha) and in 617,767 ha of the rural forest estate.
		Agroforestry development based on the Salhey Methodology (oil palm and teak) and animal protein production (fish) and food supplements (spirulina) in the suitable areas of the estate.
		Involvement in local development; creation of new income generating activities for the farmers who have illegally infiltrated the reserved forest
Compensatory reforestation of logging schemes	Contribution by the logger or industrialist to the reconstitution of wood resources as a pro rata of the volume exploited.	-By the end of December 2014, the compensatory reforestation interventions conducted by loggers since 1996 had reached 105,640 ha, including 25% of reserved forests and 75% of rural estate in addition to 15,000 ha of reforested land conducted by the communities and NGOs.
		-Local multi-stakeholder committees provide assistance to these reforestation interventions to monitor logging operations.

		-Impact assessment of the decision to proceed with compensatory reforestation
Rehabilitation of degraded forest lands and of the Ahua Reserved forest by women	The project aims at progressively restoring the Ahua Reserved forest through a partnership for forest management with women members of the MALEBI association, as a compensation for the wood they use in making charcoal. The project: with the assistance of the ITTO	-Strengthen the capacity of women charcoal producers in the production of quality forest seeds and seedlings and reforestation in the reserved forest managed in partnership with SODEFOR
		-Create a 100 ha agroforestry plantation for the production of wood energy by and for women in the Ahua Reserved forest (Central-East region of Côte d'Ivoire)
		- Produce food crops in association with fast-growing forest species and process available wood products into charcoal

ITTO: International Tropical Timber Organization

Source: Teapoinhi Seponh Stéphanie Ingénieur des Eaux et Forêts / Chargée d'Etudes, Ministère des Eaux et Forêts / Direction des Etudes, de la Planification et de l'Evaluation, Abidjan, Côte d'Ivoire. Tel. : Bureau: 20 22 30 27 cellulaire: +225 01 20 83 39 Email: seponstephanie@yahoo.fr

Establishing an African Forest Enterprises Connect Network: Investing in Africa's future for sustainable development of community livelihoods

Simanto Oscar¹

Summary

This paper proposes the establishment of an African Forest Enterprises Connect Network (AFECONET), a knowledge-base network whose vision is creating local community-based forestry businesses in Africa. The rationale for establishing this network is that locally controlled forest associations and enterprises offer particular advantages for poverty reduction. This is because enterprises owned by local community groups accrue wealth and empower entrepreneurship equivalent to or greater than in the private sector. The network aims to link isolated and dispersed local forest enterprises to markets, service providers and decision-makers. This paper is based on lessons learned by African participants during the fourth international forest connect workshop held at Hanoi, Vietnam (15-18th January 2015) which highlighted the need for developing locally owned forestry businesses in Africa. It focuses on the premise that Africa lacks networking and partnership building mechanisms aimed at developing locally owned forestry enterprises which could help fight poverty and hunger. The network will encourage African governments to shift forest management responsibilities to local communities and sees local forest enterprise development as a priority to address rural poverty and environmental degradation. It also proposes the affiliation of AFECONET to the Forest Connect International Alliance and the Africa Forest Forum (AFF) to ensure synergies.

Introduction and Background

Macquene *et al* (2015) observes that Forest Connect was established (in 2007) to build the capacity of institutions supporting locally controlled forestry enterprises. It aimed to overcome the isolation of such enterprises – linking them to one another, markets, service providers and decision-makers. The fourth international forest connect workshop was held at Hanoi, Vietnam from 15-18th January 2015, and was attended by over 35 participants from 26 countries. In this workshop, participants from Africa were drawn from Liberia (1), Ghana (1), Ethiopia (1), Zambia (1), Burkina Faso (1) and Kenya (3). The theme of the workshop was *“Organization for Locally Controlled Forest Business – Learning from Success”*. Participants, from both developed and developing countries, learned, through 12 successful case studies how locally controlled forestry programmes can be organised and implemented. The rationale for the Workshop was that locally controlled forest enterprises and their associations

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offer particular advantages for poverty reduction. These enterprises controlled by local community groups accrue wealth locally, empower local entrepreneurship and engender local social and environmental accountability. The environmental, social and financial sustainability of such enterprises provides fundamentally important support to forest law enforcement, governance and trade (FLEGT) action plans, strategies for reducing emissions from deforestation and forest degradation (REDD+) and attempts to build green economies that deliver food, fuel, and construction materials to those who need them most.

The aim of this article is to propose the establishment of an African Forest Enterprises Connect Network (AFECONET) as a knowledge-based platform which brings together forestry businesses owned by local communities in Africa.

Investing Locally Controlled Forest Enterprises in Africa

Elson (2013) observes that rights-holder organizations such as the Global Alliance of Community Forestry (GACF), the International Family Forestry Alliance (IFFA) and the International Alliance of Indigenous and Tribal Peoples of Tropical Forests (IAITPTF), known collectively as the G3, define locally controlled forestry as follows: *“The local right for forest owner families and communities to make decisions on commercial forest management and land use, with secure tenure rights, freedom of association and access to markets and technology.”* Local forest ‘rights-holders’ have substantial (and growing) decision-making power and control over forestland but not necessarily tenure or ownership rights. In Vietnam, responsibility for forest management has gradually shifted to local communities and local forest enterprise development is now seen as a priority by the government to address rural poverty and environmental degradation. This made Vietnam an appropriate venue for the fourth international workshop of the Forest Connect Alliance.

The lessons learned from Vietnam, coupled with the much appreciated international learning experience inspired participants from Africa to discuss the missing link in developing locally controlled forestry businesses in Africa. The general consensus among the participants was that the continent needs a credible knowledge network of actual relevance to the challenges facing the development of locally controlled forest enterprises in Africa. This is how the Africa Forest Enterprises Connect Network (AFECONET) was conceptualized in Hanoi, Vietnam after the participants’ realization that Africa lacks networking and partnership building mechanisms aimed at developing locally forestry enterprises which may help fight poverty and hunger in the continent.

AFECONET's Vision and Mission

The vision of AFECONET is that communities of Africa locally control their forest enterprises and have the rights to exploit their natural resources sustainably to produce food, fuel, and fibre products in ways which improve local livelihoods and sustain the environment. This vision includes creating a mosaic of businesses enterprises controlled by local communities in Africa with a view of and diversifying rural economies in Africa.

The Objectives of AFECONET

The objectives of AFECONET as envisioned by the Africa Participants at the Hanoi workshop are to;

- Create multi-functional stakeholder platforms and networks for locally controlled forest enterprises to support small and medium micro-enterprise development in Africa.
- Advocacy to influence policy to support locally controlled forest businesses and sustainable use of natural resources in Africa.
- Create regional resource and training centres for knowledge sharing and building capacities of communities to develop locally controlled forest enterprises.
- Develop strategies which enhance interaction which will create a popular movement for smallholder forest and farm producers and the private and public sectors to do business across Africa.
- Promote viable forest and farm enterprise development models appropriate and beneficial to the people of Africa and increase their resilience to climate change
- Strengthen governance/institutional capacities of forest and farm producer organizations for business development, gender equity and conflict management in Africa.
- Promote sustainable resource mobilization strategies within Africa and internationally

AFECONET's guiding principles

AFECONET's programmes and projects across Africa will be guided by the following key principles: innovative application of sustainable development goals (SDGs) appropriate to the development of locally controlled forest enterprises, application of scientific and indigenous Knowledge Management, Leveraging integrated approaches, promotion of Private-Public Collaboration and investment, enhancing communication and learning, Measurable Impact and Gender equity and inclusive forestry development.

AFECONET's Development and communication Approach to locally managed forestry

According to Inglis (2013), ForestConnect's communications platforms have initiated and facilitated dialogue between key individuals and institutions. The Forest Connect website established on the commercial social networking platform has helped to create a solid membership platform (of 940+ members) and the 10 other Forest Connect websites have also made a contribution. AFECONET envisages the development of thematic programs focusing on locally controlled forest businesses and related value chains, enterprise planning and development, policy advocacy, forest certification businesses, sustainable resource management, climate change adaptation and mitigation, gender equity, pro-poor economic development, enterprise-oriented community forest management, market development, institutional capacity strengthening for community based enterprises, technology development and transfer, advocacy for equity, establishing and strengthening of information and knowledge sharing hubs and capacity building and services in Africa. Institutional capacity development for enterprise groups coupled with technology dissemination will be AFECONET's principal focus in the continent.

AFECONET's Governance structure

AFECONET will be governed by an international Board of Directors with an African Advisory Board which will provide strategic thinking to the technical team so as to improve its outreach and impact in Africa. The international Board of Directors, Board of Advisors and Technical departments for AFECONET will consist of renowned personalities with a passion for developing rural enterprises drawn from the international stage, community and countries in Africa. AFECONET will aim at establishing and strengthening regional coordination offices in Western, Southern, Eastern, Central and Northern Africa

AFECONET's local, national, regional and international networks

AFECONET will be affiliated to Forest Connect International Alliance and the Africa Forest Forum (AFF). AFECONET will work with key stakeholders from the grassroots level to policy makers to further improve the policy development process and targeting their provisions and their Implementation in the Continent. Through these partnerships, AFECONET will be dedicated to developing sustainable resource management strategies, reducing poverty by linking Small and Medium Forest Enterprises (SMFEs) with national forest programs, emerging global and national markets and service providers.

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Participatory and inclusive forest resources management in Central Africa: Challenges and opportunities

Cecilia Julve Larrubia¹ and Jean-Claude Nguingiri²

Summary

This article assesses the current situation of the participatory and inclusive management of forest resources in Central Africa based on a study of barriers to the adoption of this new approach. We will see that progress has been made towards establishing inclusive and participatory management. However, the assessment is mixed namely because of some barriers among which, poor local governance, inefficient decentralization, insecure land tenure, lack of skills and poor communication between stakeholders. Finally we will conclude this analysis with a positive touch. The platforms of stakeholders, the landscape approaches, the teaching of participatory management in forestry schools and the regional and national forest policies are all tangible advances in the right direction. These first achievements appear to be opportunities to build participative and inclusive forest resources management in Central Africa.

Introduction

Forest resources management in Central Africa has been dominated by a centralized approach. The State takes the decisions and ensures their application in a context characterized by a strong reliance of rural populations on natural resources for their subsistence. In fact, natural resources play a fundamental role both for food and as a source of income for populations living in areas where few economic options exist. The repressive approach was mostly used through the enforcement of national legislations to control access to these resources and ensure their management.

These state-controlled management approaches with their multiple actors and uses within a single territory (sometimes concurrent and eventually antagonistic), have become a recurring phenomenon that often led to land use disputes. The juxtaposition of land uses by the State (agriculture, forest and mining concessions) barely takes into account the local systems of land and natural resources ownership. This state-controlled management system has been criticized as it generally leads to social and ecologic crises (Aubertin *et al.*, 2008). Since the 2000s, it is increasingly accepted that the repressive method should give way to partnerships. These relationships should be extended to the actors of other sectors to also promote a cross-sector

dialogue. This new orientation refers to the participatory and inclusive management of forest resources (Nguingiri, 1999; Borrini-Feyerabend *et al.*, 2000; Talla Takoukam and Djédjé Gnahoua, 2013).

After fifteen years, it is time to take stock of the progress made towards participatory and inclusive forest resources management. Without claiming to address the subject in its entirety, this article attempts to analyze the barriers to the participatory and inclusive management of forest resources and the existing opportunities for adapting the use of forest ecosystems inclusive management to the context and realities peculiar to Central Africa.

Obstacles to participatory and inclusive forest resources management

The methodology used in this article was a desk study supplemented with surveys among the local populations and the decentralized forestry administrations in Gabon, Congo and DRC (141 persons interviewed).

The analysis revealed that participatory forest resources management was promoted in various forms: joint management of protected areas, community forests, commune forests, community hunting zones, social dimension of forest concessions management plan, etc. The successes have however been mixed due to various obstacles including: poor local governance, inefficient decentralization, insecure land tenure, lack of skills and poor communication between stakeholders.

1. "Local forest resources governance" aims to ensure the sustainable conservation and use of forest resources. To that end, it is necessary to get the members of a community to meet in a permanent context to exchange on the issues related to forest resources management in their territory and to resolve them based on an environmental democracy process. On the ground, governance is poor at various levels. At local level, there is often a lack of transparency in the management as few privileged individuals are involved in decision making. It is obvious that some so-called 'participatory' management processes are often monopolized by some village elites who are well trained, good communicators, and have developed special relationships with support projects or local administrations. Consequently, the populations lose interest in the decision making process, showing a lack of communication between villagers and the body representing them (Angu Angu *et al.*, 2014). In this context, the risk of disregarding the management measures proposed is great due to the lack of trust among all actors.
2. Decentralization consists in the State transferring the appropriate skills and tools to a decentralized agency. It is the main area of development promotion, democracy and good governance

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at local level. Even though efforts are made in Central Africa to ensure decentralization, often the decentralized structures do not have the needed human and financial resources to perform their functions. Moreover, the administrative procedures needed to secure participatory management sites often remain centralized, making the processes more complex, long and expensive. This situation has led to disillusionment among the actors involved in the decentralized natural resources management process. It is the case of actors of community forestry in Cameroon (Julve *et al.*, 2007).

3. Long term secure land tenure is necessary to empower local actors and ensure sustainable forest management at local level (FAO, 2005). It is increasingly obvious that the state of forests improves considerably when they are managed locally by village institutions authorized under community forest management agreements (Romano, 2007).
4. Capacity here means having the needed abilities, resources, relations and conducive environment to act efficiently in order to reach an objective. The needed capacity to successfully implement inclusive management approaches are numerous and varied and most actors involved in this type of management lack knowledge on these aspects.
5. One of the key factors for the success of a socially inclusive management approach is communication between the various stakeholders. Efficient communication facilitates the sharing of information and experiences, the exchange of knowledge, and dialogue. Despite recognizing communication as a special tool in participatory management, it should nonetheless be noted that there is a lack of functional, efficient and adapted communication systems in rural areas of Central Africa. This situation is due, on the one part, to a lack of interest from local populations for the participatory processes generated by the factors mentioned above, namely governance issues and the lack of concrete and visible results on the ground, and on the other part, to a lack of interest from the village elites in communicating with the rest of the population as information is a source of power they would rather monopolize.

The achievements of first experiences: an opportunity to seize?

Granted, the picture is not very positive, however some achievements give reason for hope. The lessons learned from these major achievements will help build a participatory and inclusive management of forest resources. These achievements include the political will expressed through new policies and legislations, the teaching of participatory management in forestry schools, the organization of communities, stakeholders' platforms and the landscape approach.

1. The participatory and inclusive management of forest resources is part of the guiding principles of new forest policies. The forest codes are not foreign to this dynamics even though the implementing texts still lack in several countries. The political environment is 'mostly' favorable to the establishment of inclusive and participatory management as demonstrated by the recently approved sub-regional Strategy³ on the sustainable use of wildlife by local and indigenous communities in the COMIFAC region. However, attitudes are slowly changing and the sharing of power between communities and governments in managing forest resources should become more effective in the coming years.
2. Forestry schools in Central Africa have integrated participative management and social forestry in their curricula. This will improve the knowledge and know-how of learners and influence their attitudes. The new generation of foresters will certainly display a behavior that is more open to dialogue with the users and other partners in the management of natural resources.
3. The formalization and recognition of local traditional organizations is a step in the right direction towards participatory and inclusive management. A group with a legal status would be more willing to claim its rights, negotiate and participate in a decision making process that involves the group. The proliferation of farmers' organizations that derive their legitimacy from traditional organizations is a phenomenon that deserves to be guided to have legitimate partners among the delegates of communities in the decision-making bodies.
4. The establishment of stakeholders' platforms is a common practice both in the context of protected areas management and the development of forest concessions and model forests. These platforms are a participatory platform of exchange and communication between the stakeholders. It is important to ensure the transparency and accountability of these platforms. Generally, the relevance of the stakeholders' platform need not be demonstrated, however, this approach still has limitations due to difficulties in mobilizing actors who often have to travel over tens of kilometers to take part in the sessions.
5. The landscape approach promotes the global and holistic approach needed to improve the management of all the lands, to understand and assess environmental sustainability and to identify opportunities for using resources which will contribute to economic and social sustainability (Yanggen *et al.*, 2010). These long term approaches should be spread out over time and a monitoring-evaluation system should be developed (Romano, 2007).

³ Refer to the paper by Nguingui on the Regional Strategy submitted for this edition of *Nature & Faune*.

Conclusions

Inclusive management is a long and complex process that requires extensive training, awareness and supervision of all the actors involved so that management arrangements are understood and complied with by all. The progress made to date in Central Africa is relatively significant even though it is strewn with obstacles among which, poor governance, inefficient decentralization, poor capacity of local actors and poor communication. To achieve a genuinely socially inclusive ecosystems management, it is key to empower local actors as well as the other stakeholders based on the principle of equity. There is a need not only to associate them to conservation efforts by sharing social costs, but also by improving their standard of living in a context of benefit sharing (Angu Angu et al., 2014). The challenges are enormous and there is room for improvement in ensuring an institutional transition from the top-down and coercive approach to this holistic and inclusive approach. Because of its globalizing vision, the landscape approach seems the most adequate to reach the objectives stated. However, there is a need to clearly identify all the stakeholders, put in place monitoring-evaluation systems, ensure that stakeholders' capacity is strengthened, and especially take the time needed. The achievements of the first experiences can thus be put to good use as they constitute a good foundation to consolidate the process.

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The Contribution of Non Wood Forest Products to the Millennium Development Goals: Evidence from Central Africa

Ousseynou Ndoye¹ and Armand Asseng Ze²

Summary:

This paper assesses the contribution of use of Non Wood Forest Products (NWFP) to the fulfilment of the Millennium Development Goals (MDG) which were adopted in 2000 by the United Nations (UN) and to which countries in Central Africa have subscribed. It has been argued that many African countries have made significant progress but many MDG targets will not be met by the established date of September 2015. The contribution within a rural development framework of NWFP has seldom been included in the debate. The objective of this note is to help fill the gap by demonstrating the contribution of the use of NWFP to major MDG targets, drawing on data collected in 2014 in Burundi, Chad, Equatorial Guinea, Rwanda, and Sao Tome and Principe. The results show that the use of NWFP contribute, to some degree, to MDG1 (eradicate extreme poverty and hunger), MDG2 (achieve universal primary education), MDG3 (promote gender equality and empower women), MDG 4 (reduce child mortality), MDG5 (improve maternal health) and MDG6 (combat HIV/AIDS, malaria and other diseases). More specifically, the use of NWFP contributes to MDG 7 (ensure environment sustainability). This is demonstrated by the fact that species providing NWFP are an important component of forest biodiversity and they also have an important role in carbon sequestration and climate change adaptation. Furthermore, the participatory domestication of NWFP allows local communities to integrate trees producing NWFP in agricultural landscapes, and this will help reduce pressure on resources in natural forests. The international community is urged by the authors to include Sustainable Development Goals (SDG) indicators related to forests and wood and non-wood forest products.

Introduction

The Congo Basin is among the world's major reservoirs of biological diversity. These resources are exploited by 70 million persons to satisfy their subsistence needs and as a

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basis for income generation and employment. The major Non Wood Forest Products (NWFP) in the region are edible and medicinal plants, bush meat, insects, honey, rattan and other fibers for building shelter or tools. Due to rapid human population growth, the agricultural production of the region is insufficient and does not cover all food needs of the population. NWFP contribute to poverty alleviation by providing revenues and employment especially to men, women, minority groups, the young and elderly people. They also contribute to national economies by providing revenues to governments through taxes (Ndoye and Tieguhong, 2004; Tieguhong et al, 2009; Ingram *et al* 2010). In 2000, the United Nations (UN) adopted³ the Millennium Development Goals (MDG) at its 55th Session (United Nations 2014). There are eight MDG aimed at "building a better and secured world for the XXIst century, a more peaceful world, most prosperous and more equal, united by common values such as freedom, equity, solidarity, tolerance, respect of nature and share of responsibility" for the 2015 horizon (United Nations 2014; FAO 2015). They are listed below:

MDG1: Eradicate extreme poverty and hunger; MDG2: Achieve universal primary education; MDG3: Promote gender equality and empower women; MDG4: Reduce child mortality; MDG5: Improve maternal health; MDG6: Combat HIV/AIDS, malaria and other diseases; MDG7: Ensure environment sustainability; MDG8: Global partnership for development.

