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CREATING A FOREST
LANDSCAPE RESTORATION
MOVEMENT IN AFRICA

A CALL TO HEAL PLANET EARTH

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NATURE & FAUNE

Enhancing natural resources management for food security in Africa

Volume 32, Issue 1

Creating a forest landscape restoration movement in Africa: a call to heal planet earth

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Sustainable land management and
restoration of degraded and drylands
in Djibo, Burkina Faso

Message to readers

Bukar Tijani¹

Every year in Africa, nearly 3 million hectares of forests are lost and sixty five percent (65%) of the land is affected by degradation. An estimated 3 percent of GDP is lost annually from soil and nutrient depletion on cropland. This places forest loss and land degradation among the key challenges facing Sub-Sahara Africa (SSA). Exacerbated by climate change and poor management of agricultural lands, forest degradation threatens the water supplies and ecological functions vital to all SSA economies. Rural smallholder farmers and households suffer the most from degraded land as they cannot finance counter-measures if there is disruption or loss of stable weather patterns, healthy soils, tree cover and water.

At the side-lines of COP21² in Paris on the 6th of December 2015, the Global Landscapes Forum was held and, at it, African countries launched the African Forest Landscape Restoration Initiative (AFR100)³ which is a country-led pan-African effort to restore 100 million hectares of degraded and deforested landscapes by 2030. AFR100 aims to accelerate restoration of degraded and deforested landscapes to enhance food security, increase climate change resilience and mitigation, and combat rural poverty⁴.

AFR100 contributes to the Africa Resilient Landscapes Initiative (ARLI) which will in the context of the

Sustainable Development Goals complement the African Landscapes Action Plan (ALAP) and the broader Climate Change, Biodiversity and Land Degradation (LDBA) program of the African Union. AFR100 contributes to the Africa Resilient Landscapes Initiative (ARLI) and to the achievement of national restoration and sustainable development commitments and targets, the Bonn Challenge, and the New York Declaration on Forests, among many other targets. It builds on the experience and progress achieved through the TerrAfrica Partnership, the Great Green Wall of the Sahara and the Sahel Initiative, and other related landscape restoration efforts.

To realize the target of 100 million hectares of restored land, African leaders see the need for sustainable forestry projects based on a long-term approach with multi-stakeholder benefits and intensified cooperation with the private sector to enhance resources, innovation and the ability to deliver. One such private sector collaborative initiative is the 'Forests for the Future – New Forests for Africa'⁵ that is undertaking large scale reforestation.

This edition of *Nature & Faune* journal explores the science and innovations (technical, social and policy) that can support the achievement of this African dream. Articles share experiences

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2 COP21 stands for the 21st Conference of the Parties, in this case of the countries that have signed up to the 1992 United Nations Framework Convention on Climate Change. The Global Landscape Forum (GLF) was a side event to the COP. The inaugural GLF event took place in Warsaw, Poland alongside COP 19 in 2013. It heralded the merger of Forest Day and Agriculture and Rural Development Day, reflecting a scientific climate that sought an integrated landscape approach by breaking down research silos. The first four major GLF events were held annually on the side-lines of the United Nations Climate Change Conference.

3 African Forest Landscape Restoration Initiative web site: www.afr100.org

4 NEPAD. 2017. African Forest Landscape Restoration Initiative, Overview by New Partnership for Africa's Development (NEPAD). 16 April 2017. (Overview prepared by the World Resources Institute, NEPAD, and German Federal Ministry for Economic Cooperation and Development and the World Bank. http://www.wri.org/sites/default/files/AFR100_Overview_English_No_Annexes-Sept_29.pdf)

5 'Forests for the Future – New Forests for Africa' is an initiative established with the aim to stimulate and drive large scale reforestation in Africa. Website <http://newforestsforafrica.org/>

on challenges, opportunities and successful restoration, including farmer managed natural regeneration, improved management of smallholder woodlots, reforestation, evergreen agriculture with intercropped trees, and associated sustainable land management practices such as water harvesting and erosion control. Africa's Great Green Wall is presented in this edition as a transformative model for rural communities' sustainable development. In particular the lessons learned from the "Action Against Desertification" programme funded by the European Union and implemented by FAO with partner countries and organizations, are discussed, paving a way towards the implementation of African Forest Landscape Restoration Initiative. Initiatives to address land degradation and desertification trends in Africa, promote sustainable land management, and restoration of degraded forests and landscapes include Africa's Great Green Wall initiative, and 2016's African Forest Landscape Restoration Initiative – AFR100. Most of the articles dwelt on how efforts to this end are being pursued.

Preceding the detailed articles is the *editorial*, which sets the scene on the momentum being gained by Africa's forest landscape restoration efforts. This is followed by the *opinion piece* from Mafa Chipeta which queries Africa's ambitions in landscape restoration, flagging obstacles that need to be surmounted to attain the goal. Orleans Mfunne, under the heading *Special Feature* analyzes the pathway towards 'Private Forests' in Zambia and its opportunities, possibilities and risks. He states that while acknowledging the opportunities and possibilities that arise with the introduction of private forests, there are also a number

of challenges or issues that will need to be resolved in order for private forests to play the role they are required to in the country. Among these include (a) how to guard against land grabs driven by the quest for private forests or plantations (b) how to address tensions between local resource use rights and private control; (c) how to address agriculture-forestry land use competition and (d) how to incentivize land owners to venture into forestry.

The many articles highlight the realities - the spirit and the letter - of restoring deforested and degraded landscapes in Africa. The contributions in this edition are from a wide field of expertise and they share findings of programs and projects, success stories, and announcements on forest landscape restoration related matters. The coverage reflects a diversity of situations: deforestation and degradation do not occur only on drylands of Africa; the wetlands have a plethora of issues in the deterioration of the environment through depletion of resources such as soil; pollution, disruption of their hydrological systems and the destruction of habitats. A community-based ecological mangrove restoration initiative is presented in this issue, exploring the realities of re-establishing a more biodiverse and resilient coastal ecosystem with community participation.

Attention is drawn to two specific knowledge-sharing initiatives which readers and their institutions may wish to take advantage of:

- The newly established online *Community of Practice for Forest and Landscape Restoration* organized by the FAO Forest and Landscape Restoration Mechanism (FLRM) under the umbrella of the Collaborative Roadmap for Monitoring FLR in

partnership with Global Partnership on Forest and Landscape Restoration. It hosted its inaugural online knowledge-sharing forum: "Innovative Approaches for Monitoring Forest and Landscape Restoration" with a webinar and a facilitated email-based discussion in November–December 2017. Two important aspects that were elaborated on are: the need for coordination among groups that are involved; and the need for effective monitoring.

- The *Access to Global Online Research in Agriculture* (AGORA) programme, through which the Food and Agriculture Organization of the United Nations has since 2003 coordinated and provided free or low-cost access to books and major scientific journals on restoration of degraded landscapes alongside broader agriculture, forestry, fisheries, climate, food security and related biological and environmental sciences to public institutions targets low and middle-income countries. African institutions are welcome to benefit from AGORA (details in the announcements section).

Manifold opportunities abound in our different and varied ecological niches in our region to put into practice the concepts and experiences shared in this edition. The *bugle call* announcing the creation of a forest landscape restoration movement in Africa has been sounded. It is a call to heal planet Earth beginning from our own locality!

Africa's forest landscape restoration gathers momentum

Festus K. Akinnifesi¹

Summary

Africa is one of the most vulnerable continents in the world. It has over 700 million ha of its land already degraded, and degradation still occurs at an alarming rate of 3% annually. This offers tremendous opportunity for restoration. African leaders responded to the urgent global wakeup call at COP21, with a collective pledge to restore 100 million ha of degraded land by 2030. This article examines past and current efforts in restoring Africa's degraded forests and landscapes and the prospect of bringing restoration to massive scale. Historical evidence showed that landscape and forest restoration is not new in Africa. Millions of spontaneous community-led restoration efforts undertaken in the last 2-3 decades, such as in Ethiopia, Niger, Senegal, Rwanda, Tanzania, etc., can provide sufficient runways to get AFR100 off the ground. Limited available data suggests that many African countries have moved beyond pledges and are already investing in advocacy, coordination, assessing restoration opportunities, capacity development, mobilising resources and establishing the monitoring framework. There is need to accelerate the pace and scale of field implementation. Options for addressing key challenges in restoration are highlighted. Knowledge and experience sharing and scaling up of what has worked well, strengthened by good practices and technologies, appropriate investment, policies and governance are needed.

Introduction

Nearly half of the world's original forests have been fragmented, deforested, and converted or degraded. Deforestation and land degradation has cost the world over USD 6.3 trillion due to impaired ecosystem services value—equivalent to 8.3 percent of global GDP in 2016 (Sutton et al, 2016). In particular, Africa is severely impacted by land degradation, with 65 percent of arable land, 30 percent of grazing land and 20 percent of forests already lost. This translates to 3 percent annual loss in GDP, and 2.8 million ha of forest loss annually (Zingore et al, 2015). More than 25

percent of Africa is already desert, including the Sahara, Kalahari and the Namib deserts. Increasingly, desertification is threatening dry lands more than ever. However, nothing goes without a cost. This massive land degradation on nearly all types of landscapes, contribute to increasing environmental footprints and disequilibrium, and characterised by Green House Gas (GHG) emissions, rising temperatures, stressing of crops and animals, increasing climatic unpredictability, biodiversity loss, erosion and flooding. All these weaken the “sustainability”, resilience and

recovery potential of the forest and agricultural landscapes—i.e. the agility of the ecosystems to respond to shocks and natural disasters. With the challenge of climate change, Africa is one of the most vulnerable continents!

Globally, there are about 2 billion ha of land available for restoration, and 50 percent of these are croplands and settled areas. With over 700 million ha of degraded land, and an additional 3 million ha added to this number each year, Africa has the largest opportunity for massive forest and landscape restoration than any other

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continent in the world—over a third of global land available for restoration. At least 10 million ha must be restored each year to halt and reverse land degradation in the Sahel and the Horn of Africa (FAO, 2016 a). This article examines past and current efforts in restoring Africa's degraded forests and landscapes and the prospect of bringing restoration to massive scale.

Bold efforts to restore Africa's landscapes

Restoring the productivity of the world's degraded land has now become a global priority. Much of Africa's forests have been severely decimated, bulldozed, fragmented and converted to farmlands, commercial croplands, roads, power lines and residential areas. As Africa's policy makers and the global development community firmly focus their efforts on how to address the gloomy decades ahead, attention is being turned to innovative pathways of restoring the forests and landscapes. In this regard, it is noteworthy that several African countries have committed to restoration at the launching of the African Forest Landscape Restoration (AFR100), at the Global Landscapes Forum at COP21 in Paris, in 2015. This country-led initiative aims at restoring 100 million ha of degraded and deforested landscapes by 2030, even though actual commitment

stands at 75-86 million ha in 2017 (www.afr100.org; Diana Mawoko, NEPAD, pers. comm., February, 2018). At the same time, the AFR100 will address hunger and nutrition, resilience and adaptation to climate change, poverty reduction and biodiversity restoration. Implementing this broad and ambitious policy move, will contribute to the Bonn Challenge, and the New York Declaration.¹

The AFR100 is being complemented by other Africa-led initiatives, such as the African Landscapes Action Plan (ALAP), Africa Resilient Landscapes Initiative (ARLI), and the Great Green Wall (GGW) initiative in the Sahara and Sahel. With over USD 4 billion pledged, the GGW initiative is strongly backed with USD 1 billion by the World Bank. For instance, with more than 20 countries participating, the GGW initiative seeks to restore 50 million ha, provide food security for 20 million people, create 350 000 jobs, and sequester 250 million tons of carbon (<http://www2.unccd.int/actions/great-green-wall-initiative>). According to UNCCD, the GGW initiative, building on some of the early restoration successes highlighted in the below has since its launch in 2007 continued to make considerable progress in restoring the Sahara-Sahel landscapes (<http://www.fao.org/3/a-i6476e.pdf>). Put together, these ambitious efforts have

drawn tremendous and dynamic political support, suggesting that Africa's leaders are taking bold actions to address forest and landscape degradation.

Africa has a long runway on landscape restoration

Decades of several restoration initiatives in Africa suggest that the continent has a long runway to advance the AFR100 ambition. In concrete terms, integrating perennials with food crops—a form of agroforestry practice known as the “Evergreen Agriculture” has been practised by smallholder farmers in sub-Saharan Africa (Garritty et al, 2010). For instance, in **Tanzania**, there was only about 600 ha of ‘ngitili’ (i.e. a community managed natural regeneration of shrubs and trees) in 1986, but by 2001, estimated 472 000 ha of ‘Ngitili’ had been restored in the Shinyanga region in 833 villages (Barrow et al, 2001), and exceeding 500 000 ha by 2005. It has been benefitting 2.8 million people in over 800 villages since the 1980's.

¹ The Bonn Challenge refers to a global commitment to restore 150 million hectares of land by 2020; and the New York Declaration on Forests—a plan to initiate restoration on 350 million ha by 2030.

Niger is being seen as a shining example of success stories regarding country-led restoration at massive scale. Over five million ha of land has been restored and around 200 million trees planted through large-scale effort in southern Niger—a farmer-managed process of natural regeneration, which has increased annual agricultural production by about 500 000 tons of cereal per year, enough to feed 2.5 million people (Reij et al, 2009). This large-scale effort reduced wind erosion and water erosion and increased the production and marketing of crops, fodder, firewood, fruit, and other products. In these examples, the income opportunities created may potentially reduce the incentives for migration. It seems that farmers have now discovered a cheap, effective way to regreen the Sahel. According to Reij et al (2009), the investment amounted to less than \$20 per ha. Generally, the cost would be much higher under conventional forest plantation establishment and in countries where labor is expensive.

Over the last 20 years, the scale of restoration of degraded land through soil and land conservation and tree planting in

Ethiopia is noteworthy. Several accounts have put restoration work in Ethiopia at 15 million ha (Table 1). In particular, Tigray region in northern Ethiopia, between 224 000 ha to 1 million ha have been restored by planting trees, restricting grazing, and building terraces and, stone bunds among other land conservation measures.

Following its 2 million ha Bonn Challenge commitment, **Rwanda** was among the first to jumpstart the land restoration implementation. According to a recent IUCN report (2017), Rwanda assessed that 1.53 million ha present opportunities for restoration, with agroforestry offering the greatest opportunity. Recent analysis by MINILAF (Ministry of Land and Forestry) showed that nearly of 900 000 ha of land has been restored since 2011, representing about 45 percent of the total commitment by Rwanda; 860 000 ha are under agroforestry; 1400 ha are plantations; and 37 600 ha as protective forests including bamboo and other species. About 186 000 green jobs were created between 2014 and 2017, with women participating in more than 60 percent of these jobs (Table 1).

Similar efforts were documented for **Nigeria** and **Senegal** at 5 million ha and 4 million ha respectively. Landscape and forest restoration is about 300 000 ha for **Burkina Faso**, over 250 000 ha for **Uganda**, and 485 000 ha for **Mali**. However, in general, it suffice to mention that available data on restoration work in Africa is scanty and largely anecdotal. The information presented in Table 1 represents indicative extent of landscape and forest restoration activities, and should therefore be interpreted with caution.

There is good news: FAO and WRI, using a new photo-interpretation approach have worked with local experts to examine large databases of satellite imagery at high spatial and temporal resolutions, on Google Earth (see Bastin et al, 2017). This has permitted a more precise estimation of forest biomes, capable of counting individual trees and shrubs. This includes drylands forests scattered trees, shrubs and bush that had never been captured, especially in the areas designated as Great Green Wall. Applying such technique can help gauge the progress of AFR100 in the near future.



A forest tree nursery at Chess Research Forest Station in Bulawayo, Zimbabwe.

Table 1. Indicative area of Africa's landscape restored (mostly pre-AFR100 initiatives).

Country	Restored area (million ha)	Additional notes	Source
Ethiopia	15 000 000	15 million ha of degraded land restored nationally, including (a), 1 million ha including 224 000 ha to 1 million ha replanted in Tigray region (b); 960 000 ha under land and soil conservation; 1.2 million ha under 'exclosures' (assisted natural regeneration). Land tenure security improved.	a,b
Nigeria	5 000 000	5 million ha of degraded land restored by smallholder farmers on their lands and 20 000 jobs created.	b,c,d
Niger	5 000 000	5 million ha degraded land restored by famer-led initiatives—over 19 000 miles with more than 200 million new trees.	b,e,f
Senegal	4 000 000	4 million ha of degraded land restored, including more than 27 000 ha of indigenous trees. About 11.4 million trees planted.	a,c c,e
Sudan	2 000	Land restored	a
Burkina Faso	300 000	200-300 000 ha of degraded land restored/regreened	e
Mali	485 623	Land restored	h
Tanzania	500 000	472-500 000 ha of degraded land restored under the traditional <i>ngitili</i> system in Shinyanga, benefitting 2.8 million people in over 800 villages since the 1980's.	i,j
Uganda	250 000	225 000 ha of degraded land restored through REDD+ carbon offset pilot projects in Mt. Elgon ecosystem; 25 000 ha supported over the last 10 years by GoU.	k
Rwanda	900 000	900 000 ha of degraded land restored between 2011-2017, representing 45 percent progress towards 2 million ha Bonn Challenge commitment; 860 000 ha are under agroforestry; 1400 ha are plantations; and 37 600 ha as protected forests including bamboo and other species; 186 000 green jobs were created.	l

a) <http://www2.unccd.int/actions/great-green-wall-initiative>;

b) <http://www.wri.org/blog/2016/11/african-nations-poised-rapidly-accelerate-landscape-restoration>;

c) FAO (2016 b);

d) <http://newsroom.unfccc.int/lpaa/resilience/great-green-wall-growing-a-world-wonder-restoring-the-productivity-and-vitality-of-the-sahel-region/>;

e) <https://edition.cnn.com/2016/09/22/africa/great-green-wall-sahara/index.html>;

f) Reij et al (2009); see also [<http://www.wri.org/blog/2017/05/we-discovered-18-million-square-miles-forest-desert>]

g) <https://www.theguardian.com/environment/2014/oct/30/regreening-program-to-restore-land...>;

h) <https://www.smithsonianmag.com/science-nature/>

great-green-wall-stop-desertification-not-so-much-180960171/;

i) <http://foreststreesagroforestry.org/the-shinyanga-revolution-tanzanian-success-story..>;

j. <http://www.afr100.org/content/tanzania>;

k) Kasungu B. (2016);

l) Dave et al (2017).

Integrating trees in the landscapes should be a holistic investment to explore multifunctional attributes of forested ecosystems, and addressing the multiple needs of the country, the affected region and individual communities. Landscape restoration involves sustainably improving the productivity, resilience and ecosystems services of forests, agricultural, mountains, deserts, wastelands and other landscapes that have been deforested, degraded, and or underutilized. This can help reduce pressures on the remaining forests while also providing several multiple benefits, e.g. improved soil fertility, food security, windbreaks, watershed restoration, fuelwood, reduced erosion, carbon sequestration and increased biodiversity, including pollinators, honey production, etc.

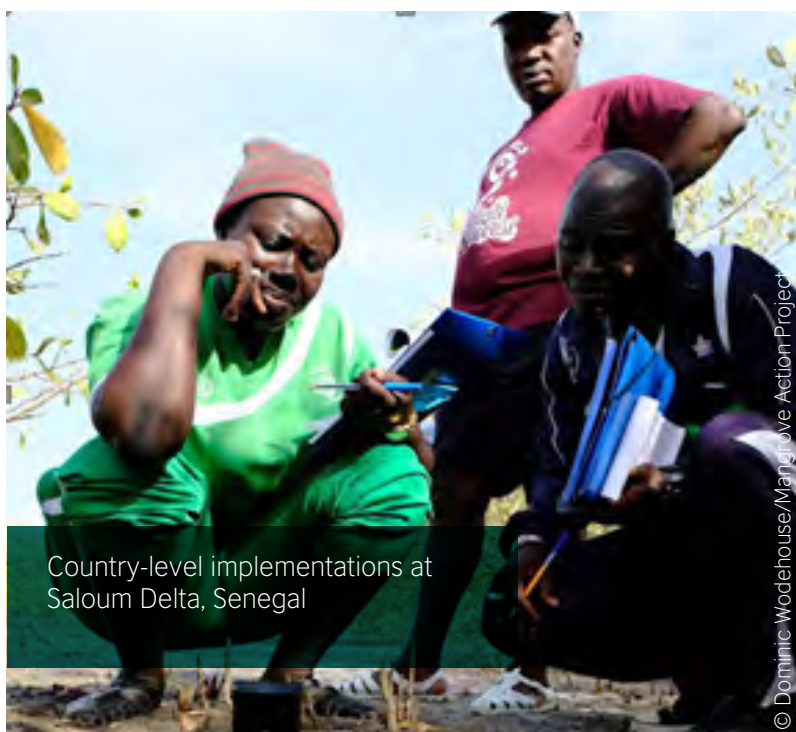
Research has indicated that every US dollar invested in restoring degraded land generates an estimated USD 7-30 in economic benefits, including improved food production, carbon sequestration, and water quality (Ding et al, 2017), let alone other benefits from timber, fuelwood,

food, etc. The Government of Zambia, with support from the World Bank, embarked on a USD 33 million forest landscape program to improve sustainable land management, diversify forest-based livelihoods and reduce deforestation (Braimoh, 2018a). Under the program, Zambian farmers and communities recently received over USD 800 000 in carbon payments for reducing forest loss and degradation and promoting the adoption of land restoration practices using climate smart agriculture approach (Braimoh, 2018b).

Turning commitments to country-level implementations

It is probably too early to realistically answer the question of what proportion of the restoration pledges has been achieved so far through AFR100. In general, as the countries seek to move from pledges to implementation,

attention has been focused on mapping and assessing their potential restoration areas using the Restoration Opportunities Assessment Methodology (ROAM) (see IUCN and WRI, 2014). This involves three phases: (i) assessing the national restoration opportunity and validating area commitment, (ii) developing a large-scale restoration strategy, and (iii) implementation on the ground. Usually, ROAM guides steps (i) and (ii), and a number of countries have already jump-started steps (i) and (ii), while some have even moved to step (iii). Table 2 shows indicative progress for selected countries. Of these, Rwanda, Ethiopia, Kenya, Malawi, DRC Congo and Madagascar are most advanced, and assessment is underway in Cote D'Ivoire. Several other countries are assessing their restoration opportunities, developing monitoring tools and building network of stakeholders.



Country-level implementations at Saloum Delta, Senegal

© Dominic Wodehouse/Mangrove Action Project

Table 2. Progress of some countries in implementing AFR100 commitment.

Country	Documented progress
Ethiopia	Targets 15 million ha; building on 20 years of massive restoration work in northern Ethiopia (see Table 1); hosted regional restoration meetings and Round Table with investors; produced restoration opportunity maps (ROM); identified priority landscapes for implementation.
Uganda	Targets 2.5 million ha; building on 10 years restoration initiatives; several partners are implementing restoration initiatives, farmer-managed restoration civil society organizations, (CSOs, e.g. World Vision); Community tree planting programme (GoU-led); Greening Uganda economy with massive tree planting launched in 2015; rehabilitation in northern Uganda.
Kenya	Targets 5.1 million ha; builds on long record of CSO-led restoration movement; formed cross-sector restoration task force; produced national restoration opportunity map (ROM); applied restoration diagnostic at national level.
Niger	Targets 3.2 million ha; builds on over a decade of community-led restoration; stock-taking underway on extent of community-assisted natural regeneration; analysis of forest policies, laws and regulations
Malawi	Targets 4.5 million ha; completed restoration opportunity assessment, including ROM; stock-taking of existing restoration projects and practices; economic and financial analysis; analysis of policy and institutional enabling environment for FLR, and strategic pathways for scaling up; preparing a national restoration strategy.
DR Congo	Targets 8 million ha; stocktaking of restoration projects and practices underway; analysis of the policy and institutional enabling environment for large-scale restoration; cross-sector restoration task force established; GIS analysis of restoration opportunities funded.
Rwanda	Target 2 million ha, of which 45% under restoration between 2014-2017 (Dave et al, 2017); built active national sector partnership for Forest and Landscape Restoration (FLR); identified priority landscape for restoration, including two national parks; improved seed quality and quantity in Tree Seed Center; cutting edge monitoring technology in two districts, to be scaled up nationally.

Source: Adapted from Diana Mawoko, NEPAD (pers. comm., February 2018)

Options for landscape restoration with integrating trees

Landscape and forest restoration should be seen with a broader lens than just a tree planting exercise. When integrating trees to the landscape, regardless of the approach used, it is important to apply holistic and integrated landscape approaches to ensure that sustainability principles are adhered to and multiple benefits of land users addressed. FAO’s

common Vision on Sustainable Food and Agriculture (SFA) has developed five elements that can be applied, including: efficient resource use, natural resources management, social equity and livelihoods, resilience to climate change and governance (<http://www.fao.org/3/a-i3940e.pdf>). Addressing ‘sustainability’ at scale is a big challenge that is not amenable to single-sector solutions. This calls for cross-sectoral integration, multi-stakeholder dialogues and approaches that

create synergies. The ecological, social, and economic benefits of forests and trees within in the landscape is an important consideration. Trees can be integrated to landscapes in several forms, e.g. agroforestry, evergreen agriculture, fertilizer tree systems, silvopasture, wind breaks, mountain and hill forests, natural regeneration, plantation, etc. There is also prospect for integrating urban forestry and parks.

Addressing the challenges to forest and landscape restoration in Africa

As the AFR100 gathers momentum and transition from bold political commitments to implementation on the ground, there is need to address some critical bottlenecks that may encumber efforts to reaching the target by 2030.

i) Forest restoration is costly.

Forest restoration is expensive. Restoration is cheaper with farmer-assisted natural regeneration than conventional forest restoration through active tree plantations. AFR100 countries should take advantage of both farmer-assisted natural regeneration and integrating trees in the agricultural landscapes and production systems.

ii) Financing forest restoration is a risky business.

This has limited private sector involvement. Although the World Bank had earmarked more than USD 1 billion in development finance and USD 540 million in private sector impact investment to support these restoration initiatives, investment from countries own resources and other stakeholders would be critical to success of these initiatives.

iii) The choice of appropriate species.

Forest and land restoration is not just about planting trees to fill the space. Many tree restoration initiatives have failed in the past due to lack of knowledge on how to select the right species,

plant and manage them. It requires knowledge and evidence based decisions on the appropriate tree species to grow, seed sources and propagation methods—to produce seedlings and or vegetative propagules, and nursery operations. It also requires considerations of the user's species preference, market opportunities and other benefits.

iv) Motivation for forest and landscape restoration.

Rather than massive industrial scale plantation efforts, smallholder and communal restoration efforts have proven to be more effective and cheaper. However, buy-in and ownership of the local community is critical to success. Multiple benefits that forest and landscape restoration offers will increase opportunity for scaling up its adoption by producers, small holder farmers and communities. Efforts that address the immediate needs, such as soil fertility, erosion control, water scarcity, food and nutrition security, fodder, fuelwood, etc., are important entry points.

v) Knowledge intensive and long-term nature of forest and landscape restoration.

Integrating trees in landscapes is a knowledge intensive and long-term effort, requiring investment in capacity building, training and lessons-learning. In the face of climate change, investment in water for tree management on diverse landscapes, especially in the drier regions and seasons, is key to success.

vi) Integrated and cross-sectoral planning and policies and governance. Most African countries are organized along sectoral lines making the planning, policies and governance of integrated land use management a challenge. By its nature forest and landscape restoration affect multiple sectors, e.g. agriculture, forestry, wildlife, natural resources, livestock, fisheries, land, water, land etc., therefore in order to address this challenge a cross-sectoral integration approach is crucial.