In recent years there have been reports highlighting the difficulty of several countries in Africa to meet many of the MDG targets by the established date of September 2015, although significant progress has been made on many other targets (United Nations 2014). NWFP have been largely overlooked in the debate in spite of their potential contribution to the MDG targets, and their role in the agricultural, livestock, fishery and forestry sectors in contributing to poverty alleviation and elimination of hunger. The present paper argues that the contribution of NWFP to MDG is important and needs to be considered for inclusion in accounting for MDG achievements at the national, regional and international levels.

The objectives of this paper are to:

- show that NWFP contribute substantially to the MDG;
- sensitize policy makers and opinion leaders to better understand the importance of NWFP and to better integrate these in national and regional strategies and programs aimed at reducing poverty and strengthening food security and nutrition of the populations of Central Africa;
- alert the international community to the need to better integrate targets on forests and forest products in the MDG and action to be taken in the post 2015 era.

³ http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/55/2

Methodology and Results:

The contribution of NWFP to food security and nutrition was estimated from a series of surveys in Burundi, Chad, Equatorial Guinea, Rwanda and Sao Tome and Principe, carried out in 2014 within the framework of the NWFP project funded by the African Development Bank (BAD) through the Congo Basin Forest Fund (FFBC), implemented by The Food and Agriculture Organization of the United Nations (FAO), under the supervision of the Central African Forests Commission (COMIFAC) (FAO 2015). The five countries included are members of COMIFAC. In each country, households were randomly selected under the supervision of the village chief. The households selected had experience in the NWFP sector and were dependent on NWFP for income generation and employment. Both the household head and his wife were interviewed. This was considered important as, in all five countries, women were those mostly involved in the gathering, harvesting and marketing of NWFP. The households selected were asked to provide detailed information on all the different uses of NWFP and on the money received after sale of NWFP. Reportedly, the money from the sales of NWFP was used by households to fulfil the following needs: purchase of food for family consumption; payment of education for the children; health of the family; clothing; and a category named, "others", which included income generating activities; kitchen ware; construction materials; agricultural equipment; savings; support to friends; debt reimbursement; payment of electricity bills. The data collected were analysed and are presented in Table 1 below:

Table 1: Sales of NWFP to enhance food security, nutrition and other basic needs in Central Africa

COMIFAC countries	Utilisations	% of revenues allocated	MDG concerned
Burundi	Food	28.0	MDG 1
	Children education	9.5	MDG 2
	Health	5.9	MDG 4, 5, 6
	Clothing	8.9	MDG 1
	Others	47.7	
Total	100.0		
Chad	Food	32.0	MDG 1
	Children education	14.0	MDG 2
	Health	26.0	MDG 4, 5, 6
	Clothing	15.0	MDG 1
	Others	13.0	
Total	100.0		
Equatorial Guinea	Food	35.0	MDG 1
	Children education	20.0	MDG 2
	Health	15.0	MDG 4, 5, 6
	Clothing	0.0	MDG 1
	Others	30.0	
Total	100.0		
Rwanda	Food	16.9	MDG 1
	Children education	10.1	MDG 2
	Health	13.4	MDG 4, 5, 6
	Clothing	7.8	MDG 1
	Others	51.8	
Total	100.0		
Sao Tome & Principe	Food	32.0	MDG 1
	Children education	14.0	MDG 2
	Health	26.0	MDG 4, 5, 6
	Clothing	15.0	MDG 1
	Others	13.0	
Total	100.0		

Source: FAO (2015). MDG=Millennium Development Goal

Discussion

The results in Table 1 show that NWFP contribute to MDG 1, 2, 4, 5, 6 (see list of MDG above) as follows: In all countries included in the study, the expenditures on food for the household, children education and family health represent between 40 to 80 percent of the revenues received from sales of NWFP. The purchase of food for home consumption contributes to food security and nutrition for households thereby contributing directly to national food security programs implemented by the majority of COMIFAC countries. It is important to mention the fact that there are a wide variety of NWFPs that are used directly as food, hence saving the households from expenditures on food, which is channelled to other uses, including school fees etc.

The expenditures on health improve family well-being and household agricultural productivity. The expenditures on children education allow families to maintain girls and boys in school. These are good investments, and benefits derived from them could become even more important in the future because well-educated children could get good jobs that will lift households out of extreme poverty. Schooling is not just for jobs; gaining knowledge is good for making life choices and also for entrepreneurship.

NWFP contribute to MDG 3 because the trainings on entrepreneurial development initiated through FAO NWFP projects strengthen the capacity of both men and women. Furthermore, the entrepreneurial development enable women to get more revenues from NWFP thereby allowing them to play a bigger role in the household.

NWFP contribute to a major extent to MDG7. Species providing NWFP are an important component of forest biodiversity, and they have an important role to play in carbon sequestration and climate change adaptation. Besides, the domestication of species providing NWFP (like *Irvingia gabonensis*, *Dacryodes edulis*, *Ricinodendron heudelotii*, *Prunus africana*, *Vitellaria paradoxa*, *Parkia biglobosa*, *Tamarindus indica*, *Moringa olifeira*, *Artocarpus altilis*, *Artocarpus heterophyllus*, *Passiflora edulis* and Bamboo species, etc.) allows the populations to integrate NWFP trees in agricultural landscapes; this will help reduce pressure *on resources in natural forests* thereby having a positive effect on the environment.

Perspectives

As shown in this article, NWFP contribute to seven out of eight MDG targets defined by the UN despite the fact that wood fuel has not been included in the counting. The importance of these products needs to be better known and acknowledged through information, appropriate sensitization and communication by the scientific community and the media. A continuous dialogue needs to be established with policy makers and opinion leaders to

better inform them of the importance of including NWFP in poverty reduction and food security strategies and programs in Central Africa. With the new Sustainable Development Goals targets (SDG targets) that will be defined for the post 2015 era¹, the contribution of forests and forest products should be more visible. The international community is therefore urged by the authors to define and include new specific SDG targets related to forests and wood and non-wood forest products.

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¹ The development program post 2015 will focus on the following themes: to end poverty and hunger; improve health and education; build more sustainable cities; combat climate change and protect oceans and forests (The Guardian, 2015).

What do humans eat when forests disappear?

Pauline Gillet¹, Cédric Vermeulen², Charlotte Lehnebach³, and Elisabet Codina Llavina⁴

Summary

To study the evolution of the alimentary bolus in relation with the loss of forest cover in the Congo Basin, we conducted semi-structured surveys on the composition, origin and amount spent to prepare meals in three study sites with a contrasted forest cover gradient. At global level, the cost price of meals increases as the forest cover decreases. The share of the alimentary bolus in relation with the use of natural resources such as hunting, fishing and harvesting drops to the benefit of proteins from livestock and agricultural commodities. This leads to a translocation of the demand but also pressures on other anthropized ecosystems. The effects of deforestation are subsequently felt at local level but also in neighboring areas.

Introduction

Even though forests in the Congo Basin are part of the best preserved areas in the world (Sanderson *et al.*, 2002), the expansion of agriculture, the development of infrastructure, roads, cities and mining as well as forest logging lead to a loss in forest cover (Geist and Lambin, 2002). Even though the environmental impacts of deforestation have been well documented, few studies have been conducted on the effects of deforestation on human populations (Feintrenie *et al.*, 2015). In the context of this study, we attempted to ascertain whether the evolution of the forest cover could have an impact on the composition of the alimentary bolus as well as on the amount spent on meals in Central Africa during one of the production seasons.

Materials and Method

Over a period of 15 to 21 days during the dry season, we conducted semi-structured surveys on the composition of main meals as well as their origin and the amount spent to obtain the products, in continuous neighborhoods in 3 study sites located in Gabon and Cameroon. Thus, these surveys are representative of the dry season but do not

extend the results obtained to all the production seasons. Our three study sites were selected along a deforestation gradient. Located in the north-east of Gabon, the first study site is characterized by a very low population density (1.6 inhabitants/km²) and a forest cover hardly disturbed by human activities, with the closed forest representing 94.13% of the village communal territory. The scarce human presence as well as the high forest cover ratio makes it the reference site for this study. Income-generating activities are mainly geared towards the exploitation of natural resources. They include hunting, fishing, harvesting Non Wood Forest Products (NWFPs) as well as shifting agriculture. Located in the Eastern province of Cameroon, the second site has a 6.3 inhabitants/km² population density. There, the forest cover represents 85.51% of the village communal territory and is subjected to degradation through agricultural activities but also because of a local logging company. However, the lawful logging activities conducted by this company hardly destroys the forest cover. Rather, its presence has generated a massive inflow of labor that led to high work force migration towards that forest zone. Village incomes are then partly related to the use of natural resources but especially to salaries, considerably increasing their purchasing power. The third site is located north of Yaoundé - the capital city of Cameroon - in a densely populated region (71 inhabitants/km²). Income generating activities are essentially related to agriculture. Only 37.02% of the village communal territory is covered by a secondary forest.

Results

Table 1 provides the average amount actually spent to feed a person in each study site. We did not consider the cost related to collection of resources by the consumer. The first site presents the lowest amount and this result is related to a village production system strongly based on the use of natural resources and low in relative value even though Gabon has a high cost of living. The second site presents the highest amount related to a high purchasing power taken from incomes generated by the logging company. In the third site, the scarcity of game and fish, as compared to the first site, compels the population to buy animal proteins, resulting in an increase of the cost price of meals.

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Table 1. Summary of the number of meals studied, the number of persons fed and the amount spent per head and per day in the three study sites

	Site 1	Site 2	Site 3
Number of meals surveyed	1,254	1,666	1,034
Number of people fed	8,970	8,971	4,933
Average amount spent per person and per day in CFAF (standard deviation)	115.97 (104.85)	184.1 (177.79)	148.94 (83.1)
Equivalent in dollars	0.20	0.31	0.25

In Figure 1, we summarized the amount spent to acquire the main items making up meals and the amount saved by the family production system which could be fishing, hunting, livestock production, gathering or farming.

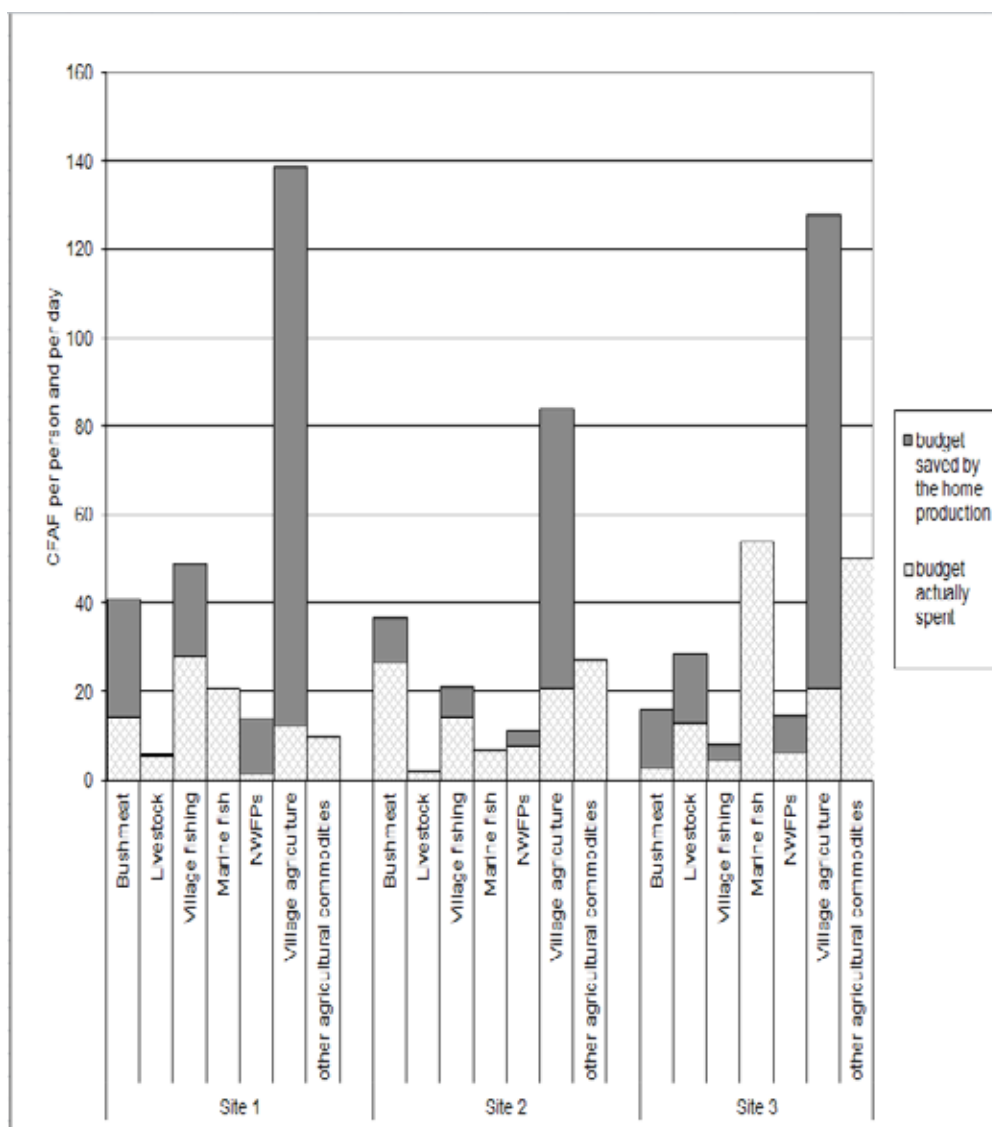


Figure 1. Distribution of budget actually spent or saved by the home production of meals components in the three study sites (CFAF per person and per day)

This figure shows that bushmeat is mostly consumed in the first study site. In addition to the protein intake, the sale of part of this venison to other village households brings in a significant cash income. It should be noted that the customary hunting of non-protected animals as well as the sale of venison to local communities are allowed by the Gabonese and Cameroonian laws. In the second site, despite a more degraded forest cover, the salaries paid by the logging company lead to a high increase of the purchasing power and the possibility for villagers to obtain bushmeat. The distance between the village and the hunting sites then considerably increases. Mostly hunters and the minority tribes (Baka pygmies) are the ones that consume part of the catches. In the third study site, bushmeat has almost disappeared from the alimentary bolus and hunting, an activity still practiced mostly by men, is mainly carried out through traps set on the edge of farms that occasionally catch very small preys. The protein gap is compensated consuming livestock. The same trend is observed for fishing in the three sites. The consumption of non wood forest products is quite low in the three sites (this could also be related to the season during which the study was conducted). These products are mainly collected by the communities, except in the second site, probably because of their high purchasing power. Agricultural foodstuffs are essentially produced in the village in the three sites. The other agricultural commodities bought are rice, pasta or processed tomatoes. These products are rarely consumed in the first site, contrary to the third site.

Discussion

The loss of forest cover leads to a decrease in the diversity of forest products available such as game, fish or Non Wood Forest Products. This decline is reflected in the composition of the alimentary bolus. In the sites currently degraded, salaries for the exploitation of natural resources (generated through the logging company in this case) results in an increase of the purchasing power for the local population. The demand for products from the use of natural resources highly increases despite their declining abundance. The distance to be covered to acquire these products then considerably increases and some villagers specialize in

one of these activities (hunting, fishing or gathering). These increasingly extractive activities exacerbate the effect of deforestation and result in highly anthropized ecosystems of which most of the goods and services generally associated with closed forests have disappeared. When the population enjoys a significant purchasing power, the products are imported from other producing regions, leading to a translocation of the demand, and pressures on the other anthropized ecosystems. The effects of deforestation are then felt locally but also in the neighboring regions. In order to restrict the impact of deforestation on the alimentary bolus directly correlated to the health of village communities, it is important to propose alternatives to the use of natural resources through the establishment of livestock production and the domestication of plants producing food traditionally consumed by the populations.

Conclusion

The loss of forest cover has a strong impact on the availability of proteins in the alimentary bolus. These are gradually being replaced with livestock and canned fish. We should expect, in all the zones subjected to deforestation pressure, a transfer of protein needs towards external sources of proteins, automatically leading to a translocation of the demand and pressures to other anthropized ecosystems. Thus, deforestation has not only local consequences, but also affects other regions, near and far. Deforestation is accompanied by a profound mutation of socio-ecosystems, namely production systems and modes of consumption. The study of the alimentary bolus has proved to be a strong indicator of such mutation.

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Analysis of forest dependency and livelihoods among rural households in Cameroon, the Democratic Republic of Congo and the Central African Republic

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Summary

This article presents the level of dependency on forests, and an analysis of expenses incurred in livelihoods among households in three Central African countries. The data were collected from March to April 2012 in 330 households in six villages, using the Forest-Poverty Toolkit. The contribution of forest resources to the total income of households is 55% in Cameroon, 53% in Central African Republic (CAR) and 51% in the Republic of Congo (RC). The daily cash income per capita is USD 1.51 in Cameroon, USD 1.30 in Congo, and USD 1 in CAR. Except in CAR, it is slightly above the poverty threshold (USD 1.25). Financial incomes from the sale of forest products are mostly used for health purposes in CR, for nutrition in CAR and for clothing in Cameroon. The annual average of financial investments per capita reveals that material goods and human assets rank first and second respectively in terms of investments (USD 11.4 and USD 10.9). Also, each year households invest in average USD 8.3 per capita for each of the social and natural assets. Populations depend on forest products which contribute to improving livelihoods and could constitute a driving force for achieving food security. It is imperative for long term development policies and mechanisms such as REDD+ to integrate these issues in order to guide investment decisions in the rural landscapes of Central Africa.

Introduction

Forests provide essential goods and services to local communities around the world (FAO, 2004) and 60 to 80% of African populations depend on them (IUCN, 2003). The African continent alone hosts the greatest proportion of persons living with less than USD 1.25 a day (Anderson *et al.*, 2006). Forests in Central Africa offer the best opportunity for local populations to meet their needs; however these forests are threatened with extinction. Yet, in several countries including Cameroon, the Republic of Congo (RC) and the Central African Republic (CAR), their indispensable role in the life of local communities had been overlooked for a long time (FAO, 1995). To this effect, local populations and development partners have become aware of their importance (Karsenty and Koiris, 1999) and today, development mechanisms such as *Reducing Emissions from Deforestation and Forest Degradation* (REDD+) have emerged. Thus, Central African countries are getting involved in this sustainable development mechanism (Sjaastad *et al.*, 2005). However, despite the great number of economic, environmental and socio-cultural benefits provided by forest products, data on the scope of their contribution to households incomes are vague (FAO, 2004), as well the investments made by local populations with the income generated by these products. This reveals why, the contribution of forest products to national development, poverty reduction and food security among populations is unknown or misunderstood. This article provides information on the dependency of rural households in three countries of Central Africa and the investments made by these households with the income generated by forest products.

Methodology

The data were collected from March to April 2012 from 330 households in six villages of Cameroon, Congo and CAR under the auspices of projects financed by the Congo Basin Forest Fund (CBFF) and the Danish Fund (DANIDA). These are: Gribé and Masséa (Cameroon), Bomassa and Kabo (CR), and Moussapoula and Lindjombo (CAR). The data were collected using the Forest-Poverty Linkages Toolkit (PROFOR, 2008) developed in partnership with the International Union for the Conservation of Nature (IUCN), the Overseas Development Institute (ODI), the Center for International Forestry Research (CIFOR) and Winrock International. The Toolkit enables to identify and document how forests contribute to local livelihoods in order to promote the role of forests in national development programmes and to integrate national forestry programmes in poverty reduction strategies. The collection of data from a stratified sample of households, consisted in organizing focus group discussions, socio-economic surveys and analyzing livelihoods based on tool 4 of the Toolkit. This tool helps to quantify the proportion of the cash and non-cash incomes in the annual livelihood needs of households generated by the forest, as well as other sources (agriculture, small services, etc.). The following procedure is used for assessing cash and non-cash incomes:

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- The percentage (P) of cash income of each product in the total income of the household is the proportion obtained by the values allocated to products based on their respective contribution to the income of the household surveyed. The sum of percentages is equal to 100.
- The Annual revenue (Ra) of one of the products contributing to the cash income of the household is declared by the respondent during the individual survey.
- The estimation of the household's Annual Gross Cash income (RmBA) is obtained by the rule of three: $RmBA = (Ra \times 100) / P$.
- Given PrM, the proportion of the total household income generated by cash sources and PrNM the proportion of the total household income generated by non-cash sources obtained in tool 4, the Annual Gross Non Cash income (RnmBA) of the household is obtained by the rule of three: $[RnmBA = RmBA \times PrNM / PrM]$.
- The Annual total income (RTA) of the household is the sum of the cash income + the non-cash income $[RTA = RmBA + RnmBA]$.
- If "n" is the number of households participating in the collection of data, the Total Income of the group (RTg) is the sum of the RTA for each household.
- If "m" is the number of groups in each village, the Total Income of the sample (RTe) is the sum of income of the various groups.
- If "k%" is the true sample of households that participated in collecting the data, the Total Income of the village (RTv) = $[RTe \times 100 / k\%]$
- Given that "X" is the number of household(s) in the village, and "Y" the average size of the household, the income per household is: $Rm = RTv / X$; the income per capita is: $Rt = Rm / Y$ and the daily income per capita is: $Rtj = Rt / 365$.

The average and total expenses were calculated based on values declared by the respondents on the categories of expense (nutrition, health, education, clothing and others). In this article, the dollar rate has been estimated at CFAF 500.

Results

Dependency of households on forest resources

The contribution of forest resources to the total income of households in the villages studied is 55% in Cameroon, 53% in CAR and 51% in CR. In all the villages surveyed, the combined mean contribution is 53%. Agropastoral and fisheries products contribute to 42 and 45% respectively for an average contribution of 43%. In average, 4% of households income is earned from sources such as small jobs, remittances, etc. In monetary terms, the total income which represents the sum of cash and non-cash income per capita and per day generated by forest resources in all the villages surveyed is USD 1.3 (that is a USD 0.9 non cash contribution and a USD 0.4 cash contribution) of which: USD 1.51 in Cameroon, USD 1.6 in CR and USD 1 in CAR. In all the countries, the non-cash values derived from forest products are more than 50% higher than the monetary values.

Allocation of incomes to households' livelihoods

In the study area, the financial income generated by the sale of forest products is mostly used to purchase clothing in Cameroon, food in CAR and for health care in CR (Figures 1, 2 and 3). Altogether, for all the countries surveyed, the financial incomes are mainly used for health care, clothing, purchasing food and material goods (television, furniture, cooking utensils) (Figure 4). Other sources of major expenses are: school fees, ceremonies, agriculture and fuel. In financial terms, the households in the study area spend between USD 12.3 and USD 17 annually to purchase material goods in Cameroon and in CAR. On the other hand, they spend between USD 12.1 and USD 22.2 annually for human assets. In average, they spend USD 20.6, USD 18.9, USD 11.4 and USD 11.3 per capita for health care, transport, material goods and food respectively. The average financial investments per capita for the entire zone reveals that material and human assets rank first and second (USD 11.4 and USD 10.9) respectively. Similarly, for livelihood needs, households invest annually an average of USD 8.3 for each of the social assets (organization of ceremonies, transport, access to energy (fuel and electricity) and natural assets (hunting, agriculture). No financial investment is made during the year. Thus, no savings are possible for these populations.

Discussion and conclusions

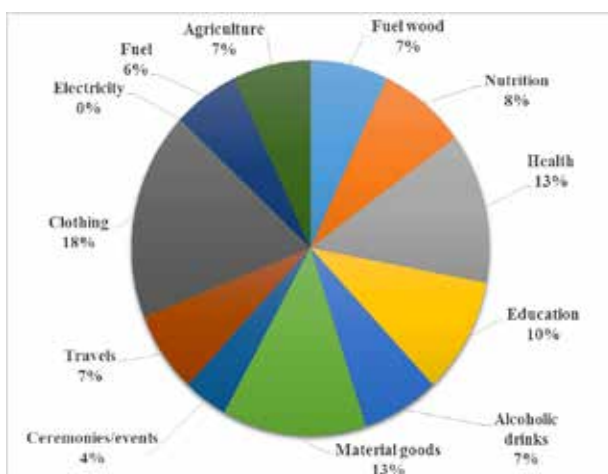


Figure 1: Allocation of households' income in Cameroon

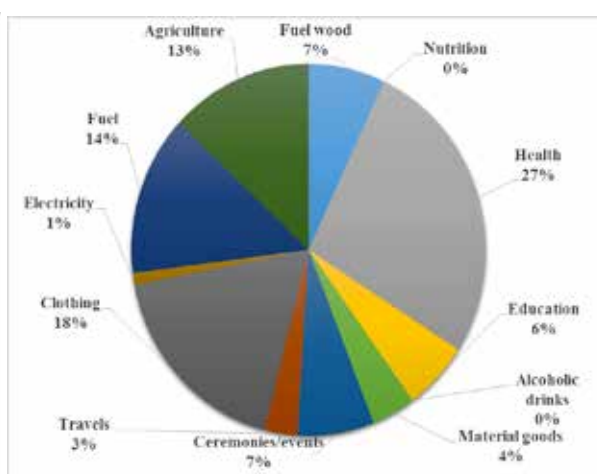


Figure 2 : Allocation of households' income in Congo

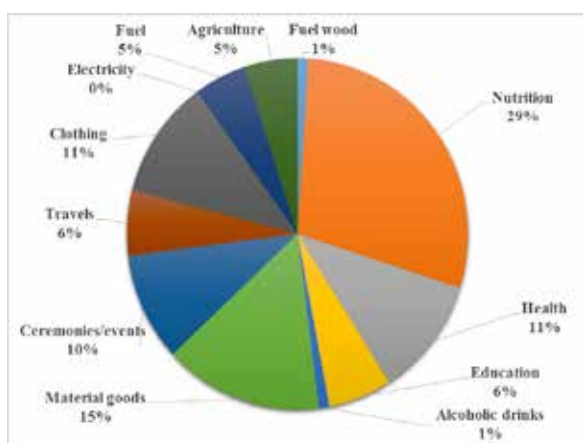


Figure 3 : Allocation of households' income in CAR

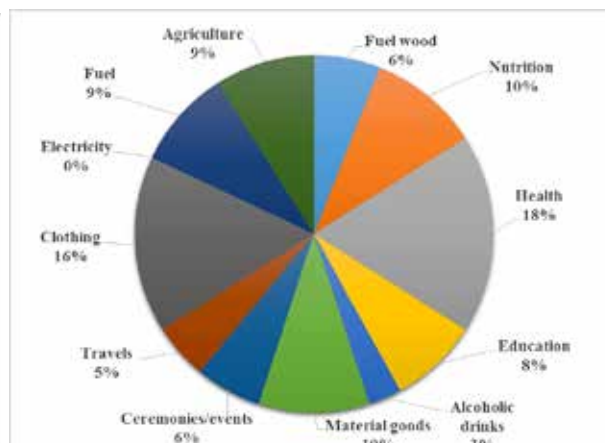


Figure 4: Allocation of households' income in all the villages surveyed

Forest products are important for populations living in and around forest villages in the Central African countries surveyed. In these countries, they significantly contribute to households' cash and non-cash incomes. In Cameroon, that contribution to the total income is clearly higher than in the other countries surveyed. In these regions, and especially in CAR, a country that recently emerged from civil war, the marketing channel of forest products is very little developed as they reach the markets with difficulty and the households sell their forest products around Libongo, a border city of Cameroon. A large part of these resources are consumed in the households to meet daily needs (Loubelo, 2012). According to Sahonogo (2009), the households involved in forest activities have a total income higher than those who are not. In terms of cash, the annual income per capita and per day enables the households surveyed, except in CAR, to live slightly above the poverty threshold (Anderson *et al.*, 2006). Despite that they are still low, these incomes are significant and can be improved if competitiveness mechanisms through the development of the value chain of forest products, are implemented. In terms of investments, very little information exists on the outcome of incomes generated from the sale of forest products. Research is often more oriented towards monetary values earned by rural households because the analysis of local populations' incomes is an important theme in the forest management debate (Wollenberg, 2000). In this article, the cash incomes generated by the sale of forest products are mostly invested in material assets and human assets like health care and children school fees. Consequently, the incomes are mostly used to take care of sick members of the household. Therefore, forest products in the countries surveyed in Central Africa remain a means for survival for local populations. The majority of populations are unable to save their income since they live in a circle of continuous loan. In each of the countries, the income per household is distributed based on the importance of the sources/sector of expense. Forest products alone may not therefore be enough to improve the wellbeing of these populations. The cumulated effect of incomes generated by forest products and other sources can therefore be managed so as to meet the needs of the communities. However, this management should integrate the values on the investments made by the latter based on their available resources and income. It is in this perspective that, current long term development policies and mechanisms (e.g. REDD+) in the Central African countries surveyed, should integrate this information in order to guide investment decisions in rural areas. These mechanisms should thereby ensure food security for the livelihoods of local populations, their development and resources conservation.

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Gender and forest dependence in the Cameroon segment of the Dja-Odzala-Minkebe Tri-national landscape: implications for REDD+

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Summary

The paper explores the gender forest-poverty-dependence nexus in the Cameroon Segment of the Dja-Odzala-Minkebe Tri-national (TRIDOM) landscape and its implication on Reducing emissions from Deforestation and Forest degradation, Conservation of forests, Sustainable management of forests and Enhancement of forest carbon stocks (REDD+). Drawing from data of an International Union for Conservation of Nature (IUCN) study conducted between 2011-2015, as part of its "Towards Pro-Poor REDD+ in Cameroon" project, it highlights the relevance of gender issues in forest-poverty dependence and implications for REDD+ projects and national strategy in Cameroon. We are of the opinion that tackling deforestation and forest degradation would require innovative, comprehensive and systematic approaches that clearly mainstream community interests, including gender considerations in interventions and projects especially in REDD+ projects and programs.

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Introduction

The Congo Basin is the second largest tropical forest ecosystem in the world with enormous value for energy, food security and climate change mitigation (Brown, 2011). However, high rates of deforestation and forest degradation which are mainly due to human activity is putting strains on forest resources, livelihoods of forest dependent people and threatening their socio-economic development (Ndoye and Kaimowitz, 2000 and Gbetnkom, 2005). Cameroon, which is a Congo Basin forest nation, has committed to sustainably manage its forests as a means to attain the country's vision of becoming an emerging economy by 2035 (Vision 2035¹⁰). Responding to a net rate of deforestation of -1.07 % between 2000- 2005 (FAO, 2010) and forest degradation of 0.01% (Duveiller *et al.*, 2008), the Government of Cameroon (GoC) and its development partners have been exploring options for sustainable forest management. In line with this, Cameroon has embraced the REDD+ mechanism as part of its development strategy by adopting a Readiness Preparation Plan (RPP) in 2013 and she is currently elaborating a national REDD+ strategy.

As a key development partner of the GoC, IUCN has been working since 2009 with forest communities of the Cameroon segment of the TRIDOM landscape in its "Towards Pro-Poor REDD+ in Cameroon". The project seeks to conciliate effective poverty alleviation and reducing deforestation and forest degradation. Given the geo-ethnic context of the study area and the acknowledged importance of focusing on gender in forestry research (Mai *et al.*, 2011), IUCN conducted research between 2011-2015 by using the Poverty-Forests Linkages Toolkit (PFTK)¹¹ to show forest poverty-dependence in Baka¹² (Pygmy) and Bantu¹³ communities of Efulan-Otong-Mbong, with due consideration to gender issues.

This Research was executed from 2011 to March 2015 in the Cameroon segment of the TRIDOM Landscape with funding from the Government of Denmark, field assistance from local communities and organizations, including technical support from Cameroon's Ministry of Environment, Protection of Nature and Sustainable Development. This paper is a brief description of the investigation methods and the results obtained, and suggestions for further research.

Methods and Results

The PFTK was used to determine the forest-poverty dependence of males and females in the Efulan-Otong-Mbong community. Research within this area was carried from 2011-2014. Data used for this paper was collected

10 Cameroon's Vision 2035; Available at: <http://www.platform2035.com/index.php/cameroon-2035/cameroon-vision-2035>

11 Poverty-Forests Linkages Toolkit (PFTK) is a participatory tool used to analyze poverty and livelihood dependence.

12 Baka (Pygmy) is a group of indigenous people in Cameroon, specifically living in the forest regions (Southern and Eastern regions).

13 Bantu represent the non-indigenous communities.

in September 2014 and analyzed in March 2015. Data was collected from a total of 92 households (48 Baka and 44 Bantu; average Baka household size was 6 and Bantu household size 9). Data gathered through designed questionnaires, focus group discussions and participant observations covered eight tools of the PFTK. Much of the data in this paper is based on Tool 4: "Livelihood Analysis", Tools 6 and 8, "Trees and Forest Product Importance" and "Monetary Values" were also employed.

Information obtained revealed that the use of forest resources and the general make up of household incomes differed clearly between males and females in the community under study. While both men and women were in general dependent on forest resources, there was a higher dependency for women, especially poorer women, as compared to men. Furthermore, evidence from the data suggested that women obtained large parts of their cash and non-cash revenue from Non-Timber Forest Products (NTFPs). Agro-pastoral activities were also increasingly important.

Discussion

Two graphic representations are given below. Figure 1 shows cash and non-cash household revenue from forests for males and females, and Figure 2 illustrates global revenue sources per sociological group (Bantu and Baka) and gender from forest resources, agro-pastoral resources and other sources (such as: drum making, raffia, and cultural services like dancing, etc).

As can be seen in Figure 1, non-cash revenue from the forest for both men and women was largely higher than cash revenue. Further, Baka men obtained a very large part of their revenue in cash as opposed to Baka women who showed an almost equal distribution of their revenue stream from cash and non-cash sources. The non-cash revenue of Bantu women was less than that of Bantu men but high enough to be over half of their total revenue. While Bantu men had predominantly high non-cash revenue, their cash revenue was as high, making their overall average revenue far higher than that of Bantu women. This same trend was observed between Baka men and women. Despite differences in non-cash and cash revenues for both Baka and Bantu men and women, non-cash revenues constituted a very important source of household income, although such sources are often neglected when using classical tools of wealth measurement in Cameroon such as GDP and National Income statistics. Analyzing the above data using an ethnic prism could further explain gender in forest poverty dependence.

Figure 2 illustrates the percentage of income from forest products, agro-pastoral products and other (non-forest) products and services of total Baka and Bantu males and females. The data revealed that forest products constituted a significantly higher part of household revenue for both Baka men (over 55%) and women (60%) than for the Bantu (over 35% for men and 25% for women). This highlights the importance of forest resources (especially NTFPs) for the

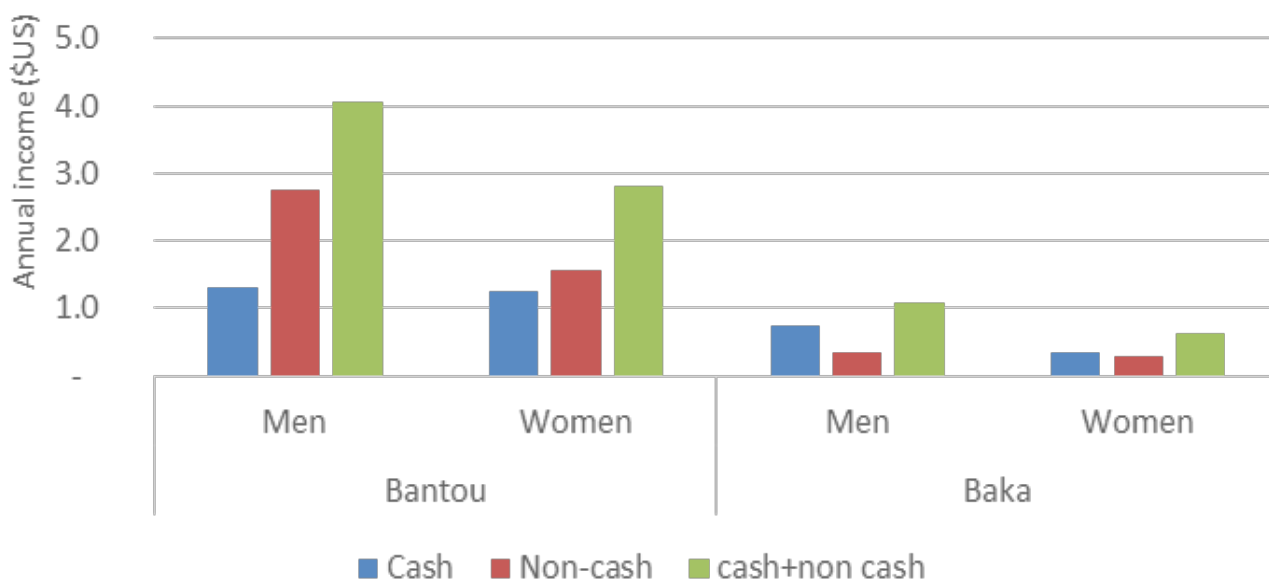


Figure 1: Annual income cash and non-cash per capita per day (\$US) for males and females in Efoulan-Otong-Mbong

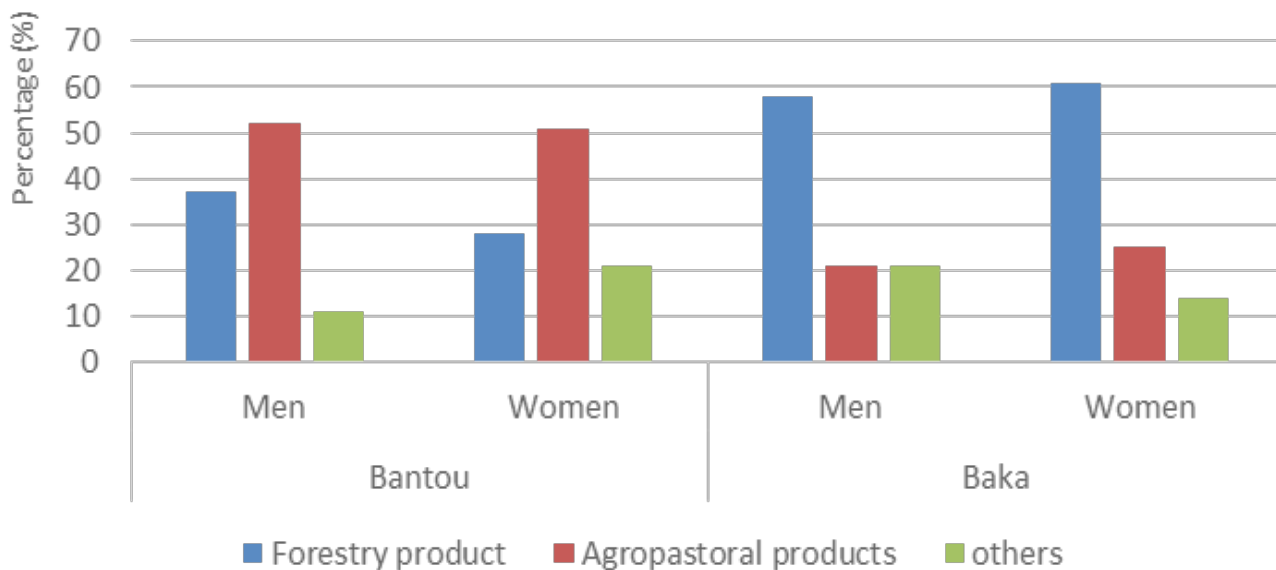


Figure 2: Global revenue sources (%) of Bantu and Baka groups in the community and gender

Baka group. Bantu men were more dependent on forest products than Bantu women for their household income but both men and women obtained the largest part of their household revenues from agro-pastoral resources. This could be explained by the sedentary lifestyle of the Bantu communities, (stable agriculture, commercial exchange) and the “added value” they give to their products through local transformation of agricultural products (example cassava to “nkoum- nkoum”, “miondo” and “bobolo”). In contrast, the Baka were more directly dependent on the forest, with a larger proportion of their income obtained from gathering NTFPs. In general, there was a relatively strong dependence of both communities on the forest, but the Baka community depended on the forest for two thirds () of their revenue, whereas the Bantu obtained twice as much as the Baka of their global revenues from agro-pastoral sources.

While revealing the different levels of forest dependence between males and females, the study provided an opportunity to calibrate REDD+ interventions by using precise revenue streams for specific gender groups. The results are also important for the identification of livelihood enhancing options which could help reduce deforestation and forest degradation and could be used in the development of a community action plan for REDD+, targeting actions that seek to improve community livelihoods while promoting SFM.

Conclusion and Recommendations

Gender plays an important role in forest poverty dependence and analyses drawn from data obtained in Efulan-Otong-Mbong confirm this. Cash and non-cash revenues from the forest are very important for both males and females, and although non-cash revenues could easily be neglected by classical tools of wealth measurement in Cameroon, they constitute a vital source of household wealth. For the purpose of this article, analyses reflected general forest dependence per gender group per sex. There is available data on gender relations per forest product and activity, specific social and economic needs per gender group, how to ensure specific involvement of Baka men and women, collected using the PFTK. This available data, including findings from this study reiterate the importance to mainstream gender in the design and deployment of interventions in REDD+ projects especially if such projects aim to enhance community livelihoods and help attain SFM.