Conclusion and recommendations

Landscape and forest restoration—centered on massive tree and shrub planting programmes has the potential to transform livelihoods and reclaim degraded land across Africa. Africa has a long record of accomplishment in forest and landscape community-led large-scale initiatives that the AFR100 can build upon. The AFR100 is in its third year, therefore, assessing progress is rather too early. Nonetheless, considerable efforts are being invested in advocacy and creating awareness, building political and stakeholder networks, coordination, resource mobilization and capacity development, assessment of restoration opportunities and establishing the monitoring framework. The success of these integrated landscape restoration initiatives depends on knowledge intensive supports, capacity development, training and quality tree seed supply system for smallholder farmers, and the enabling environment, including governance and

policies. Such efforts will also help to integrate and manage trees on Africa's agricultural landscapes to address hunger, climate change and reverse environmental degradation

Beyond political commitment, coordinated efforts, policies and investments are needed to achieve the target. There is need to invest in result monitoring on all relevant land restoration programmes in Africa, and to differentiate past achievements from new progress, so as to avoid double counting. In particular, the new photointerpretation approach with high resolution imageries can go a long way in generating more precise estimates of restoration progress. As the AFR100 advance to reach a "tipping point," there is need for stocktaking of lessons learned and a massive scaling up of what has worked well, which should be supported by good practices and technologies, appropriate investment, policies and governance mechanisms. This needs to happen at an accelerated speed and massive scale. The AFR100 initiative could take advantage of triangular and south-south cooperation, especially intra-Africa countries to exchange capacity, knowledge and resources.

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Towards 'private forests' in Zambia: opportunities, possibilities and risks.

Orleans Mfune¹

This paper is intended to be an early cautionary comment on Zambia's recent forestry reforms that have led to the adoption of 'private forests' as a new institutional form for allowing private sector participation in the forestry sector. While this marks an important departure from previous forest management systems that excluded private actors' participation in the sector and is in tandem with the country's market oriented macro-economic policies, in practice, the notion of private forests remains untested. In this regard, the paper examines the opportunities and risks that emerge with a private sector centered approach to forest management. It offers a useful guide to policy implementers on some issues that may require attention if 'private forests' are to play an important role in restoring the country's forest conservation fortunes.

While forests cover 65.4% of Zambia's land surface, the country's rates of deforestation at between 250 000 and 300 000 hectares per year (FAO, 2015) remain among the highest in Africa. A particularly challenging undertaking for the country has been finding the most suitable institutional form to effectively manage this vast forest estate and stem deforestation. Over the decades, Zambia has utilised both state and community centered approaches without lasting success. Consequently, more recently, in 2015, forestry legal reforms saw the introduction of 'private forests' as an alternative private sector centred approach to forest management in the country. Being new, this approach remains untested in the country and is yet to generate scholarly attention. However, its introduction raises numerous important

questions that should concern both forestry practitioners and scholars. Among them, whether or not it could be the game changer in Zambia's quest to halt the rapid rate of deforestation and restore the country's forest conservation fortunes.

This paper, in this regard, examines the notion of 'private forests' in the context of both opportunities and potential risks that may emerge in the implementation of this approach. By considering these issues, the paper is intended to be an early cautionary comment on Zambia's new forestry policy and thus seeks to offer useful guidance to actors involved in implementation of such policies in Zambia. The paper is structured in three parts. First, it provides a brief history of formal forestry in Zambia. This is then followed by an examination of the

concept of private forests as conceptualized in Zambia's Forestry Act. In the last part, the paper discusses the opportunities and risks associated with private forests before ending with the conclusion.

Forest conservation in Zambia has an eighty-year history, starting with the pre-independence period. Three main ages can be discerned since the advent of 'formal' forestry. These stages correspond to shifts in forestry policy and practice in the country over these eight decades. These are (a) the age of exclusive state management; (b) the age of state-community collaboration and; (c) the age of private forests.

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The age of exclusive state management (from the 1940 - 1998)

The age of exclusive state forest management has its roots in the colonial era when lands were appropriated by the colonial government for conservation. The state, in this age, assumed the role of sole proprietor, regulator and manager of the country's forest estate. This system remained in place even after three decades of independence. While in the short run, especially between the 1960s and 1980s, this system was instrumental in bringing vast swaths of forests under formal protection, local realities in forest sites and various political and economic structural forces simply brought it into moribund by the early 1990s. The collapse of this era ushered in a new age of state-community partnership.

The age of state-community collaboration (1999 - 2014)

Given the failures of the bureaucratic system, in 1999, policy reforms saw the introduction of Joint Forest Management (JFM) conceived as collaborative forest management between the state and forest-dependent communities (ZFD, 2005). This era not only saw the inclusion of the 'community' and their local governments as important actors in forest management, but also a broadening in forest objectives to include local livelihood objectives. However, over a decade has passed since the introduction of JFM and it is clear this has not produced the desired effects as many JFM initiatives lined up across the country barely passed the teething stage (Bixler et al,

2015; Umar and Vedeld, 2013; Aongola, 2009). Many factors such as failure to develop benefit sharing mechanisms, poor funding to the Forestry Department, lack of technical capacity within the forestry bureaucracy and other socio-political factors conspired against the approach.

The age of 'private forests' (2015 – to date)

The enactment of the 2015 Forestry Act represents the third age of Zambia's forestry system. Although the 2015 Forestry Act retains community centered approaches (JFM and community forestry), it also introduces a new actor in forest management – the private sector. The introduction of 'private forests' heralds a new era in the forest sector that is consistent with government's macro-economic policy of encouraging private sector investment in the natural resources sector.

The notion of 'private forests' has long been dominant in most western countries where private land ownership is most dominant. In Scotland, for example, private landowners own most of rural Scotland (Ramsey, 1993). In Finland, just like in the United State of America, approximately 60 percent of total forest areas are privately owned (Rautiainen et al, 2017; Stein, 2005). The introduction of 'private forests' brings to the fore the conceptual question of what exactly constitutes a 'private forest'. Stein et al (2005:5) define private forests as 'forest land owned by individuals, families, corporations, tribes, organizations, or the forest industry'. In this definition, any

forestland outside state or public ownership is categorized as 'private forests'. However, while this definition may hold in western countries where statutory tenure is the dominant land tenure system, it is clearly insufficient for countries with a dual tenure system (i.e. where leasehold/freehold exists side by side with communal or customary tenure systems). In such countries, lands 'owned' by tribes are largely held by custom and tradition, and is hardly considered as 'private'. Thus, for the purposes of this paper, the concept of private forests refers to privately owned lands that have been dedicated to forestry and excludes forested lands considered common-pool resources.

In the Zambian context, private forests are defined by the Forests Act of 2015 as any land or plantation registered as a private forest. In order for such lands to qualify as private forests, the 'lessee(s)' must apply to the Director of Forestry to have their lands considered for registration as private forests (GRZ, 2015). There are two important things to note about the notion of 'private forests' as conceptualized in the Forestry Act. First, is the fact that private forests can only be established on land held under leasehold tenure. This definition, in this regard, precludes land held under customary tenure. Thus for customary lands to be considered as private forests, landholders must first apply to convert their land to leasehold tenure (as provided in the Lands Act, 1995) before applying to the Director of Forests for registration as private forest.

Second, the land in question does not necessarily need

to have standing forests or a plantation to be considered for registration. Instead, it is the intended use that is considered in the registration process. This, in this paper's view, is an important departure from the last two ages where land was designated as a forest reserve or JFM area on the basis of the quality of its standing forest. In this new era, private lands, including bare lands, may be registered as private forests as long as the intention is forestry.

Opportunities and possibilities associated with private forests

As the concept of 'private forests' is quite new, having emerged only in the past two years, we are yet to learn of its real dividends to the country's conservation efforts or revenue base. However, in literature, some proponents of private forests note numerous environmental and economic benefits of private forests in countries with this category of forests. Stein et al (2005) for example, note that in the U. S, where private forests comprise 60% of America's forests land, such forests provided nearly 60 % of all water-flow originating from U. S forests on a typical year. Similarly, Sweden's high level of forest protection owes much to the role of private actors who manage almost all productive forests. Annually and sustainably, 90 cubic meters of wood are cut against an annual growth of 120 million cubic meters (Royal Swedish Academy of Agriculture and Forestry, 2015; Swedish Forestry Agency, 2018). Besides environmental protection, it can be argued that in these countries, private forestry also provides the

foundation for timber and forest products businesses.

Learning from literature, it can be argued that 'private forestry' provides an opportunity for increasing forest stock on private lands, which could otherwise have been liquidated through other land uses. In other words, it provides an opportunity for private actors to participate in nature conservation, an activity that has traditionally been viewed as state responsibility in the country. In this paper's view, looking at Zambia's forestry landscape, the notion of 'private forests' offers great possibilities of engaging two types of actors –the corporate sector and small-holder farmers.

Engaging corporate actors

The notion of private forestry offers opportunity for engaging two types of corporate actors. First are corporate actors who may be interested in investing in commercial forestry or plantations. Given the right incentives, these actors may be instrumental in attracting investments into a sector that has for the past two decades been starved of financial and technical resources for managing the country's forest estate. The crucial role of the corporate sector in this regard is well noted in Evans(2009) where it is argued that the corporate private sector tends to employ forestry professionals who often deploy improved genetic stock and nursery practices, apply intensive silvicultural management and invest in fire and forest health protection.

Besides corporate actors that may be interested in commercial

forestry, private forests also opens up possibilities for the Forestry Department to engage strategic corporate actors that may not be interested in commercial forestry, but have businesses that depend on services offered by forests. For example, water and hydro-energy companies may be willing to invest in the protection of catchment forests. Similarly, tour operators may be interested in forests of recreational value. With this new policy, such corporate actors could manage such forests in their own right (as forestland owners) or partner with the Forestry Department (FD) in the form of public –private partnerships.

Engaging smallholder farmers

Besides engaging the corporate world, there is also an opportunity for the FD to use the notion of 'private forests' as an opportunity to engage smallholder farmers across the country in establishment of forest plantations as home or farm plantations both for domestic and commercial purposes (depending on the context and interests of private land owners). The FD should not only target well forested lands owned by smallholder farmers, but also marginal or degraded lands where smallholders can be involved in forestry projects. This has potential not only to kick-start the rehabilitation of degraded lands, but also provides an opportunity for local actors to complement their agriculture income through forest-based enterprises. In suggesting the idea of targeting smallholders, this paper is aware of the potential challenges that emerge in trying to do so.

Among these is the question of whether smallholders may have the right skills and sufficient financial capital to engage in such ventures. There are also questions surrounding the extent to which smallholders may engage in commercial forestry at individual level given their land sizes (i.e. to meet the demand of high volume buyers) and capacity to negotiate their interests. In going round these problems, one possible solution is for the FD to facilitate the formation of forestry cooperatives or other forms of organizations to represent their collective interests. Such structures would allow farmers to collectively supply products and negotiate their interests. In addition, through cooperatives, it is easier for the Forestry Department to establish skills development programmes (i. e. for development of silvicultural, financial and negotiation skills etc.).

While acknowledging the opportunities and possibilities that arise with the introduction of private forests, there are also a number of challenges or issues that will need to be resolved in order for private forests to play the role they are required to in the country. Among these include (a) how to guard against land grabs driven by the quest for private forests or plantations (b) how to address tensions between local resource use rights and private control;(c) how to address agriculture-forestry land use competition and (d) how to incentivize land owners to venture into forestry.

Possibilities of land grabs

As already noted, only private actors holding land under

leasehold can register for private forests. It is important to note here that the majority of the rural population in Zambia subsists on customary land. Over the last decade and half, this customary land has been a major target of private investors seeking land for agriculture, game ranching, real-estate and other projects. As such several incidents where large swaths of customary land have been converted to leasehold for such projects have been reported across the country. The result of some of these conversions has been the displacement of local people and disruption of local livelihoods. Without proper mechanisms for safeguarding against such challenges, it is possible that the notion of 'private forests' may provide further impetus for conversion of customary land to leasehold as private actors seek land for land for plantations, REDD+ and other private forestry interests. This has potential to lead to a spike in land grabs.

Tensions between local usage and private control

Furthermore, even in cases where establishment of private forests may not raise the issue of land grabs, there is also the question of how to protect local customary resource rights in areas where private forests are established. The concern here is that once land is designated as 'private forests' landowners may act to fence their land and exclude other actors from exercising local use rights as part of conservation measures. For example, in many parts of the country, even where land is held by individuals customary norms still gives local actors the

right to fetch firewood, water or indeed to graze their livestock as long as the land in question is not being used for agriculture or other productive land uses. There will be need, in this regard, to develop mechanisms for addressing tensions between local usage and private control.

Forestry-agriculture land use competition

Besides the question of local use rights, another potential risk that may emerge with the establishment of private forests is increased land use competition between forestry and agriculture with potential implications on food security in rural areas. In the past, such concerns have been voiced out in the context of production for biofuels competing for arable land with agriculture. As already noted, the definition of private forests does not preclude agricultural lands. As such even lands already under agriculture or indeed with agricultural potential can be converted to forestry use.

Incentivising private forests

While the notion of private forestry provides an opportunity for private sector participation in a sector traditionally dominated by the state, it is critical for the country's Forestry Department not to assume that private actors will automatically take up this space. As research elsewhere has shown, most private interests in land use tend to be highly guided by mostly utilitarian values. This is essentially because private landowners want to use their land for what provides them the most value. It is

crucial in this regard, that in implementing this approach, the country must develop incentives and strategies that will make 'private forests' attractive. In other countries such as Turkey, private sector participation in plantations has been encouraged through low interest rate loans and low land prices (FAO, 2008). Second, it has also been observed that where private actors have been involved in private forestry, interest in high value timber production tends to override other conservation objectives such as ecosystem services protection. It is thus critical that in developing the right incentives, attention must not only focus on how to attract private sector participation in the sector, but also how to ensure that once private actors are involved, other conservation objectives other than utilitarian ones are given space in private forestry. Further, it is important that such incentives not only target corporate actors but also smallholder farmers and other local level actors interested in venturing into private forestry.

This paper is written as a commentary on Zambia's new forest policy that allows private sector participation in forestry. It notes that this represents a marked departure from previous forest policies that saw forestry as mainly a centralized matter that required the attention of the forestry bureaucracy. However, while the new policy represents an important opportunity with the potential of revolutionizing the forestry sector by attracting private sector investments (finances and technical skills), there are also a number of issues that policy implementers need to consider before translating the policy into

action. These include the threats of land grabs, possibilities of interdiction of local resource user rights such as grazing rights, right to river frontage and many other rights enjoyed by rural actors in the countryside. In this paper's view, the extent to which 'private forests' may emerge a game changer will largely be conditioned by how well these issues are addressed by the Forestry Department and other actors involved in its implementation. It is thus vital that attention is paid to these factors in the design of regulations and initiatives aimed at promoting 'private forests'.

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Regaining ecological functions and enhancing livelihood through forest landscape restoration in West Africa: West Africa Biodiversity and Climate Change (WA BiCC) approach

Wale Adeleke¹

Summary

The realisation that the world's forests are being lost and degraded at an alarming rate has led to the development of various international, regional, and national initiatives and approaches – one of such approaches is the introduction of the Forest Landscape Restoration (FLR). FLR is a process that aims to regain ecological integrity and enhance human well-being in deforested or degraded forest landscapes. This paper briefly examines the introduction of FLR in West Africa, especially considers the use of the Restoration Opportunity Assessment Methodology (ROAM) developed by IUCN and the World Resources Institute (WRI) in mapping restoration opportunities at the national and sub-national levels in the sub-region. The main aim of the paper is to raise the awareness about ROAM as a tool for National Governments to meet their commitments to the Bonn Challenge² and the African Forest Landscape Restoration Initiative (AFR100)³. The paper also highlights the role that the USAID supported West Africa Biodiversity and Climate Change (WA BiCC) is playing in rolling out a regional ROAM for climate change mitigation and reducing biodiversity loss. WA BiCC is currently employing ROAM in Ghana, following up on an earlier work done by IUCN in Cote d'Ivoire.

It is envisaged that the WA BiCC activities will lead to a better understanding of perspective buy-in to the concept of FLR and support will be offered to further piloting ROAM in targeted learning landscapes in West Africa so as to generate lessons on how FLR can be adapted to varying ecological and socio-political contexts in transboundary landscapes.

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² The Bonn Challenge is a global aspiration to restore 150 million hectares of the world's deforested and degraded lands by 2020. It was launched at a ministerial roundtable in Bonn, Germany, in September 2011, by a bold group of world leaders.

³ AFR100 (the African Forest Landscape Restoration Initiative) is a country-led effort to bring 100 million hectares of deforested and degraded landscapes across Africa into restoration by 2030.

Introduction

West Africa's forests have been subjected to profound changes, particularly deforestation and degradation – especially from human intervention through unsustainable logging, illegal mining activities, etc. West Africa faces a huge challenge to reduce the rates of deforestation and forest degradation. Even though enormous efforts have been made with the support of development agencies in the region there is a lot more to do.

Land and soil restoration are key components in many

international agreements and goals. These include the United Nations Conventions on biodiversity, climate, and desertification, the Sustainable Development Goals and the 2016 Paris Agreement. Without restoring degraded lands, nations cannot make progress towards achieving their Sustainable Development Goals. All the international agreements and goals make it clear that restoration is an international priority through which other

development goals can be addressed.

West Africa has lost 90% of its Upper Guinean Forests. The remaining 10% of these forests (7.3 million ha) are in fragmented blocks and patches mainly in Liberia 50 %, Côte d'Ivoire 21%, Ghana 17 %, Guinea 6%, Sierra Leone 4 %, and Togo 2 %. The proportion of forest loss over the last 40 years is estimated at 37% (Fig. 1). This implies that almost half of the total loss occurred within the last 4 decades.

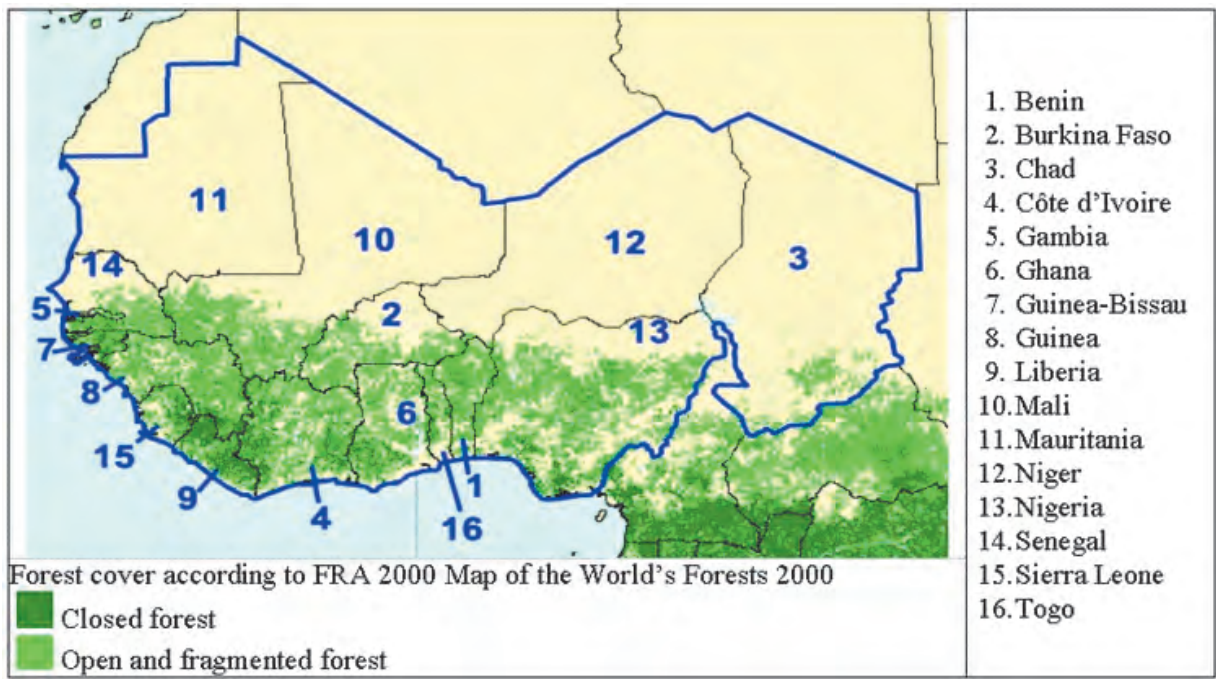


Figure 1: Deforestation of the West African Forests - EROS/USGS¹

For the same period (last four decades), a closer look at individual countries, reveals a range of deforestation rates going up to 77% (Table 1)

due to numerous factors, including population growth (5

folds between 1950 and 2015 while the world average increase

is only three folds); causing overexploitation of resources and the expansion of agriculture (11 folds).

¹ The Center for Earth Resources Observation and Science (EROS) is a United States Geological Survey (USGS) data management, systems development, and research field center. It serves as the national archive of remotely sensed images of the Earth's land surface acquired by civilian satellites and aircraft.

Table 1: Forest cover loss of West African countries 1975 - 2013

Country	Deforestation (1975-2013)
Benin	Woodland (70%), Gallery forest (27%)
Burkina Faso	Gallery forest (30%) forest and mainly in Protected Areas
Cote d'Ivoire	Forest (67%) Degraded forest (28%) woodland (48%)
Gambia	Gallery forest (42%)
Ghana	Forest (17%) Gallery forest (8%)
Guinea	Forest (33%,) Gallery forest (3%), woodland (1%)
Guinea Bissau	Forest (77%)
Liberia	Forest 15%, woodland 98%
Mali	Gallery forest (23%)
Niger	Gallery forest (66%), Sahelian short grass savanna 27%
Nigeria	Forest 45%
Senegal	Woodland (42%), Gallery forest (19%)
Sierra Leone	Forest (30%) Degraded Forest (26%) Gallery forest (22%)
Togo	Forest (21%) Gallery forest (36%)

Source: eros.usgs.gov/westafrica/land-cover/land-use-and-land-cover-trends-west-africa

To reduce further degradation and possibly reverse the trend, countries from all over West Africa have embarked on programmes and projects on forest restoration. Some of the countries have put in place national policies in support of tree plantings, while others have made ambitious commitments to international conventions, pledges and agreements – notably the “Bonn Challenge” for the restoration of large tracts of degraded forest and other lands, the Africa Forest Restoration (AFR) 100, the Great Green Wall of the Sahara and Sahel Initiative, etc. Notable pledges made to the Bonn Challenge and AFR 100 so far include – Cote d'Ivoire - 5 million hectares, Ghana - 2million hectares, Guinea - 2 million hectares, Liberia – 1 million hectares, and Niger - 3.2 million hectares, Nigeria – 4 million, and Sierra Leone plan to restore

10 000 hectares by 2020. Some countries in West Africa have experiences in plantation establishment, which essentially is basic tree planting. Ghana, for example, put in place a national forest plantation strategy for 2016 and 2040. Most of the countries tree planting exercises do not follow a forest landscape restoration approach, which involves integrating various spatial scales to address multiple elements of biodiversity, landscape connectivity and watershed management.

Forest landscape restoration – what exactly does it mean in the context of West Africa?

It has been quantified that over two billion hectares of degraded or deforested lands offer opportunities for

restoration worldwide. African countries have a large share in land degradation. Africa has the largest restoration opportunity of any continent in the world – more than 700 million hectares of degraded land. Most of the 700 million hectares are losing, or have lost, the functions they are noted for – ranging from ecological sustainability to the provision of social and economic goods and services. West Africa is of importance because it is one of the sub-regions with high rates of deforestation and forest degradation. Moreover, The Guinean forests are home to substantial biodiversity, with many species not found elsewhere, i.e. in central Africa.

Forest Landscape Restoration (FLR) is a process that aims to regain ecological integrity and enhance human well-being in deforested or degraded forest landscapes. In addition

to the reforestation and ecological restoration potentials, FLR involves bringing all stakeholders together in the process of restoring the function and productivity of degraded forest lands through a variety of interventions.

The West Africa Biodiversity and Climate Change (WA BiCC) approach

Tetra Tech ARD in partnerships with Palladium, Columbia University's Center for International Earth Science Information Network (CIESIN), PCI Media Impact (PCI), and Pact -- were awarded the USAID contract for implementation of West Africa Biodiversity and Climate Change (WA BiCC) project activities starting from May 2015. The WA BiCC program is expected to run through May 2020. This Program is designed to strengthen the resiliency and sustainability of West African institutions, ecosystems, and communities.

Two of the three components of the WA BiCC program is about working with the West African people to increase coastal resilience to climate change and reducing the threats to deforestation, forest degradation and biodiversity loss in WA BiCC targeted coastal and forest landscapes. Strategies have been developed focusing on supporting effective interventions and creating an enabling environment. One of the approaches identified by WA BiCC for the implementation of the strategies includes Forest Landscape Restoration.

WA BiCC is following up on the activities of the International

Union for Conservation of Nature (IUCN) on FLR – especially in the use of the Restoration Opportunity Assessment Methodology (ROAM) to quantify the areas suitable for restoration in West Africa – notably the Mano River Union (MRU) countries (Guinea, Sierra Leone, Liberia, and Cote D'Ivoire) and Ghana. The use of ROAM aligns with the Economic Community of West African States (ECOWAS) Forest Convergence Plan developed in 2013 for the Sustainable Management and Utilization of Forest Ecosystems in West Africa. This document embodies the ECOWAS strategic vision for the sound management of natural resources, environmental preservation and sustainable development in our ecosystems. One of the priority areas of the convergence plan focuses on forest ecosystems management and reforestation in which forest landscape restoration plays a significant role.

WA BiCC and ECOWAS intend to mainstream the concept of FLR, by providing support to some of the West Africa countries in the identification and mapping of potential priority sites for restoration. An African /Hausa proverb says- «Mai lura da ice bashin jin yunwa» i.e. “He who takes care of trees will not suffer from hunger”. Hence, the promotion of not just the planted trees, but also the broader consideration of the functions of forests in a landscape should be taken as priority actions by the governments of West African States and supported financially. Restoring the whole landscape targeting watersheds and complementing (not displacing) existing land uses such as sustainable agriculture, agroforestry, improved fallow

systems, ecological corridors degraded forest/woodland areas, and river and lakeside plantings to protect waterways should be further explored. This is, in fact, the way to strengthen landscape resilience to optimize their ecosystems goods and services and address people/ society's needs. The process will require leveraging a suite of strategies ranging from natural regeneration to tree planting, avoiding further reduction of natural forest cover, tailoring to local conditions, involving stakeholders, using adaptive management and searching for multiple benefits.

WA BiCC intend to promote FLR as a viable land use mechanism to reverse deforestation, forest degradation and biodiversity loss, and also use the process to estimate the climate change mitigation and adaptation potentials of the West Africa forests through the enhancement of carbon stocks.

WA BiCC has commenced consultations with selected West Africa countries especially those that have demonstrated interest and commitment to FLR. The countries of priorities are those that form part of major watersheds including the watersheds of river Niger, Senegal, Gambia, Mono, Volta, Tano, Bia, Komoe, Sassandra, Cavally, Cestos, St John, St Paul, Lofa, Mano, and Moa rivers (Fig. 2). These watersheds are ideal environments for FLR and quick restoration of ecological functions of the landscape and biodiversity.



Figure 2: West African watersheds as ideal sites for initial FLR program

Source: EROS/USGS/West Africa/Atlas

As mentioned above, WA BiCC will partner with institutions and sub-regional economic bodies including ECOWAS, MRU, SERVIR West Africa, and national governments in the promotion of FLR in the sub-region.

The following are the approaches that WA BiCC is employing for FLR interventions in West Africa:

- Stakeholder consultation on the concept of FLR in six countries of West Africa notably – Burkina Faso, Guinea, Liberia, Niger, Senegal, and Sierra Leone. This aims to introduce the concept of FLR and stimulate multi stakeholder processes in the countries. It will also enhance the knowledge and understanding of the FLR and ROAM assessment process across national stakeholders. This will entail inviting all stakeholders that are involved in the management and use of natural resources. The idea behind the consultations go beyond the introduction of FLR concept, it will also demonstrate the countries' willingness in meeting up to their Bonn Challenge and AFR 100

pledges and supporting the implementation of national priorities that can lead to increased food productivity, water security, biodiversity, and resilience to climate change, each of which will benefit the countries and the global community. This can be the starting point for the development of a Regional FLR Strategy for West Africa or at a minimum Mano River Union FLR Strategy.