For a country like Cameroon which considers REDD+ as a development tool, with keen interest on non-carbon benefits, understanding and mainstreaming gender considerations is vital for the successful implementation of REDD+ at national level. Further, REDD+ benefit sharing mechanisms and/or any forms of compensation for SFM should consider both cash and non-cash revenues of households and communities.

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Future climate change challenges to sustainable forest management in the Zambezi Basin

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Summary

The issue of estimating future climate variability and change of seasonal rainfall and temperature under which ecosystem processes and human interventions will take place in the future is relatively new to forestry. The Zambezi River Basin in southern Africa experiences highly variable climatic conditions across the basin and through time that can affect forest ecosystems in a number of ways. Estimating future climate, using current methodologies could provide information in a form that could support forest managers with policy and technical decision making in aid of adaptation to climate variability and change. Predicting the likely seasonal variations of rainfall and temperature in terms of decades could certainly be useful to forest management which operates in longer time frames than is the case in other crops. Most of the people living along the Zambezi River basin depend on forest for their livelihoods. Therefore, this study, presents a framework for assessing predictions and projections of future climates which may have impact on the vulnerability of existing forest ecosystems and in the process, impede the achievement of sustainable forest

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management objectives in the basin. To estimate future climates in terms of mid-summer seasonal rainfall and maximum temperatures over the Zambezi River Basin, this study used the global climate model, the conformal-cubic atmospheric model (CCAM) to produce hindcasts (re-forecasts) of seasonal-to-interannual values and to produce multiple decades of climate change projections. Climate projections indicate the possibility for a switch in ecosystem type for this region with far lower likelihood of appreciable tree cover within the 2100 time horizon.

Introduction

Seasonal rainfall and temperature variation in the Zambezi River Basin affect forest productivity, to the extent that temperatures and rainfall affects plant growth and development, and can influence other aspects such as species composition especially through facilitating different fire regimes (Archibald et al., 2013). Significant changes in temperature and rainfall regimes may cause changes in the frequency and intensity of biotic and abiotic disturbances, and a host of other biological responses (Chenje, 2000; Timberlake, 2000). It is therefore crucial to estimate future scenarios of climate change and how such changes may affect other aspects of sustainable forest management (Johnston et al., 2010; Edwards and Hirsch, 2012). This is because changes can have both direct and indirect influences on species habitats, tree growth, regeneration, mortality, and disturbance processes and can therefore modify the location and structure of forests, the distribution of species, and forest productivity (Williamson et al., 2012). Other attributes such as surface water flows and soil stability can also be affected through processes such as flooding and erosion. These adverse effects have important implications for the long-term achievement of the objectives of sustainable forest management (SFM).

Today, methodologies in estimating or modelling climatic variability have become more accurate than before (Wang et al., 2006) and model-based multiple decade climate change projections are becoming more reliable (Räsänen, 2007). Knowledge of future climatic conditions will enable forest managers to develop adaptation strategies for sustainable forest management (Millar et al., 2007) as long as climate change does not result in rainfall and temperature shifts that are significant enough to compromise the viability of the tree growth form. Management areas of application include timber harvesting methods and the management of grazing, wild fires, pest and disease outbreaks, and invasive species. It is important to note that this study assesses the time horizon for such forest management options in light of improved climate predictions and projections.

Materials and methods

The archived data of the general circulation model and gridded rainfall data

A global climate model, the conformal-cubic atmospheric model (CCAM; McGregor 2005), is used here to produce hindcasts (re-forecasts) of seasonal-to-interannual values and to produce multiple decades of climate change projections over southern Africa (Engelbrecht and Engelbrecht 2015; Engelbrecht et al. 2009; 2015). The CCAM model for seasonal forecast production consists of a number of tiers. The first tier is the prediction of sea-surface temperature (SST) anomalies that acts as the boundary forcing of the CCAM, followed by using 24-hour lagged average forecasting (Hoffman and Kalnay, 1983) in order to set up the atmospheric initial conditions for 12 ensemble members. The large-scale output of the model is then statistically downscaled to a higher resolution (Landman and Beraki, 2012; Landman et al. 2012) over our area of interest. The CCAM raw output is typically at a horizontal resolution of 200 km, but the statistical downscaling process increases the resolution to 50 km. The period over which hindcasts were generated is from 1983 to 2010 and here we will present the results of three lead-times, each lead-time one month apart. Greater detail on this configuration is described in Landman et al., (2014), but here we do the downscaling to an area from 15°S to 20°S, and 26°E to 33°E by using the 850 hPa geopotential heights fields of the CCAM as predictor in a model output statistics (MOS) approach for December-January-February (DJF) rainfall and for maximum temperatures. This area, that includes major forests of the Zambezi river basin as shown in Figure 1, have been chosen as it has already been found as an area of high seasonal predictability (Muchuru et al., 2014). The same area is used for the downscaling over multiple decades. The procedure to do the statistically downscaled climate change projections is described in Landman et al., (2013) but here we use the 850 hPa heights of the CCAM-MIROC AR4 SRES2 as predictor in a perfect prognosis approach for both DJF rainfall and maximum temperature

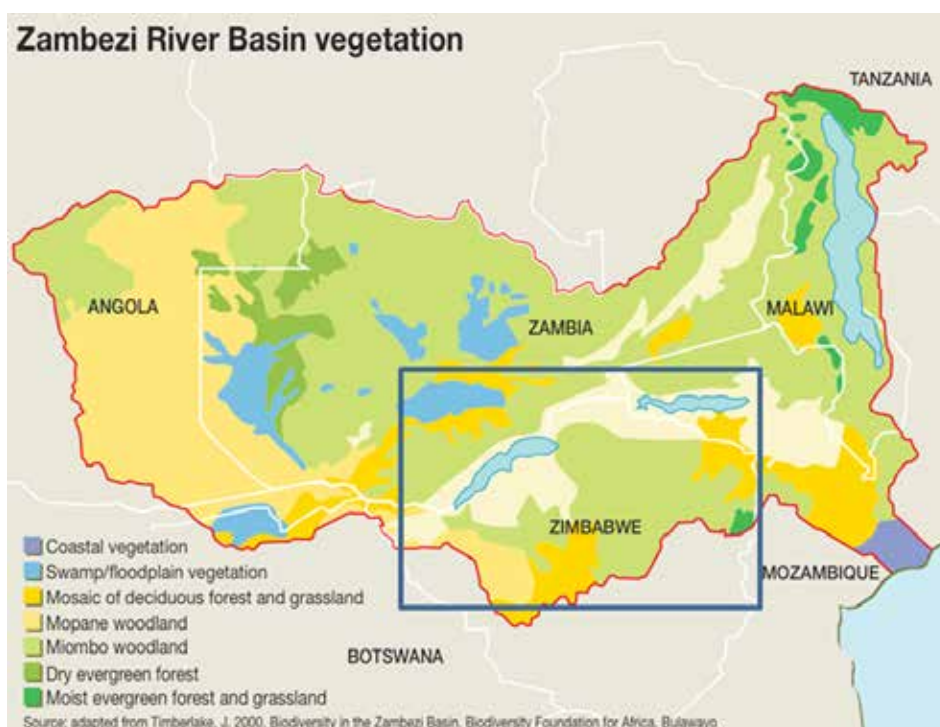


Figure 1. The vegetation types of the Zambezi river basin. The demarcated area is the area to which the forecasts and projections for DJF rainfall and maximum temperatures have been downscaled.

Results

The CCAM seasonal hindcasts for the DJF season have been produced for 27 years from 1983/84 to 2009/10 by initializing the CCAM near the beginning of the months of September (3-month lead-time), October (2-month lead-time) and for November (1-month lead-time). The 850 hPa geopotential height fields are used as predictors in a 5-year-out cross-validation procedure to downscale to the 0.5° x 0.5° resolution of the Climatic Research Unit (CRU; Harris et al., 2014) gridded data. The downscaled values are then averaged over the forecast area and normalised in order to obtain an index value for each of the 27 years. Figures 2 and 3 respectively show the results for DJF rainfall and for maximum temperatures. The figures also show the Kendall's tau correlation between the downscaled (coloured lines) and observed (black line) indices and their respective levels of statistical significance. The Kendall's tau correlations for maximum temperatures are higher than found for rainfall.

This result is typical to what is found for seasonal forecasts in general (Barnston et al., 2010). Notwithstanding, forecast for both DJF rainfall and temperatures are skilful at least for lead-times up to two months since for both variables the Kendall's tau correlations are statistically significant at the 95% level at these lead-times.

The seasonal forecasts of Figures 2 and 3 demonstrate the CCAM's ability as atmospheric model to correctly respond to SST forcing. The CCAM is also forced by bias-corrected SST from a coupled global climate model used in AR4 of the IPCC (MIROC) over the period from 1961 to 2100. The projection is for the A2 SRES emission scenario. The fact that the CCAM predictions on seasonal time scales have been shown to be skilful over the region of interest, enhances the confidence in the CCAM's projections of future climate change.

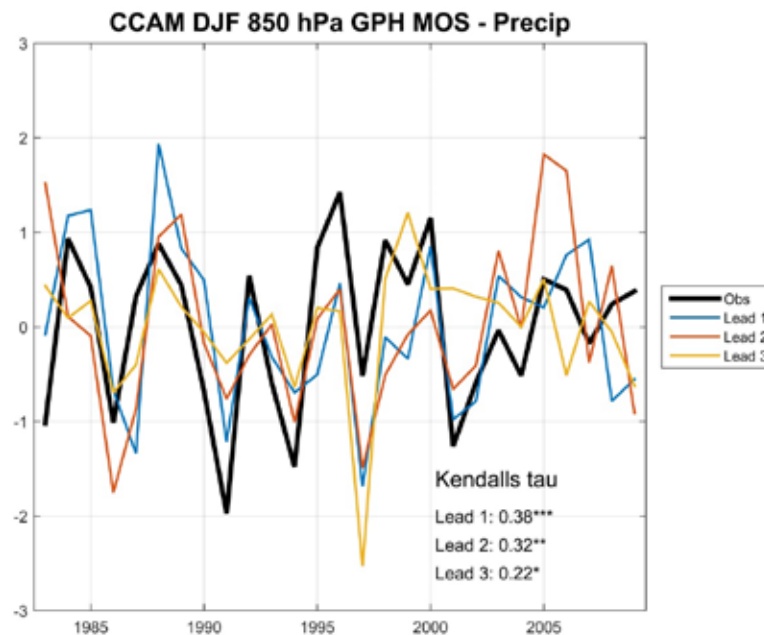


Figure 2. Downscaled and cross-validated DJF rainfall predictions at lead-times from 1 to 3 months. The coloured lines represent predictions for the respective lead-times and the black line represents observed values. Kendall's tau correlations are presented for each lead-time; the asterisks next the values represent the 99% (***) , 95% (**) and 90% (*) levels of statistical significance.

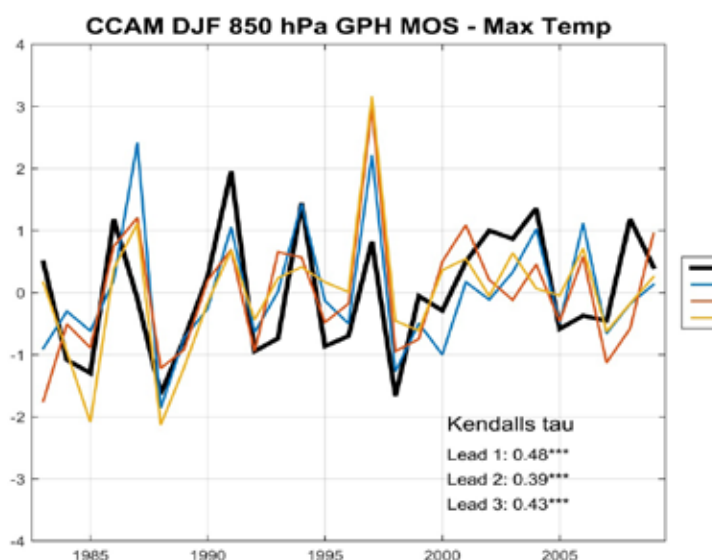


Figure 3. Downscaled and cross-validated DJF maximum temperature predictions at lead-times from 1 to 3 months. The coloured lines represent predictions for the respective lead-times and the black line represents observed values. Kendall's tau correlations are presented for each lead-time; the asterisks next the values represent the 99% (***) , 95% (**) and 90% (*) levels of statistical significance.

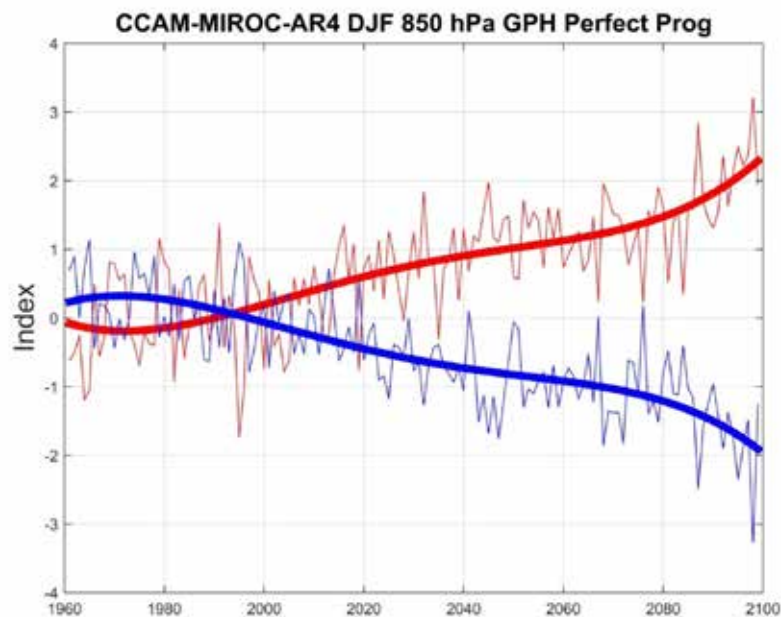


Figure 4. Projected DJF rainfall (blue) and maximum temperatures (red) over the 139-year period from 1961/62 to 2099/100. The thick lines represent 4th-order polynomials for the two variables and the thin lines represent individually downscaled values over the period.

Figure 4 shows the downscaled values for the region expressed as indices. Bias adjustments are made to the projections by first downscaling over the model development period from 1979/80 to 2008/09 and then comparing the downscaled values with the CRU data over the same period. Bias adjustment is subsequently applied over the entire 139-year period. The figure shows that maximum temperatures are to increase and rainfall totals to decrease towards the end of this century. DJF rainfall are to decrease from about 480 mm to less than 260 mm, and maximum temperatures may increase by 2°C, which may even be an underestimation (Thornton et al, 2011). Such a scenario would significantly reduce the viability of the tree growth form within this region within the 2100 time horizon, and render forest management adaptation responses futile.

Discussion and Conclusion

The paper focuses on the Zambezi River Basin since 75% of the land area in the Basin is forest and bush in which communities depend on for their livelihoods. The mostly dominated forests are the Zambezi teak forests, shared by five of the Zambezi basin countries, and the Miombo woodlands, Zambezi redwood (*Baikaea plurijuga*, Msasa (*Brachystegia spiciformis*), Wet Miombo woodlands, Munondo (*Juibernardia species*), Msasa and Pod Mahogany (*Alfzelia quanzensis*). The importance of Zambezi River Basin forests motivated investigation of the predictability of seasonal rainfall and maximum temperature over the basin during the mid-summer rainy season and on the estimation of how these variables may behave in a changing climate. Forecast at lead-times of two months for both DJF rainfall and maximum temperatures have been found to be skilful and thus the CCAM as atmospheric model forced by SST has responded correctly to this forcing on a seasonal time scale, subsequently enhancing the confidence in the CCAM's projections of future climate change (Palmer et al., 2008).

Seasonal forecasts and multiple decade projections are both significantly important to the forest managers who seek to make informed decisions and to develop adaptations strategies for sustainable forest management. Wet/dry seasons on both seasonal and multi-decadal time scales can affect forest impact scenarios that could include descriptions of changes in a variety of processes such as forest physiology, phenology, and regeneration, frequency and intensity of biotic disturbances (such as insect outbreaks and diseases) and abiotic disturbances (such as severe weather, drought, and wildfire), ecosystem health and productivity, forest inventory, forest composition and age class over the landscape. Here we have shown that rainfall and maximum temperatures during mid-summer seasons are predictable, including the prediction of extremely hot/cool and wet/dry seasons (cf. Figures 2 and 3). Moreover, these variables, when projected over multiple decades, are projected to become even more extreme as future rainfall (maximum temperature) climates are expected to decrease (increase) by about two standard deviations from the present-day climate. Such a projection would indicate that management responses and decision support systems would be unable to provide significant benefits within the 2100 time horizon for forest managers of the Zambezi River basin. This indicates that mitigation of climate change via international action remains the only viable response that would allow continued sustainable forest management within this region.

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Entomophagy among the Ngbakas in the Central African Republic and the Komas in the Alantika Mountains, Cameroon: another sustainable food option in Africa

Séverin Tchibozo¹

Summary

For centuries, natural forests have enabled the Ngbakas and Komas to sustainably include insects in their diet. The migration of some people towards cities in the Central African Republic and Cameroon has introduced these foods to periurban and urban populations. A first exploratory mission among these local communities enabled to identify sixteen species of edible insects among the Ngbakas and eighteen among the Komas. Harvesting and cooking techniques have been discussed as well as the various species identified. The sound management of forests that takes into account the promotion of various insect species will contribute to ensuring food and nutrition security and contribute to the sustainable harvest of Non-Wood Forest Products (NWFPs) in general, and in particular edible insects for the Ngbaka (Central African Republic) and Koma (Cameroon) communities. Furthermore, the installation of agroforestry parks will enable to have enough trees to develop the breeding of these edible insects in the village and for the paleo diet.

Introduction

FAO (2013) believes that over 2 billion people worldwide traditionally consume insects. More than 1,900 species are listed by FAO (2013). These species used in human diet, mainly belong to the Coleoptera, Lepidoptera, Hymenoptera, Isoptera, Orthoptera, Hemiptera, Odonata and Diptera orders, and are used in human diet. Insects have always been consumed by humans in many countries around the world.

A bibliographical compilation of the list of insects consumed in the world was established by Jongema (2014). No study makes mention of the insects consumed by the Ngbakas in the Central African Republic (CAR) and the Komas of Cameroon. The only research related to similar communities are those of Roulon-doko (1998 and 2001) which make mention of insects among the Gbayas of CAR, of Thomas *et al.*, (2004 and 2007) among Bantu pygmy hunters-gatherers in the southern part of CAR, and of Seignobos *et al.*, (1996) about the Mofus and their insects in the Mandara Mountains in Northern Cameroon.

The link <http://gbif.africamuseum.be/lincaocnet/> provides information on the edible insect species listed on the ground in collaboration with local populations who

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consume them in the following countries: Benin, Burkina Faso, Cameroon, CAR, Congo, Democratic Republic of Congo, Guinea Conakry, Mali, Niger and Togo.

This document specifically deals with insect species consumed by Ngbakas in the Central African Republic and Komas in the Alantika Mounts of Cameroon.

Insects among the Komas

The Fulubés or Koma Fulani in the Alantika Mountains, located at 1,032 m of altitude in Cameroon near the Nigerian border, make use of eighteen species of insects in their diet. The species are highly diverse with some very peculiar species not yet listed anywhere and consumed by other African communities. The genus and species of several specimens harvested have not yet been identified. Many other species are yet to be discovered by future identification campaigns during the harvest season. The first exploratory mission conducted helped us to list some species as well as their host plants. Forests are indispensable to ensure the natural development of edible insect species as well as their sustainable management.

Harvesting insects is done with bare hands with traps smeared with sap from the shea tree (*Vitellaria paradoxa*). The technique consists in slashing the trunk of the tree and drawing the sap to boil it until it hardens. This paste is then smeared on tree branches to trap flower beetles (*Pachnoda cordata dahomeyana*, *Pachnoda marginata aurantia*) and other edible flying insects, except for caterpillars which are harvested using a different method. Among the Komas, cetonids larvae and adults *cordata dahomeyana* and *Pachnoda marginata aurantia* are consumed.

The Komas do not sell insects and use them only for home-consumption as a family or with friends residing in neighboring villages.

Insects among the Ngbakas

Caterpillars play a highly significant role in the diet of Ngbaka communities in the Pissa forests in southern Central African Republic. In 2010, a total of sixteen species including ten caterpillar species were recorded, as well as their various host plants. The caterpillars are harvested by hand as they fall from big trees (*Ricinodendron heudelotii*, *Amingeria altissima*, *Triplochiton scleroxylon*, *Terminalia superba*, etc.).

Caterpillars constitute a valuable source of animal proteins for the communities that harvest them; the surplus is sold to neighboring populations or to the city to be consumed by populations in Bangui or other towns in CAR.

Deforestation is one of the main threats disrupting the sustainable management of these Non Wood Forest Products (NWFPs), especially the felling of big trees (ex. Sapelli, *Entandophragma cylindricum*). Loggers are supposed to reforest as they cut trees to reduce the

extinction of species and ensure their abundance during harvest time. Village breeding through the development of artificial forests with local caterpillar host species will enable local communities to have more edible insects.

The *Imbrasia oyemensis* species (Lepidoptera, Saturniidae) with a taxonomic status yet to be revised, is one of the most threatened by deforestation in CAR especially and in the Congo Basin in general.

Cooking methods

Among the Komas

Caterpillars are boiled with *Piliostigma thonningii* leaves for about 10 minutes. They are then removed from the boiling water and dried for a few minutes in the open before being grilled or fried with a little oil and salt for about 15 minutes. They are eaten without accompaniment or with millet paste (*Panicum miliaceum*).

After being harvested, winged termites are washed and grilled in an earthen cooking pot (*canari* in French) with some water, oil and salt for 10 minutes maximum and eaten immediately. To ensure long conservation, they are boiled with local salt for 10 minutes and dried for two days in the open.

Crickets are boiled in hot water and then grilled with salt in a *canari*. They are then eaten at will.

Among the Ngbakas

Big caterpillars and coleopteran larvae (*Rhynchophorus phoenicis* F., *Oryctes* spp. and *Augosoma* sp.) are cut and washed. They are then cooked in water, with salt and condiments (onion, Maggi cube). Small caterpillars are cooked in the same way but whole.

Discussion and conclusion

Tropical forests are pools of edible insects. For the Ngbakas and Komas, the sustainable management of these forests by local communities will contribute to the sustainability of insect breeding for future generations.

The species *Rhynchophorus phoenicis* F., *Oxycatanops spissus* (Walker, 1870) and *Zonocerus variegatus* (Linnaeus, 1758) already mentioned are consumed in Cameroon (Jongema, 2014). Table 1 provides an overview of the insects consumed among Ngbakas and Komas in comparison with Jongema's world list (2014).

Edible insects are an alternative to bushmeat. Their consumption and marketing help reduce poaching and contribute to improving the economic incomes of some poor households.

The Ngbaka and Koma communities sustainably manage the harvest of these natural resources that belong to Non Wood Forest Products (NWFPs). These communities should also install small forest plantations with local host plants to develop the village breeding of caterpillars and other edible insects.

In the face of the demographic evolution of the world population, many people and organizations such as FAO (United Nations Food and Agriculture Organization) are concerned. How to feed 9 billion human beings? With their high nutritive value, edible insects offer an opportunity to face to Man's Future.

Table 1: Summary of insects consumed among the Ngbakas and Komas and comparison with Jongema's world list (2014)

Order	Family	Genus and species	Ngbakas	Komas	Already mentioned on Jongema's list (2014)	
Coleoptera	Curculionidae	<i>Rhynchophorus phoenicis</i> F.	x	x	From Cameroon	
	Dynastidae	<i>Oryctes spp.</i>	x	x	-	
	Dynastidae	<i>Augosoma sp.</i>	x		-	
	Scarabaeidae	<i>Pachnoda cordata dahomeyana</i> Rigout, 1985		x	-	
	Scarabaeidae	<i>Pachnoda marginata aurantia</i> Herbst, 1790		x	-	
Lepidoptera	Notodontidae	IND 1	x		-	
	Notodontidae	<i>Anaphe venata</i> Butler, 1878	x		-	
	Saturniidae	IND 2	x		-	
	Saturniidae	<i>Imbrasia sp. 1</i>	x		-	
	Saturniidae	<i>Imbrasia epimethea</i> Drury	x		-	
	Saturniidae	<i>Imbrasia obscura</i> Butler		x	-	
	Saturniidae	<i>Imbrasia truncata</i> (Aurivillius)	x		-	
	Saturniidae	<i>Imbrasia sp. 2</i>	x		-	
	Saturniidae	<i>Cirina forda</i> (Westwood)	x	x	-	
	Saturniidae	<i>Imbrasia oyemensis</i> Rougeot, 1955	x	x	-	
		IND 1	IND 3		x	-
		IND 2	IND 4		x	-
		Saturniidae	<i>Pseudanhereae discrepans</i> !	x		-
	Orthoptera	Acrididae	<i>Nomadacris septemfasciata</i> (Serville, 1838)		x	-
Acrididae		<i>Oxycatantops spissus</i> (Walker, 1870)		x	From Cameroun	
Acrididae		<i>Zonocerus variegatus</i> (Linnaeus, 1758)		x	From Cameroun	
Grillydae		<i>Brachytrupes membranaceus</i> (Drury)	x		-	
Grillydae		<i>Gryllus sp.</i>		x	-	
Grillydae		<i>Bachytrupes sp.</i>		x	-	
Tettigoniidae		<i>Ruspolia sp.</i>	x		-	
	Tettigoniidae	IND 1		x	-	
Hemiptera	Lygaeidae	IND 1		x	-	
Isopter	Termitidae	<i>Macrotermes sp.</i>		x	-	
	Termitidae	<i>Macrotermes falciger</i> Gerstaecke	x	x	-	

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Dietary role of indigenous leafy vegetables in urban communities of southeastern Nigeria

Labode Popoola¹ and Paulinus Aju²

Summary

The research in this study was conducted in the urban communities of the Southeastern zone of Nigeria. It assessed the levels and patterns of consumption of Indigenous Leafy Vegetable (ILV) species among the urban households in the zone. Twenty ILVs were found to be traded and consumed in urban areas of the three study states in Southeastern Nigeria. Average amounts of money spent on this per household on weekly and yearly bases were ₦194.68 (US\$ 2.00) and ₦10123.36 (US\$ 60.10). Demands for ILV species is rising and is negatively impacting supplies, prices and invariably, conservation. This calls for proper valuation and domestication on the identified ILV species to enhance sustainability.

Introduction

At a 2004 joint Kobo workshop, the World Health Organization (WHO) and the Food and Agriculture Organization (FAO) developed a framework that proposes ways to promote increased production, availability, access, and adequate consumption of fruits and vegetables (FAO, 2004). The framework recommended that fruit and vegetable promotion interventions should consider the whole process from production to consumption. This recommendation drew attention to the gap in knowledge and information on the production and consumption of African indigenous vegetables (AIVs). As has been argued over time, a dire need exists to close this gap, as ever-increasing global attention is focused on mobilizing action to conserve and sustainably use local biodiversity to underpin food security and human health (Smith and Eyzaguirre 2007). This paper is a product of a research aimed at identifying indigenous leafy vegetable (ILV) species that require further development and domestication for the promotion of food security in urban areas of Southeastern Nigeria in particular and, more generally the country as a whole. It assessed the consumption levels and patterns of ILV species among the urban households in Southeastern Nigeria.

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Materials and Methods

The Study Area

The study was conducted in the three states of Imo, Anambra and Ebonyi. The three states lie within the area enclosed by longitudes 6°35' and 8° 10' East and latitudes 4°45' and 6° 17' North. The three states have a total population of 10,282,338 which represents approximately 63% and 7% of the total population of the Southeast and the Nigerian federation, respectively (FRN, 2009). The climate of the three states is tropical with well-defined wet and dry seasons during which mean temperatures reach 22°C and 28°C, respectively. The seasons are associated with the prevalence of the moist maritime South-westerly monsoon from the Atlantic Ocean in the wet season and the dry continental North-easterly harmattan winds from the Sahara Desert in the dry season. Mean annual rainfall is 2000mm, while humidity ranges from 51 to 84% (BeakConsults/Geomatics, 1999). The majority of the inhabitants in the study area reside in peri-urban and urban areas.

Data Collection and Analysis.

In order to assess the consumption of ILVs in the various urban households in the three states, household surveys were undertaken monthly for a period of one year. The surveys involved mainly, interviews of urban household members in which ILV species consumed during a week that preceded the interview were recorded (i.e. one week memory-recall), and including the number of times these were consumed during the week, means of acquisition and monetary values or costs of the vegetables. The study covered a period of twelve calendar months.

The three states involved in the study are each made up of three agricultural zones. This zoning arrangement formed the basis for sample selection. One urban community was selected from each agricultural zone for sampling. Thus, a total of three communities were selected per state, i.e. nine communities for the three states. Within each of the selected communities, 10 households were randomly sampled monthly for the one year period. Thus, in total, a total of 120 household surveys were conducted per zone, 360 per state and 1080 for the three states.

Results and Discussion

Indigenous leafy vegetable species consumed and their consumption patterns.

Table 1 shows the various ILVs consumed by the urban households and their consumption patterns. Twenty different species of ILVs were mainly consumed in the urban communities, (column 2), with *Telfairia occidentalis* being the most widely consumed leafy vegetable species (consumed by 94%) of the urban respondents. Edwin-Wosu *et al* (2012), in their survey in Ogoja and Calabar in Cross River State, recorded 30 species of indigenous

plants that were commonly consumed as leafy vegetables in the areas. Each of the ILV species was consumed by an average of 21% of the urban households in the study area (column 4). The result seems to confirm the findings of Maziya-Dixon *et al* (2004), who noted that even though indigenous leafy vegetables were relatively easily available and affordable in Nigeria, they remained among the least consumed foods. Furthermore, each of the vegetable species was consumed on an average twice weekly (column 5). A similar survey in Yaoundé, Cameroon, revealed that indigenous leafy vegetables were consumed three to four times weekly (Kamanga *et al*, 2013). The consumption of these traditional vegetables on a regular basis demonstrates their role in the diets of people, similarly reported in other studies (e.g., Bonet and Valles, 2002; Kala, 2007).

Consumers either purchased the ILVs directly from growers or from markets, or collected them from personally and/or communally owned farm/forest lands within their neighbourhoods (columns 6 & 8). On the average, the greater percentage of the urban households (70%) met their vegetable needs through purchases. This is in contrast to what obtains in the rural communities. For instance, similar surveys conducted in the rural communities of Southeastern Nigeria showed that majority of the consumers (62%) met their ILV needs mainly through collection from personally and communally owned farm/forest lands within their neighbourhoods (Aju, 2014). The average amount of money spent on each vegetable species by each urban household on a weekly basis was N48.67 (column 7). This amounted to total weekly and yearly expenditures of ₦194.68 (US\$ 2.00) and ₦10123.36 (US\$ 60.10) per household.

Table 1: One year averages of weekly consumption patterns and expenditure of indigenous leafy vegetable vegetables by urban households in Southeastern Nigeria

S/N	Scientific Name	No of H.H that consumed	% of H.H that consumed	Mean freq/ week	% of H.H that bought	Expenditure H.H/week (₦)	% of H.H that met their needs from nearby farm/ forest lands
1	<i>Telfairia occidentalis</i>	64	94	3	71	96	30
2	<i>Solanum spp</i>	19	28	2	72	57	28
3	<i>Vernonia amigdalina</i>	43	63	2	66	56	34
4	<i>Talinium triangulare</i>	19	28	2	65	50	36
5	<i>Amaranthus spp</i>	37	54	3	75	67	24
6	<i>Curcubita</i>	2	3	2	66	45	34
7	<i>Murraya koeningii</i>	6	9	2	82	21	18
8	<i>Colocosia antiquorum</i>	1	2	1	----	----	100
9	<i>Corchorus Spp</i>	6	9	2	92	33	8
10	<i>Gnetum africanum</i>	13	19	4	90	101	10
11	<i>Piper guineense</i>	5	7	2	55	46	44
12	<i>Gongronema latifolium</i>	8	12	2	75	26	24
13	<i>Ocimum spp</i>	17	25	2	60	26	40
14	<i>Pterocarpus spp</i>	29	43	2	85	74	15
15	<i>Ficus ovata</i>	2	3	2	----	----	100
16	<i>Celosia argentea</i>	1	2	1	67	15	33
17	<i>Pterocarpus santalinoides</i>	5	7	1	44	41	56
18	<i>Solanum nigrum</i>	3	4	1	60	44	40
19	<i>Solanum Giloraddi</i>	1	2	1	71	31	29
20	<i>Vitex doniana</i>	2	3	1	----	----	100
	Total	281	417	36	1196	829	803
	Mean	14	21	2	70%	49	40%

Source: Field survey, 2007. NB: H.H = Households

Percentage of family's budget for food spent on vegetable purchases:

Table 2 shows that the majority of the urban households (67%) were spending between 1-10% of their family food budget on vegetable purchases. Whereas 17% of the urban respondents claimed that between 11-20% of their family's budget on food went into vegetable purchases, 10% claimed that the percentages lied between 21-30%. The mean percentage family food budget that went into vegetable purchases was found to be 12%.

Table 2: Percentage of households' budgets on food spent on vegetable purchases weekly in urban communities of Southeastern Nigeria

Percentage of Household Food Budget		
	Frequency	Percentage
1 - 10	482	66.6
11 - 20	122	16.9
21 -30	69	9.5
31 -40	37	5.1
41 - 50	10	1.4
51 - 60	4	0.6
Total	724	100.0
Mean		11.5

Source: Field survey, 2007

Indigenous leafy vegetables are a crucial part of a diet of many families and communities in many parts of Nigeria since they can be produced within a short time soon after the onset of rains. They are used in soups, stews, porridges and relishes which accompany the staples consisting

mainly of carbohydrates. The ILVs provide very important contributions to the dietary needs of the people as they provide inexpensive but excellent sources of proteins, vitamins, and minerals. For instance, *Pterocarpus spp* and *Gnetum africanum*, two of the most highly cherished ILVs in the Southeastern part of the country are said to have protein contents of 32 and 30 percent of their dry matter respectively and hence can substitute for meat (MANR, 1976; Spore, 1995). They also play very important medicinal roles. The herbal preparation of *Telfairia occidentalis* for instance has been employed in the treatment of sudden attacks of convulsion, gastrointestinal disorders, malaria and anaemia (54), while *Ocimum gratissimum* is effective in the management of upper respiratory tract infections, diarrhea, headache, skin diseases, pneumonia, fever and conjunctivitis (95). These vegetables are traded in virtually all urban markets in Nigeria. Their relative cheapness in comparison to the other conventional and exotic vegetables as well as their high nutritional and medicinal values make them a highly sought after commodities in this part of the world.

The study brings to the fore the extent of contribution of ILVs to the nutritional wellbeing of urban dwellers. It also identifies species with food security potentials for further research, development, domestication, and commercialization purposes. Two key issues that require urgent intervention are appropriate valuation of the ILVs, and their packaging and preservation during haulage to the points of consumption in urban areas. The ILV are always fresh at the point of harvest (Plate 1) but lose vigour and texture in the course of haulage to the points of consumption. There is also the challenge of huge post-harvest losses.

These challenges call for concerted efforts involving technology, the application of indigenous knowledge and the resource tenure rights contexts to formulate measures that will enhance the efficiency of the value chain of the ILVs. The ILV user groups are frequently also custodians of the knowledge required for ILV conservation: the closer the relationship with the resource, the more robust this knowledge. These relationships therefore, require further research to enhance the sustained contribution of ILVs to food security in the region.



Figure 1: *Fresh Gnetum africanum on display at the village level*

Conclusions

The study has shown that a wide range of ILV species (a total of 20 species) is commonly and regularly consumed in urban households in the Southeastern parts of Nigeria. As a result of a high level of consumption of ILV, large amount of money is spent on their purchase by urban households on weekly basis. Purposeful cultivation in home gardens and commercialization of the ILV species, especially those in high demand by the respondents- such as *Telfairia occidentalis*, *Solanum spp* and *Vernonia species*, are recommended.

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Trade and income generation potentials of African bush pepper (*Piper guineense*, Schum. & Thonn) in tropical lowland rainforests of Southwestern Nigeria

Tajudeen Okekunle Amusa¹

Summary

The African bush pepper (*Piper guineense* Schum. & Thonn) is an important forest vine, which provides a commonly used spice from its dried fruits, while its leaves are used as a vegetable in many countries in the tropical and subtropical regions of the world. In spite of the socio-economic importance of this species, precise data on its contribution to livelihoods of forest dependent people is lacking. Therefore, this study was carried out to investigate the trade and income generation potentials of the species in tropical lowland rainforests of Nigeria. For the questionnaire survey, the "Snowball method" and a simple random sampling technique were used to select harvesters and marketers of the plant in the forests and adjoining markets of Omo and Shasha Forest Reserves, Southwestern Nigeria. Results showed that trade in African bush pepper is dominated by women (harvesters: 67%; marketers: 89%), who were mostly non-native and in the age range 31-50 years. About 56% of the harvesters earned between ₦21,000.00 and ₦30,000 (\$105.00 - \$150.00), contributing up to 40% - 50% of their monthly income. Slightly over a third of the marketers (36%) earned between ₦10,000.00 and ₦20,000 (\$500.00 - \$1,000.00) from these activities, representing 51% - 60% of their total monthly earnings. Respondents' sex, level of education, primary occupation, trading experience and age significantly impacted the level of income generated from product sales. The study showed that, to further enhance the benefits from harvesting and marketing, the domestication and integration with traditional land use systems of African bush pepper requires urgent attention.

Introduction

Around the world, harvesting of non-timber forest products (NTFPs) from natural forests is a traditional livelihood practice of communities inhabiting the forest areas (Ahenkan and Boon, 2010). However, the last few decades have seen the commercialization of NTFPs being widely promoted as a means to the sustainable development of tropical forest resources. A prime justification for this is based on the economic outcomes that commercial exploitation of NTFPs could add to the value of standing forests, and thereby stimulating their conservation (Nkwatoh, 2005). Yet, several authors have declared that promoting NTFP harvesting does

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not necessarily lead to forest conservation given that the extraction of NTFPs can cause significant ecological impacts (Ticktin, 2004; Kusters, 2009). But besides the ecological effects of harvesting NTFPs from natural forests, the dearth of information on the production, marketing and utilization pattern of many NTFPs is a major problem militating against their sustainable management and potentials to contribute to forest conservation. This is true for many products within the tropical lowland rainforests, and one of such is the African bush pepper (*Piper guineense*, Schum. & Thonn).

The African bush pepper is an important forest vine belonging to the family Piperaceae in the order Piperales (Hutchinson and Daziel, 1958). The genus *Piper* is widely distributed throughout the tropical and subtropical regions of the world. The West African species of *Piper*, *Piper guineense*, is known as: West African pepper, Ashanti pepper, Benin pepper, false cubeb, Guinea cubeb or Guinea pepper. In Nigeria the local names are: mfri (Efik); uziza (Igbo); adusa (Ibibio); masooroo (Hausa); and iyere (Yoruba). The plant is mostly collected from the wild, but sometimes the species is cultivated on farms and in home gardens. The species provides two main products; the spicy fruits used as a condiment and the leaves used as an aromatic additive to soup. Both products have local and international market potentials (Termote *et al.*, 2012).

The culinary, medicinal, cosmetic and insecticidal uses of the African bush pepper have been reported (Okwute, 1992). The leaves are considered aperitive (having a stimulating effect on the appetite), carminative (expelling gas from the body; relieving flatulence) and eupeptic (aiding good digestion). They are also used for the treatment of cough, bronchitis, intestinal diseases and rheumatism (Sumathykutty *et al.*, 1999). There is a growing demand on the African bush pepper owing to its being used for a variety of purposes (Amusa *et al.*, 2014). However, despite the importance of this forest vine, precise data on its contributions to livelihoods of forest dependent people in the tropics is lacking. Therefore, this study was carried out to investigate the trade and income generation potentials of *Piper guineense* in tropical lowland rainforests of Southwest Nigeria, with a view to promoting the use and sustainability of this valuable forest resource.

Methodology

The study was conducted within and around Omo and Shasha Forest Reserves, Southwestern Nigeria (Figure 1). Although, there is significant variation in climate, soils and market access, the two forests are tropical lowland forests with a common history. The reserves are subject to heavy use and the population density is high. They are both important for the collection and trade in African bush pepper. The Snowball method (Marshall *et al.*, 2006), in which one respondent provides the name and contact of another, and a simple random sampling technique were used in the study to select harvesters and marketers of the plant in the

forest reserves and adjoining markets. All the eleven (11) harvesters involved in the product extraction and a total of sixty four (64) respondents among the marketers were interviewed using a structured questionnaire. Information was collected on product harvesting, distribution channels, units of marketing and pricing, influence of seasonality on product availability, and percentage contribution of the product to household income. The information obtained through the interviews was complemented with participant observation in the field.