- Finalize the Ghana ROAM processes started by IUCN. WA BiCC intend to follow up and finalize the earlier work of IUCN in the use of ROAM for the development of the Ghana FLR Opportunity map and use it in the estimation of the amount of carbon that could be available from forests for climate change mitigation and adaptation. Ghana has also pledged 2 million hectares to both the AFR 100 and Bonn Challenge and the mapping will be useful in the identification

of the areas available to meet the pledge. The Ghana Assessment report will be useful in supporting the forest sector investments, by ensuring ease of working in areas of highest potentials. The report will support the implementation of the Ghana REDD+ strategy and the Forest Investment Plan. It will serve as the basis for replication in the MRU countries.

- Application of Regional ROAM in Mano River Union (MRU) – WA BiCC intend to employ ROAM to estimate i) the current and future carbon sequestration potentials and ii) the biodiversity potentials of the Mano River Union landscapes and corridors with the aim of producing a West Africa FLR map. The rationale behind this is the decline in forests cover in MRU countries. The rate of deforestation and degradation have been different in each of

the countries but the trend remains the same. Land degradation associated with soil erosion is also increasing. This trend has negative impacts on the ecological resilience of the different landscapes of the sub-region and their ability to provide ecosystem services that support livelihoods of millions of people. There have been some mitigation efforts by the countries – for example through their respective National Development Plans. As mentioned above, the four countries of MRU pledged to contribute to the Bonn Challenge commitment - Cote d'Ivoire - 5 million, Guinea - 2 million, Liberia – 1 million, and Sierra Leone plan to restore 10 000 ha by 2020. By employing a regional ROAM, the MRU countries will be able to identify areas available for restoring degraded forest landscapes leading to improved ecosystem quality and resilience, providing new opportunities for rural livelihoods, while securing adequate water and energy supplies and supporting low carbon economic development. This will be the first example of regional integration in forest management and will be an ideal strategy for the maintenance of the Fouta Djallon watershed. The FAO/ Africa Union “Fouta Djallon Highlands Integrated Natural Resources Management Project” and the MRU/IUCN/ GEF “Mano River Union Ecosystem Conservation and International Water Resources Management Project” are specific examples of projects that will

benefit from using the FLR approach. It is envisaged that this could be one “best practice” that ECOWAS might want to replicate in other part of the region, for example the Sahel.

- Engagement of private sector in FLR implementation. WA BiCC has identified the method of restoration used by Form Ghana (one of the private sector actors involved in forest restoration in Ghana) as an ideal method to replicate with other private restoration companies in West Africa. WA BiCC will organize exchange visits between Form Ghana and other private sector companies. Form Ghana benefits in two fronts – they are able to sell their sustainably managed timber products as well as also get paid for the ecosystem services they rendered through the offer of their carbon credits. Form Ghana’s restoration activities have been independently validated under the Verified Carbon Standard (VCS).
- Organization of a Regional Technical Learning Event on FLR in West Africa – there have been discussions between ECOWAS, IUCN, and WA BiCC on the importance of organizing a regional workshop on best practices in FLR. This learning event will be for technical people from governments, civil society, and the private sector involved in restoration activities. ECOWAS will be expected to play a leading role in this learning event and subsequent high-level events to follow.

Conclusions

It is envisaged that the implementation of the WA BiCC approach on FLR in West Africa will lead to

- a) a better understanding of perspective and achieving national buy-in to the concept of FLR through consultations involving all stakeholders in the countries selected;
- b) support and showcasing the Ghana and Cote d'Ivoire assessments as pilots and a learning opportunity in the sub-region. The Cote d'Ivoire assessment was carried out by IUCN;
- c) further piloting FLR/ ROAM in targeted learning landscapes within MRU to generate lessons on how FLR can be adapted to varying ecological and socio-political contexts – for example producing sub-regional ROAM assessments in transboundary landscapes of
 - i. Zياما-Wonegizi-Wologizi-Foya between Liberia and Guinea, and
 - ii. Gola Transboundary Landscape between Liberia and Sierra Leone;
- d) some of the private sector in the sub-region will be employing FLR process for plantation establishment; and
- e) the lessons learnt through the process will be useful for replication in other countries within West Africa.

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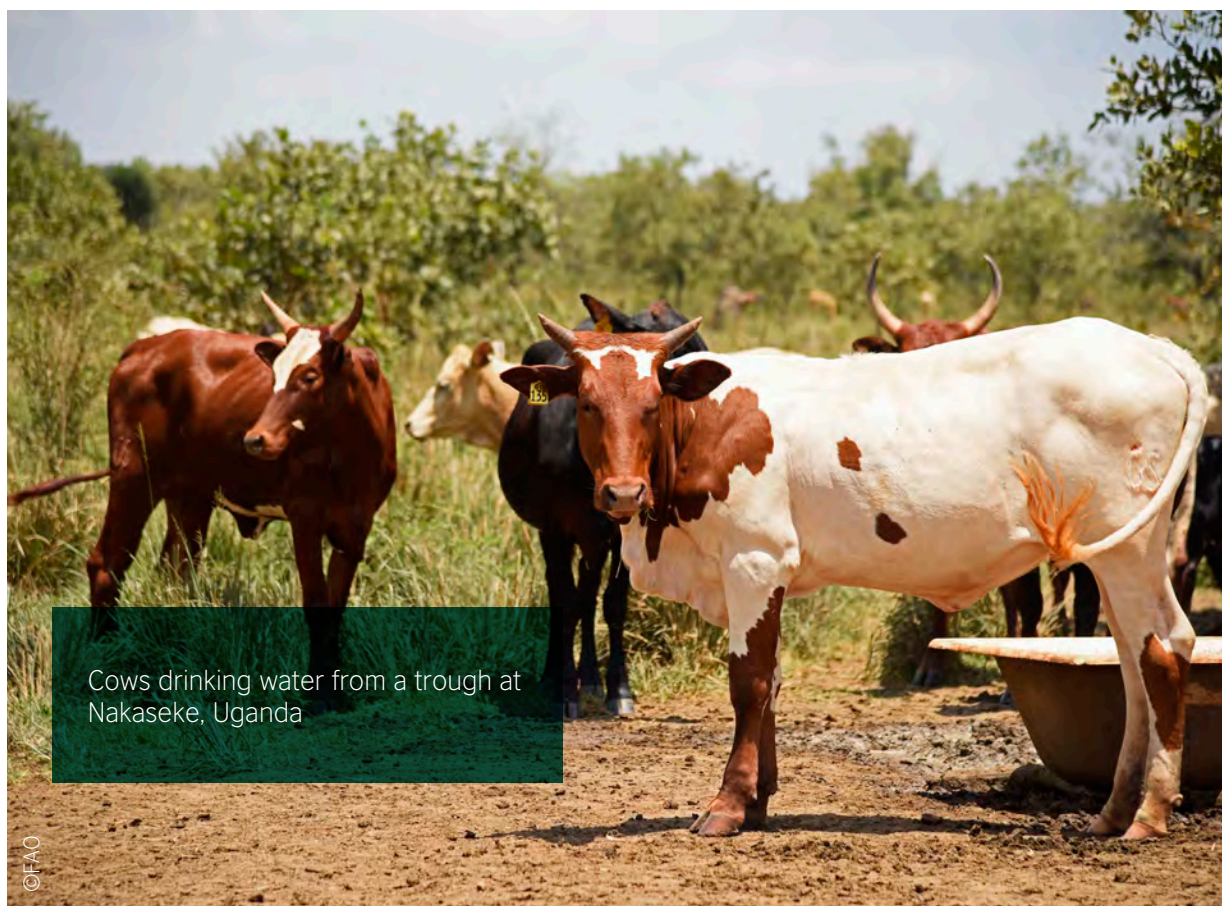
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Africa's ambitions in landscape restoration

Mafa E. Chipeta¹

Mankind is prone to committing sins – including many against the environment. Most talked about over the last decade has been man's massive discharge of carbon dioxide, methane and various nitrogenous and sulphurous gases which now account for a heavy blanket around earth that makes the atmosphere a greater trap for heat than before mankind made his contribution. As progressive planetary warming occurs and leads to even higher temperatures, earth is already subject to frequent and very severe climatic events – floods, snowfalls and droughts. To moderate the global warning which dominates climate change symptoms, man has identified the planting or retention of trees and other vegetation to capture carbon as one part of effective penance for sins committed.

Foresters have committed themselves to playing their part and on the 6th of December 2015 at the Global Landscapes Forum on the margins of the UNFCCC Conference of Parties (COP21) in Paris, they showed their intention to pursue aggressive vegetational restoration of landscapes. The Paris events were a follow-up to the September, 2011 decision of world leaders assembled in Bonn to launch the world's largest-ever landscape restoration initiative, which has been labeled "the Bonn Challenge"² whose ambition is to restore 150 million hectares of degraded and deforested lands by 2020. Subsequently, on December 17, 2017 in Bonn, the Global Partnership on Forest and Landscape Restoration (GPFLR) and Global Restoration Council (GLR) held their joint summit "Scaling up Collaborative Action on Restoration"³ to

review the state of play in restoration, how best to have complementarity in their efforts to advance the restoration agenda, and to propose a roadmap for interventions. It became clear right from the start that, as reported by Akinnifesi (this issue of the journal) some 2 billion ha of land is available globally for restoration, of which over 700 million ha is degraded land in Africa alone, which is increasing by 3 million ha annually. .

Africa therefore has the greatest need for and gives the largest opportunities for forest and landscape restoration among the continents. Akinnifesi quotes a recent FAO assessment indicating that in order to halt and reverse land degradation in the Sahel and the Horn of Africa alone will call for about 10 million ha of annual restoration. It was only right therefore

that in the global fora Africa stepped forward to play its part: the 2015 Paris Global Landscapes Forum witnessed the launch of the African Forest Landscape Restoration Initiative (AFR100) as a pan-African but country-led effort to restore 100 million hectares of degraded and deforested landscapes by 2030. Africa was present and active in Bonn as also at other occasions where international treaties are signed in favour of development, environment, trade, agriculture and food security, intellectual property or other topics. The Bonn commitments add to Africa's own range of agreements under the African Union or subregional organizations to conserve, enhance or combat illegal and irresponsible treatment of forest/woodland and wildlife resources.

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² see <http://www.forestlandscaperestoration.org/topic/bonn-challenge> and http://www.forestlandscaperestoration.org/sites/default/files/topic/the_bonn_challenge.pdf

³ <http://www.afr100.org/content/gpflr-partners-meeting-glf-bonn>

This issue of Nature & Faune focuses on African ambitions to satisfy agreements made under the Bonn Challenge and at the Global Landscapes Forum in Paris to reclaim damaged or destroyed landscapes: in many regions, this is largely viewed through a forestry lens and Africa is no exception. The journal carries some excellent papers – some giving an overview of the magnitude of restoration needed (e.g. Akinnifessi; WRI) and others giving specifics on programmes or projects or on initiatives in specific countries. Fortunately, the collection of writings does not suggest that interest in restoration was invented either at Bonn 2011/2017 or at Paris 2015: there are foundations and experiences to build upon some of which (including the fencing off of land to allow regeneration) have gained much from African experiences and experiments during the post Sahelian drought.

Ideally, Africa should fully implement the treaties it is signatory too, including the one on landscape restoration; if it does that, Africa will be among the most environmentally responsible and compliant regions in the world. But it faces some challenges which should not serve to discourage action or dampen commitment but should help guide towards realistic approaches to intervention. This opinion piece draws attention to such considerations – it carries no ambition of introducing new information or insights into the commendable desire to re-green landscapes but to raise some points of necessary contextualization so that action is anchored in realism of ambitions and thereby improves

chances of such interventions being sustainable over the long horizon. The following are among the dimensions proposed for consideration:

1. *Change is a permanent feature of all evolution in nature, including of ecologies; some of the change will necessarily involve replacing former green cover with more bare landscapes.* The ambition of re-greening/landscape restoration should therefore not aim to turn the clock back and reverse evolution in all cases but should select areas where degradation has become too severe to ignore. Nevertheless, in a continent where massive deserts already exist (some probably formerly forested or wooded) – Africa should feel obliged to walk the extra mile in regaining vegetation relative to other continents.
2. Also, Africa's smallholder agriculture runs mostly on the low-input/low output model and so its people clear vegetation from the land at a most unsustainable pace. If effective measures are not taken to raise agricultural productivity and so to slow down this degradation/deforestation, the benefits of re-greening already degraded areas will be largely nullified. This will be a case of running after a fast-growing problem. It is absolutely essential that in Africa more than elsewhere, restoration efforts be accompanied by policy measures to slow down damage to new vegetation- especially by raising farm productivity through (fertilisation, better breeds etc) so that boosting farm output does not call for extensive forest and woodland clearing.
3. In Africa more than elsewhere, methods for vegetation restoration must not just be cost-effective but also seriously low-cost per unit land covered. This is because Africa is poor and its limited funding capacity can only be modestly spared for re-greening given the existence of other large pressing demands for health, education, infrastructure etc. As orders of magnitude, it is well to note that with its billion-odd people, Africa has about 15-16% of the world's total human population but has an economy that accounts for only 2-3% of the global GDP and its share of global trade has similar orders of magnitude. *With poverty and poor capacity to fund its own interventions being among Africa's defining attributes* Africa must be selective on where it intervenes, at what scale, and where the chances are best for sustaining long-term intervention;
4. Historically, when new initiatives come, their early stages attract easy donor funding: this can be a trap. Donor funding is also still needed and is inadequate for many other pressing needs in Africa (education, food, health, development etc) – Africa must exercise good judgement based on dispassionate analysis as to how much priority it should give to this latest and most fashionable desire to re-green landscapes as compared to channelling

- some aid to older but also pressing needs;
5. Given poor capacity to internally fund interventions, a particularly important question for Africa has been alluded to earlier: how to choose for low cost and for cost-effectiveness. This will require careful choice between cost-intensive technologies (such as planting afresh) and less costly but socially difficult natural regeneration (how to keep out people from using resources to allow re-growth). In fact, when money is as tight as in Africa, we should not applaud interventions based on superficial gain (e.g. massive plantations appearing almost overnight) but should subject them to rigorous comparative cost-benefit analysis relative to the many other pressing things the investment could have been applied to;
 6. Most papers in this issue of the journal are silent on the cost at which landscape restoration will be achieved. The environmental benefits may be clear but rural communities will want more than this - in particular, landscape restoration should also offer them employment and income – even longer-term prosperity – and not just a greener environment. I appeal for designers of programmes to include a visible economic dimension in restoration/re-greening interventions. Without this, it may be hard to motivate local people to take part in such activities;
 7. Tree cover is not synonymous with correct restoration; nature is too clever to accept tree-only or tree-focused re-greening as a substitute of natural reality. Since none of the papers suggests the potential value of renewing landscapes using non-tree vegetation (grassland, shrubs etc) Society must encourage all key umbrella initiatives - such as AFR100 or the Great Green Wall of the Sahara and the Sahel Initiative, to combine a range of vegetation and animal life in restoring nature. (It is unlikely that nature if left alone would have wanted to be restored only to trees; most likely it would have evolved to combinations of many life types. Globally, carbon capture for example may be at least as high via sea algae as through terrestrial vegetation – that is how open-minded nature is.);
 8. In almost all sub-Saharan African countries, 60-80% of the population is still rural and therefore interacts intimately with landscapes and their resources, including using them as a land bank to convert to farming. Urbanisation and infrastructure expansion also eats away daily at natural landscapes: such pressures are often an absolute need for development. To the proposals in the papers in this journal which focus on introducing green cover onto the land, society must press for complementarity with non-forest, non-tree uses of the landscapes, some of which are also very important for local people. This may call for governments to put in place institutional and policy arrangements to ensure inclusive planning and execution of restoration initiatives in context of overall sustainable national development;
 9. Bonn and its re-greening agenda is only the latest high-profile initiative Africa is excited about. To mention a few, every single African country also has to act on its obligations under agreements on combating desertification, climate change, biodiversity, food security and nutrition, industrialization, trade and its globalization, health and education ambitions, the SDGs and their preceding MDGs, the outcomes of endless global summits on gender, child development, human rights etc. Internally each country may have signed off on the AU NEPAD ambitions, AU 2063 vision, and subregional agreements both inside and outside forestry. Africa has been sequentially excited about all these agreements when they were still fresh. Africa may wish to act differently this time: the tendency to promote action vigorously simply because initiatives are in fashion is unhealthy. Africa should link the new restoration to many earlier related actions for example under the UN Desertification Convention, Tropical Forest Action Plan, and Great Green Wall of the Sahara and the Sahel and other initiatives. It should also sustain interventions in non-greening and non-forest activities that the continent needs for balanced and sustained development.

The speed with which Africa has embraced global intentions to restore landscapes is commendable and Africa's foresters and all others who work on the land must be proud. But they need to ensure that this goes beyond governmental statements of intent. Governments in Africa have committed to many other ambitions, such as food security, but for failure to mobilise their people and institutions, countries have made only modest gains. Should we allow this to also happen for land

restoration? The land and its natural cover is the capital upon which sustainable development is founded. It is only the unwise who allow their very foundations to remain threatened. Given that the level of degradation is worse than in any other region of the world, Africa should set the lead in restoration efforts. It must plant; it must enclose land to allow regrowth; it must integrate life-saving vegetation on farmlands as well as in the urban space. And it should demonstrate commitment by allocating substantial sums of its

own human energy and financial resources, with donor support to be only a complement.

But in doing this it should not forget that its people cannot eat a green environment; they are poor and they will embrace restoration action only if it is done in such a way that they can also derive income, employment and long-term prosperity from the interventions. Africa needs not "environment" or "development" but both; and it can do it.



Moctar Sacande, forest seed and restoration specialist, FAO, leading a group of farmers for harvesting seeds in Tera, Bajirga, Niger.

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From pledges to action: Africa's 100 million hectare restoration goal comes into focus

Tangu Tomeo¹, Salima Mahamoudou² and Emily H. Averna³

Summary

Forest landscape restoration—the process of returning productivity to forest, agricultural, pastoral, and even urban landscapes—is a critical pathway to achieving human prosperity and environmental sustainability. Experience from the African continent demonstrates how restoration can boost food and water security, household income, and communities' resilience to climate change. An African restoration movement is underway to scale up these successes and transform hundreds of millions of lives and hectares across the continent.

An African restoration movement is taking root

Africa is home to the world's largest restoration opportunity, with more than 700 million hectares of deforested and degraded land that could be restored.⁴ The continent is also home to some of the world's most iconic restoration successes. For example, farmers and community members in Niger implemented farmer-managed natural regeneration (FMNR) and soil and water conservation to restore five million hectares of land. Their

efforts have resulted in improved crop production and food security, increased household income, reduced fuelwood collection time for women, and increased carbon sequestration – estimated at 25 million tons of carbon over the past two decades.

Community members, local government, and donors came together in Ethiopia's Tigray region to restore more than one million hectares of degraded land through FMNR, rainwater harvesting, and stone bund and terrace construction. Restoration in Tigray has been associated with multiple impacts including

a thousand-fold increase in irrigated land, self-sufficient food production, and a 50% drop in the number of people living below the national poverty line (Reij, 2015 & World Bank, 2015). The 2017 Future Policy Award—known as the “Oscars for best policies”—was awarded to Tigray as having the world's best land restoration policy.

Momentum for forest landscape restoration (FLR) is surging across the continent.

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4 Forest landscape restoration (FLR) refers to the ongoing process of regaining ecological functionality and enhancing human well-being across deforested or degraded landscapes. FLR takes a landscape approach and is implemented not just in forests but also in agricultural, grazing, and even urban areas. FLR, or tree-based landscape restoration, includes activities such as agroforestry, assisted natural regeneration, silvopasture, and farmer-managed natural regeneration as well as tree planting.

To date 26 countries have made ambitious commitments—totaling nearly 85 million hectares—to the African Forest Landscape Restoration Initiative (AFR100) and the Bonn Challenge. Through the AFR100 partnership, stewarded by the NEPAD Secretariat, countries are accessing technical support and financial assistance to translate their commitments into action

on the ground. Malawi and Madagascar have launched first-of-their-kind national restoration strategies that outline where and how restoration interventions can be implemented (MNREM-Malawi, 2016; NRPF-Madagascar, undated). Malawi’s strategy outlines five restoration interventions that can be implemented to restore as many

as 7.7 million hectares—80% of the country’s total land area.

A number of common themes are emerging as countries pivot to implementation. These include effective community engagement, accessing private finance for restoration, and linking restoration with efforts to halt deforestation and improve land use planning.



Figure 1: AFR100 partner countries, as of May 2018
 Source: NEPAD Agency and World Resources Institute

Communities can lead the way

Experience from Malawi demonstrates the critical role that community engagement and capacity building will play in achieving the country’s 4.5 million hectare target. Many restoration practices are being implemented throughout Malawi, including conservation agriculture, soil and water conservation, river and stream-bank tree planting, agroforestry, and afforestation. In addition,

FMNR has been broadly adopted as a means of restoring soil organic matter and increasing crop yields (MNREM-Malawi, 2017). As its name implies, farmers and community members play a central role in implementing FMNR.

A low-cost agricultural practice, FMNR encourages farmers to manage the natural regrowth of trees on-farm, especially those that have multiple uses and the potential to enhance land productivity. In Malawi

FMNR is advancing women’s empowerment, particularly by reducing the time burden of collecting fuelwood and fodder, and also through diversified sources of income (MNREM-Malawi, 2017). Research has shown that FMNR can result in a 10% crop yield increase in “good” years and a two-to-five times higher crop yield in “bad” years, and can stabilize fodder availability allowing more livestock to graze in the same area.

As indicated in Malawi's national Forest Landscape Restoration (FLR) opportunities assessment, improved agricultural technologies including FMNR could be implemented on as many as 3.7 million hectares. This is close to 40% of Malawi's total land area. However, a number of barriers inhibit smallholders' adoption of FMNR despite its many benefits. Barriers include a lack of emphasis of on-farm trees in agricultural extension messaging, the perception that it

takes a long time for farmers to realize the benefits of tree-based interventions, and concerns that trees on-farm could reduce crop yield by taking up space otherwise dedicated to agricultural production.

In order to surmount these barriers Malawi's Department of Forestry, the USAID-Malawi Protecting Ecosystems and Restoring Forests in Malawi (PERFORM) project, and technical partners have engaged communities to increase

understanding of FMNR and how to implement it. The Department of Forestry and PERFORM project have facilitated farmer exchange visits and peer-to-peer trainings in villages across Malawi to clarify: the benefits of and barriers to implementing FMNR, actors already practicing FMNR and where they are doing so, simple FMNR techniques, pathways to engage women and marginalized groups in decision-making, and approaches to accelerate adoption by community members.



Figure 2: Demonstration on pruning in a farmer's field in Mthiko village, Ntubwi EPA, TA Nkula, Machinga, as members appreciate some young seedlings left deliberately on farm.

Source: Republic of Malawi Ministry of Natural Resources, Energy and Mining and the USAID Protecting Ecosystems and Restoring Forests in Malawi (PERFORM) project.

Private finance is needed to restore at scale

Restoration has historically been funded through public finance from governments or long-term impact investors motivated

by environmental and social benefits. With as many as 700 million hectares of degraded lands that could be restored in Africa, public finance alone will not be enough (DeWitt and Weber, 2015). Research shows that less than 20 percent

of annual funding needs for restoration and conservation are met, leaving a gap of \$250-\$350 billion annually (Faruqi, 2017). FLR must attract a broader investor base to support governments' transition from

pledges to action on the ground (Wu, 2017).

FLR can generate substantial revenue sources from wood, non-wood products, tourism, and other goods and services. The action of restoring is an investment, as restored lands can provide a steady flow of goods and services and deliver capital gains by increasing property value. Restoration business models related to consumer products, commercial forestry, technology, and project management have been shown

to deliver financial returns (Faruqi et al, 2018). For example, F3 Life is a Kenyan company that adopted a technology-based business model, enabling smallholder farmers to create agricultural loan portfolios and access credit using an online platform. They are projected to make over \$100 000 in revenue in 2018, with an estimated 25 000 hectares of land to be restored by 2020. Achats Service International (ASI) is another example of a restoration business model. Based in

Niger, Achats created *Acacia Senegal* plantations on about 8 000 hectares of degraded lands, allowing the areas to be rehabilitated and water erosion to be prevented. Achats has produced and sold gum Arabic in local and international markets for the past five years. Many investors do not realize the possible financial returns from restoration, or know of profitable, scalable companies that have restoration as a core part of their business model (Verdone et Seidl, 2017).



Figure 3: *Acacia senegal* plantation established by Achats Service International (ASI) in the Tillabery region, in Niger.

Strengthening the policy environment for restoration can also help unlock private and public finance. Governments can take a number of actions including: imposing carbon prices and utilizing those funds to restore land, incentivizing restoration through subsidies, accessing multilateral climate finance to fund restoration, adopting a cross-sectoral approach, and bundling projects to increase investment size and minimize risks (Ding et al, 2017).

Restoration must be paired with efforts to halt deforestation

While FLR has been welcomed in many African countries, deforestation remains a persistent problem across the continent. Without halting and reversing deforestation, gains made through landscape restoration will be neutralized and will fail to deliver urgently needed benefits to communities.

Deforestation is of particular concern in tropical areas (Bergen, 2017). Africa houses the second largest continuous tropical forest in the world after the Amazon. But in recent years, the majority of Central African countries have seen a surge in deforestation and land degradation fueled by population growth and increased demand for (forest) land and trees for agriculture, charcoal production and firewood. In fact, while many governments are

committing to restoring millions of hectares and developing national restoration strategies, demand for timber, agricultural lands, palm oil, cocoa, oil and minerals is putting severe pressure on the African forests that remain.

To be successful, restoration must be paired with avoided deforestation efforts and integrated into broader land use planning processes. It can be a powerful tool for reducing deforestation without compromising associated development while supporting economic growth and communities' livelihoods. Restored landscapes provide important alternative sources of wood and fuel that reduce pressure to clear primary forest. Early-stage efforts are underway in the Democratic Republic of the Congo (DRC) to solidify these links. DRC's Ministry of Environment and Sustainable Development is exploring options to integrate restoration opportunity assessment map layers into its Forest Atlas, a platform used to drive participatory land use planning. Economic analyses that show the costs and benefits of restoration activities may also be applied to help decision-makers weigh the tradeoffs of different land uses.

African countries are partnering to make large-scale restoration a reality

Africa is poised to trigger a continent-wide restoration movement, but significant barriers must first be surmounted. Farmer innovators and restoration champions must be fully engaged to share good practices and build support for restoration within communities. Increased private investment must flow to countries and enterprises that restore land. Avoided deforestation and restoration efforts must be viewed as two sides of the same coin to inform holistic land use planning and management.

African countries are sharing knowledge and working hand in hand with technical partners and financiers to tackle these challenges and achieve restoration across 100 million hectares. Doing so will benefit millions of households with enhanced food, water, and energy security, livelihood diversification, and strengthened resilience to climate change.

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Scaling up commercial reforestation as part of forest landscape restoration: some key factors to success

Christine Naaijen and Paul Hol¹

What has happened since the launch of the initiative 'Forests for the Future, New Forests for Africa', in 2016? How far have we got with the ambitious plan to replant 100 million ha of African forests?

Sustainable Forestry Investments (SFI), is a Dutch investment company with large-scale investments in landscape restoration in Ghana and Tanzania. It has about 30 000 hectares under management and is still expanding with the support of new investments, such as a loan from the African Development Bank (AfDB). There are tangible results and key factors to success to share, that prove that it is possible to create change.