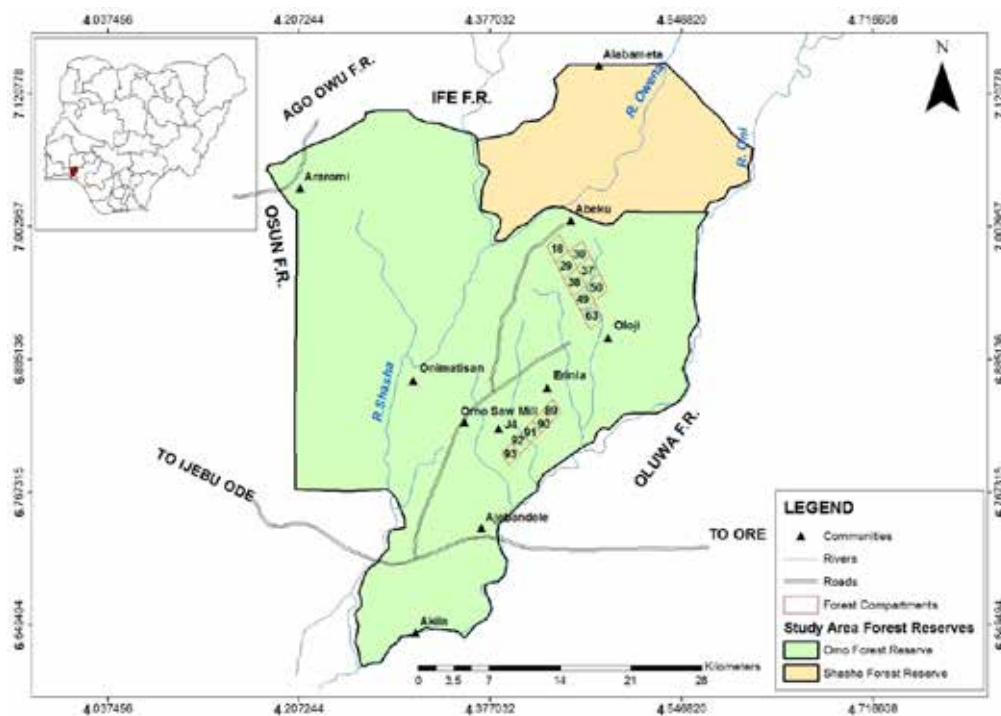


Figure 1: Omo-Shasha Forest Reserve Complex

Results

The harvesting and marketing of African bush pepper were found to be undertaken by different ethnic groups including Efik, Ibo, Ibibio, Hausa and Yoruba. The Hausa (33%) and the Ibo (33.3%) dominated in the harvesting phase, while the Yoruba (who are the natives) represented the largest proportion (36%) of respondents among marketers. All the harvesters (100%) were immigrants, and only 17% of marketers were native to the region of the survey. This shows that outsiders are raising the status of harvesting the plant from being a customary subsistence activity among the natives, to a commercial endeavour with local and international market potentials. Trade was found to be dominated by married people (harvesters:- 78%; marketers: 100%), who were largely women (harvesters:- 67%; marketers: 89%), indicating the socio-economic potentials of trade in the products in terms of increase of income and diversification of livelihoods. The modal (most frequent) age category was 41-50 years (45%) among harvesters, while most marketers (43%) were in the age range of 31-40 years. The modal household size among harvesters was 6 (67%), while for marketers it was 5 (53%). The majority of the harvesters and marketers (harvesters: -45%; marketers:-70%) had First School Leaving Certificate (primary education) as their highest level of education. They (harvesters: 56%; marketers: 51%) also had substantial trading experience in the product (an average of 6 years).

Harvesting, processing and marketing of African bush pepper products

The African bush pepper is harvested for its leaves and seeds. The Ibo and Efik are involved in leaf harvesting, while the Hausa group focus on harvesting of the fruit/seeds. Both the leaves and seeds have high marketing preferences among the different ethnic groups, thus highlighting their commercial potentials. The leaves are consumed as a vegetable. They are also used in the treatment of cough and pneumonia. The seeds are used as a flavouring and spice in food, as well as an additive/food preservative. The stem is further used in the preparation of a hot-water-based yam delicacy (a local dish among the Ibo and Efik ethnic groups). Harvesters of African bush pepper commonly reside in enclaves or camps within the forest reserves. The plant is common, and has fresh leaves during the rainy season, while dryness of the leaves during the dry season negatively affects harvesting and marketing of the product as vegetable. Conversely, for the Hausa group

who mainly deals with fruit and seed extraction, harvesting is done during the dry season between December and February to coincide with the fruiting period. This tendency to have two annual harvests is clearly a problem for the plant in terms of sustainability. Besides, it also suggests the possibility of potential conflict between the Hausas and the Ibibio/Efik, since both are destructive in their harvesting approach. As the species is a climber, harvesters often cut the plant at the base and pull it down. The leaves are thereafter gathered into bunches and taken to neighbouring markets, including markets in other States. The seeds, on the other hand, are extracted and dried before being taken to the local markets. The unit for measurement of the African bush pepper when harvested for its seeds is a milk tin and *kongo*. A milk tin of the product weighs approx. 89g and is sold at ₦300.00 (\$1.50) while a *kongo* weighs about 715g and is sold for ₦2,000.00 – ₦2,500.00 (\$100.00 - \$125.00). Marketers further used transparent nylon stockings as packaging to sell the product in ₦20.00 and ₦50.00 units. Marketers often grind the pepper into powder form before selling to the final consumers. Table 1 shows the average retail price for the seeds during the rainy and dry seasons.

Table 1. Average retail price for seeds of African bush pepper during the rainy and dry seasons

Year	Price per Kilogramme (N)	
	Rainy season	Dry season
2009	3,400.00	3,200.00
2010	3,500.00	3,400.00
2011	3,600.00	3,500.00
2012	4,000.00	4,200.00
2013	4,400.00	4,200.00
2014	4,400.00	4,300.00

Contribution of product sales to household income

The average sales per month for the fruits of African bush pepper ranged from 21kg– 30kg (44% of respondents) and 31kg– 40kg (56% of respondents). For marketers, the average sales ranged from < 10kg (17%), 11kg–20kg (40%), 21kg–30kg (28%) and 31kg–40kg (218%) per month. Just over one-half of the harvesters (56%) generated between ₦21,000.00 (\$105.00) and ₦30,000 (\$150.00), while about 36% of the marketers generated incomes between ₦10,000.00 (\$500.00) and ₦20,000 (\$1,000.00) per month (Figure 2). The average percentage contribution of product sales to respondents' household income ranged from 31%-40% (33% of respondents), 41%-50% (56% of respondents) and 51%-60% (11% of respondents) for harvesters. For marketers, the average percentage contribution of the product to household income ranged from 31%-40% (23% of respondents), 41% 50% (32% of respondents) and 51%-60% (45% of respondents (Figure 3). Respondents' sex, level of education, primary occupation, trading experience and age significantly impacted the level of income generation from product sales.

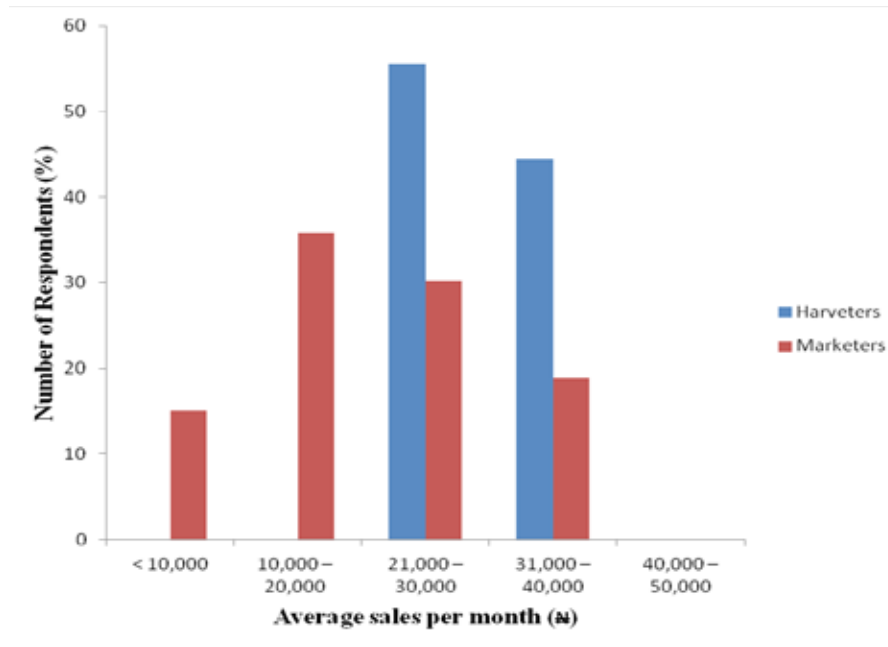


Figure 2: Respondents' sales per month (₦) for African bush pepper

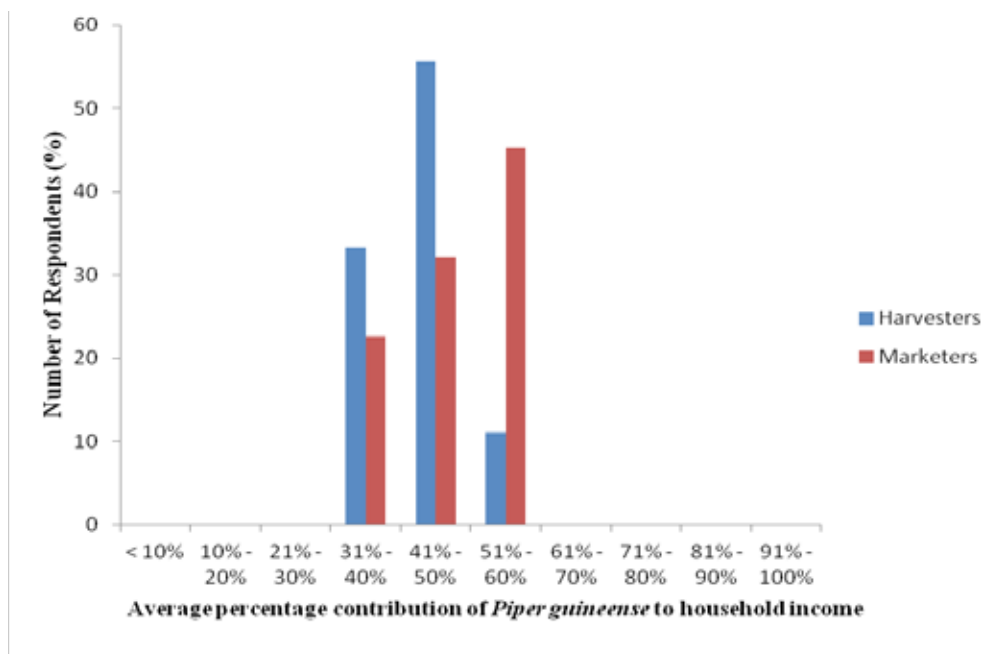


Figure 3: Percentage contribution of African bush pepper to household income

Conclusion

The evaluation of trade and income generation potentials of the African bush pepper has shown that incomes based on products harvested from the species vary widely, but remain a substantial proportion of the total household incomes of respondents. This is especially important for the women in terms of increase of income and diversification of livelihoods. From the status of being a customary subsistence activity among the natives, harvesting of African bush pepper by outsiders within southwestern Nigeria has raised the status to that of a product with local and international market potentials. Nonetheless, to further enhance the benefits from the harvesting and marketing of African bush pepper, action in the domestication of the species and its integration in traditional land use systems require urgent attention. This is based on concern for the sustainability of wild harvest from the natural forests. The widespread degradation and increasing pressure on tropical lowland rainforests in Nigeria and across the West African region, increases this urgency.

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Impact of anthropization and climate change on natural resources in North Africa: The case of the Nesmoth cork oak forest in northern Saida Mounts (Western Algeria)

Nasrallah Yahia¹ and Kefifa Abdelkrim²

Wildlife in North Africa is made up of numerous species valuable as genetic resources including some that constitute speciation at global level. The combined action of anthropogenic and climatic factors has considerably affected that wealth. Some species are found in near-extinction natural situations. The Forestry administration that manages these landscapes should develop them using a participatory and partnership approach based on negotiation and consultation with local actors (local elected officials, foresters, pastoralists, riparian populations) to reduce these risks.

Introduction

Forests in the Mediterranean basin constitute a global showcase for nature conservation that regroups almost 10% of the flora on 1.5% of the earth's surface area. Forests in North African countries are part of that region and play a strategic socio-economic and environmental role. Two thousand years ago, the forest cover stretched almost uninterrupted over the entire North Africa, from the Atlantic Ocean in the west, to the Libyan Desert in the east, and from the Mediterranean in the north, to the foothills of the Atlas in the south. According to Trouessart (1905), North Africa hosts wildlife species similar to a number of those that inhabited Europe during the Quaternary era (e.g. hippopotamus, rhinoceros, lion, leopard, hyena, boar, warthog, bear and stag).

The gap analysis conducted by WWF (2001) considers that the original forest cover represented about 82% of the total surface area of Mediterranean countries. Currently there remains only 17% of this forest heritage often considered as profoundly degraded in the countries of the south. However these environments and forest biotopes and the extraordinary biodiversity of Maghrebien forests are in danger under the impact of climate change on the one part, and the combined effect of man and his herds on the other part. A significant share of this natural capital (estimated at 25% of the species) would undoubtedly not be able to migrate or adapt to these changes and is threatened with extinction (M'hirit, 1999). Even if several actors agree that

the North African forest heritage still holds genetic resources that need to be efficiently managed from a conservation and utilization standpoint (Harfouche *et al.*, 2005; Quezel and Médail, 2003), would the current management methods be in a position to save these resources? This modest contribution attempts to provide some elements of response through the concrete example of the Nesmoth forest³. Actually this forest located in the Mascara Province (western Algeria) was initially well endowed and covered a surface area of 6,490 ha. This cork oak forest is faced with multiple pressures. Its continuous regression is the result of a combination of historic, socio-economic, silvicultural and natural factors. A sound and participatory management should seek to restore the balance between man, livestock and forest while mitigating the pressure on the environment.

I. Materials and methods

This contribution is based on the development of climatic factors, the land use typology and the calculation of some anthropogenic indexes:

1. Series of average temperatures and precipitations during the 1927-1938 period (Seltzer, 1946) and 1986-2006 period (ONM, 2009) are compared based on the Bagnouls and Gausson Ombrothermic Diagram to show the regressive evolution of the climate.
2. The development of a typology for the Nesmoth Cork oak forest is based on a satellite image of the Landsat ETM scene dated 18/01/2010 (Path 197 Row 036) that was calibrated and corrected from atmospheric effects using the ENVI 4.7 application. The RGB false color colored composition (Band4, Band3 and Band2) was developed to obtain a unsupervised classification in 10 classes. We then used the MAPINFO 8.0 application and the Vertical Mapper to obtain the Digital Field Model (MNT) of the area studied to realize various maps (slopes, hypsometric exposures). This map enables to know the distribution of the dynamics of spaces.
3. The demographic, agricultural and livestock data originating from DPAT (2009) are used to calculate the various man-made indexes.

II. Results and interpretations

The comparison of climatic data for the 1927-1938 period (Seltzer, 1946) and the 1986-2006 period (ONM, 2009) clearly shows a decrease in the rainfall and an increase of the dry period (fig. 1).

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³ This work is a contribution to the sustainable development of a former cork oak forest. This periurban forest is currently subjected to a strong pressure in view of its location and the demographic evolution of the population. The entire wildlife and specific flora species are threatened. The lack of a management plan and the priorities selected expose this beautiful and privileged forest to conflicting utilizations that threaten to destroy the forest. It is conducted between 2010 and 2012 after consulting with local populations and authorities.

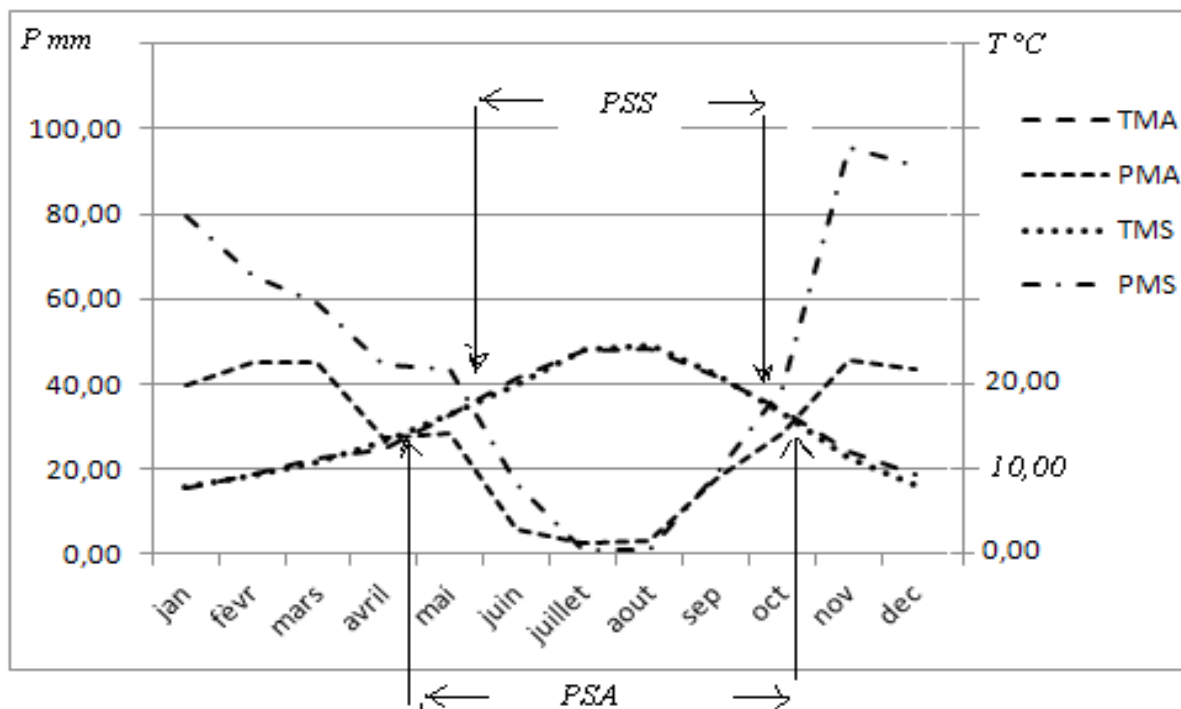


Figure 1: Evolution of the dry period at the Nesmoth forest based on the Bagnouls and Gausson Ombrothermic Diagram between 1927-1938 and 1986-2006. Seltzer's 1927-1938 PSS period (1946), and the 1986-2006 PSA period (ONM, 2009). TMA: Current average temperature, PMA: Current average rainfall, TMS: Average Seltzer's temperature (1946). PSS: Seltzer's Dry Period. PSA: Current Dry Period.

At the level of forest ranges, the size and number of herds is often hard to ascertain. In our case, the surface area available by unit of livestock estimated at 1.7 ha shows the importance of the animal burden on forest fodder resources. According to DPAT (2009), the number of livestock units is 25,451, and their needs amount to 7,633,300 fodder units. Theoretically, to meet these requirements, there is a need for 58,000 ha, that is 8 times the current surface area. Agricultural lands are decreasing as the population increases (Table 1).

The vegetation map shows that oak trees occupy the higher parts and resinous trees the lower parts, with many degraded and bare lands. A reduction in the initial surface area of the cork oak followed by the uncontrolled increase of farmlands (11%), as well as a progression of the Kermes oak and lentisk maquis (48% of the surface area (fig. 2)). According to local foresters, this uncontrolled anthropization has an adverse impact on all forest services and products.