Introduction

Climate change, population growth and predicted resource scarcity has led to insights that deforestation, and the tragedy of the commons that had been used as an excuse for too long, had to stop. In 2016, the African Forest Landscape Restoration Initiative (AFR100) was launched, a country-led effort to bring 100 million hectares of deforested and degraded landscapes across Africa into restoration by 2030.

Africa is determined to minimize negative effects of climate change. According to World Resources Institute (WRI) and the International Union for the Conservation of Nature (IUCN), more than 700 million hectares (1.7 billion acres) in Africa, have

potential for restoration (WRI, 2016). In fact, many African countries are taking action, focusing on reforestation but also on farmer-managed natural regeneration of trees, agroforestry and management of rangeland and presently non-forested ecosystems.

"While the priority must remain on preserving our natural forests, the revival of denuded areas through reforestation helps not only Ghana but also the global fight against climate change," were the inspiring words of Kofi Annan, strong supporter of the AFR100 agreement, in the documentary **Forests for the Future – New Forests for Africa**, which can be found on the website www.forminternational.nl

At the start of the AFR-100 initiative, the private sector was identified as a major

force that will make large-scale reforestation and forest landscape restoration possible. The 'do-good approach' was developed, meaning that commercial investments simultaneously improve the environmental integrity of the landscape and the livelihoods of the people living there, while also making a profit. Commercial reforestation companies can, and should, be enabled to do so from a sustainable and inclusive business perspective, including financial independence of the project.

At a special session at the latest Global Landscape Forum in Bonn, December 2017, *scaling up* investments that benefit smallholders and the landscapes they live in, was the main topic. *"There is nothing wrong with making profit from saving the planet",* said Erik Solheim, Executive

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Director of UN Environment, in his opening address. *“What is wrong is making profit from destroying it”.*

Doing good business, on the ground

In reforestation projects we distinguish three phases. First, financial preparations need to be made, by defining a bankable proposal, building a business case and finding investors. Then, the project is being implemented. Right from the start, the project should be embedded in the local context by building a balanced stakeholder framework and forming public private partnerships. Many projects end here, but this is where the landscape challenge begins: starting from one or several successful projects, further extension of impact beyond company boundaries should be created, including an improved governance structure for the whole landscape. At this stage, an inclusive commercially viable business model is applied, which is also beneficial to low-income communities.

Unlocking capital flows for forest development in Africa

Over the past ten years, Sustainable Forestry Investments (SFI), a Dutch investment company with large scale investments in landscape restoration in Ghana and Tanzania, has invested more at large scale with support from private impact investors. In 2017, a 24 million-dollar loan was approved by the African

Development Bank (AfDB), which was considered a breakthrough in climate financing, as part of the investment is ‘concessional loan’ from the Climate Investment Funds’ Forest Investment Program (CIF FIP), complementing the AfDB co-financing.

For the AfDB, the loan to SFI destined for the Form Ghana¹ reforestation initiative, represents the first Private Sector direct investment in restoration of degraded forests, of the Forest Investment Program (FIP). The AfDB loan will be used for restoration and extension of the area of sustainably managed forest in Ghana. The AfDB loan enables growth of the plantations from 7 500 hectares in 2016 to 11 700 hectares by 2020 and assist Form Ghana to maintain and bring to maturity the existing plantations until positive cash flow. In this period the company can expand the work force and provide jobs to over 1 200 staff. By 2040, these plantations will have sequestered approximately 3.5 Million tons of CO₂. In order to increase the number of reforested hectares even further, SFI aims to have a total of 150 million dollars invested by 2030 in Ghana, Tanzania and other African countries.

Forest landscape restoration (FLR) from a commercial angle: enhancing value, benefits and services

Forest landscape restoration (FLR) involves increasing the density of trees across landscapes to boost productivity

and ecological functionality. Restoration practices go well beyond simply planting trees. For the African continent, the most direct benefits would be to improve soil fertility and food security, facilitate access to clean water, improve micro climate conditions, combat desertification, create “green jobs”, and bolster economic growth and livelihoods, while at the same time making a substantial contribution to climate change mitigation.

As population growth and resource scarcity is putting tremendous pressure on African forests, the demand for timber, poles, charcoal, fuelwood and wood fibre cannot be met by just sustainably managing the remaining tropical forests. With so many degraded lands in the region, the concept of commercial scale reforestation, as promoted by the AFR-100 initiative, can help contribute to counteract forest landscape degradation. It can even provide necessary stepping-stones in restoring ecological networks in the region that offer refuge and migratory paths for wildlife and promote adaptation pathways for flora and fauna in the face of climate change.

Form Ghana Ltd. is a forest plantation management company based in central Ghana that provides services in the field of reforestation of degraded Forest Reserves and plantation management. The company was established in 2007 and is an affiliate company of Sustainable Forestry Investments B.V. in the Netherlands. Form Ghana currently manages over 20 000 hectares of degraded

¹ Form Ghana Ltd is an offshoot of Sustainable Forestry Investments (SFI) – Netherlands; Form International is a forest management and services company that delivers a range of technical and financial services to Form Ghana and other clients worldwide.

land in the Ashanti and Brong Ahafo region of Ghana, of which about 10 000 hectares has already been replanted since 2007. Form has agreed a Public Private Partnership with traditional landowners and the Forestry Commission of Ghana. It is very important to achieve a balanced stakeholder framework between the company, local people and the government. The vision of Form Ghana is that restoration of degraded land is only feasible when based on highest standards of sustainable management, where ecological, social and economic components are developed simultaneously. Form Ghana holds the Forest Stewardship Council® (FSC®) certificate for sustainable forest management since 2010. Commercial tree sales are the financial backbone of this initiative: In about 5 years' time, this reforestation project will provide timber, and with the timber revenues the AfDB-loan will be paid off. Commercial reforestation is not a temporary solution. At the end of the rotation of about 20 years, the harvested area will be replanted again, in order to provide a continuous and sustainable contribution in mitigating climate change. Besides facilitating continued growth and harvest of the commercial teak species *Tectona grandis* also native species are actively grown in nurseries and planted for long-term nature conservation purposes and for soil protection, especially along creeks and waterways and in high conservation areas. These species will not be harvested

but will remain the basis for biodiversity development.

The reforested parts in the Forest Reserves in Ghana (Afrensu Brohuma, Asubima, Tain II) are considered as 'aggregators', that can serve as a nucleus for development of these wider forest landscapes, and link groups of smallholders to investors.

Scaling up: the landscape around the Tain II forest reserve

In the severely degraded landscape in and around the Tain II Forest Reserve (Brong Ahafo region, Ghana), Form Ghana works towards the restoration of the degraded landscape to its former production function, with the support of DOB Ecology. DOB Ecology is a Dutch foundation, providing support to partners that work to protect and restore forests and wetlands in Africa and South-America, and (re) build the conditions for resilient livelihoods of local communities. The already established plantations of Form Ghana, near Berekum, are the starting point for upscaling and outreach towards other stakeholders in a broader landscape.

Collaborating with smallholders and other stakeholders is an appropriate method to reach scale. The overall goal is integral management of a landscape with all stakeholders to improve livelihoods, productivity and the protection of biodiversity. Since the landscape is currently

heavily fragmented with little coordination between land users, the extended partnerships will focus on development of a governance structure for sustainable regional development, promote and pilot commercial tree and perennial crop planting and catalyze economic development and investment.

Through a participatory process this project will assist neighboring stakeholders with restoring their environment, engaging in climate smart agriculture and forestry outgrowing activities, thus providing good social and economic perspectives to them. Support will be given to smallholders and communities to raise land productivity, generate more income and become stewards of the land. In different parts of the landscape, restoration activities will take place through various pilots, such as the restoration of the threatened Eastern Guinean lowland forest along the Tain River, providing an ecological corridor. Community controlled land within the forest reserve will be restored and off-reserve smallholder farmers will receive support to develop sustainable and climate-smart agriculture, woodlots and perennial crops. Although activities are concentrated in the Tain Forest Reserve (9 000 ha), and over 2 200 hectares outside the Forest Reserve, the benefits will be felt in a much bigger landscape, comprising more than 100 000 ha.

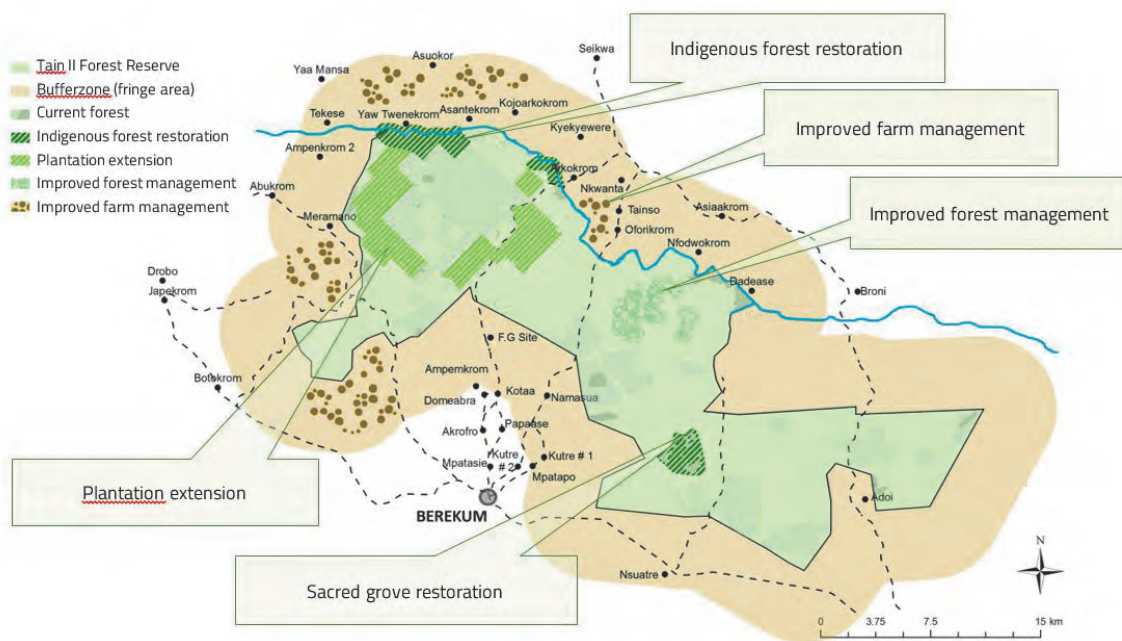


Figure 1. Sketch of the future landscape around the Tain II Forest Reserve; proposals for restoration and upscaling

Turning each challenge into success

What is a challenge in the first place, can become a success

factor once a solution has been designed. Probably the biggest challenge of each landscape restoration project is to start connecting with partners with

an open attitude, not being restricted by prefixed solutions on beforehand, create motion and motivate others to stay with the group.

Challenges & Success factors

Who takes the lead? In the case of Form Ghana, the company has been working for quite some time on its own plantation and restoration project. During this time, relations with public entities and other stakeholders are already developed. Once there is a basic level of trust, there is room for expansion. Landscape restoration initiatives are best led by a trustworthy entity, with a clear agenda, driven from their own interests and ideals. This kind of initiatives must have grass roots support, rather than be imposed from above.

Long-term investments: as for trees, a minimum of 10 years of growth is needed before the timber can be harvested and sold, the return on investment of approximately 10-15% a year will only then be released. Long-term investments are needed to make this possible. However, long-term investments imply high risks for investors. It is a challenge to mitigate risks in the project design to acceptable levels.

A long-term sustainable and integrated approach: highest standards of sustainable management, where ecological, social and economic components are developed simultaneously. Long-term thinking is a challenge as well as a key to success. Different aspects of the project have to be integrated and can be conflicting. Unfortunately, there is no recipe for the right proportions of ingredients.

<p>Development of a business case / bankable proposals: The economic aspects of the project need to be tackled, in the development phase. Some activities will have costs, other will generate revenues. There should be a balance in costs and expected revenues on the overall scale of the project. Commercial restoration has the aim of creating a productive landscape, which can generate revenues and sustain itself and safeguard long-term environmental and social sustainability.</p>
<p>Sharing costs is a challenge, and so is sharing revenues and benefits. It requires a high level of transparency and trust between partners. The creation of Public-Private Partnerships provides a solid basis for stakeholder involvement and benefit sharing. The process of defining the content and conditions of a formalized partnership can be seen as a 'negotiation', in which good relations are forged.</p>
<p>Most threats and problems (e.g. wild fires, but also poverty and climate change) cannot be solved by isolated entities and ask for cross border collaboration. Identifying all stakeholders in the local context of land tenure and their user rights, is the basis for strong relations and good landscape governance. Each stakeholder needs to be heard, and the group as a whole needs to agree on priorities. The total has to be more than the sum of the parts and each partner should see his benefits reflected. All stakeholders should be admitted taking part in the process and formulate their interest. In the upscaling phase, stakeholders cannot be treated as a homogenous group. Variations in characteristics need to be known in order to further lay-out the project. Rethinking your strategies in accordance with these characteristics is vital.</p>
<p>Design of a productive 'mosaic' landscape: Every stakeholder should have a clear benefit to participate and an eye for balance in the bigger picture. This means recognition of your own needs and your neighbours'. The challenge is not only to identify and solve conflicting land use issues but to find 'win-win solutions': finding optimum tailor-made solutions for every land use unit and integrating trees in the current local context, using different commodities including timber, cash and food crops, to be sold commercially or for domestic consumption.</p>
<p>Stakeholders cannot be asked to participate and be involved in a project if they have no income. But generating employment can only be done if there is a sound commercial element in the landscape project. Creating green jobs: Form Ghana not only generates employment for over 1 000 people. The nature of the company's activities also makes employees aware of challenges related to forest and landscape restoration.</p>
<p>Proven due diligence: In the case of SFI, FSC certification has helped to prove to the investors that environmental, social and governance requirements are covered. Environmental, social and governance requirements inside and outside the landscape project should be assessed. Not all of them can be influenced by the project and should be considered as pre-conditions.</p>
<p>Innovative attitude is needed: R&D, constant optimization of approaches and techniques. It takes time and money to develop new techniques. Testing of new techniques has a certain risk to it but can yield dividends when good results are implemented.</p>

More than the sum of parts

Government's support and cooperation in this kind of projects is essential. At the same time, the private sector's involvement is crucial to drive success. They are needed to attract much-needed investments, to lay-out the third component of sustainability: increase the financial independence and improve the financial position for all stakeholders involved in order to make change on regional level. Forest & Landscape Restoration

is one of the answers to climate change. However, in most cases 'changing the climate' will not be the ultimate motivation for participants, it can even be different for each land user. To make FLR projects successful, we need each other, and every single partner, whether a company, authority or a farmer, needs to see the added value of participating.

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Community-Based Ecological Mangrove Restoration (CBEMR): re-establishing a more biodiverse and resilient coastal ecosystem with community participation

Alfredo Quarto¹ and Ibrahima Thiam²

Summary

West Africa is ranked high on the list of regions threatened by climate change. Severe drought, massive deforestation, unsustainable agricultural practices, and poor watershed management have left much of West Africa dangerously vulnerable to sea-level rise and extreme weather events provoked by climate change. Restoration and conservation of the region's wetlands, especially their mangrove ecosystems, is a vital part of disaster mitigation and coastal protection strategy proposed for the region.

Mangrove Action Project's Community-Based Ecological Mangrove Restoration (CBEMR) program seeks to empower local communities to restore and steward their mangroves while deriving sustainable mangrove-based livelihoods. Involving local communities in mangrove restoration is essential, as it offers participants a sense of empowerment and involvement in resolving their own environmental, social and economic issues of community development.

Traditional mangrove restoration efforts face a fair number of challenges in restoring healthy mangrove ecosystems. Most are erroneous attempts to establish monoculture plantations that lack biodiversity and

true ecosystem function, or project designs that neglect underlying problems or stressors that impact mangroves and cause their loss in the first place, such as unusually high salinity or disturbed hydrology - tidal flow and mixing of salt and fresh water - essential to healthy mangrove ecosystems. Inland watershed problems, such as drought or flooding from dam releases or severe rainstorms, may affect flows of fresh water into the mangroves, negatively affecting hydrology. This may require creating ways to capture, store, and later release fresh water into the mangroves to maintain proper saltwater/ freshwater flow and balance.

CBEMR methodology, in contrast, works to restore underlying hydrology and considers adjustments to a disturbed area's topography, so that mangroves may regenerate naturally, resulting in true ecosystem restoration with a richer biodiversity. Importantly, local mangrove communities learn to perform this work, and in the process learn to restore, value, and responsibly steward their mangroves. Towards these ends, Mangrove Action Project (MAP) has joined forces with Wetlands International Africa to implement a training workshop in CBEMR in the Saloum Delta, Senegal that brought together and engaged 21 participants in April 2018.

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Background

Mangrove forests are vital for healthy coastal ecosystems in many regions of the world. These forest wetlands support an immense array of marine and coastal life, serving as vital fish nurseries, nesting and feeding grounds for migratory waterbirds, last stands for Bengal tigers and lemurs and a wide variety of other mammals including manatees and Proboscis monkeys, a myriad of insects and reptiles, including sea turtles. Mangroves also support the health and productivity of coral reefs and sea grass beds. In addition, mangroves play an important, life-supporting role for countless coastal communities and indigenous peoples who depend on mangroves for life and livelihoods. Mangroves now are recognized for their important role in reducing climate change, sequestering up to five times more carbon than other forest ecosystems, storing that carbon in their peat soils for hundreds, if not thousands of years. Mangroves are also living buffers against the forces of storms and waves that can otherwise devastate a coastline.

Yet, mangroves are one of the most threatened habitats on earth with an annual loss outpacing other tropical rainforests. It is estimated that less than 15 million hectares remain worldwide, less than half their original area. Their disappearance is primarily due to clearing for shrimp aquaculture, timber and fuelwood extraction, charcoal production, urban and agriculture expansion, pollution, coastal road construction and other industrial and infrastructure developments.

Cleared forests and degraded wetlands are turned into shrimp ponds, oil ports, tourist hotels, golf courses and marinas. Today, it is imperative to counter these losses. This one of the challenges taken up by Mangrove Action Project since its founding in 1992.

Wetlands International too has joined the movement for mangrove conservation and restoration in various places around the world. Wetlands International Africa has piloted local conservation and restoration projects extensively on the West African coast and in Kenya in the Eastern African region. Wetlands International Africa has worked with partners in West Africa for the adoption of a mangrove charter by governments. This experience is now being extended in a collaboration with the Abidjan Convention, which was established by participating nations of West Africa in 1981 via The Convention for Cooperation in the Protection, Management and Development of the Marine and Coastal Environment of the Atlantic Coast of the West, Central and Southern Africa Region (Abidjan Convention in short). It covers a marine area from Mauritania to South Africa, which covers 14 000km of coastline. The Convention provides an overarching legal framework for all marine-related programs in West, Central and Southern Africa.

Wetlands International Africa has identified a number of critical drivers of change for the degradation of mangroves, including issues of land clearance for agriculture, severe drought, increasing salinity and local wood harvest. Clearly

these concerns are complex, dynamic and arising at multiple levels, some of which we dealt with during the CBEMR training workshop in April 2018 on Senegal's Saloum Delta.

Seeking the most effective path towards long-term mangrove conservation and recovery, Mangrove Action Project (MAP) promotes the concept and practice of Community-based Ecological Mangrove Restoration (CBEMR). This holistic approach to mangrove restoration views the proposed plant and animal communities to be restored as part of a larger ecosystem, connected with other ecological communities that also have functions to be protected or restored. Mangrove forests can self-repair, or successfully undergo secondary succession, if the normal tidal hydrology is restored and if there is a ready source of mangrove seedlings or propagules from nearby stands that are accessible to reseed an area.

CBEMR focuses on re-establishing the hydrology, which will facilitate this natural regeneration process. CBEMR also engages local communities in the restoration process, empowering them to be stewards of their environment, and enabling them to regain the livelihoods ruined when the mangroves were destroyed. Five to ten-day intensive workshops train local people to do CBEMR, and long-term community management and monitoring plans ensure project sustainability.

Working with local communities and NGOs, MAP has been holding trainings in CBEMR and helping to develop and implement small successful

CBEMR projects in Senegal, Thailand, Indonesia, India, Myanmar, Honduras and El Salvador. MAP is planning further CBEMR training workshops in both East and West Africa, working with field-based NGOs such as Wetlands International Africa in Senegal and Guinea Bissau. Many challenges remain, however, such as the need for more robust monitoring and evaluation with internationally recognized outcome indicators. Also, there are challenging issues of land tenure and site availability; restrictions imposed by donors; carbon offset plantings encouraging ecosystem conversion rather than true mangrove restoration; and securing government permits and approvals.

Reforestation programs where the mangroves have been lost would therefore aim to re-establish mangrove forest protection, while furthering the potential for sustainable development. The improvement of mangrove ecosystems through restoration will enhance their functions as a natural water treatment system and spawning and nursery grounds for fish and shrimps, thereby improving health and livelihood possibilities to the benefit of marginalized local communities; and restoring the vital carbon sequestration powers of these forests.

MAP has witnessed the all too frequent failures of the so-called “traditional” hand planting approaches when performed at large scale. There is great need for the wider dissemination of the ecological mangrove restoration methodology to improve the success of mangrove restoration. The challenge was to adopt and introduce ecological mangrove

restoration, only described previously in scientific journals, to the socio-economic and cultural situation of mangrove communities, NGOs and governments of developing countries in Africa, Asia and the Americas. In the process, based on the principles of ecological mangrove restoration MAP has developed CBEMR, a sustainable model that engages and integrates local communities in the long-term process of conservation, restoration and management.

Community-Based Ecological Mangrove Restoration (CBEMR) defined

Ecological Mangrove Restoration (EMR) was first developed by Robin Lewis over the 40 years of his extensive international work on mangrove restoration. EMR is a more holistic approach to mangrove restoration that also includes a view of the proposed plant and animal community to be restored as part of a larger ecosystem with other ecological communities that also have functions to be protected or restored. Lewis has used EMR very effectively to restore both the biodiversity and functionality of mangrove ecosystems (Lewis, 2009). EMR aims to restore certain ecosystem traits and replicate natural functions as mangrove forests can self-repair or successfully undergo secondary succession over periods of 15–30 years if:

- 1) the normal tidal hydrology is not disrupted; and, if disrupted, attempts are made to restore that prior hydrology

- 2) the availability of waterborne seeds (propagules) of mangroves from adjacent stands is not disrupted or blocked (Lewis, 1982; Cintrón. and Shaeffer-Novelli, 1992).

Since mangrove forests may recover via their natural reseedling process, the need for labor-intensive hand planting and mangrove nurseries can be greatly reduced. It has been recommended that restoration planning should first look at the potential existence of stresses such as blocked tidal inundation that might prevent secondary succession from occurring, and plan on removing those stresses before attempting restoration (Hamilton and Snedaker, 1984; Cintrón and Shaeffer-Novelli 1992).

Long-term observations or monitoring should be carried out over six months to one year to verify if natural seedling recruitment is occurring once the stressors have been removed. There should be evidence of volunteer seedlings on site within one year of the hydrological adjustments. If not, a reassessment of the attempted restored hydrology and identification of other potential problems should be undertaken. If seed limitation is a factor, then collected seeds can be broadcast or released on an incoming neap tide, which can then recolonize the area in question. Only if natural recovery is not occurring should the third step of assisting natural recovery through planting be considered. (Brown, B., 2008).

Contrary to this scenario, many mangrove restoration projects move immediately into planting of mangroves without determining why natural recovery has not occurred. There may even have been a large capital investment in growing mangrove seedlings in a nursery and time and labor in hand planting before the stress factors are assessed; this often results in failures of planting efforts. Unfortunately, very little

effort goes into monitoring and evaluating these types of restoration efforts, whereby failures are not noted, nor reported, and valuable lessons not learned. Instead of this kind of non-scientific approach, MAP supports the restoration of a naturally functioning habitat through the six-step EMR approach to restoration and does not support “plantation forests” which disregard natural

species biodiversity and zonation. (Lewis, 2005).

This method has proven extremely successful in numerous past endeavors by Robin Lewis – for example in West Lake, Florida where 14 ha of mangroves were restored at a very low cost. CBEMR has been implemented by MAP in small-scale projects in Honduras, El Salvador, Indonesia and Thailand (see Figure 1).

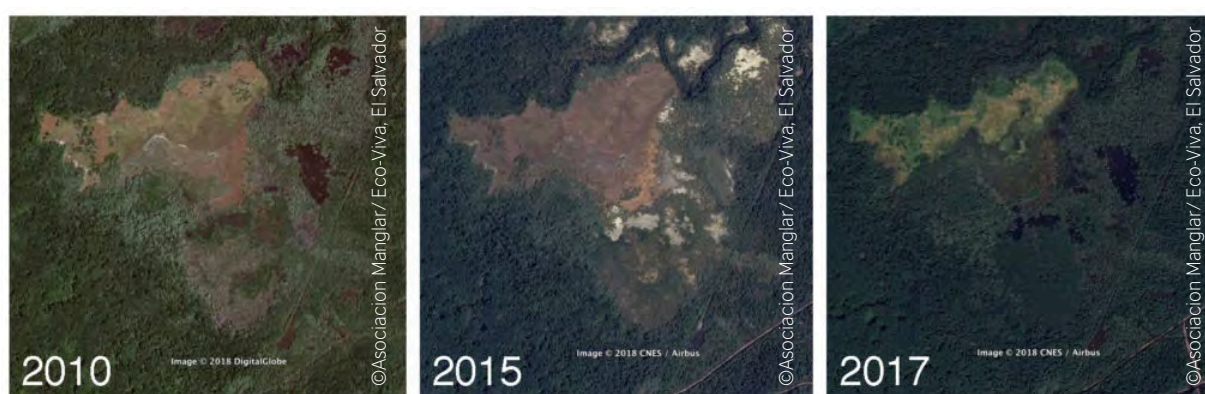


Figure 1. Photo sequence of a successful CBEMR project MAP helped initiate in El Salvador eight years ago resulting in good mangrove recovery after the blocked hydrology was restored by volunteers from the resident communities.

In the last few years, MAP has been working in Thailand to introduce CBEMR at 10 sites, working closely with the local communities along the Andaman Sea coast. The program aims to build capacity to implement CBEMR and empower selected local leaders from the villages to disseminate CBEMR to other communities, and to advocate the CBEMR approach to government. This is occurring through field visits, training, coaching and building capacity with study tours, environmental education and sustainable livelihoods.

Such small-scale projects serve as working models, intended to inform and inspire larger-scale

applications of CBEMR where it is needed. MAP is especially interested in restoring some of the estimated 400 000 ha of abandoned shrimp farms, rice paddies and cleared charcoal concessions in former coastal wetland areas in Africa, Asia and Latin America (Robin Lewis, pers. comm. 2012). MAP and Wetlands International Africa have recently launched a partnership to work together for this aim in the Saloum Delta region.

Advantages of Community-Based Ecological Mangrove Restoration over other current methods

Community-Based Ecological Mangrove Restoration (CBEMR) involves a more methodological ecosystem approach than the usual monoculture restoration efforts, incorporating natural mangrove dispersal and ecological recovery. The key is in the restoration of the hydrology of the area being considered for restoration, and then working with nature itself to help facilitate regeneration of the area’s naturally occurring mangrove species. Adequate monitoring and evaluation follow this at each site to assess progress and take corrective action to ensure success and replicability (Lewis et al., 2006). CBEMR is based on principles of community engagement and

empowerment, recognizing that sustainable restoration requires the active participation of the affected local communities. The importance of local community involvement in mangrove conservation and restoration cannot be overstated, as it is these local communities who reside on-site and have most to gain from a healthy, living mangrove buffer, including improved livelihoods from increased wild fisheries and protection from storms and wave surges. These communities also possess important local knowledge of their community base and surroundings, and are more able to monitor and assess the status of their mangrove areas on an ongoing basis.