Table 1: Link between the population and natural resources

Density/Inhabitant/km ²	Availability/resource/household			Availability Surface area/livestock unit		
	SAU (ha)	Livestock unit (1 sheep = 1 goat = 1/4 cattle)	Forest area (ha)	Total area (ha)	Total area plowed	Forest area (ha)
41	7.72	8	2.50	1.70	0.92	0.31

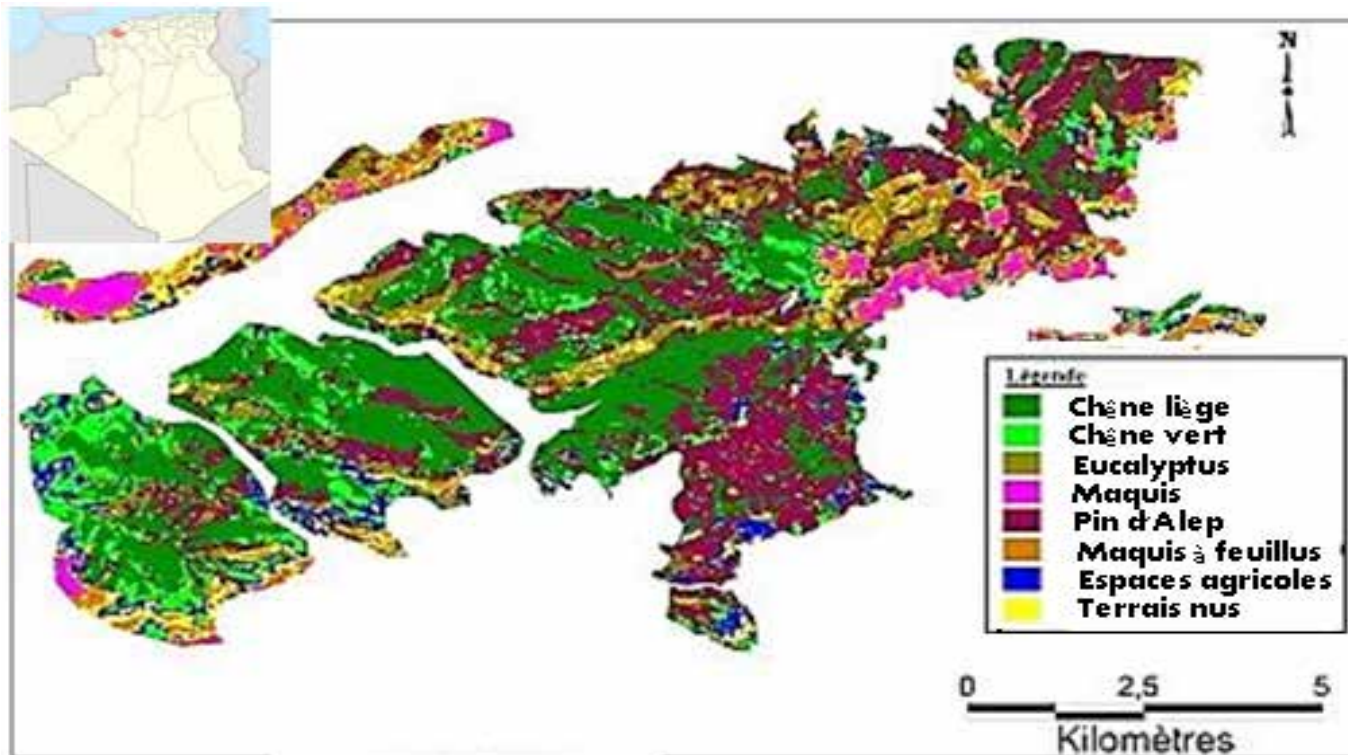


Figure 2: Nesmoth forest Land use map showing the evolution of the scrub-forest and non forested areas at the expense of forests

III. Discussion and conclusion

This summary shows how climate analyses associated with satellite images and data on populations are important in decision making for sustainable ecosystem management. The combined effects of environmental degradation factors, resulting from the strong anthropogenic pressure caused by the expansion of farmlands, forest fires (100 ha in 1994) and overgrazing, lead to a regression of the forest ecosystem, weakening it and depleting its biodiversity (Abourouh *et al.*, 2005; DPAT, 2009). This forest landscape is a site of potential conflicts claimed by a multitude of actors. Only the agrosilvopastoral development and participatory management covering the uses and interests of local populations, and associating forest-wildlife to human needs, can reduce the current pressure on the environment and ensure its sustainability. To that effect, public authorities should delegate part of the task of protecting natural resources, conserving wildlife and developing ecotourism to civil society bodies.

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A Sub-Regional strategy in response to the bushmeat crisis in Central Africa

Jean-Claude Nguingiri¹

Overhunting for bushmeat in Central Africa has become a major concern and threatens both the biodiversity and food security of the populations that rely on wildlife for subsistence. In response to that concern, Central African countries have formulated a sub-regional strategy that will serve as a guiding document and framework to streamline policies and legislations in the area of sustainable use of wildlife by the indigenous and local communities. This strategy was developed using a participatory methodology which recognizes the rights of indigenous and local communities to become the true managers of wildlife resources. The sub-regional strategy was adopted in January 2015 by COMIFAC Council of Ministers. Internalizing the strategy constitutes a new challenge.

Introduction

Each year, about five million tons of bushmeat are consumed in Central Africa (Fa *et al.*, 2003). These generally originate from an illicit and unsustainable exploitation of wildlife. Overhunting is currently practiced in some areas and constitutes a severe threat to biodiversity as it leads to the scarcity and local disappearance of some vulnerable species (Bennett and Robinson, 2000). The “empty forest syndrome” is gradually becoming a reality. In these conditions, hunting has an impact not only on the target species but also on the entire ecosystem. Since most of the hunted species are disseminators, their disappearance will inevitably affect the biodiversity by modifying the plant and natural regeneration dynamics (van Vliet *et al.*, 2011), or by adversely impacting predator populations.

For a long time, the bushmeat crisis was addressed by enforcing the law on wildlife and anti-poaching operations, promoting alternatives to hunting and environmental education. This approach in itself has shown its limitations as it did not lead to an outright ban on the consumption or illicit trade of bushmeat. Today, the solution is no longer envisaged from the limited angle of enforcing laws and regulations, but through a holistic approach of the sustainability of hunting (Christophersen and Nasi, 2008). This new approach would have the advantage of simultaneously promoting biodiversity conservation, food security and the improvement of livelihoods among the populations that rely on wildlife for survival.

Central African countries did not remain on the sidelines

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of this conceptual change. A sub-regional strategy for the sustainable use of wildlife by the indigenous and local communities in COMIFAC countries was developed in 2014 and adopted by the Council of Ministers of the Central African Forest Commission (COMIFAC). In this article, we present this strategy, its development process and its foundation in international commitments.

Development of the sub-regional strategy: a participatory process

The sub-regional strategy for the sustainable use of wildlife by indigenous and local communities in COMIFAC countries has been developed with the support of the “Sustainable management of wildlife and the bushmeat sector in Central Africa” Project. A participatory approach was used as the preferred methodology. The strategic choices were not to be prescribed by a consultant but developed through dialogue and consultation among the various stakeholders. The guidebook on how to develop an efficient forest policy (FAO Study: Forests 161, 2010) served as a guiding document during the planning phase. The Project served as a process facilitator to mobilize the recipients of decisions and the decision makers in order to identify together the strategic objectives and choices through dialogue and negotiation. The strategy was built in stages: (i) analysis of the situation and development of the first draft of the strategic framework during a sub-regional workshop held in January 2014 in Brazzaville; (ii) review of the draft strategic framework by the COMIFAC Sub Working Group on Protected Areas and Wildlife (SGAPFS) in February 2014 in Libreville, (iii) large consultation on the first draft of the strategy paper; (iv) review and validation of the second draft by the SGAPFS in November 2014 in Kigali; (v) review and approval of the third draft by the COMIFAC Council of Ministers in January 2015 in Bujumbura.

Participation is definitely not an empty word as the Project tried, as much as possible to involve all the categories of stakeholders, both during sub-regional or national workshops and during the large consultation that enabled several international and sub-regional organizations to make their voice heard. The large consultation also enabled the indigenous and local communities, especially in the project pilot sites, to express their views on the strategic choices. In practical terms, these strategic choices have been often reviewed, sometimes thoroughly by slashing here and regrouping there after debates between the stakeholders.

The scope of the sub-regional strategy constituted the first stumbling block. Conservation NGOs especially did not consider it feasible, in the context of the Project, to formulate a sustainable management strategy for wildlife as a whole. It was therefore agreed to restrict the scope of the sustainable strategy for wildlife use by the indigenous and local communities in order to improve their livelihoods.

The first draft of the strategic framework composed of eight strategic areas and produced during the first sub-regional workshop was thoroughly reviewed by the SGAPFS. It was amended by integrating the guiding principles and by halving the number of strategic areas. These modifications were accepted by all following extensive discussions.

The key lesson from the facilitation of that process relates to the increasing legitimacy of the debates on bushmeat, namely responses based on the sustainability of hunting. A few years ago, such a process would have been subject to all manner of accusations because it runs contrary to the prevailing line of thinking. The simple mention of the sustainability of hunting as a response to the bushmeat crisis would have been perceived as an affront to common decency. The subject was such a taboo that it was scarcely addressed at that level for fear of opening up the way to poaching and the illicit trade in wildlife products in a context dominated by corruption and bad governance. By legitimizing the bushmeat debate, stakeholders have been able to discuss peacefully and without any ulterior motive. All the possible options have been considered including the legalization of bushmeat trade to ensure reliable information and value chain control.

The strategic framework: options to ensure sustainable hunting

The strategic framework is guided by a vision that contributes to the 'dream' of having emerging countries by 2025, a dream shared by several countries in the sub-region. To fulfill this dream, the strategy is structured around two pillars: the establishment of framework conditions to ensure the sustainability of hunting and the development of responsible practices. Each pillar is supported by two strategic areas that are in turn divided into outcomes. The strategic framework is presented in Table 1.

Table 1. Strategic Framework

Vision: "By 2025, the sustainability of wildlife resources is ensured with the involvement of indigenous and local communities in order to contribute to improving their living conditions and developing the national economy"			
Overall Objective: Contribute to the sustainable use of wildlife resources to improve the livelihoods of indigenous and local communities.			
Specific Objective 1: Ensure the sustainability of wildlife resource samplings.		Specific Objective 2: Improve the livelihoods of indigenous and local communities	
Strategic Area 1.1 Research and knowledge management	Strategic Area 1.2 Technical policies, laws, regulations, institutions and standards	Strategic Area 2.1 Advocacy, enhancement of wildlife products value chains and other alternative products	Strategic Area 2.2. Community wildlife management
<p>Outcome 1: Environmental knowledge, including traditional knowledge on the main wildlife resources are documented and accessible</p> <p>Outcome 2: Techniques of wildlife resources inventory, hunting areas management, wildlife products domestication and enhancement are developed.</p> <p>Outcome 3: The statistics on the bushmeat value chain and traditional knowledge are regularly published by the countries and shared in the sub-region.</p>	<p>Outcome 1: The policies, laws and institutions governing wildlife are revised and enforced using a participatory approach and taking into account the rights of stakeholders, especially indigenous and local communities.</p> <p>Outcome 2: The new procedures regarding the enforcement of laws and regulations and the empowerment of indigenous and local communities are developed.</p> <p>Outcome 3: Regulations on bushmeat trade are prepared, adopted and applied.</p>	<p>Outcome 1: The products of the bushmeat value chain are enhanced and promoted.</p> <p>Outcome 2: The alternative sources of proteins and incomes are diversified, promoted and/or developed.</p> <p>Outcome 3: Incentives to promote the domestication of some wildlife species are adopted and applied.</p> <p>Outcome 4: Institutions specializing in quality control and monitoring of the "One Health" concept of wildlife products are promoted.</p> <p>Outcome 5: Entrepreneurial capacity in vision tourism and game tourism are strengthened.</p>	<p>Outcome 1: Community hunting grounds are delimited and allocated to indigenous and local communities.</p> <p>Outcome 2: Activities in community hunting grounds, the rights and responsibilities of indigenous and local communities are governed by laws and regulations that have been disseminated;</p> <p>Outcome 3: The strengthening of local and indigenous communities' capacity in community management of hunting grounds, sustainable management, conflict management, negotiations skills, community hunting grounds monitoring of, etc. is conducted.</p>

Crosscutting issues common to the four strategic areas have been addressed in the form of guiding principles. Six have been identified, namely (i) governance, (ii) participatory management, (iii) Gender; (iv) communication, education and public awareness; (v) training; and (vi) access to and sharing of benefits accrued from the use of wildlife resources.

This strategy has the particularity of basing on the commitments made at international level to respond to the bushmeat crisis. It contributes for example to Decision UNEP/CBD/COP/12/L.13 recently taken in October 2014 by the Conference of the Parties (COP) to the Convention on Biological Diversity (CBD). Through Strategic Area 1.2, Central African countries recognize the rights of indigenous and local communities to use wildlife for subsistence purposes. They undertake to adopt policies and to put in place regulatory frameworks that strengthen the capacity of indigenous and local communities to exercise their rights to fulfill their responsibilities in the area of sustainable wildlife management. Thus, the sub-regional strategy contributes to Articles 9, 10 and 11 of this Decision. Strategic areas 2.1 and 2.2 refer to the sustainable use of wildlife for subsistence purposes through the community management of wildlife and the enhancement of wildlife products value chains. They contributed to the establishment of integrated sustainable wildlife management programmes as recommended by Article 12 of the Decision.

Conclusion

The objective of the COMIFAC sub-regional strategy is to achieve the sustainable use of wildlife in order to meet the nutritional, cultural and socio-economic needs of indigenous and local communities. Through this strategy, Central African countries can boast of having been the first to take concrete measures to implement Decision UNEP/CBD/COP/12/L.13 taken at the twelfth meeting of the Conference of the Parties to the Convention on Biological Diversity. This strategy represents a first achievement; the greater challenge for the coming years is its internalization at national level through policies, laws and regulations and supervisory actions of indigenous and local communities. To that effect, to avoid this sub-regional strategy becoming just another strategy, COMIFAC should appropriate the call by the Conference of the Parties to other governments and to relevant organizations to strengthen their financial and technical support to developing countries (Article 5 of Decision UNEP/CBD/COP/12/L.13). It would be useful to put in place a mechanism to monitor this strategy within the framework of the SGAPFS meetings; each country should produce a report on the progress made in achieving the sustainable use of wildlife by indigenous and local communities.

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A toolbox for human-wildlife conflict management in Central Africa

Lena llama¹

Summary

Cohabitation between humans and wildlife in the forests, village lands, farming land and protected areas leads to increasingly frequent conflict situations in Central Africa. However, there is a lack of adapted tools to assist local communities in managing these conflicts. In response to that demand, a toolbox adapted to the Central African context has been produced. It provides users with a series of tools to analyze the problem and a set of 45 practical solutions. To guarantee the adaptability of the toolbox, a monitoring system through Smartphones was put in place.

Introduction

Recurring human-wildlife conflicts (HWC) in Central Africa are a major concern as they severely affect food security, the safety and wellbeing of local populations, but also wildlife conservation efforts. Managing human-wildlife conflicts has thus become a new challenge in preserving wildlife species. In view of the adverse socioeconomic impacts, the Central African Forestry Commission (COMIFAC) has prioritized HWC with the objective of developing approaches and tools to mitigate these conflicts. To that effect, several actions have been initiated both at sub-regional and national level. COMIFAC thus adopted a regional human-elephant conflict management strategy developed with the technical support of the *Réseau des aires protégées d'Afrique centrale*² (RAPAC). Gabon has also developed a national strategy and action plan to manage human-wildlife conflicts which was adopted during a Council of Ministers in October 2012.

Despite these advancements at strategic level, the lack of tools and poor technical capacity compromise the implementation. Consequently, COMIFAC and the Central African Protected Areas Network (RAPAC) called for FAO's and CIRAD's (International Cooperation Centre of Agricultural Research for Development) expertise to produce a human-wildlife conflict management toolbox. This article presents the toolbox³, the development process and the HWCs monitoring mechanism through Smartphone.

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² Central African Protected Areas Network

³ The Toolbox is downloadable at: <http://ur-bsef.cirad.fr/produits-et-expertises/produits/boite-a-outil-bo-CHF>

1 - HWC toolbox Development Process

The development of the toolbox was initiated during the sub-regional workshop aiming to assess the training needs in HWC management in Central Africa. Following that workshop held in November 2012, it was decided to adapt the toolbox developed for Southern Africa to Central Africa with the assistance of FFEM (*Fonds français pour l'environnement mondial*⁴) and BIO-HUB Trust. A roadmap was formulated and a sub-regional working group made up of volunteers was put in place. That working group was tasked with providing the missing information, contributing to the construction and validation of the prototype toolbox, helping to choose pilot sites and testing its use in these sites. The roadmap has three steps:

- Production of the toolbox based on the Southern Africa toolbox;
- Tests in the pilot sites in the sub-region;
- Completion of the toolbox based on the tests results.

The development of the toolbox was a team effort coordinated by FAO. The first draft was produced by CIRAD and the NGO Awely. It was presented to the working group at the second workshop in April 2014 in Libreville. During that workshop, the five handbooks of the toolbox were subjected to a critical review.

The test phase was conducted from May to September 2014 in collaboration with WWF, WCS, RAPAC and ANPN on 11 pilot sites distributed in 4 countries in the sub-region: Angola, Cameroon, Congo and Gabon. The observations made on the sites were addressed in the production of an improved version of the toolbox. The latter was officially presented to the Sixth World Parks Congress in Sydney in November 2014. The toolbox was presented and submitted to the beneficiaries during a last workshop held in Douala in December 2014. During that workshop, the participants exchanged on the follow-up to the process. The following actions were selected: (i) create a group of HWC experts under the COMIFAC sub working group on "Protected Areas and Wildlife"; (ii) disseminate the toolbox in all COMIFAC member countries; (iii) establish a HWC monitoring system based on the android application KoBoCollect which offers an interesting option for the collection and transmission of information in real time.

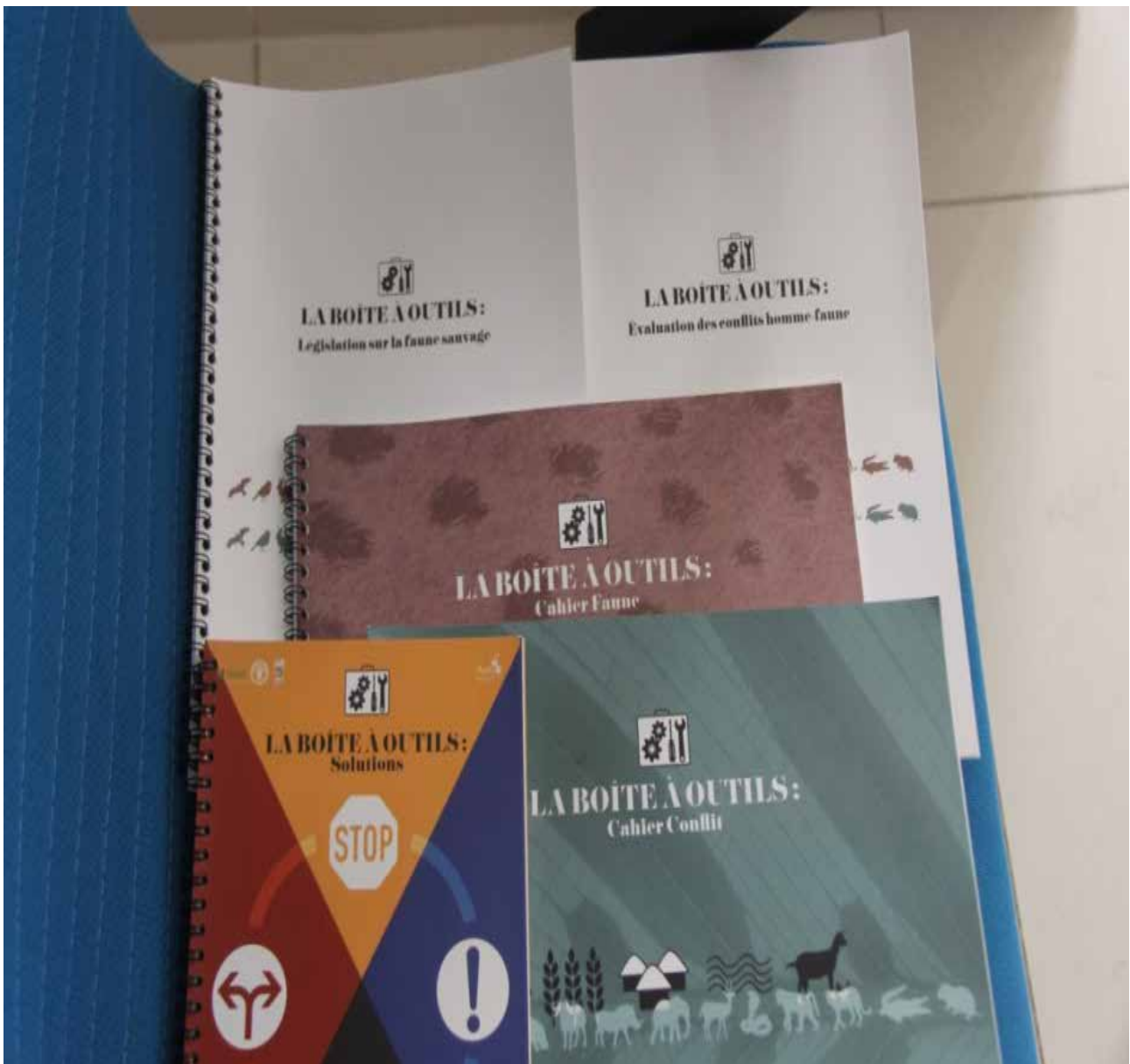
2 - Presenting the HWC Toolbox

The Toolbox is a set of five (5) thematic illustrated handbooks proposing a conceptual and practical process for the participatory management of human-wildlife conflicts. Its design is user-friendly. The five thematic handbooks are illustrated and assembled in a handbag.