Challenges, obstacles and opportunities ahead

The majority of past and current restoration efforts utilizing the traditional hand planting techniques have been failures. A comparative analysis of current methodologies is needed, so we can learn from our mistakes and avoid these in the future. We need to define more clearly what constitutes “restoration” and what should be labeled a “success.” Too often, just planting a certain large number of *Rhizophora* (red mangrove) propagules represents success, when in reality these mass hand-plantings may be dismal failures with quite poor seedling survivability, and if “successful” resulting in the forced conversion of one important wetland ecosystem (a mudflat or salt flat where most of these mass plantings occur) into another (a mangrove). These mass single-species plantings most often result in monoculture

plantations at best, or, more often, large-scale failures at worst. Planting competitions have even been introduced to the “restoration” scene, when one-day mass plantings of over a million mangrove seedlings have set and reset superficial Guinness World Records in countries such as Pakistan and the Philippines among others. However, what do such records mean if these planted seedlings do not survive, or if once viable coastal ecosystems are irreversibly altered?

And, who is doing the follow-up and noting the particulars of these “restoration” attempts? There clearly needs to be a follow-up on the many attempts at restoration to ensure restoration is actually occurring, and these follow-ups need to be done over a period of at least five years or more to confirm the results. How can we learn the lessons that need to be learned, and avoid the mistakes that need to be corrected, without such follow-up assessment and evaluation with an agreed upon set of “best practices” as guidelines for mangrove restoration?

Further analysis is needed to determine more accurate values of selected benefits and services, and the intrinsic worth of such factors as biodiversity and resilience to restore an ecosystem that benefits both nature and livelihoods.

Success is often judged by percentage of surviving seedlings at 3–6 months, and sometimes one or two years after the attempted restoration, but several years are needed to better understand the nuances that determine success or failure at each unique restoration site.

Restoration practitioners must define more clearly and much earlier the outcome indicators used for determining the result. What exactly are they looking for in determining what constitutes a successful restoration - restored biodiversity, forest density and height, number of surviving seedlings, or other factors? But such assessments are not short-term. Monitors need to implement long-term assessments of at least 5 years to determine if the restoration effort succeeded and to deal with issues that may arise.

Funder-driven restrictions

Too often, funding restrictions of donors make it hard to pursue effective CBEMR programs by providing only one or two years of funding, whereas medium to long term funding (at least five years) is needed to carry out CBEMR effectively because of the more intense monitoring and evaluation needs. Donors seeking to support only short-term results are unwittingly engendering long-term failures. Support for several year's monitoring and assessment of a restoration project is crucial. In other words restoration is not a one-moment event, but an ongoing one that must include the M & E effort as integral to the whole process. What did we do right, what went wrong? We can learn much from such evaluations, and in so learning improve on our methodology to ensure future greater success. This is what restoration should entail - a significant learning process, where success increases with experience, and we do not repeat the same mistakes over and over. We need not hide our failures to

avoid embarrassment, which is seen to threaten chances for further funding. Though CBEMR may not provide the cute images of photogenic school children planting red mangrove

propagules by hand, our approach does ensure a much better chance of real success involving much better informed restoration practitioners. And, if needed, we can show

good photo images of local community participants involved in various stages of the CBEMR process (See Figure 2).



Figure 2. Local community participants involved in CBEMR training Saloum Delta, Senegal.

Source: The CBEMR training workshop in Saloum Delta, Senegal; 17th April to 1st May 2018.

Limited number of mangrove experts.

In many countries with significant mangrove populations, and in particular in the African region, there is a dearth of mangrove experts who can help provide the science base of conservation activities, perform necessary action research, collect and interpret data from field activities,

integrate local knowledge and practitioners' experience to build a knowledge base and feedback into the conservation and restoration projects. Wetlands International Africa has launched a Mangrove Course in West Africa in 2018 working with the Cheikh Anta Diop University in Dakar (UCAD) and the Abidjan Convention. Wetlands International has already supported the same course in East Africa working with the

Kenya Marine and Fisheries Research Institute, the African Mangrove Network, the Nairobi Convention and other partners. The specialists trained out of that program will be a positive asset for further implementation of CBEMR in Africa.

Challenges caused by climate change

Climate change and consequent rising sea levels present urgent cause for concern for the future of our planet's mangroves. New siting challenges will arise because mangroves will need open areas upland to colonize when rising sea levels force them to migrate inland, otherwise they will be permanently submerged and drown. Therefore, forethought must go into planning to establish and preserve a buffer behind the mangroves where mangroves can "migrate" inland as the sea level rises to re-establish themselves above the rising low tide mark. This will prove a challenge because of the extensive development happening behind mangroves, including roads, shrimp farms, industrial complexes, hotels, agriculture and urban centers. These will potentially hinder or block the necessary access areas which mangroves can colonize as sea levels rise. The infrastructure and dikes, berms and roads can also block important freshwater inputs into the mangroves, causing high salinity and stress.

Conclusion

MAP is currently engaged in a timely endeavor to disseminate the CBEMR approach on a wider scale. With the majority of past mangrove restoration efforts by others failing and the continuing losses of primary mangrove forests to unsustainable developments, prospects are dim for our planet's coastal

rainforests and the bountiful marine and terrestrial life these wetlands support.

Working collaboratively with Wetlands International Africa is a great opportunity for MAP to demonstrate the principles of CBEMR to a new and interested audience, and teach mangrove restoration practitioners the skills to implement this more natural, science-based ecosystem approach to restoration that better ensures long-term success. MAP hopes that the recently concluded (April 2018) first CBEMR training workshop in Senegal's Saloum Delta has opened doors to work in other parts of coastal Africa where mangroves are found. We also hope to introduce our "Marvelous Mangrove Curriculum" to Senegal and other parts of West Africa as a way to educate the future generations of decision makers about the importance of mangroves. (see Youtube- Marvellous Mangroves Curriculum)

There is still much to do, and we are really only now at the starting gate, but with time and opportunity, MAP hopes to collaborate further with Wetlands International Africa and others in teaching more mangrove restoration practitioners the principles of CBEMR. We are in this race together to win back our planet's mangrove wetlands and prevent their further loss.

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Is developing rice farming compatible with preserving waterfowl in the Senegal delta?

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The President of the Republic of Senegal has set the objective of reaching rice self-sufficiency in his country with a target production of 1.6 million tons of paddy rice in 2018, against 906 000 tons in 2015, of which 438 000 tons in the Senegal Delta, representing 32.1% of national needs (SAED data, 2016). To that end, large rice development and water management sites are being put into operation in the Senegal Delta. Areas that had been, up until recently, arid, are now transformed into artificial wetlands. Existing temporary wetlands are also being managed in such a manner that their water network could be modified, preventing their filling up, or on the contrary, filling them up with polluted water flowing out of paddy fields. The areas developed for paddy fields covered 87 500 ha in 2016 and are projected to cover 91 250 ha in 2017 (SAED data, 2016). All these areas are not exploited and some remain without function or service due to the lack of funds, thus transforming these landscapes into large clear-cut areas.

The Senegal Delta is also one of the main wintering areas for numerous waterfowl species indigenous to Europe or reproducing in Europe. About 330 000 Anatidae (ducks, geese, swans) live in Senegal Delta from November to March each year.

Ornithological literature often relates the antagonistic relationships between waterfowl and rice farmers, while other examples indicate that these birds, especially ducks, could be valuable helpers for rice farming, if particular measures are put in place (Pernollet *et al.*, 2015). Up

until now, no reflection has been initiated in the Delta concerning rice development and the waterfowl presence, and especially on their relevance for bird watching and game activities, two potential sources of economic growth for the Delta (ongoing RESOURCE FAO Project).

As the Senegal Delta is transforming into a vast complex of paddy fields, a workshop held in September 2016 in Saint-Louis, Senegal, under the initiative of the Directorate for National Parks, gathered 45 rice producers, bird conservationists and other stakeholders and

representatives of village communities. The workshop helped define the current level of knowledge on birds-paddy fields linkages in the Delta and to compare it with results gathered elsewhere in the world. This article reports relevant parts of the conclusions of the workshop and provides an overview of the issues that need to be promptly addressed to ensure that the Senegal Delta is still considered as one of the largest wintering areas for birds in Africa.

Geographic framework

The Senegal Delta is a vast alluvial plain that covers

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320 000 ha, from Rosso to the Atlantic Ocean (i.e. 165 km long). In the 50's, that area was a floodplain covering 74 000 to 110 000 ha in Senegal and about 80 000 in Mauritania (cf. Triplet & Yésou, 1997, for a detailed description).

Described by, among other authors, Engelhard (1986) and then Triplet & Yésou (1997), hydro-agricultural developments are at the origin of rice farming. Two types of rice production are practiced: - a traditional production, less mechanized, practiced by villagers for subsistence food production on collective lands spanning a few hectares, and an industrial production made possible through foreign investors, mechanized and practiced on larger areas. In the second case, yields and access to chemical fertilizers and phytosanitary products are much higher than in the former. It was facilitated by the commissioning of the Diamas dam (Tréca, 1999), paving the way for a second rice season (from February to April, summer farming or off-dry season) in addition to the wintering cropping traditionally established between seedling, in July-August, and harvesting in November-January.

The possible causes of ricebirds conflicts

Quelea quelea: The species identified as a big pest for rice is the Red-Billed Weaver, *Quelea quelea*, a passerine with populations numbering in the hundreds of thousands individuals. Even though it does not belong to the group of waterfowl, it is necessary to keep in mind its depredation as

it influences the image that most rice farmers have of birds.

The absence of uniformity in farming practices: The work of Tréca (1999) and discussions initiated during the workshop have shown that waterfowl, especially Fulvous Whistling Ducks, *Dendrocygna bicolor*, mainly used rice fields where rice farming produced 'mirrors' on which these birds can land at night and attack the ears of rice. One of the outcomes of that workshop is that it is preferable to consolidate production on very high-yielding units, without mirrors, and to have lesser-yielding zones where waterfowl could forage. This could be the case for the buffer zone at the Djoudj National Bird Sanctuary where 1,423 ha are already cropped out of the 22,466 ha farmed in the Delta (data from Djoudj National Bird Sanctuary, 2016).

Stalk heights: Up until the early 90's, harvesting was done using scythes or combine harvesters that cut rice straws close to the ground leaving short stalks on field and facilitating straw recycling to feed the livestock. The volume of grains on the ground forms the basic diet of the Black-Tailed Godwit, *Limosa limosa* and the Ruff, *Philomachus pugnax*. The use of more modern and efficient harvesters has led to an increase in the cutting height, leaving 25 to 30 cm-high stalks that restrict the movement of the two above-mentioned species whose numbers have dropped in the Delta. On the other hand, these high stalks do not prevent Red-Billed Weavers from accessing the food resource as they easily perch on high stalks to feed themselves and keep reproducing.

Thus, the numbers of Ruffs have dropped from over 130 000 during the 90's (Trollet *et al.*, 1992) to less than 10 000 currently (Triplet *et al.*, 2014), and the numbers of Black-Tailed Godwits have dwindled from about 11 000 in the early 90's (Trollet *et al.*, 1995) to an average of 1 700 during the 2013-2017 period (Database, Directorate of National Parks of Senegal/OMPO/ONCFS). Both species appear to be declining over their entire distribution area (<http://wpe.wetlands.org/search>). However this global decline does not reach the proportions observed in the Senegal Delta, which indicates that there is no global reduction of the population due to the situation in the Delta, rather a transfer of the numbers to other wintering areas that provide more adequate feeding conditions.

Discharge of overflow water and drainage water from rice fields: While an outlet enables to collect most of the drainage water from rice fields in the Delta, the situation is not the same with rice fields located at the outskirts of the Djoudj National Bird Sanctuary which receives effluents containing chemical fertilizers and phytosanitary products, leading to the stimulation of plants, mainly Southern Cattails (*Typha domingensis*) and other exotic plants. The volume of organic matter produced by these plants obstructs backwaters and could, in the short term, and in the absence of appropriate measures, reduce the land area accessible to waterfowl.

Possible solutions

The September 2016 meeting was a landmark. For the first time, all stakeholders in the land with diverse but interconnected interests interacted in all serenity and suggested solutions both on rice development and on waterfowl conservation. Actually, there are real possibilities for mutual understanding and for creating common projects. These involve the possibility of designing waterfowl conservation-friendly practices at the outskirts of the Park and developing rice fields elsewhere that are highly productive and in which land-leveling enables to avoid mirrors and thus waterfowl' landing, and rice depredation.

Natural rich wetlands should also be preserved to continue providing human food such as fish. One of the participants to the workshop thus explained that if no measure is taken, in a few years, the Delta will produce rice but there will be no fish to cook with it. Also, agreements should be concluded so that livestock breeders can retrieve straws or allow their animals to graze on these plots.

The Delta is also suited for the development of discovery routes of rice fields' birds, and this would help to develop birdwatching activities and strengthen or even create eco tour guide jobs for village communities.

Regarding rice fields' drainage water discharges filled with chemical fertilizers and phytosanitary products, the project to build a dam separating these from the Djoudj National Bird Sanctuary is progressing slowly. It is heartening to point out that this problem is being addressed and discussions about building of the dam have been initiated and the project has been validated within the framework of the new site management plan endorsed in May 2017.

In the context of the project "Strengthening expertise in Sub-Saharan Africa on birds and their rational use for Communities and their environment (RESSOURCE¹)" coordinated by FAO, a second international workshop is being planned for 2020 to compare situations in various African countries.

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¹ Project RESSOURCE (Strengthening expertise in Sub-Saharan Africa on birds and their rational use for Communities and their environment) aims at improving the natural resources management in large Sahelian wetlands where local populations benefit greatly of these resources, especially in terms of food security and local development. Waterfowl are the natural resource targeted by the project.

Focus: Sahelian Africa: Nile Basin, Lake Chad Basin, Niger Basin, Senegal Basin

Partners: FAO (coordinating body), FFEM, EU, MTES, ONCFS, CIRAD, OMPO, Tour du Valat, Wetland International, BirdLife International, Ramsar Convention, AEWA, Target countries: Senegal, Mali, Chad, Sudan, Egypt.

Inappropriate village land use plans impede conservation efforts in Kilosa District, Tanzania

Charles Joseph Kilawe¹, Hillary T. Mrosso¹, and Numan S. Amanzi²

Summary

Village Land Use Plan is increasingly becoming a tool for land resource management in rural areas of Tanzania. The plan is expected to enhance conservation and reduce resource use conflicts and degradation. Despite the good prospects of the plan and large investments vested in it, little is known about its adoption and implementation. This paper provides the required information, based on interviews administered to households and key informants in two villages located in East Central Tanzania. Results revealed that on average a village land use plan is adopted and implemented by only 45%. Low level of implementation is partly due to inadequate involvement of local community and lack of land suitability analysis during the planning stage. Poor adoption and implementation of land use plans threatens the conservation efforts since land set aside for conservation is used contrary to the prescription.

Introduction

Land use planning in Tanzania was firstly proposed in 1980s to address a perceived problem of environmental degradation associated with poor farming methods. After a decade of institutional reforms, it was officially formalized after the enactment of National Land Act No. 4 of 1999, National Village Land Act No. 5 of 1999 and National Land Use Planning Act No.6 of 2007. Land use planning can be done at national, zonal, regional, district and village levels but this paper focuses only at village level where there are a lot of

resource use conflicts and environmental degradation.

A village land use plan (VLUP) has the potential of reducing landscape fragmentation and land use conflicts; formalizing settlement; modernizing agriculture; improving natural resource conservation; improving tenure security and reducing land grabbing (NLUPC 2006). VLUP is one of the best documents the village government should possess. It is a pre-condition for provision of customary land tenure titles, designation of conservation areas and a requirement for acceptance of any external funded development project or private investment in the

village (Mango and Kalenzi 2011)

The government has in place the comprehensive guidelines for developing and implementing VLUP (NLUPC 2006). However, it appears that the process becomes lengthy and costly if the guidelines are followed. For example, the cost of creating one village land use plan could go as high as Tanzania Shillings 12 000 000 (USD 6 000), an amount that cannot be raised by local governments (Mango and Kalenzi 2011). In order to overcome this challenge, the government invited private sector to facilitate the process of land use planning through provision of financial and

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technical support (Hart et al. 2014; Mango and Kalenzi 2011). Most of the new actors (private sector) have developed their own guidelines-which are time and cost effective but skipped important steps for participatory land use planning. There are growing concerns about the quality of VLUP produced by not following the national guidelines (Hart et al. 2014).

The aim of the present paper is to assess the extent of adoption and implementation of village land use plans by the local community. The paper provides information that can be used by planners and policy makers to develop implementable plans and hence achieve the desired outcomes.

Methodology and results

The study was conducted in Ibingu and Chabima villages in Kilosa District, Morogoro region, Tanzania. Land use plans in both

villages were approved in 2011. The process was financially and technically facilitated by two local NGOs, namely Tanzanian Forest Conservation Group-(TFCG) and Network of forest dependent communities in Tanzania (MJUMITA), but with foreign funding. The NGOs were involved because they were interested in establishing a Village Land Forest Reserve (VLFR) aimed at carbon sequestration through Reducing Emissions from Deforestation and Forest Degradation (REDD) pilot project.

Data were collected in 2014, using questionnaires administered randomly to 88 households; 52 in Ibingu and 36 in Chabima. The difference in sample size between the villages was due to a difference in population size between them. The larger population in Ibingu necessitated a larger sample size. In-depth interviews with key informants and reviewing of the plans were also used. The

key informants were the Village Chairman (VC), Village Executive Officer and other people who were leaders in various natural resource committees such as the Environmental Committee, Beekeeping Committee, Forest committee, and Village Land Use Management Committee. Respondents were requested to give their assessments on the implementation of five land use categories identified in the land use plans: Agriculture (crop production), forestry, grazing, settlement, and community services (markets, religion, schools, hospitals, and sports). Respondents were requested to rate their perception on a scale of 1-100%, with 1 as a very low level of implementation and 100% the highest.

Results revealed that on average a village land use plan was implemented by only 45% (Table 1). Generally the adoption in all land use categories was poor, but grazing was unexpectedly extremely low.

Table 1. Assessment of households on adoption and implementation of different components of land use plans

Land use category	Ibingu (n=52)	Chabima (n=36)	Average
Agriculture	47%	47%	47%
Grazing	15%	2%	9%
Forestry	58%	52%	55%
Settlement	62%	56%	59%
Community services	60 %	55 %	58%
Average	48 %	42 %	45%

The main reason for the low level of adoption of the land use plans was explained to be the low level of local communities' participation in the land use planning process. In

Chabima only about 40% of the households were involved in the demarcation of the boundaries of areas allocated to different land uses and in Ibingu only about 20% (Fig. 1). This lack

of participation can be related to the fact that most of the areas allocated to different land use categories were already demarcated on maps by the facilitators (using Geographical

Information System), prior to the start of the actual planning process. The local communities were just required to accept and approve the pre-determined land allocation for different land utilization types that were

imposed top-down from outside on them.

Relatively high degree of participation was reported in seminars that mainly involved few nominated people, mainly village leaders who were rewarded allowances for

participation. To a lesser extent this was also true for meetings. The objectives of these meetings and seminars appears to inform participants of what had been decided rather than taking their opinions on desired future land uses.

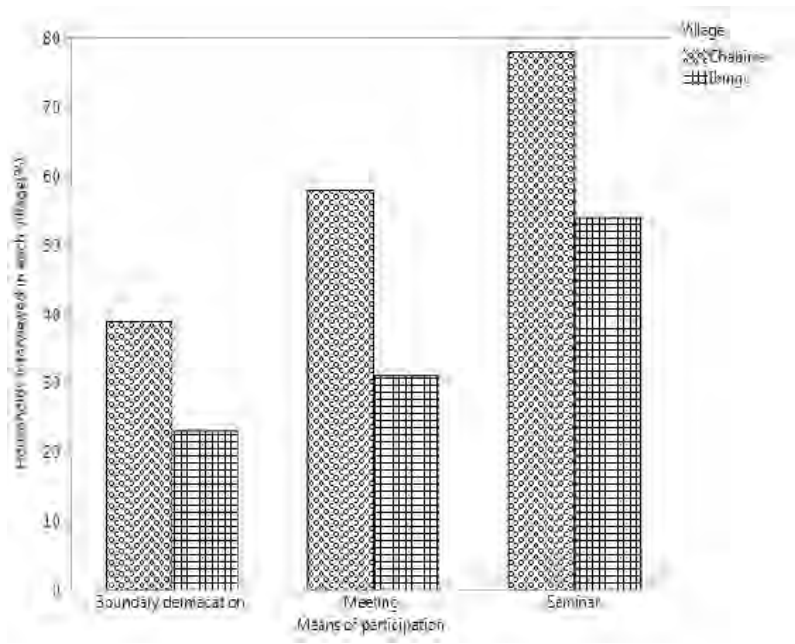


Figure 1: Involvement of households in various activities in land use planning process.

Furthermore, we learned that some land users, in particular shifting cultivators and pastoralists were not represented at all in meetings or seminar. Poor representation of marginalized groups in the community can lead to serious conflicts in the future (Benjaminsen et al. 2009). This lack of involving of the communities during the development of the VLUP was the main cause of poor adoption and failure of the plans. The outsiders who drafted the plans clearly did not understand the socio-economic, cultural, religious, etc. situations in the villages. As a result there were mismatches between proposed

land utilization types, land use requirements and existing socio-economic settings of local communities. Consequently many of these were not implemented or abandoned.

Land utilization categories that were very important for the communities were reduced in size or completely excluded. In Chabima village only a small piece of land was allocated for grazing, thus explaining the low implementation of grazing in that village. In Ibingu village land under shifting cultivation was converted to forest reserve and the farmers resettled to concentrated sub-villages where they were required to practice

conservation agriculture (Kilawe et al. 2018). Poor soil fertility, soil erosion and weed pressure impeded implementation of the proposed conservation agriculture. In studies also in Tanzania, Rioux and San Juan (2015) found that there are barriers and challenges to the implementation of conservation agriculture and that these need to be addressed. Conservation agriculture will not be adopted if it is just simply imposed.

The long distance to the areas allocated to croplands hindered the implementation of proposed concentrated settlement. In many African cultures women are responsible for tending

to the crop fields (planting, weeding, etc.). But they also have household's chores to perform. Thus, crop fields need to be close enough to the homesteads so that the women can perform both duties. In addition a rural "village" is often not the usual type of village with houses close together, but consists of homesteads spread within the village area. These people often do not want to move into a situation where their homes are boxed in between a lot of other homes.

Some areas allocated for community services were not well conceived. For example worshiping and burial areas were located far from settlements, contrary to usual practice in both villages. Most people in the villages prefer to bury their relatives near their ancestors within their homestead area. It was also not normal in the villages to allocate worshiping areas for Muslims and Christians in the same neighborhoods.

Low levels of implementation of the land use plans were also associated with the lack of detailed resource surveys (soil, climate, water, and vegetation) and land suitability evaluations. Key informants revealed that boundary demarcation for the different land use categories was based on convenience for the developers of the VLUPs, who skipped the processes of resource surveying and land suitability evaluation in order to cut down the cost of land use planning, rather than the qualities of land.

Discussion and conclusion

Findings of this study showed that the village land use plans are implemented by only 45%. The result implies that majority of the land (55%) is used contrary to the prescriptions of the VLUP. Low adoption of the plans has and diminished the outcomes desired by the outsiders who drafted the plans, such as reduction of deforestation and enhancement of conservation. It has been shown in other studies that land use conflicts and deforestation have increased despite land use planning in Kilosa District (Benjaminsen et al. 2009; Kilawe et al. 2018).

In this case the poor adoption could mainly be attributed to exclusion of the communities during the drafting of the plans. The objectives and priorities of the outside planners were clearly in conflict with those of the communities. This study illustrates the fallacy of a top-down planning process that ignored the practices and livelihood strategies of locals, which are adapted to their circumstances. Facilitators dominated the planning process, and shaped it to fit in with their interest – carving out protected areas. The local communities were used purely as rubber stamp to pass readymade decisions by inviting them to participate in meetings where superficial information about the process was provided. This resonates with studies of Loveless (2014); Moyo et al. (2016); Hart et al. (2014); and Igwe and Croucher (2007) who argue that experts manipulate the so-called participatory process in favour of their

interests. Exclusion of local communities during the land use planning process creates tensions and frequent conflicts among local communities and between local communities and the village government and/or with the investors, thus diminishing the usefulness of the land use plans. On a broader scale it should resonate the statement by Rosenthal (1977); "It must be kept in mind that agricultural development is intended to benefit the community, not to gratify the donor."

Poor implementation of the land use plan was, furthermore, associated with a lack of physical/biological resource surveys and land suitability evaluation. Furthermore surveys of available infrastructure, services and socio-economic conditions need to be done (URT 1999)

All the problems encountered in these two VLUPs could have been avoided if the developers of the plans adhered to the legal requirements of Tanzania's Land Use Planning Act (NLUPC, 2006), which stipulates that

- Participatory approaches must be used in land use planning. With a participatory approach is meant that the community must be central to the planning process. The outsiders should be involved only in a facilitating/advisory capacity and should not be dominant.
- The necessary resource surveys and land suitability evaluation must be done.

Recommendations and suggestions for further research

1. In order to increase adoption of land use plans, we recommend the involvement of **all** land users categories in **all** steps of land use planning right from the start. Participation should not be limited to seminars and meetings during which attempts are made to convince communities to participate in preconceived plans that are imposed top-down on them. A true Participatory Rural Appraisal (PRA) approach should be followed.
2. In order to match the proposed land use categories or land utilization types with land qualities, we recommend that the required resource surveys and land suitability evaluations be conducted.
3. We suggest studies to determine the extent to which top-down non-participatory approaches to development have aggravated land degradation and conflicts.

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Benthic macroinvertebrate assemblage as a tool for the detection of degraded landscapes: lesson from Malawi

Elias R. Chirwa^{1,*} and Limbikani Chilima²

Summary

In a number of poor countries of the tropics, efforts to restore deforested and degraded landscapes are beset by lack of clear and affordable methodologies of assessing land degradation. A study was carried out in central Malawi to investigate the potential use of benthic macroinvertebrates as an affordable and cost-effective tool for the detection of degraded landscapes that require restoration. The study involved use of both physico-chemical and benthic macroinvertebrate indices to evaluate the ecosystem health of two comparable reservoirs built on streams that pass through different land use patterns. Bunda stream, on which Bunda reservoir is located, passes entirely through deforested agricultural fields. Much of Lilongwe stream, on which Kamuzu Dam I reservoir is found, traverses through forested area of the Dzalanyama Forest Reserve. Since the water quality of rivers and their reservoirs reflect conditions in their catchment area, the ecological integrity of the surrounding landscapes was inferred from the ecosystem health of the reservoirs. Although physico-chemical indices largely failed to elicit significant differences between water quality of the two reservoirs, benthic macroinvertebrate indices were able to show that Bunda reservoir was enriched with organic matter attributable to eutrophication through nutrient loadings from erosion of the soils in the surrounding deforested agricultural land. Since soil erosion and its resultant nutrient loss is associated with land degradation, it was concluded that Bunda reservoir was surrounded by degraded landscapes that needed restoration through afforestation. The ability of benthic macroinvertebrates to elicit differences in ecosystem health between the two reservoirs suggested that benthic macroinvertebrates have a greater potential for use as a fast, efficient and affordable technique for the evaluation of water quality and detection of degraded landscapes in Malawi and other poor countries of the tropics.

Introduction

Deforestation is a global environmental and economic problem (Kapalanga, 2008; Houghton, 2005). It leads to land degradation, global warming, water cycle alteration, ecosystem

disturbance and can worsen the living standards of the poor (Black, 2008). Considering the negative impacts of deforestation, the Bonn Challenge encourages countries to restore deforested and degraded landscapes that

lie under their administrative jurisdiction (www.bonnchallenge.org).

Since not all deforested land is degraded, the first step in any land restoration initiative is to determine how much of the deforested land is

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actually degraded and in need of restoration (Higginbottom and Symeonakis, 2014). Many countries, particularly the poor ones of the tropics, have found this first step a difficult task due to lack of clear and affordable methodologies of assessing land degradation (Lanly, 2003). For example, 40% of the African countries participating in the African Forest Landscape Restoration initiative (AFR100), including Malawi, have not yet been able to determine how many hectares of land to be put under restoration.

Traditional methods of assessing land degradation have included remote sensing, expert opinion surveys, erosion models, productivity changes, land cover assessment, sediment yield analysis and other physico-chemical techniques (Kapalanga, 2008). These techniques have not provided early detection of land degradation, have suffered from subjectivity bias, have tended to measure only some aspects of land degradation, did not reflect the long-term situation of ecosystems and were too expensive for developing countries (Deborde et al., 2016).

Countries in the temperate zone have benefited from using biological indicators, particularly benthic macroinvertebrates in streams and reservoirs to understand the ecosystem health status of the surrounding landscapes (Czerniawska-Kusza, 2005). These indicators provide complete spatial-temporal integration of knowledge of freshwater ecosystems and their surrounding landscapes, making them an excellent

method for effective evaluation of the ecological health of rivers and their landscapes (Uherek and Gouvela, 2014). Although they are relatively inexpensive to use, their potential use in developing countries of the tropics has not been adequately explored (Deborde et al., 2016). This paper reports of a study conducted in two comparable reservoirs occurring in the same agro-ecological zone in Malawi to investigate the potential utility of benthic macroinvertebrates as a tool for the detection of degraded landscapes in poor countries of the tropics.

Materials and methods

The study was conducted in Lilongwe West Rural Development Project (RDP) of the Lilongwe Agriculture Development Division (ADD) located in central Malawi between latitudes 13°29' and 15°20' S, and longitudes 33°14' and 35°56' E. Sampling was done at Bunda reservoir and Kamuzu Dam I reservoir for four months. Although the two reservoirs lie in the same agro-ecological zone and are comparable with respect to their physico-chemical and biotic features, the catchment area of Bunda stream on which Bunda reservoir is located is dominated by agricultural farms whereas much of the catchment area of Lilongwe stream on which Kamuzu Dam I reservoir is found is covered by Dzalanyama Forest Reserve.

Benthic macroinvertebrates and physico-chemical data were collected from four randomly selected sampling stations on each reservoir every month

for four months (December 2016 to March 2017) between 07:30 and 13:00 hrs. Physico-chemical parameters measured included Secchi disk depth (SDD), Ammonia nitrogen (NH₃-N), phosphorus (P), dissolved oxygen (DO), electrical conductivity (EC), salinity, temperature, pH and Chlorophyll-a (CHL-a). Standard methods were used for the determination of physicochemical parameters (APHA¹, 2005). Benthic sediments were collected by using a Van Veen Grab sampler of 0.052 m² sampling area. The macroinvertebrates were isolated from the sediments, identified to orders and families and counted. Biodiversity indices such as Simpson's index (D) and diversity index (1-D), Shannon's index (H), Margalef's (D_{Mg}), Pielou's index (J) were determined using version 3 of Paleontological Statistics (PAST) software (Hammer et al., 2001). Community assemblage metrics (% EPT² abundance, % Chironomidae, % Dominant taxon) were also computed from the enumeration data. Student t-tests were applied on the biological and physico-chemical data to compare the ecological health status of the two reservoirs at confidence level of 5% (p=0.05).

Results

Seven hundred and seventy eight (778) benthic macroinvertebrate individuals belonging to ten (10) taxonomic groups were encountered in the study area. By order of importance the groups included oligochaete worms (30.70%), bivalves (15.04%),

1 American Public Health Association

2 Ephemeroptera, Plecoptera and Trichoptera

leeches (12.08%), crustaceans (11.18%), chironomids (8.99%), gastropods (8.22%), stonefly nymphs (4.24%), mayfly nymphs (3.60%), caddisfly larvae (2.70%) and dragonfly nymph (2.70%). Oligochaete worms dominated the macroinvertebrate fauna at both reservoirs, seconded by bivalves (21.76%) at Bunda and EPT (20.5%) at Kamuzu Dam I. T-tests showed that there were significant differences in the mean numbers of EPT, oligochaetes and chironomids between the two reservoirs ($p < 0.05$), with Bunda reservoir having less EPT and more oligochaetes and chironomids than Kamuzu Dam I reservoir. Diversity indices also showed significant differences between Kamuzu Dam I and Bunda reservoirs ($p < 0.05$), with Bunda reservoir having higher Simpson's index (D) and lower diversity index (1-D), lower Shannon's index (H), lower Margalef's (D_{Mg}) and lower Pielou's (J) indices than Kamuzu Dam I reservoir. Physico-chemical parameters of water quality tested in the study were generally not significantly different between the two reservoirs ($p > 0.05$), except SDD which was significantly higher at Kamuzu Dam I than at Bunda reservoir ($p < 0.05$). CHL-a was significantly higher at Bunda reservoir than Kamuzu Dam I ($p < 0.05$).

Discussion

SDD is affected by both colored dissolved and particulate substances because of their ability to absorb and scatter light (Molot, 2009). The lower secchi disk visibility at Bunda reservoir suggests that the reservoir has a high concentration of these substances (Khattab et al., 2015). These dissolved

substances and particulate matter can originate either from inorganic materials such as sediment, clay, silt or organic matter such as plankton, algae and decaying material, all of which may arise from the surrounding catchment area through erosion due to land use or autochthonous production within the water body (Wetzel, 2001). The dominance of the benthic invertebrate assemblage by oligochaete worms and chironomid larvae suggests that much of these dissolved and particulate matter is organic in nature. Oligochaetes and chironomid larvae tend to dominate benthic invertebrate assemblages in organically polluted habitats because they can tolerate low dissolved oxygen due to their cutaneous respiratory capability (Mandaville, 1999). Further evidence of organic matter enrichment in Bunda reservoir is the low EPT index. Organic pollution leads to decrease in EPT value and increase in chironomid abundance (Hamid and Rawi, 2014; Lencioni et al., 2012). In addition, the higher Simpson's index (D), lower Simpson's diversity index (1-D), Shannon index (H), Margalef index (D_{Mg}) and Pielou's evenness index (J) indices at Bunda reservoir show that the water body has low diversity of benthic fauna, a situation typical of organically polluted water bodies (Morris et al., 2014; Dudgeon et al., 2006). High levels of CHL-a at Bunda reservoir suggest that much of the organic matter is algae and plankton. The major driver for algal and plankton proliferation in water bodies is eutrophication through nutrient loadings of nitrogen and phosphorus from erosion of deforested agricultural land (Withers et

al., 2014). Soil erosion and the accompanying loss of nutrients is associated with land degradation because it deprives land of its productive potential that allows accumulation of energy in form of vegetation (Ovuka, 2000). Thus, landscapes surrounding Bunda reservoir are considered degraded. This agrees with Munthali (2013) who found that except for areas near Dzalanyama Forest Reserve, much of the landscape in Lilongwe West Rural Development Project (RDP) is degraded due to inappropriate agriculture practices and deforestation which leaves the soil exposed and prone to erosion.

Conclusion

Bunda reservoir is enriched with organic matter due to nutrient loadings from soil erosion of the surrounding agricultural fields. Since landscapes that lose soil and nutrients through erosion are considered degraded, the deforested agricultural land around Bunda reservoir are regarded as having lost their reproductive potential to accumulate energy in form of vegetation. In contrast, a comparable Kamuzu Dam I reservoir, lying in the same agro-ecological zone, is not organically polluted, likely because much of its catchment area is forested. It is therefore recommended that afforestation initiatives be considered to restore the degraded agricultural landscapes surrounding Bunda reservoir. It is also important that efforts to curb deforestation which has become rampant in Dzalanyama Forest Reserve in recent years due to charcoal burning be increased.

While both physico-chemical and benthic macroinvertebrate indices were used to gauge ecosystem health of the two comparable reservoirs, the former indices failed to reveal significant differences between the two water bodies. Much of the difference in ecological health between the two reservoirs was elicited by benthic macroinvertebrate indices, suggesting that these are more robust indicators of ecological conditions even in the tropics and can reveal the occurrence of ecologically-significant environmental changes which physico-chemical methods may be unable to show. It is recommended that Malawi and other developing countries in the tropics utilize the capabilities of benthic macroinvertebrate indices for rapid, efficient and affordable detection of degraded landscapes.

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A Vietnamese aquaculture officer speaking with a fish farmer on the banks of an aquaculture pond in Bongor, Chad

Implications of conversion of customary land tenure to leasehold tenure on the management of natural resources : a case study in Zambia

Janet Nyanga¹

Summary

This study examines the implications of tenure conversion on the management of natural resources. Using Focus Group discussions and in-depth interviews with local people and key informants, the study found that where conversion of customary tenure to leasehold tenure is not allowed, the communal rules and regulation on the use and extraction of natural resources is strictly controlled under group management. In such areas, this study found no evidence of exploitation of natural resources. This is attributed to the tight hierarchical control over land and natural resources that traditional leaders exercise. Thus, local people profit from managing natural resources. On the other hand, the study found tenuous management of natural resources in areas where conversion of customary tenure to leasehold tenure is allowed. Thus, natural resources are exploited unsustainably as there are no strict measures to deter perpetrators from unsustainable harvesting of natural resources. This tends to jeopardise the already fragile natural resource base on which the local people derive their livelihood from.

Introduction

Zambia has had a dual tenure system since the colonial era. One of the most recent developments in the country's tenure system is the legal provision allowing the conversion of customary land tenure to leasehold tenure (Section 8(1), Lands Act, 1995). This land policy is premised on the idea of opening up rural areas to investment as well as enhancing tenure security (MMD, 1991). Since the enactment of the 1995 Lands Act, surveys conducted in many

customary areas have shown that settlement land appears to be unavailable to new settlers particularly in areas close to cities (FSRP, 2010). In areas such as Chibombo and Chongwe districts, for example, land pressures resulting from urban expansion are leading to large scale conversion of customary tenure to leasehold tenure. Although several researchers (such as Tygesen, 2014) have examined this phenomenon for some time, there is little work focussing on comparing the implications of tenure conversion on

the management of natural resources by drawing on cases which respond differently to tenure conversion. Therefore, this paper examines comparison of the implications of conversion of customary tenure to leasehold tenure on the management of natural resources in two different areas.

Research methodology

Data were collected in 2016 from Chibombo district in Mungule chiefdom and Nkomeshya chiefdom of

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Chongwe district in central Zambia. Data were obtained focus group discussions (FGDs) comprising of 5-9 people of mixed gender. Each chiefdom in the respective district had two FGD of its own. In addition, five (5) in-depth interviews were held with key informants, consisting of one government official from the Ministry of Lands and four village headperson from each chiefdom. The data was analysed by thematic analysis.

Results and discussions

Land Resources and Livelihoods in the study areas

The study shows that local people derive their livelihoods from different activities such as farming, wage employment and small scale businesses. Of these activities, the study revealed that farming is the most dominant source of livelihood. Due to the importance of farming, land is considered the most important natural asset in both districts. The study also found that tree resources are important as almost all households in both districts rely on fuel wood and charcoal as sources of energy.

Trends in tenure conversion trends in Chibombo and Chongwe districts

Traditional leaders in *Mungule* chiefdom of Chibombo district

have allowed local people to convert their traditional land tenure to leasehold tenure. They argued that leasehold tenure is expected to enhance tenure security in the chiefdom. Traditional leaders argued that, allocated land cannot be repossessed by anyone from a household without the legal repossession process as outlined under leasehold tenure. This study found evidence of people having title deeds to their land. The study further found that the majority of those obtaining leasehold tenure are new settlers while financial constraints preclude local people from obtaining leasehold tenure.

On the other hand, traditional leaders in *Nkomeshya* chiefdom of Chongwe district have not allowed the conversion of customary tenure to leasehold tenure in the area. This implies that all the common pool resources are controlled through communally accepted norms and traditions. The traditional leaders argued that tenure conversion has the potential of making poor people landless as more productive land is taken up by wealthy individuals. Data from focus group discussions revealed that non-conversion of customary tenure to leasehold tenure is an opportunity denied for local people. This is because

although individuals own land under customary tenure, they do not have the right to sell land as the land is still part of the collective. Thus, this fact may sometimes makes customary land to be vulnerable to corrupt practices of traditional leaders. Respondents argued that there is tenure insecurity as land can be repossessed from a household by traditional leaders anytime they wish to accommodate new settlers.

Implications of tenure conversion on the management of natural resources in the study areas

The opening up of customary land to leasehold tenure in *Mungule* chiefdom has attracted new settlers in the chiefdom. The influx of new settlers has led to reduced land holding sizes as larger size of land are being subdivided to accommodate new settlers. On average, this study found that the majority of people own less than two hectares of land (the entire land held by a household including cropland). It should be mentioned here that individuals ‘own’ land under customary tenure although the land is still part of the collective. The influx of new settlers has a number of implications on the management of natural resources, as summarised in Table 1.

Table 1: Effects of increased population due to introduction of leasehold tenure on customary land

Reduced landholding sizes due to increase in population and new settlers acquiring land.
Non-fallows due to reduced landholding sizes, leading to heavy reliance on chemical fertiliser for restoring soil fertility.
Reduced harvesting of forest and non-forest products per household due to reduced increased population leading to reduced flow of cash raised from forest and non-forest products.
Excessive harvesting of forest products due to pressures on land created by increase in population.



Figure 1: Villagers loading sand at Mungule chiefdom of Chibombo district



Figure 2: Sand heaped for sale at Mungule

The study found that the natural resources, such as trees, in open access areas are being harvested unsustainably for fire wood and charcoal production. The respondents pointed out that the recent increase in population provides a ready market for the commodity. Interviews with key informants revealed that local people engage in the charcoal business to supplement their falling income due to their reduced landholding sizes. However, respondents during focus group discussions acknowledged that the proceeds from charcoal sale do not exceed the benefits (such as ecosystem goods and services) that they stand to gain by preserving the tree resources. The study also found that use and extraction of natural resources in *Mungule* chiefdom is free for anyone (non-members and members of the community).

The study further found rampant sand mining activities which has employed many youths. Respondents pointed out that the increase of sand mining is as a result of growing construction business in the chiefdom. The unregulated sand mining activities in the area has led to the degradation of the land as well as damaged roads

due to heavy sand trucks that ferry sand and to extensive deforestation. This tends to jeopardise the already fragile natural resource base from which the local people derive their livelihoods. The interviews with key informants revealed that unsustainable harvesting of natural resources in *Mungule* chiefdom has been perpetrated by the existence of the dual tenure systems.

In *Nkomeshya* chiefdom, the land resources on village forests (regarded as unoccupied in this study) and areas designated as grazing land are treated as open access where access free to all village members. Although rules regarding use and extraction of natural resources on the communal areas are not formalised, local people are forbidden from exploiting such resources unsustainably. Thus, the study found no evidence of unsustainable harvesting of natural resources in the chiefdom. This is attributed to the tight hierarchical control over land and natural resources that traditional leaders in *Nkomeshya* chiefdom exercise.

Conclusion

The study concludes that the introduction of leasehold tenure

on customary land has in some areas led to mismanagement of natural resources in areas where tenure conversion is allowed. Therefore in order to safeguard the already depleting resources in rural areas, the traditional leaders and the government should formalise and strengthen the rules regarding use and extraction of natural resources upon which rural people derive their livelihood from.

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Arboriculture: a relevant option for developing sustainable agriculture in Algeria

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Summary

The goal of this paper is to show that arboriculture is a viable option in sustainable agriculture development in Algeria. Not only has this option been the basis for designing the National Agricultural Development Plan (NADP) launched in 2000 in Algeria, but also it was also instrumental in Alexis Monjauze's doctrine (1906-2001) during the colonial and post-colonial period. Indeed, in-depth documentary review shows that the NADP fits in with the doctrine of A. Monjauze regarding the significant role of trees in preserving soils and reducing fallows in a semi-arid country. However, divergences appear namely in the absence of soil restoration programmes (another key principle in the Monjauze doctrine) and in the implementation of NADPs (lack of management master plans). However, the approach recommended by Monjauze is based on an ideal development plan and on three five-year plans that embody a harmonious vision.

Introduction

The issue of land management raises the challenge of exploiting the silviculture-agriculture interface and the issue of balancing the exploitation and preservation of natural resources. Two issues that are not easy to solve: Often we hear everywhere that, "we should modify the cropping systems, introduce fodder, plant trees. (...)." Development plans should not be based solely on these pious hopes. In several instances in history, under a xerothermic climate, there have been individuals and even groups of people who attempted to bounce

back but failed. The best of them, often supported by an external forces formed under more favorable environment, were able to restore the balance and some enclaves

They were not able to establish themselves sustainably. They were overtaken by the difficulty of maintaining barely artificial constructions requiring excessively sustained effort, in a context of other men who needed balance at the lowest biological level (A. Monjauze, 1960). In Algeria, this concern was addressed by Alexis Monjauze (1906-2001) who endeavored to find solutions in a semi-arid

context characterized with long periods of dryness often followed by heavy rains and floods, especially on the high plateaus, leading to soil erosion and dam silting.

Indeed, Algeria's climate could be defined by a distinction between the wet and hot seasons. Contrary to what happens in temperate regions, rain and heat alternate during the year instead of combining. The two conditions needed for the development of plants are not fulfilled (A. Monjauze, 1960). In the face of these difficulties, Monjauze developed a doctrine that may be summed up by the

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following quote: “Soil and plantations restoration provide the key to resolve the problems in Algeria” (Monjauze, 1958).

Years later (2000), the Algerian government launched a National Agriculture Development Programme (NADP) with several objectives: food security, sound judicious soil management, sound water use, and the return of rural communities to their homes after a forceful exodus

due to security reasons. This plan was built upon, among others, the principle of natural resources preservation. This principle was Monjauze’s main concern. Hence, the following question: Is there a link between Monjauze’s doctrine and the NADP?

To answer, we make the following assumption: there is a convergence of principle between Monjauze’s doctrine

and the NADP in developing plantations that ensure both the use and preservation of natural resources. However, the NADP did not address soil restoration, and was not implemented following a designed development plan. On the other hand, Monjauze’s doctrine was based on the principle of soil restoration and provided for implementation following an ideal development plan.



Figure 1. A farmer with sheep on degraded land. Djelfa, Algeria.



Figure 2. Restoration and Development of degraded land. Tlemcen, Algeria.

Methodology

We explored in particular publications by Monjauxe during the colonial period (1958, 1960) and post-colonial (1972), but we also explored other publications that address the issue of management, agricultural policies restoration and development of rural areas. (Benchrit, Bedrani, and Montaigne). Finally, the comparison between the two sources of documentation enabled us to confirm both the convergences and divergences between Monjauxe's doctrine and the NADP.

Results and discussion

The NADP helped to inject investments in plantations, irrigation and other related sectors aiming to start a

reconversion process that would ensure sound soil management, by preferring plantations to annual crops. Actually, "the fundamental fact is that the soil is deprived of the powerful vegetation that protected it and maintained its life, but the strength and balance of which, it in turn maintained." (Monjauxe, 1972).

"Soil balance stemmed from two main sources: 1) it was protected and invigorated by powerful natural vegetation, typically by trees. However, wheat is not a powerful plant. Moreover, after the harvest, the plot remains barren for months. 2) The natural soil recovered all the products of natural vegetation: the latter maintained the humus and gave back to the soil what it had taken. Now there is a harvest of

seeds and straws. There is no or very little recovery by the soil. Therefore, the imbalance increases with each passing year, both in surface and depth" (Monjauxe, 1972). In addition, the NADP had positive impacts on production. In fact « the increase of production levels is also spectacular in the areas of fresh vegetables (and especially potato), stone fruits, dates or white meat" (Montaigne *et al.*, 2009). Thus, there was an increase in tree plantations (basic principle of the Monjauxe's doctrine). However, soil restoration (another principle) is not explicit in the NADP. Nevertheless, this oversight does not harm the economic impact of the NADP as a whole, but the assessment of soil restoration through the introduction of bench terraces before and right

after the colonial period, was mixed. It was observed that “numerous treated surfaces are again subjected to disastrous erosion”. Since the bench terraces networks have not been correctly implanted, or most often, because they are not maintained, as they should by farmers (...) we could make a long list of difficulties. However, the main cause of these difficulties resides in the following fact: DRS (soil defence and restoration) could not integrate the agricultural economy of the regions concerned: it appeared as a foreign body, an initiative by the administration that commissioned developments that did not address the immediate concerns of farmers and that they considered as servitude (M. Benchtrit, 1970).

Moreover, the implementation of the NADP was insufficiently prepared: the various Directorates of Agriculture in Wilaya (department) that should have been responsible operated without the support of the development master plan. In addition, these administrations were not sufficiently prepared to implement the commission. This lack of institutional and logistical preparation is a consequence of the eagerness imposed by political imperatives, and the need to bring back farmers and populations to their homes and farms after adverse security conditions. That eagerness had negative consequences, especially at the beginning. In fact, ‘it seems that during the 2000-2003 period several projects were funded without proper preliminary studies’. This led to relatively large waste of resources (unsuccessful drillings, delays in development works due to project reassessment, lack of businesses or their poor

qualifications, to the difficulty in securing the collaboration of future beneficiaries of the managed land (Bedrani, 2008). However, in Monjauze’s doctrine, the implementation of the agriculture development plan is based on a harmonious vision implemented based on an ideal development plan. It starts with a first five-year plan that involves finding the human resources, means, legal instruments, governing and control bodies and numerous demonstrations, before initiating the second and third five-year plan which consists in restoring soils and fruit plantations on 9/10 of the cultivable area.

Conclusion and recommendations

This article aimed at linking Monjauze’s doctrine with the National Agriculture Development Plan (NADP) using a desk study methodology. The results obtained show that plantations have been selected in the NADP as a priority to trigger the reconversion process of farmland (basic principle in the Monjauze doctrine). However divergences appear, namely in the lack of soil restoration programmes (another basic principle in the Monjauze’s doctrine) and in the implementation of the NADP (lack of development master plans). However, the approach recommended by Monjauze is based on an ideal development plan and on three five-year plans that embody a harmonious vision.

The main recommendations first target developing regional agricultural development master plans that result from agricultural policies, but also improving institutional instruments and

logistical tools to implement the development plans. To that effect, there is a need to train staff, secure logistical and informational means and an administrative structure for oversight (monitoring and control), and finally, ensure the availability of selected tree seedlings. Thus, agricultural development planning appears to be a necessity.

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Initiative to restore forest landscapes through household-managed fenced plots in Burkina Faso

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Summary

Faced with the large scope of deforestation and forest and farmland degradation, Burkina Faso is implementing a policy to restore ecosystems. Various ecosystems restoration initiatives have been put in place with different levels of success. Among these, is an initiative based on household-managed fenced plots (from the French acronym MED (Mise en défens)). They strengthen resilience of rural communities by ensuring various additional income sources and access to medicinal plants. Moreover, they help protect biodiversity through the natural regeneration of species and the planting of a large variety of local species.

Introduction

In Burkina Faso, dry forests and wooded areas cover about 10 million ha (FAO 2015). They play a key socio-economic and food role for the Burkinabe population, providing income, energy and diverse food (Ouédraogo *et al.*, 2006; Paré *et al.*, 2010; Vinceti *et al.*, 2013). In addition, 1,033 out of the 2,067 plant species found in Burkina Faso are used in traditional medicine as documented in the literature (Zizka *et al.*, 2015). Burkina

Faso lost over 2.5 million ha of forest and other wooded lands between 1990 and 2015 and currently experiences an accelerated rate of deforestation linked to climatic and anthropic factors (FAO, 2015; Ouédraogo *et al.*, 2011). A high population growth rate associated with reliance on forest resources have induced a reduction and fragmentation of the forest cover to the advantage of farmland (Ouédraogo *et al.*, 2015). Moreover, wandering animals hinder the natural

regeneration of woody plant species (Zida, 2007).

Efforts to restore ecosystems are on-going in Burkina Faso promoted both by governmental and international organizations, for example through the Great Green Wall project (<http://www.greatgreenwall.org/>) and by non-governmental organizations and local associations. These initiatives to restore ecosystems often combine tree protection or planting with other aspects such as the mechanical soil tillage

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or sustainable agricultural practices. The objectives of these ecosystem restoration projects fit into a poverty alleviation and climate change adaptation policy.

Tiipaalga is a local association based in Burkina Faso that promotes the sustainable management of natural resources. Since 2003, Tiipaalga supports, among other activities, the creation of household-managed fenced plots. Fencing plots is a practice aiming at protecting a piece of land or plot against various pressures (grazing, bushfire, logging, etc.). It contributes to soil restoration and protection, reduced runoff and erosion, and the restoration of the natural vegetation. Its contribution to reducing the impact of climate change foster adaptation through its ability to alleviate the effects of heavy rains (erosion, crusting, etc.) while improving soil water balance in case of drought. It is also seen in mitigation through its ability to store carbon (Source: Permanent Secretariat of Non-governmental Organizations/SPONG, Burkina Faso). This practice could be improved by combining it with contour stone bunds, soil scarification, half-moons and complementary afforestation (fenced plots) so as to enable the regeneration of tree-based ecosystems. This forest restoration initiative targets a total of 308 site closures (924 ha) of which 176 in the north (Soum and Lorum provinces) and 125 in the Central region¹ (provinces of Kadiogo, Boulikémdé, Ouhritenga, Kourwéogo, Sanmatenga, and Zandoma). In this article, we will

illustrate some of the benefits provided by these site closures to partner farmers who establish them and sustainably use them.

Methodology and results

Methodology

The creation of household-based enclosures consists in establishing fenced plots managed by individual rural households. Due to the high establishment cost (roughly USD 3 600 of which USD 2 530 for the equipment and the rest for the contribution of the partnering farmer), and the high demand by farmers to implant site closures, tiipaalga carefully select future partners based on specific criteria (motivation, non-contentious ownership of a plot of at least 3 ha). Land tenure should be secure, free from contentions and verified before installing the fence. A local land agreement report, including customary and administrative rights, is signed by the stakeholders – customary and administrative authorities, the partner farmer and his direct neighbors. In case of positive feedback from tiipaalga, the partner farmer is responsible for mobilizing the aggregates and labor needed to establish the closure. The partner also commits to implement the activities as defined in his terms of reference and in the related action plan that covers seven years and is renewable only once (create a fire-break, apply sustainable soil restoration techniques and increase the biomass and biodiversity, etc.). To improve the maintenance of this fire-break, the partner

may engage in agroforestry over a 12 m-large cropping strip along the fence and plant useful trees in low-density. Tiipaalga develops a local land agreement signed between the partner, grassroots groups in the community (municipal advisers, Village Development Councils (CVD) and Farmers' Organizations (FOs)), resource persons from the village (land and/or village chiefs, religious leaders), the local administration and tiipaalga to secure the delineated future plot. These land agreements include customary and administrative rights and copies are filed at the city hall; other copies are entrusted to the technical partners and tiipaalga.

The results presented here result from two studies. The first study focused on aspects regarding the value and monetary gains generated by the fenced plots. It includes the answers to a questionnaire administered to 105 partners of tiipaalga in the central region. The second study was conducted in the same region and focused on tree planting practices within fenced plots and the seed sources used. The results presented include the answers of 19 partner farmers of tiipaalga, representing a total of 57 ha of closures, and 14 farmers who are not tiipaalga partners, identified as tree growers in the same villages. The goal was to compare planting approaches and their respective challenges and benefits between the two groups of farmers.

¹ These are the intervention zones of tiipaalga in northern and central part of Burkina. Not to be confused with the administrative 'regions' of Burkina Faso.