1. The Wildlife Handbook presents a list of 17 problem species or groups of problem species, with the elephant leading the pack;

⁴ French Global Environment Facility

2. The Conflict Handbook presents the 4 main categories of conflicts caused by wildlife (i) agriculture; (ii) villagers' health and lives; (iii) life in the village; (iv) livestock; and (v) access to water;
3. The Solution Handbook regroups a range of 45 practical solutions intended to (i) prevent conflicts; (ii) prevent access to wild animals; (iii) repel wild animals; and (iv) remove the most dangerous animals;
4. The Legislation Handbook adapted to each national context provides information on the actions allowed in case of conflicts with wildlife.
5. The Evaluation Handbook proposes a HWC monitoring-evaluation strategy.



The handbooks of human-wildlife conflicts (HWC) Management Toolbox in Central Africa



Handbag of human-wildlife conflicts (HWC) Management Toolbox in Central Africa

As a technical management instrument, the HWC Toolbox strengthens the efforts by the States to research solutions to this growing phenomenon. This tool enables to address the various technical and legislative aspects for the prevention and mitigation of HWCs. However, the toolbox should be adapted to the rural communities to facilitate their involvement and empowerment in HWC management.

3 - Monitoring HWCs using Smartphones

Sharing information and experiences is an essential resource to prevent and mitigate human-wildlife conflicts (F. MADDEN, 2006). In that vein, it was envisaged to put in place a *monitoring system* using Smartphones to collect, manage and inform with the data originating from the observation of human-wildlife conflicts. The collection is done by entering data directly on a form integrated in an application on the phone or on a printout. Then, the data is sent from the phone to the server centralizing all the information collected (sending through a Wi-Fi spot or via the mobile telephone network). The information can be consulted everywhere and at any given time.

The monitoring system via Smartphone was just launched in Yaoundé in April 2014, with the support of CIRAD, FAO, RAPAC and the *Observatoire des forêts d'Afrique centrale* (OFAC). A Smartphone application for monitoring HWCs called Kobocollect was developed based on the Kobo Toolbox application. The innovation of this application is in the improved entry of data online or offline. It also uses audio/photo/video platforms to optimize information and data processing. Through the automatic or manual recording of GPS points, results are restituted in a map format, thus enabling the location of conflicts areas. The encrypted access (login and password) to the data protects the information. Kobocollect is innovative in managing HWCs through its user-friendly features, its precision through geolocation of the collection area, and its simplified data entry.

This monitoring system is being tested in about thirty HWC observation sites distributed in six countries: Cameroon, Congo, DRC, Central African Republic, Gabon, Chad and Equatorial Guinea. The data collected will be hosted on the OFAC server which will also process, analyze and disseminate them. In the future, a network to exchange information between HWC managers will be developed. This new tool will help managers to guide and develop adapted measures to mitigate human-wildlife conflicts.

Conclusion

Managing human-wildlife conflicts remains a pressing issue. While addressing the International Conference on the Illegal Exploitation and Trade in Wildlife and Forest Products of Africa held in Brazzaville in April 2014, the Prime Minister of Gabon, Ona Ondo, announced that his country was organizing an international forum on human-wildlife conflicts. The political will is indubitable and was actually clearly expressed in the various strategy papers. With the production of the Toolbox, now is the time to assist local communities in defining action plans for the management of human-wildlife conflicts at local level and to make good use of the tools available in order to establish sound bases for a beneficial cohabitation of humans and wildlife.

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IITA, UCLA Partner on Congo Basin Research

The International Institute of Tropical Agriculture (IITA), a member of the CGIAR Consortium, and the University of California Los Angeles (UCLA) have established a new research facility in Cameroon, the Congo Basin Institute, which aims to address challenges of food and water security, climate change, biodiversity loss, public health and emerging diseases with focus on the Congo Basin. *Read more by following this link on IISD website:*

Culled from International Institute for Sustainable Development (IISD) website: <http://nr.iisd.org/news/iita-ucla-partner-on-congo-basin-research/>

African Development Bank Launches Payments for Ecosystem Services Report

The African Development Bank (AfDB) has released the first report, titled "Payment for Environmental Services: A promising tool for natural resources management in Africa," of an AfDB-Climate Investment Funds (CIF) knowledge series that will gather and share initial lessons in implementing and financing green and inclusive growth projects in Africa

Find the full piece at: [http://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/Payment_for_Environmental_Services - A promising tool for natural resources management in Africa - 06 2015.pdf](http://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/Payment_for_Environmental_Services_-_A_promising_tool_for_natural_resources_management_in_Africa_-_06_2015.pdf)

The rise of Africa's super vegetables

Long overlooked in parts of Africa, indigenous greens are now capturing attention for their nutritional and environmental benefits.

Full article available on-line at: http://www.nature.com/news/the-rise-of-africa-s-super-vegetables-1.17712?WT.ec_id=NATURE-20150611

Source: Nature Vol. 522, pages: 146–148.

2015 African Ecological Futures report

For information on the above report, visit: <http://www.afdb.org/en/news-and-events/article/african-ecological-futures-2015-report-now-available-14295/> and <http://nr.iisd.org/news/afdbwwf-report-examines-what-africas-economic-success-means-for-its-ecological-future/>

CBD, WHO Report Discusses How Biodiversity Protection Benefits Human Health

The Convention on Biological Diversity (CBD) and the World Health Organization (WHO) have produced a *report on biodiversity and health* that shows the significant contribution of biodiversity and ecosystem services to improved human health. The report, titled "*Connecting Global Priorities: Biodiversity and Human Health*," which was launched during the 14th World Congress on Public Health, in Calcutta, India, outlines the ways that the conservation and sustainable use of biodiversity positively impact human health.

The book is published as a news item at: <http://biodiversity-l.iisd.org/news/cbd-who-report-discusses-how-biodiversity-protection-benefits-human-health/>

Also shared by: <http://unjobs.org/themes/biological-diversity> AND again by <http://biodiversity-l.iisd.org/>

Reorienting land degradation towards sustainable land management: linking sustainable livelihoods with ecosystem services in rangeland systems by M.S. Reed, L.C. Stringer, A.J. Dougill, J.S. Perkins, J.R. Athopheng, K. Mulale, and N. Favretto. The above study is well designed and the results in the article are analyzed with some care. The addresses of the authors are given in the article; visit link:

http://eld-initiative.org/fileadmin/pdf/Reorienting_land_degradation.pdf

Source: Journal of Environmental Management 151 (2015) 472 - 485

Humans eat almost 11 kg of forest foods per person each year



Forest foods such as leaves, fruits, nuts, mushrooms, honey and insects have long been important items for people living in small villages and provide them with essential vitamins and minerals.

Source: http://www.fao.org/zhc/detail-events/en/c/280085/?utm_source=intranet&utm_medium=intranet-dyk&utm_campaign=dyk

The new 'conservancy' conservation concept giving Kenya's local communities jobs, income and a brighter future

An alternative approach to wildlife conservation in Kenya called 'the conservancy concept' is helping to create a sustainable future for animals, local communities, the environment and visitors alike for the very first time – and the son of British emigrants to Kenya (Jake Grieves-Cook) is one of those at the forefront of the movement.

His site is one of 140 conservancies across the country operating on land leased from local communities.

The idea has been hailed as defining a new era of ecotourism in the East African country, and has proved such a success there are now more than 7.5 million acres of conservancy land across 22 counties.

Conservancies mean local communities benefit directly from the use of their land and willingly host and protect wildlife populations, reducing the incidence of human-wildlife conflict, which has been known to arise from poaching, farming and the construction of infrastructure.

He says the initiative is benefiting the communities who own land alongside government-owned parks and reserves by giving them the opportunity to earn income and livelihoods from conserving wildlife by putting their parcels of land together to form wildlife conservancies.

"The conservancy concept enables landowners to benefit from allowing their land to be set aside for wildlife and to earn a regular monthly income stream from rents paid per acre for their plots of land," he said, "as well as to have employment opportunities for their family members as rangers in the conservancies and through staffing the camps". Conservancies are also said to be better for visitors as visitor numbers are strictly controlled, guaranteeing a personal, exclusive safari experience. They also reduce stress and disturbance of the wildlife population, supporting the repopulation of areas and land transformation.

Kenya's conservancy concept was devised as a means to address the escalating issue of lost indigenous habitats, through the division of land, over-grazing and intensive farming. The idea has recently gained momentum; it has had such a profound impact on the country's conservation practice that the term was recently legally recognised for the first time in the Wildlife Act 2013.

The renowned elephant conservationist Cynthia Moss recently described the establishment of conservancies in Kenya as "the single most successful conservation initiative since the creation of national parks in the 1940s". She added, "conservancies protect land for Kenya's wildlife and, even more important, create sanctuaries of safety. In addition, conservancies bring benefits in the form of direct payments and jobs to the people who share their land with wildlife."

Mr Grieves-Cook added that the approach was also conserving Kenya's spectacular flora and fauna outside of parks and he and his team are keen to spread the word to encourage more communities to follow suit.

Source: *The UK Independent, August 2015. This article was provided by the Kenyan Wildlife Service to promote a greater understanding of Kenya and its natural wonders to an international audience. Full article at link:*

<http://www.independent.co.uk/voices/campaigns/giantsclub/giants-club-the-new-conservancy-conservation-concept-giving-kenyas-local-communities-jobs-income-and-a-brighter-future-10440511.html>

FAO and Norway to help developing countries monitor forest resources

Norway and FAO have signed a \$4.5m partnership agreement to improve the capacity of developing countries to monitor and report on their forest resources and changes in forest area. The project will facilitate countries' access to earth observation data sources, including satellite imagery, and develop an easy-to-use platform for processing and interpreting this data. The new platform offers countries a set of efficient tools for monitoring changes in their forest area and carbon stocks, and for developing sustainable forest management regimes. It will be an efficient tool for everyone. Gaining access to satellite imagery can be difficult for users with poor internet connections, posing a serious challenge for natural resource managers in developing countries. Additionally, old, outdated computers process large-scale data very slowly. FAO's new software aims to overcome these problems by avoiding the need to download images locally and by using a scalable, "cloud-based" supercomputer instead. All downloading and processing takes place elsewhere, in locations where connections are good and large amounts of computing power is available.

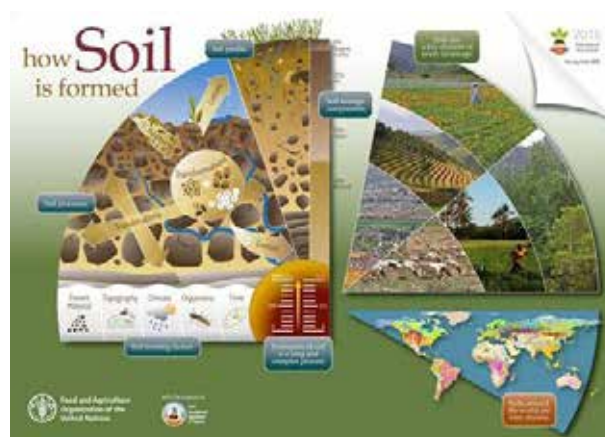
Click <http://www.fao.org/news/story/en/item/283188/icode/> for more about how this new software will enable fast processing of satellite data in countries with poor Internet connections.

Soil is one of nature's most complex ecosystems



Soil is one of nature's most complex ecosystems and one of the most diverse habitats on earth: it contains a myriad of different organisms, which interact and contribute to the global cycles that make all life possible.

To explore this topic further visit: <http://bit.ly/1aZfvBl>
_Estimates suggest informal and formal forest sector employ 1.7% of global workforce
Read more: <http://bit.ly/WorldForests> #Forests2015
Source: FAO Forestry 2015
It can take up to 1000 years to form 1 cm of [# soil](#)!
Learn how soil is formed with this new [# UNFAO](#)
[# infographic](#) : bit.ly/1yPTb8N [# IYS2015](#)



ANNOUNCEMENT

New Report: Strengthening African CSOs for Improved Natural Resource Governance & Conservation

Maliasili Initiatives announces the release of a new report, "Strengthening African Civil Society Organizations for Improved Natural Resource Governance and Conservation". The report, co-authored by *Maliasili Initiatives* and *Well Grounded*, explores key organizational challenges facing African civil society organizations (CSOs) working in the natural resources and conservation fields. It also recommends five ways international donors and NGOs can change how they support African CSOs to ensure they can continue to catalyze positive changes in natural resource governance, management, and conservation. Download the report at:

http://www.maliasili.org/wp-content/uploads/2015/07/Final_Report_Strengthening-African-CSOs-Improved-Natural_Resource_Governance_Conservation_English.pdf

Maliasili Initiatives is a non-profit organization that supports the growth, development and performance of leading civil society organizations working to advance sustainable natural resource management practices in Africa.

Contact: Jessie Davie, Head of Communications, *Maliasili Initiatives*

Source: www.maliasili.org

New book assesses climate challenge and ways of coping with it

Global warming will have profound consequences on where and how food is produced, and also lead to a reduction in the nutritional properties of some crops, all of which has policy implications for the fight against hunger and poverty and for the global food trade, experts say in a new book "**Climate Change and Food Systems**". The book collects the findings of a group of scientists and economists who have taken stock of climate change impacts on food and agriculture at global and regional levels over the past two decades.

Visit the following link for more information about the new book: <http://www.fao.org/documents/card/en/c/2d309fca-89be-481f-859e-72b27a3ea5dc/>

Contact: Peter Mayer, Media Relations (Rome), (+39) 06 570 53304, peter.mayer@fao.org

Family Farming Knowledge Platform Launched

Recognizing the contributions of family farmers to food security and poverty eradication worldwide, FAO in June 2015 launched a new digital platform that aims to become a "one-stop shop" for information, data and legislation on the sector that produces some 80 percent of the world's food. By gathering digitized information on family farming from

all over the world - including public programs, national and regional legislation, up-to-date statistics, case studies and academic research -- the new Family Farming Knowledge Platform will allow governments to build stronger policies in support of family farmers and help policy dialogue with family farmers' organizations.

The launch was announced at : <http://www.fao.org/news/story/en/item/293696/icode/> and also at: www.fao.org/family-farming.

A new book: On the Edge: The State and Fate of the World's Tropical Rainforests

On the Edge - The State and Fate of the World's Tropical Rainforests ... A Report to the Club of Rome by Claude Martin ... In this new book the distinguished biologist *Claude Martin* summarizes the bad news and the good news about rainforest conservation, the leading threats to the world's rainforests.

Further information on the new book is posted: <http://www.clubofrome.org/?p=8465>

A recent publication "Carbon Conflicts and Forest Landscapes in Africa"

The book asks: what difference does carbon make? What political and ecological dynamics are unleashed by these new commodified, marketized approaches, and how are local forest users experiencing and responding to them? Amidst the pressing challenges of global climate change, the last decade has seen a wave of forest carbon projects across the world, designed to conserve and enhance forest carbon stocks in order to reduce carbon emissions from deforestation and offset emissions elsewhere. Exploring a set of new empirical case studies, *Carbon Conflicts and Forest Landscapes in Africa* examines how these projects are unfolding, their effects, and who is gaining and losing. Situating forest carbon approaches as part of more general moves to address environmental problems by attaching market values to nature and ecosystems, it examines how new projects interact with forest landscapes and their longer histories of intervention.

The book's case studies cover a wide range of African ecologies, project types and national political-economic contexts. By examining these cases in a comparative framework and within an understanding of the national, regional and global institutional arrangements shaping forest carbon commoditisation, the book provides a rich and compelling account of how and why carbon conflicts are emerging, and how they might be avoided in future. This book will be of interest to students of development studies, environmental sciences, geography, economics, development studies and anthropology, as well as practitioners and policy makers. The book is edited by Melissa Leach, Ian Scoones. Routledge. *More information about the book is on the following web page:* <http://www>.

routledge.com/books/details/9781138824836/?utm_source=adestra&utm_medium=email&utm_campaign=sbu3_mbs_4mx_1em_9env_rnl15_x_x

Wildlife debate at the World Forestry Congress on Wednesday 9 September 2015

The one-day Wildlife Forum will address challenges and opportunities in sustainable wildlife management, showcasing the experiences of countries, organizations, indigenous peoples, local communities and the private sector in addressing poverty alleviation and livelihood security issues while safeguarding the world's rich and diverse wildlife. Sustainable wildlife management practices help to conserve native fauna and their natural habitats, and to improve the livelihoods of rural communities. Deforestation and conversion of forested habitats to agricultural and other land uses, forest fragmentation and degradation, wildlife habitat encroachment, overgrazing, human-wildlife conflict, and the unregulated, unsustainable exploitation of wildlife and its products (bushmeat) pose threats to wildlife resources. The 1st Wildlife Forum aims at offering a unique opportunity to exchange information and knowledge on initiatives across different sectors and biomes related to the sustainable use and conservation of terrestrial and semi-terrestrial wildlife. The event will focus on four main topics: (1) community-based management and governance; (2) wildlife crime and legality issues; (3) human-wildlife conflict; (4) bushmeat, food security and livelihoods.

Everyone registered for the World Forestry Congress, from all sectors, is welcome to join the Wildlife Forum.

For update visit: <http://www.fao.org/about/meetings/world-forestry-congress/programme/special-events/wildlife/en/>

THEME AND DEADLINE FOR NEXT ISSUE

The next edition of *Nature & Faune* journal will be a special Issue to mark the International Year of Soils. This special edition is planned to be issued during the Conference of the African Soil Society taking place in Ouagadougou - Burkina Faso from 2nd to 10th December 2015. The special edition of the journal will feature short articles that address the central theme: "Sustainable soil management: an indispensable need for environmentally sound food security in Africa".

Soils are very important because of a variety of reasons among which are: healthy soils feed the world; soils can contribute to climate change mitigation; soils are alive, teeming with life. Therefore, investing in sustainable soil management makes economic and environmental sense. Eighty three percent (83%) of rural people in sub-Saharan Africa depend on their land for livelihood and yet the current status of most soils in the continent is worrying: 40% of Africa's soils are currently degraded¹. This degradation must be stopped and reversed. Poverty, hunger, unemployment, forced migration, conflict and security issues are just some of the many threats arising from this situation. Good soil husbandry is therefore essential for Africa's food security and sustainable future.

The journal invites all stakeholders – governmental departments, nongovernmental organisations, academia, research, development community, civil society and individuals working in the soils, land and natural resources sector and related fields to contribute short articles to the special edition of the journal. Authors are invited to explore this topic from varying perspectives and share their experiences, challenges and vision on the future of Africa's soils.

Guidelines and instructions for submitting manuscripts are available at the journal's website - <http://www.fao.org/africa/resources/nature-faune/en/> - . Short and succinct papers (3 pages) are preferred. Visit the website or send an email to receive a copy of the 'Guidelines for authors.' Please send us your paper(s) and information requests by email to the following addresses: nature-faune@fao.org and Ada.NdesoAtanga@fao.org

Deadline for submitting manuscript(s) and other contributions for the next edition is 1st October 2015



"Healthy soils for a healthy life"

<http://www.fao.org/soils-2015/about/en/>

¹ <http://www.fao.org/assets/infographics/FAO-Infographic-IYS2015-fs1-en.pdf>
<http://mgafrika.com/article/2015-01-08-2015-is-the-year-of-soil-10-reasons-why-every-african-should-care>

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Nature & Faune journal is a peer-reviewed open access international bilingual (English and French) publication dedicated to the exchange of information and practical experience in the field of wildlife and protected areas management and conservation of natural resources on the African continent. It has been in wide circulation since 1985. Nature & Faune journal is dependent upon your free and voluntary contribution in the form of articles and announcements that enhance sound management of renewable natural resources for food security in Africa.

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