Benefits for tiipaalga partner farmers

Tiipaalga focuses on developing income sources generated by non-wood forest products and farming products from the fenced plots (Figure 1). In view of the fact that closures are installed on lands once abandoned due to their highly degraded state, any income they generate is considered as value-added by the partner.



Figure 1. Non-wood forest products harvested in fenced plots in the Kourwéogo and Boulkiemdé provinces. Top left: modern beehives installed with help from tiipaalga; top right: fodder and *Andropogon* sp; bottom left: *Securidaca longepedunculata* seeds, a rare medicinal specie; bottom right: *Saba senegalensis* fruits.

The income generated by the fenced plots reaches an average of USD 450 per partner/year, i.e. 7.5 months of the minimum wage (USD 60) in Burkina Faso (based on a study conducted in 2016 by tiipaalga). This income is highly helpful to farming households during the lean period (Table 1). Besides, medicinal plants are also a major benefit of fenced plots. They are largely consumed by rural households and villagers, upon request, are often granted free access by owners of fenced plots, who gain some social prestige. The seeds of trees within the fenced plots also play a role, partly in nursery production. Tiipaalga procures large quantities of *Acacia* spp and other local species and subsequently distributes them to partners with fenced plots to plant live fences and strengthen the stability of the fence in the long-term. Upon request, tiipaalga partners may be trained on modern and sustainable beekeeping. Beekeeping is key in regenerating the plant cover. Honey is bought, processed and sold with the help of tiipaalga.

Table 1. Income generated by household-managed fenced plots during the lean period. (*) Percentage of fenced plots owners (MED) in the central region (105 MED) who earned income from each of the products. Income surveys conducted in 2016.

Sources of income during the lean period (central region, 105 MED)	Amounts (US\$)	Number of individuals	Partners (%) *
Wood	2 364	37	35
Fruits	3 719	44	42
Leaves	1 256	7	7
Fodder	10 000	73	70
Honey	3 242	29	28
Meat	0	0	0
Medicinal plants	585	6	6
Andropogon	5 554	76	72
Farm products from the cropping strip	8 843	55	52
Total	35 563		

Biodiversity conservation

The study of tree planting practices conducted with 33 farmers in the Central

Plateau region and the Central-West region, shows that site closures may contribute to the conservation of species highly endangered by habitat degradation and overgrazing. The trees planted or naturally

regenerated are protected by the fence. The species planted in the fenced plots are more diversified and include a greater proportion of native species than those planted by farmers in non-fenced plots (Table 2).

Table 2: Specific diversity of woody species planted by 33 farmers interviewed. (*) Species that have been reported by at least 2 farmers as formerly used by villagers and currently difficult/impossible to find..

	Tiipaalga farmer partners	Tiipaalga non-partner farmers
Average land area owned (ha)	14.2	11.4
Total number of species	41	21
Average number of species	8.5	4.9
Share of exotic species (%)	35	78
Number of species planted considered endangered (*)	14	3

Interviews with farmers revealed that fenced plots appear to protect planted or naturally regenerated trees species which would have been, in the absence of fences, threatened

by livestock grazing or by overexploitation. This enables to secure investments in tree planting and rediscover useful plants that have disappeared in some regions. In addition,

naturally regenerated tree species within the fenced plots become a potential source of seeds for a great variety of species that are increasingly hard to find locally.

IV. Discussion and conclusion

The results show some of the benefits associated with implementing fenced plots. This approach has its limits: the high initial cost that requires external financial support and the need for a plot of at least 3 ha per partner. Despite the limits, these initiatives present clear and viable positives aspects within the framework of a forest landscape restoration policy in Burkina Faso. They reach several goals and help improve livelihoods, regenerate soils, preserve biodiversity, protect rare threatened trees, rediscover some woody species that had disappeared locally and provide highly useful species that produce edible and medicinal products. Securing access to forest resources and protection against wandering animals, motivate partners to get involved in maintaining their fenced plots and in planting woody species. The results of this study also serve as leverage to facilitate the adoption of sustainable practices in the use of natural resources. Indeed, observing restoration inside

the fenced plots, raises the awareness of populations and motivates them to engage in the sustainable management of lands and forests.

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Population pressure and wildlife conservation in Benin biosphere reserves

Séraphin Mouzoun^{*1}, Toussaint O. Loughégnon² and Jean T. Claude Codjia³

Summary

*Biosphere reserves in Benin are subjected to numerous mainly man-made pressures (poaching, clearing, etc.). Wildlife habitats are being destroyed, changed, and wildlife populations, especially the Crested porcupine (*Hystrix cristata* - Linnaeus, 1758) are gradually decreasing. These species are increasingly vulnerable to the effects of climate change and man-made actions. The results reveal that, in the face of anthropic and climatic effects, resources found in conservation areas are becoming more attractive since those outside the reserves are no longer sufficient to meet the livelihood needs of populations. Incursions in the reserves for poaching (84.72%), grazing (28.82%), and finding new farms and non-wood forest products have been observed.*

Introduction

With a surface area covering 114,763 km² (INSAE, 2015), Benin is endowed with a remarkable ecological, cultural and anthropological diversity. The country boasts of several protected areas which are composed of national parks and game areas. Among these protected areas, the Pendjari and W-Benin biosphere reserves in northern Benin.

Today, biodiversity conservation has become a must for any society in search of sustainable development. Natural resources are used all over the world to achieve various national and international development goals. In

developing countries such as Benin, reliance upon natural resources is relatively more important due to population growth that leads to overexploitation for food, fodder, socio-economic and cultural services purposes. Today, biosphere reserves in Benin (Pendjari and W-Benin) have become a target for loggers, farmers, pastoralists and poachers. Under the pressure of population growth combined with increased impoverishment, riparian communities encroach on this protected zone in search of game, new lands for farming or firewood, etc.

The obvious consequence is resources degradation (habitat modification) with

serious threats for the ecological integrity of vital ecosystems, i.e. systems that support all forms of life. For rural communities, the loss of livelihoods is the most crucial challenge since most of them do not have the capacity or resources to adapt and are often vulnerable to climate change, drought and desertification. This challenge highlights the need for approaches that involve the community in resource management and ensure that populations are made aware of the dynamics between their socio-economic activities and natural resources.

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Over the past decades, the degradation of big game populations in West Africa has reached alarming proportions and there is no good reason to believe that this process will slow down anytime soon (Cornelis, 2000; Amahowé *et al.*, 2012). Populations of Crested porcupine are constantly declining over their entire area due to poaching, intensive unregulated hunting and habitat degradation, and the species is endangered as it is haunted for its meat and quills (Nowak, 1999; Cuzin, 2003; Grubb *et al.*, 2008).

The goal of this paper is to analyze the impacts of population growth on onsite biodiversity conservation, namely wildlife species in Benin biosphere reserves.

Material and methods

Researches were conducted in the Pendjari and W-Benin Biosphere Reserves in northern Benin. They are located between 10°30'–12°25' north latitude and 0°50'–3°05' East longitude, span a surface area of 834,040 ha and are found in the Sudanian zone with two contrasted seasons. The land on the outskirts of Benin biosphere reserves is subject to an alarming degradation.

An analysis of the relationship between riparian populations and the reserves on the one hand, and between populations and forest agents on the other hand, was conducted through a survey of the stakeholders. The survey was done through semi-

structured interviews based on a pre-tested questionnaire. Two types of questionnaires were developed to that effect and administered to local populations and managers respectively. The questionnaires included identification variables of respondents and questions pertaining to the activities performed within the reserves and on their outskirts, and the challenges faced by forest agents in performing their mission. During the study, ten riparian villages were studied and 260 individuals were interviewed.

Results

The study area (biosphere reserves) is located in the Alibori and Atacora departments. These two departments have experienced increased population weight due to population growth. It should be noted that the population in Alibori numbered 867,463 inhabitants in 2013 against 521,093 in 2002, while that of Atacora increased from 549,457 in 2002 to 772,262 in 2013. Both departments accounted for 16.38% of the total national population in 2013.

The adverse effects of climate change on communities neighboring biosphere reserves in Benin are essentially due to slash and burn farming, hunting, non-wood forest products harvesting and transhumance. Actually, the fact that populations encroach on these protected areas is a

major problem. For example, entire villages have settled in these reserves (Kandèrou, Kponta). Villagers clear the forest to create new farmland, settle farming hamlets on these very fertile lands and graze their livestock there. Riparian populations have identified the causes of wildlife species decline especially the crested porcupine: farming, poaching, population pressure, transhumance and climate change. For riparian populations, climate hazards are the main sources of damage caused to wildlife and its habitat. Over the past decades, farmlands have registered a drop in yields that could lead to agricultural production losses. Regarding pastures, recurring droughts have led to the increased scarcity of pastoral resources, conflicts between farmers and breeders, and conflicts between reserve managers and riparian populations. Climate **hazards** also affect the availability of other natural resources on which riparian communities rely and this is translated by a degradation of wood-based resources for energy, among others. This situation also affects the occupation of rural space and leads to agricultural clearing, exacerbating conflicts between wildlife and local populations over access to resources. The main factors of wildlife species decline in general and of the crested porcupine in particular in the study area, have been identified by riparian populations of both reserves and are presented in Figure 1.

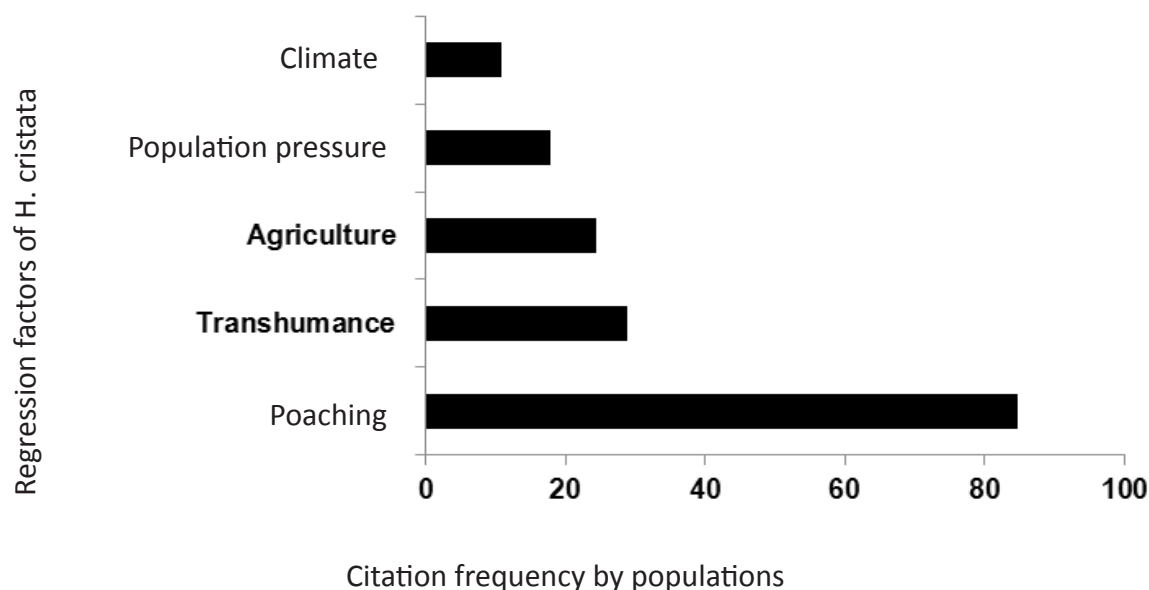


Figure 1: Citation frequency of *Hystrix cristata* populations' regression factors.

A data analysis reveals that 84.72% of the individuals interviewed point to poaching as the main factor for the regression of crested porcupine (*Hystrix cristata*) populations, followed by transhumance (28.82%), farming/clearing (24.45%), population pressure (17.90%) and climate (10.92%) respectively.

Livestock movements create paths and excessive trampling zones everywhere, especially around ponds and water bodies. These various activities that were once forbidden in those reserves are now conducted by riparian populations due to the increased population and widespread poverty. The products removed are both intended for local use and sale. These activities have been regularly repressed by forest agents who arrest the offending individuals, confiscate their equipment, destroy the farms and products seized or impose fines. All of this leads to strained relationships between forest

agents, eco-guards and local populations. Anthropogenic factors strongly disrupt the functioning of ecosystems in the reserve, thus leading to a change in the botanical composition and structure of vegetation.

In these reserves, poaching and vegetation fires are frequent and lead to the destruction of animal habitats and thus reduce the available wildlife potential. It should be noted that the extinction of some animal species could slow down the dissemination rate of some plant species the fruits of which are carried by animals from one environment to the other, or pass through the digestive system of an animal to facilitate germination; this is the case of elephants for example.

Conclusion

The study helped to highlight the main activities conducted in and around reserves. The hold on the resources of these reserves shows the limits of

the management system put in place. Indeed, the lack of transport and control means is a challenge that hinders the good management of these reserves. In such a context, sustainable development calls for concerted land rehabilitation strategies at the outskirts of the reserves or the diversification of activities that ensure improved income for farmers and wildlife preservation.

The sustainable management of these reserves could only be effective if the needs of local populations are well identified by managers and integrated in their program of action. It would therefore be desirable to conduct appropriate actions to preserve wildlife and flora in these reserves. This will help enhance the touristic potential and thus create sources of income for local populations. Also, game ranches could be created and the breeding or domestication of some animal species could be promoted to meet the animal protein needs of populations.

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Ensuring rural energy security: a path to sustainable land restoration movement in Africa

Dawit Gebregziabher, Arezoo Soltani, Ole Hofstad, and Ermias Aynekulu

Summary

Land degradation has long been recognized as a major problem in Ethiopia which threatens ecosystem functions that small holding farmers obtain from their landscapes. For decades a number of solutions have been devised and implemented with varying levels of success. Establishing exclosures (closed to human and animal interference) is one of the major interventions to rehabilitate degraded lands in northern Ethiopia. This paper identifies the reasons why farmers residing adjacent to exclosures participated in illegal wood harvest from exclosures. Despite the fact that a majority of interviewed households agreed on exclosure intervention, illegal wood harvest from the rehabilitating exclosures has been continuously reported. Survey results from 446 households and discussions with key informants and groups of farmers indicated that lack of alternative energy sources was the major driver for illegal wood harvesting. These results indicate that rural energy security is essential for successful restoration programs in Africa. To address this problem, there is a need to balance ecological rehabilitation and local communities' economic livelihood needs, like fuelwood. Of the respondents 118 (26%) indicated that fuelwood shortage had forced them to use cow dung and crop residues for cooking which in turn negatively affects the fertility of their soils and hence food production. Using renewable energy sources such as biogas, solar panels and agroforestry practices could help narrow the fuelwood supply gaps. Forest landscape restoration is an ideal approach to balance human wellbeing and ecological rehabilitation of degraded rural landscapes.

Introduction

Land degradation problems exist across sub-Saharan Africa (Yaynesht et al., 2009, Nedessa et al., 2005) which threatens ecosystem functions that small holding farmers obtain from their landscapes. For decades a number of solutions have been devised and implemented with varying levels of success. The Land Degradation Neutrality (LDN) target of the United Nations Convention to Combat Desertification (UNCCD) is one of the recent global initiatives to achieve a land

degradation neutral world by 2030 (UNCCD/GM, 2016). The African Union has set a target under the African Forest Landscape Restoration Initiative (AFR100) to restore 100 million hectares of degraded lands by 2030. As part of the AFR100 initiative, Ethiopia, for example, has committed to restore 15 million hectare degraded lands.

Exclosure land management is one of the several sustainable land management (SLM) practices which have been widely implemented in northern Ethiopia to

rehabilitate degraded lands. An exclosure is a degraded communal area where livestock and human activities are restricted for land rehabilitation (Aerts et al., 2009, Balana et al., 2010, Nedessa et al., 2005, Mekuria and Aynekulu, 2013, Mekuria et al., 2009). Exclosures were established by the joint effort of the local communities and governmental and non-governmental organizations (Descheemaeker et al., 2006). This paper addresses the potential drivers of illegal wood harvest from exclosures in northern Ethiopia.

Research methodology

Study area

We used nine exclosures selected from highland, midland, and lowland agroecologies in northern Ethiopia (Figure 1). The

exclosures were 10, 15, and 20 years old. Each age category was represented in the three agroecological zones.

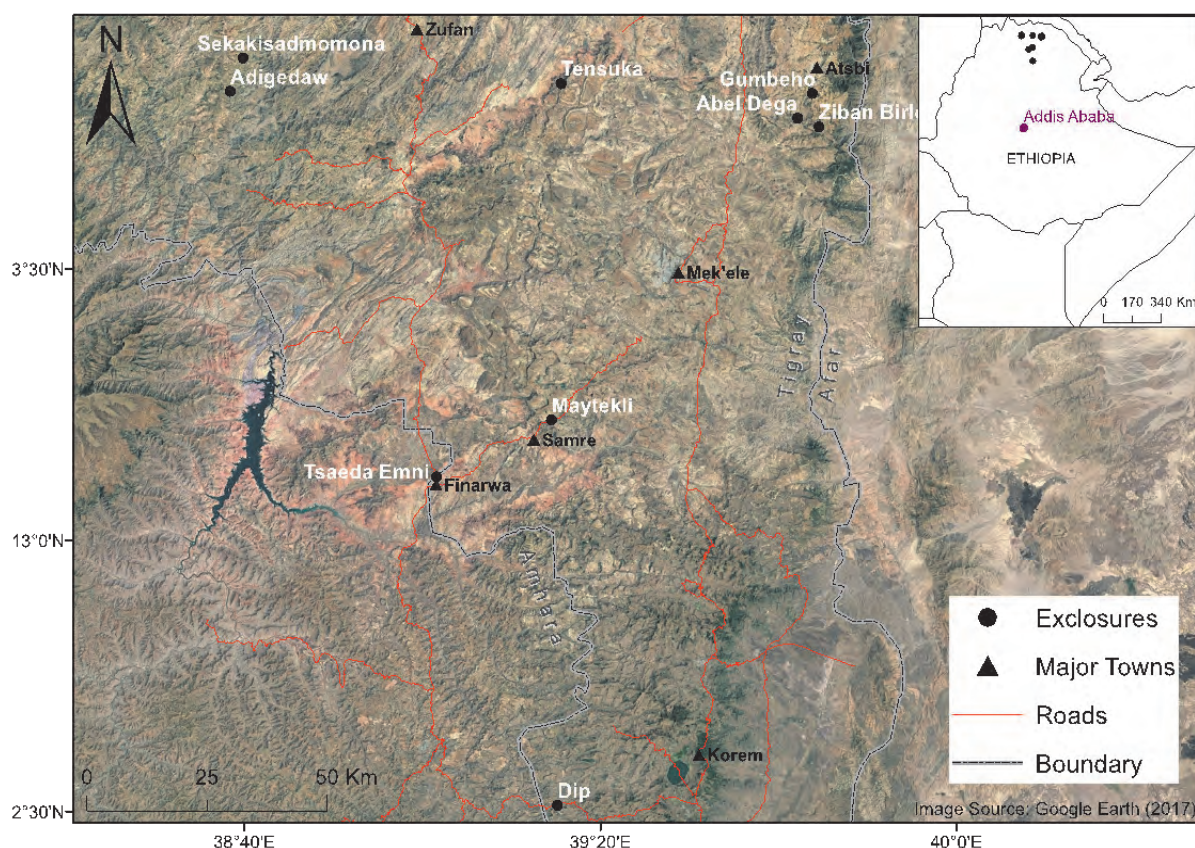


Figure 1. Locations of the selected exclosures in the Tigray region

Source: Google Earth (2017) and own collected GPS (Geographic Positioning System) coordinates

Data collection

Field surveys were conducted from October to November 2015. The survey consisted of interviews with 446 households in five districts and nine exclosures and field discussions with key informants and groups of farmers. We used descriptive statistics to analyze the data.

Results

About 85% (377) of the sampled households agreed with the establishment of exclosures on their degraded landscapes.

Similarly, 97% (431 households) agreed on the effectiveness of exclosures to rehabilitate degraded lands (Gebregziabher and Soltani, 2018). Despite the fact that the majority of interviewed households agreed with the establishment of exclosures and are happy about the existing exclosures, illegal harvesting of wood and fodder (like grass) has been continuously reported. The group discussions also confirmed illegal harvesting from exclosures. This is the main reason why exclosures were protected by guards.

Confiscating illegal wood and hiring farmers to guard the exclosures in our view is not an end in itself to stop the illegal harvest of outputs from exclosure areas.

One should rather aim at identifying the root cause of the illegal wood and fodder collection and find means to address that. About 266 (59.6%) of the respondents stated that there was an increasing trend in time used for fuelwood and fodder collection following the establishment of exclosures, which deny communities who

live near the exclosures to have access for fuelwood collection.

Figure 2 illustrates why farmers are engaged in illegal harvest from exclosures. Land degradation trigger establishment of exclosures. Bylaws cause restricting of

fuelwood collection and grazing, though it is allowed to collect grass using cut and carry system. This, coupled with a lack of alternative energy sources, and increased population causes the local community to be unable to satisfy their energy demand. As a result,

they will be forced to engage in illegal wood harvest leading to land degradation, which in turn, results in the establishment of exclosures. This is a vicious cycle approach unable to satisfy the energy demand of the local communities living adjacent to exclosures.

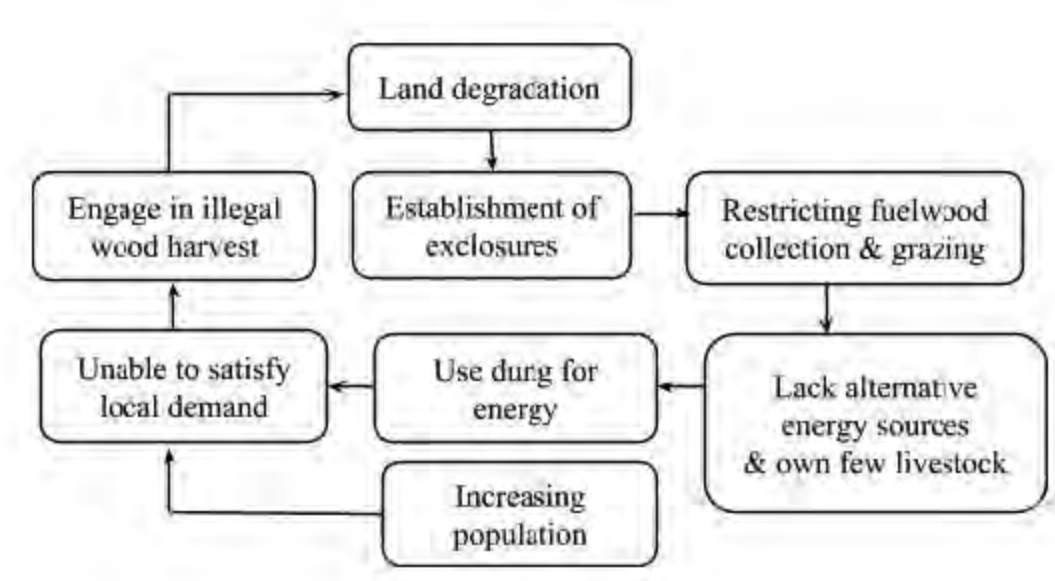


Figure 2. Potential drivers of illegal harvest from exclosures

Conclusion and implications

Our study showed that the main drivers of illegal wood harvest from exclosures was lack of alternative energy sources in the communities. This is mainly because the socio-economic expectations of the local communities from the exclosures were not adequately met due to the high priority given to ecological rehabilitation over the economic benefits like satisfying the communities’ fuelwood and fodder needs (Gebremedhin et al., 2003, Yami et al., 2013). For this reason, despite the positive environmental impacts, the introduction of exclosures

had limited benefit to the local communities, in most cases only collecting grass for animals fodder using cut and carry system (Gebregziabher et al., 2017). Moreover, the increasing population with diverse interest and competition on natural resources has made the situation worse (Mansourian, 2017).

The results clearly indicated that rural energy security is essential for sustainable land restoration movements in Africa. Therefore, introducing alternative energy sources to reduce the dependence on fuelwood is important. Using renewable energy sources such as biogas, solar panel and agroforestry

could be investigated as potential technologies to reduce the fuel supply gap of local communities. This in turn will contribute to combating illegal harvest practices and developing a sense of ownership by famers residing adjacent to the exclosures in northern Ethiopia.

Therefore, to achieve the intended rehabilitation program along with the economic benefits for the local community, design and implementation should balance ecological aspects and economic benefits for the community. Forest landscape restoration is also an ideal approach to balance human wellbeing and

ecological improvement from the previously degraded forest landscapes.

Finally, to minimize illegal harvest the issue should be communicated clearly with smallholder farmers in a bottom-up approach rather than setting rules that are punitive in nature and that may not prevent farmers from engaging in illegal harvesting. Moreover, the community will be encouraged to engage in environmental protection activities, if they could perceive tangible benefits from protection measures (Gebregziabher et al., 2017, Mekuria et al., 2011).

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Rights to farmers and rural households to manage trees and forest resources: sharing recommendation of Mount Marsabit forest, Kenya

Diida Karayu Wario¹

Summary

The aim of this paper is to show how Mount Marsabit indigenous forest is being threatened by human activities. The actions not only affect the forest cover but also the livelihoods of the growing population. Therefore, this paper briefly examines the importance of the forest and trees to the residents of Marsabit. It is worth noting that illegal harvesting of trees for firewood and construction materials are among the main contributors to the aforementioned destruction. Others are farming practices that are not adhering to good conservation standards, lack of community involvement in management of trees and forest, low investments from government and lack of enforcement of existing forest laws and policies. The article concludes that the forest is destroyed due to negligence by all stakeholders. It recommends embracing a low-cost and sustainable land restoration techniques in order to allow regeneration of trees and shrubs. There is a need to embrace proper community based management practices to manage forests and trees.

Introduction

The purpose of this paper is to indicate how the Mount Marsabit forest in Kenya is being destroyed (Figure 1.). Additionally it recommends better ways of conserving trees and forest. Poor management of the forest resources have contributed immensely to the destruction. Mount Marsabit forest is a rare indigenous forest. It is surrounded by desert and semi-desert environments. Among its unique features is wild Arabica coffee that grows naturally.

Marsabit town, which is the headquarters of Marsabit County, lies in the northern part of Kenya about 700 kilometres from Nairobi, the capital city of Kenya. Marsabit County is one of the 47 Counties of Kenya created by the 2010 constitution. The Marsabit town is situated on the slope of Mount Marsabit, around 1 400 metres above sea level. The peak of Mount Marsabit is 1,707 metres above sea level. The high elevation of Marsabit Mountain allows indigenous forests to flourish. This

forest sustains the lives and livelihoods of the population as a result of its advantaged position compared to surrounding areas. Mount Marsabit receives a mean annual rainfall of 800 mm, compared to an average of less than 300mm in other parts of Marsabit County. In a good season, the area around Mount Marsabit can support production of crops such as maize and beans which form part of the staple food for the population. As a result, the harvest ensures food security and food availability.

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Figure 1. Part of Mount Marsabit forest showing shrinking Lake Paradise

The lowlands of Marsabit County begins from about a 20 kilometre radius around the mountain, extending to about 500 kilometres to the furthest corner of the County. Marsabit Mountain and forest can rightly be described as an oases and important water tower compared to the arid and semi-arid areas of Northern Kenya. The runoff water drains into the Chalbi desert to the west and the Lorian Swamp to the east of Marsabit town.

There is clear evidence that the Marsabit forest is suffering seriously from a high rate of deforestation and consequently degradation of water and environmental resources. In the recent past the forest area has experienced decline from 19 000 hectares back in 1980s to about 11 000 currently (Robison, 2013). The serious destruction of this important forest occurred in the last two decades. Degradation is mainly attributed to illegal harvesting

of the forest resources while there are fulltime armed forest guards Station at the edge of the forest. Unabated harvesting of forest trees for construction and firewood was a major contributor to the reduction of forest cover (Figure 2.). Mount Marsabit is a very important ecosystem for the pastoralists and agro-pastoralists who are the main population groups living around Mount Marsabit.



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Figure 2. Women from Parkishon village in Marsabit central carrying firewood they harvested from the forest and driving donkeys with water from the springs in Mount Marsabit forest

Discussions

The indigenous trees deep in Mount Marsabit forest were targeted for harvesting for construction and firewood. Apparently, the forest guards gave permits to people intending to harvest dead trees in the forest. Giving of permits by guards was legal according to a policy mandate permitted by existing laws. But in most occasions they did not escort the individuals they gave permission, with result that live trees were also harvested by those who received permits. A case in point is when my elder brother was constructing a house back in 1993. I happened to follow the hired labourers in

the forest. The labourers felled several live standing trees for this purpose and started splitting them into building wood. I realized, it was not easy to determine whether a tree had been alive or dead when it was cut. Splitting of trunks easily conceal the illegal act of cutting live trees. The growing human population, pastoralists who settled down, poaching, banditry and unresolved issues around access to the forest to utilize its products have also contributed to destruction of this forest.

A growing problem is the large scale ongoing reduction of former grazing land due to the expansion of agriculture on Mount Marsabit. The area under cultivation has increased on the

more productive slopes of the mountain. This led to pushing of the pastoralist from the lands hitherto considered as pasture reserves, causing them to invade the forest areas. There is also an increase in insecurity created by conflicts over land and other resources. In the past for example, there was frequent conflict between Badassa and Songa locations, which are dominated by Agro-pastoralists from the Borana tribe, and their counterparts from the Redille tribe. Traditionally, for pastoralists, migration is the most important coping strategy to mitigate drought and minimize the effects of drought. Traditional pastoralist societies living in Marsabit followed a transhumance grazing strategy.

This consisted of regular seasonal moving of livestock between a dry season grazing area and a wet season grazing areas area which were known to all the members of the community. Such area is managed by a council of elders who hold regular meetings on grazing plans and share the information and decisions with the rest of the community. They decide where their livestock will migrate to next. Their decisions and directions were always obeyed.

In the past also, pastoral communities in Marsabit County had to combat the effects of droughts on their livelihoods in several ways. Following the 2011 drought, inhabitants of Moyale, North-Horr and Maikona reduced household food consumption, sold livestock and migrated to towns to cope with the drought. Moving of livestock was also employed by most pastoralists in Marsabit with some moving as far as Southern Ethiopia in search of water and pasture (VSF, 2011). Following proper community grazing patterns is an old strategy which has worked in reducing overgrazing in Mount Marsabit forests. The herders had the opportunity to move far away from the forest. Additionally, the natural environment becomes increasingly relevant, as livestock owners are expected to fulfil an important stewardship role in sensible resource utilization. It would appear that livestock makes a greater contribution to the income of lower income farmers as compared to higher income farmers (Gill, 1999). This is justification for involving the

community in the development of resource management strategies. In the recent past, efforts had been made by forest authority to impose a total burn on harvesting of wood from Mount Marsabit forest. The forest area is also being surveyed in order to make a clear boundary. It is hoped that these efforts will contribute to conservation effort of Mount Marsabit.

The Kenyan constitution of 2010 is very progressive in terms of the empowerment of communities on matters affecting their lives. The constitution empowers the community that policies or bills that are enacted by parliament or any other body must first go through public participation. Policies and Bills are first drafted by experts, subjected to stakeholders for inputs, goes through public participation, debated by members of parliament and may go for public participation depending on whether parliamentarians are satisfied on the level of public participation. Upon the review of the parliament, the bill is sent to the head of state if it is a national bill or the County governor if it is a county bill for formal signing into law. Below are important pieces of legislations in Kenya that are key for managing the forest resources. Effective community participation in the processes of these legislation will not only comply with legal provisions but also on ensuring proper management of forest resources.

a) Forest conservation and management Bill 2014, is a bill of parliament which if passed by Kenya National

parliament intend to update the Forest act. Forest act 2005 revised 2012.

b) Forest (Charcoal) Regulations 2009

These regulations were in addition to any other written law relating to forestry and sustainable charcoal production, transportation and marketing, for the time being in force.

c) Timber Act 1972/Revised 2012

The Timber Act is an act of parliament to provide for the more effective control of the sale and export of timber; for the grading, inspection and marking of timber; for control of the handling of timber in transit; and for matters incidental to and connected with the foregoing

d) The Environmental Management and Co-ordination (Amendment) Act, 2015.

This Act of Parliament is to amend the Environment Management Act, 1999

e) Land (Group Representatives) Act 1970/ revised 2012

An Act of Parliament to provide for the incorporation of representatives of groups who have been recorded as owners of land under the Land Adjudication.

There is evidence based justification for advocating right to farmers and rural households for managing

trees and forests. Literature gives enough evidence that farmers and rural households can manage the trees and forests sustainably if conditions are conducive for them to do so. The concept of Farmer Managed Natural Resource Regeneration is an evidence based support to this paper. Farmer Managed Natural Resource Regeneration (FMNR) is a concept developed by World Vision in Africa with a view of protecting the environment. This concept has worked in many parts of Africa in contributing to conservation efforts. The concept advocates the community to take the full ownership of conservation in their area hence improving natural resource management.

Conclusions

There is clear destruction of forest and trees on Mount Marsabit that went on unabated without good checks and balances. There is no shortage of legal and policy measures to ensure protection. However, the law enforcers failed to enforce these legal measures so as to protect the forest. Sustainability is hampered by the fact that there is little community

involvement in the management of the forest.

Finally, the local people who are pastoralist and agro-pastoralist communities living in the areas around the forest were marginalised due to the reduction of their rangelands as a result of conversion to sedentary agriculture (cropping). These people then performe invaded the forest, with many negative consequences to both the people and the forest.

Recommendations

This paper recommends employment of suitable community based management and sustainable land restoration techniques to aid regeneration and management of trees and shrubs on Mount Marsabit.

Rigorous law enforcement must be implemented to protect the forest from illegal exploitation. It is very important to appreciate the communities' rich knowledge of their rangelands, including the pastoral communities living in the areas surrounding the forest. The local resident populations should be involved in the development of policies that affect the utilization of their rangelands. Their transhumance migratory routes and seasonal

grazing areas should be respected. They should be allowed to make use of their indigenous knowledge for the sake of effective land and natural resource management. There is a need for government and various development partners to significantly invest in protecting the forests and trees on Mount Marsabit.

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Youths in forest landscape restoration movement in Republic of Rwanda

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Summary

Rwanda is a small country with dense and rapidly increasing population on a fragile land resource. The country has recognized and acknowledged the crucial role forests have to play in its development agenda and therefore is involving different sectors and partners in sustainable forest management. Community and Youth groups are among the targeted actors striving for efficient forest management. Young Rwandans aged between 0-35 years account for 78.7% of the country's population of which 39.6% are aged between 14-35 years.

Youth initiatives like the “Rwanda Youth Volunteers in Community Policing”, the Environmental Clubs in schools, the collaboration frameworks with schools on tree nursery preparation and different campaigns are key interventions that youth are using to participate in forest and environmental protection. The National Forest Policy encourages the mainstreaming of youth into forest management and protection programs. This will foster youth engagement in the national development agenda.

More efforts are still needed to increase involvement of youth into different programs for effective forest management. Empowering youth groups by building their capacity will enhance skills that may lead to the involvement in forest co-management approach that the government is promoting. Furthermore, it will be an opportunity for increasing decent employment among young generation.

Introduction

Rwanda has one of the highest population densities in Africa, and the population is growing at 2.8% per year. The higher scenario of the population projection of Rwanda suggests an increase from around 11 million in 2016 to about 17 million by 2032 with the density of 667 inhabitant per square kilometer. As the population grows, there are unprecedented pressures on land, water, agriculture and energy resources, hence the environment. This is also exacerbated by the

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fact that 70% of the population are engaged in agriculture for subsistence on small plots with poor soil fertility due to repeated cultivation and effects of soil erosion.

Rwanda faces scarcity of land, which is exacerbated by high population density that need more land for cultivation and more wood for cooking.. More than 83.3% of the population rely on firewood for cooking¹ leading to an increasing gap between wood supply and demand, which drives the deforestation and land degradation. This is coupled with different effects of climate change affecting the country in different ways such as, erratic rains causing floods and landslides, and rising temperatures resulting in harsh dry seasons contributing to forest degradation. Based on the Baseline Climate Change Vulnerability Index for Rwanda², the country is exposed to high risk of climate change and variability, and immediate actions are required for mitigation and adaptation. This therefore raises an urgent need for the country to prioritize and increase the momentum for landscape restoration through a wide range of awareness campaigns, adopting policies and implementing various strategies, including restoration and protection of forests. This paper examines and describes how the various initiatives put in place at local, district and

national levels spur youths to contribute to halting and mitigating effects of forest degradation and deforestation in Rwanda.

Extent of forest degradation

Forest resources have been playing and are still playing important roles in supporting the livelihood of Rwandans. Biomass provides approximatively 98.5% of primary energy in Rwanda in different forms namely firewood (83.3%), charcoal (15.2%) and crop residues and peat (0.8%)³. Furthermore, the forest sector contribute up to 5% to the GDP. Additionally, Rwandans also use wood as building materials and raw material for furniture. However, high pressure from anthropogenic activities drive deforestation and forest degradation in Rwanda. Agriculture, infrastructure development, urbanization, artisanal mining practices and limited forestry extension service are main drivers with the underlying causes from high population growth, poverty, lack of awareness, limited alternative source of energy and imbalanced wood supply and demand.

The high economic growth of Rwanda coupled with infrastructure development exacerbate pressure on forest. Karamaga et al., (2016) argue that from 1990 to 2016, the total built-up area increased by

over 300%⁴. Natural forest areas declined by 65% during the 1960 – 2007 period; currently a number of tree species are on the verge of extinction.

In 2010, Rwanda developed a national forest policy which was reviewed and enacted by the cabinet in February 2018⁵. The current policy states: “forest resources are managed to play an integral role in supporting Rwanda’s development goals for sustainable, low-carbon and climate resilient to improve livelihoods of present and future generations”. The Forest Sector Strategic Plan which was developed in conjunction with the policy gives the direction to achieve policy actions leading to sustainable forest management, private sector involvement and building institutional capacity among others. Furthermore, the policy leads to the achievement of the national pledge to restore 2 million hectares from the Bonn challenge, a global effort to bring 150 million hectares of the world’s deforested and degraded land into restoration by 2020, and 350 million hectares by 2030.

1 National Institute of Statistics of Rwanda (NISR), Rwanda Poverty Profile Report, 2013/14, August 2015

2 “Baseline Climate Change Vulnerability Index for Rwanda”, Rwanda Environment Management Authority, Kigali, 2015

3 National Institute of Statistics of Rwanda (NISR), Rwanda Poverty Profile Report, 2013/14, August 2015

4 Karamaga F, Zhang C, Fang X, Liu T, Ndayisaba F, Nahayo L, Kayiranga A, Nsengiyumva JB (2017) Modelling Rainfall-Runoff Response to Land Use and Land Cover Change in Rwanda (1990–2016). *Water* 9: 147.

5 Ministry of Lands and Forestry: National Forestry Policy. February 2018

Youth initiatives in forest and environmental protection

Restoration efforts require involvement and participation of Rwandans from different groups of community including the youth. According to the National Youth Policy, young Rwandans

aged between 0-35 years account for 78.7 % of the

Country's population, which is currently over 10.5 million.

The 2018 Forestry Policy suggests an action to mainstream youth equity into forest related development and decision making processes. Detailed activities to involve youth were developed in the Forest Sector Strategic Plan including the development of the technical guidelines of integrating youth into forest and tree resource management¹.

The country's youth have special responsibilities in relation to protection of the environment. This is mainly due to the fact that today's young people will be accountable and responsible for the Rwandan environment for many years to come. The National Youth Policy emphasizes the need to increase awareness on natural resource management by integrating youth as actors and beneficiaries²



Photo 1. Forest Landscape Restoration Campaign at school I Gicumbi district

The government has put in place a number of initiatives and campaign programs for forest protection involving the youth. Among them, **“Where Trees Grow, People Grow”** campaign through which environmental clubs in schools

were established with the aim of planting trees and sensitizing the community on the role of environment.

Different views were assembled on youth involvement in environmental management and

protection. Gilbert Gatsinzi, 20 years old university student from Nyaruguru District (southern part of Rwanda) participates in environmental clubs and states: *“I feel it is my responsibility to take part in such social and developmental works; I know the*

1 Ministry of Lands and Forestry: Forest Sector Strategic Plan 2018-2024-February 2018

2 National Youth Policy. Ministry of Youth, 2015

significant role forests play in our daily life. This is the reason why we must help our country protect our environment by planting trees,” said Gatsinzi.

In 2017, youths in Ruhango district (Southern province) planted about 8 000 trees on 16 hectares of agroforestry land in Kigaga village of Munini cell.

“We cannot afford to lose our natural heritage through environment degradation. Our future generations depend on the sustainable use of environmental resources and improved management of land areas struggling with pollutants, soil erosion, deforestation and degradation of national resources,” said Donah Kwitonda, the Executive Director of the **‘Association des Amis de la Nature’**, a local non-governmental organization.

Students at Green Hills Academy (a local school located in Kigali City) make use of other strategies to avoid deforestation, such as experimenting with cooking stoves and various methods using technics that consume less wood. The students also created an environmental page on the school website as well as links with other websites in the country and abroad.

Accelerating the momentum

Different initiatives are in place to promote youth involvement in environmental protection activities in country. Youth in the private sector under Rwanda Youth in Agribusiness Forum (RYAF) have also developed a five-year project through which they aim to plant 60

million trees across the country. It is worthwhile to mention that the National Strategy for Transformation, which is a current strategy leading the development agenda of the country encourages allocation of the management of public forest to private investors and to increase the percentage of private forest managed by Forest Owners Association in which youth group may play crucial role. Youth groups are being encouraged to participate in these schemes.

“We need to reduce dependence on rainfall for our activities. Trees provide fresh air and are the pivot of environmental protection and preservation,” said Jean Baptiste Hategekimana, Chairman of RYAF.

Youth under the movement **“Youth in forest and landscape restoration”** in 2017 alone planted 1 million trees, empowering the participants, showing them they can make a difference.

In November 2017, the ‘Rwanda Youth Volunteers in Community Policing (YVCP)’ launched countrywide development programs aimed at enhancing human security but also environmental protection. The activities are conducted every second Saturday of the month. They have committed to plant trees on 27 000 hectares in the next five years.

The Rwanda Water and Forestry Authority (RWFA), which has mandate to manage forests nationwide in collaboration with the International Union for Nature Conservation (IUCN) initiated a collaboration framework on tree nurseries

preparation with schools in Gicumbi and Gatsibo District for the 2018/2019 tree planting season. Seven schools were identified and accepted to collaborate. The aim of this program is to involve youth at early age and to acquire skills and knowledge on tree nursery preparation and planting technics. This will enhance awareness among communities and will extend forest cover in the area.

Enlarging the Network for Forest Landscape Restoration (FLR) champion

Building the capacity of youth through training, sensitization and coaching is gradually empowering youth to speak and participate in different activities. More youth are interested in the FLR programme and champions are emerging country wide in primary, secondary and tertiary institutions. More active involvement of youth in FLR work has led to the emergence of youth FLR champions particularly through school clubs. As youth continue to gain knowledge and skills through training and sensitization on key issues like climate change, they are more confident to act. In this case, youth communicate their concerns, ideas and values on environmental issues.

Youth learn and tell their stories about climate change and degradation through different media plat-forms, which enables the public to see environmental issues from a new angle different from politics enabling spreading of climate change awareness.



Photo 2. Training session on Forest Landscape Restoration champions

All for forest landscape conservation and restoration

The Governor of the Northern Province declared, “It is a continuous effort as we have in our plans to make sure that at least every primary school in the Northern Province has a tree nursery for fruits. There are also environment clubs in both primary and secondary schools and all of such initiatives highlight the role of the youth in preserving environment”.

The Head of Forestry Department at Rwanda Water and Forestry Authority (RWFA) revealed that youth are major players in forest development since they are the most involved in seed collection, seedling production as well as tree planting activities that combine afforestation, re-forestation and rehabilitation of degraded forests.

There are also about 40 university students working with private sector in the southern province where they help in forest inventory. The head of forestry department at RWFA

also disclosed that youth from various sectors in the country such as the Army and Police are involved in establishing forest tree nurseries as well as out planting of the seedlings raised in such nurseries.

It is very clear that if the African youth does not take up this task, future generations will be affected by today’s course of action because their future depends on the extent to which they have addressed concerns such as the depletion of natural resources and the loss of biodiversity. Therefore, by involving the

youth in implementation of forest and environmental projects, they not only gain important experience but it also qualifies them for increased participation in decision-making about environmental policies not only in Rwanda, but also internationally.

There are several ways youth can be involved in forestry in Rwanda. Developing a communication strategy and mechanisms to reach youth is crucial. Rwanda has a well-designed and operational youth council working up to the District and Sector level, and this can be used as channel of information to engage youth in forest management. This can be a path towards creation of more youth cooperatives that can contribute in tree nurseries creation and management of new and existing forest.

Rwanda is currently motivating private sector to invest in forest management including activities such as: tree plantation, nurseries preparation, existing forest management etc. These are carried out by private entities, therefore youth cooperatives once supported in capacity building, can compete to carry out some of these activities and thus get involved in co-management of forests. This is seen as an opportunity to reduce unemployment among youth.

Conclusion

Forest protection requires effort from different partners and groups of people to tackle deforestation and forest degradation for a bright future. Involvement of youth, gender and other community groups is an added value to the ongoing effort to increase the forest cover and enhance sustainable forest management. The government of Rwanda through different policies and strategies lay great emphasis on involving youth in the country's development agenda including mainstreaming youth into forest management and protection.

Different youth initiatives are in place to deal with environmental protection. Each school in Rwanda has an environmental club which aims at increasing awareness on environmental protection among students and hence to the community in general. The current collaboration among schools in tree nursery preparation is envisaged to boost youth involvement and enhance their skills and knowledge in tree nursery preparation and tree planting.

The government of Rwanda and its citizenry are not resting on their laurels; they have to continue to innovate and motivate and empower youth groups to allow their

engagement in the co-management approach of forest landscape in country.

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Africa’s Great Green Wall: a transformative model for rural communities’ sustainable development.

Lessons learned from Action Against Desertification towards the implementation of African Forest Landscape Restoration Initiative

Moctar Sacande¹ & Nora Berrahmouni²

Summary

FAO has supported the Great Green Wall (GGW) initiative, since its launch in 2007, as a game changer for Africa, given its potential to address climate change adaptation and mitigation, prevent and combat desertification, eradicate poverty, end hunger and boost food and nutrition security. With the generous support of donors such as the European Union, FAO has become a key technical partner in building this programme of opportunities for Africa’s drylands and its people. Through the EU-funded Action Against Desertification (AAD) project, FAO’s efforts are focused on supporting six African countries (Burkina Faso, Ethiopia, Gambia, Niger, Nigeria and Senegal) in implementing their GGW National action plans: As a result, a comprehensive approach for large-scale land restoration — one that places rural communities at its heart— has led to on the ground interventions in an estimated 12 000 hectares of degraded lands between 2015 and 2017. The impact has been sustained by developing the capacity of local communities to become self-supporting in technical activities, such as better management of their production systems, conservation of biodiversity, and in socio-economic activities such as the production and processing of forest products benefiting their livelihoods. Although the Great Green Wall initiative is still far from completing the development of a great mosaic of green and productive landscapes, where communities can thrive. FAO’s approach to large-scale restoration is seen as a transformative model for rural community development, hand in hand with the transformation of the landscapes they live in. The methodology and lessons learned from its application can lead the way for implementation of the new commitment African Forest Landscape Restoration Initiative (AFR100)³ in particular in the restoration of those degraded lands difficult to regenerate naturally because of the loss of seed banks.

Introduction

Rural communities across about 1.9 billion hectares	(ha) of dryland Africa have always depended on forests, which cover an estimated 286 million	hectares (Bastin et al, 2017) as well on grasslands, agroforestry, silvopastoral and oasis systems for their
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3 African Forest Landscape Restoration Initiative (AFR100) : <http://www.afr100.org/>

food and nutrition security and livelihoods. However, those natural resource-based production systems are being rapidly depleted in many places as a result of overpressure on resources combined with climate change. This makes these communities more vulnerable to increased weather extremes such as heat waves, droughts, and floods. The lack of alternative socio-economic opportunities, also leads to forced migration and conflicts over scarce natural resources.

Initiatives to address land degradation and desertification trends in Africa, promote sustainable land management, and restoration of degraded forests and landscapes include Africa's Great Green Wall initiative, and 2016's African Forest Landscape Restoration Initiative – AFR100. The latter is a country-led effort to bring 100 million hectares of deforested and degraded landscapes across Africa into restoration by 2030.

FAO has supported the Great Green Wall (GGW) initiative as a game changer for Africa, given its potential to address climate change adaptation and mitigation, prevent and combat desertification,

eradicate poverty, end hunger and boost food and nutrition security (AUC/PAGGW, 2012). With the generous support of donors such as the European Union, FAO has become a key technical partner in building this programme of opportunities for Africa's drylands and its people. Through the Action Against Desertification (AAD) project¹, FAO's efforts have focused on supporting six African countries in implementing their GGW national strategies and action plans: Burkina Faso², Ethiopia³, Gambia⁴, Niger⁵, Nigeria⁶ and Senegal⁷.

This article highlights FAO's Action Against Desertification restoration approach, its innovations and lessons learned from the ongoing implementation with rural communities and partners in support of the GGW initiative. These innovations and lessons are ready for deployment in other GGW areas, other Africa dryland countries and restoration initiatives. We explain here the restoration methodology and provide some results obtained between 2015 and 2017 as well as the challenges still lying ahead.

1. Enabling local institutions and experts to assess the restoration opportunities across the Great Green Wall

The AAD project has supported the development and application of a methodology to estimate the restoration ambition across the GGW, based on the analysis of the data collected in 63 000 plots across the drylands of North Africa, Sahel and the Horn of Africa as part of FAO's Global Drylands Assessment (FAO, 2016). The Collect Earth tool was used to collect data. It enabled interpretation, by FAO and regional technical dryland experts, of high-resolution satellite images (Berrahmouni *et al*, 2016; Bastin *et al*, 2017).

The GGW area of intervention extending over 780 million ha, includes 88 million ha of forests, 243.4 million ha of grasslands, 71 million ha of cropland and 18.9 million ha of irrigated cropland. For GGW, the restoration challenge is huge. In analyzing the data collected for tree-based systems, restoration needs were assessed and estimated to reach at least 166 million ha, not taking account of grasslands and oasis systems (Berrahmouni *et al*, 2016), see map in Figure 1.

1 www.fao.org/in-action/action-against-desertification

2 Burkina Faso (2012). Stratégie et plan d'actions de l'Initiative Grande Muraille Verte au Burkina Faso: <http://www.fao.org/3/a-av144f.pdf>

3 Ethiopia (2012). National strategy and action plan for the implementation of the Great Green Wall Initiative in Ethiopia: <http://www.fao.org/3/a-av141e.pdf>

4 Gambia (2012). National action plan for implementation of Great Green Wall for the Sahara & the Sahel Initiative for the Gambia, 2012: <http://www.fao.org/3/a-av146e.pdf>

5 Niger (2011). Initiative Grande Muraille Verte, 2011: <http://www.fao.org/3/a-av149f.pdf>

6 Nigeria (2012). Great Green Wall for the Sahara and the Sahel Initiative: National Strategic Action Plan, 2012: <http://www.fao.org/3/a-av149f.pdf>

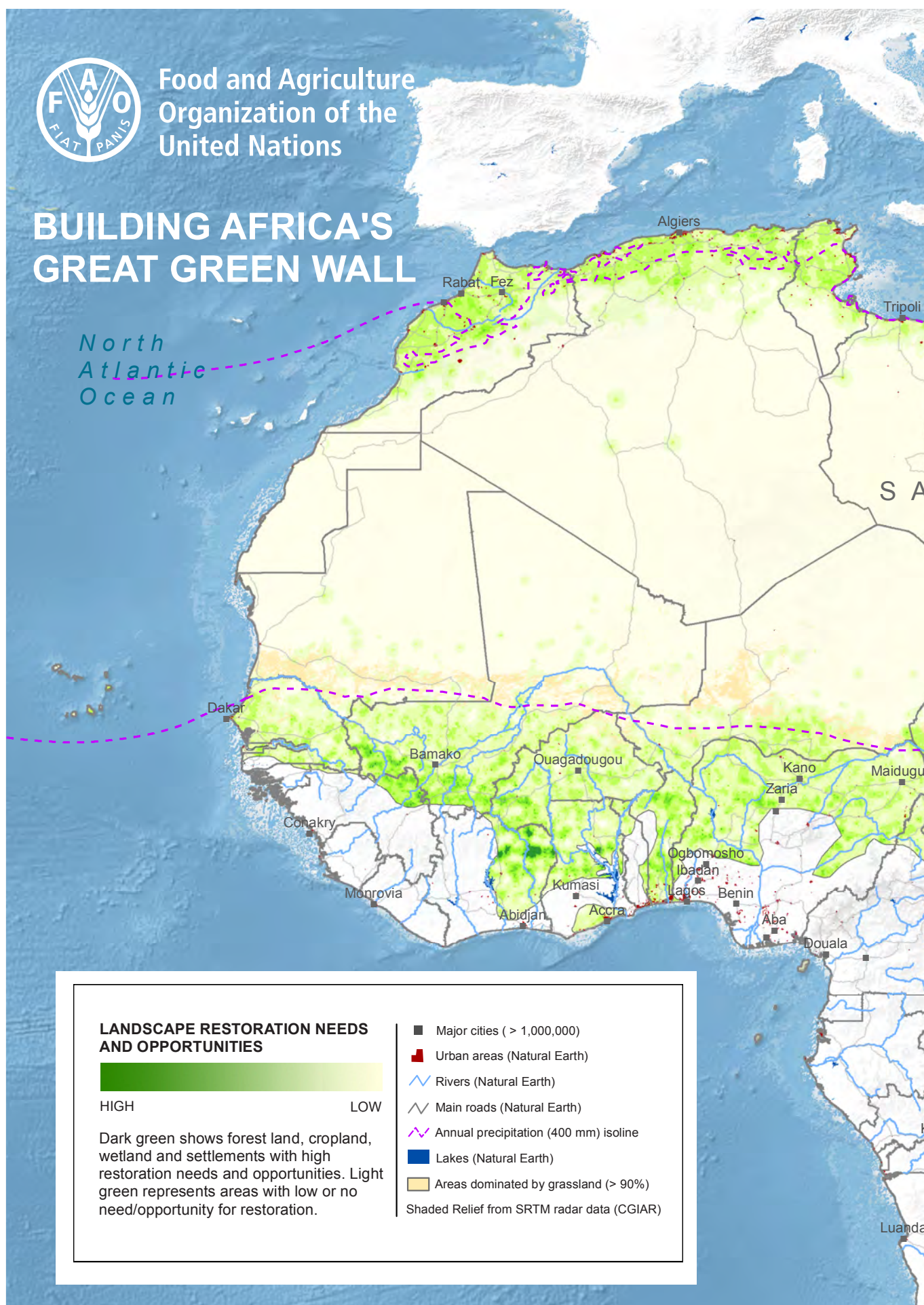
7 Sénégal (2011). Financement de la Grande Muraille Verte. Projet de Plan d'Action du Sénégal 2012-2016 <http://www.fao.org/3/a-ax346f.pdf>



Food and Agriculture
Organization of the
United Nations

BUILDING AFRICA'S GREAT GREEN WALL

North
Atlantic
Ocean



LANDSCAPE RESTORATION NEEDS AND OPPORTUNITIES



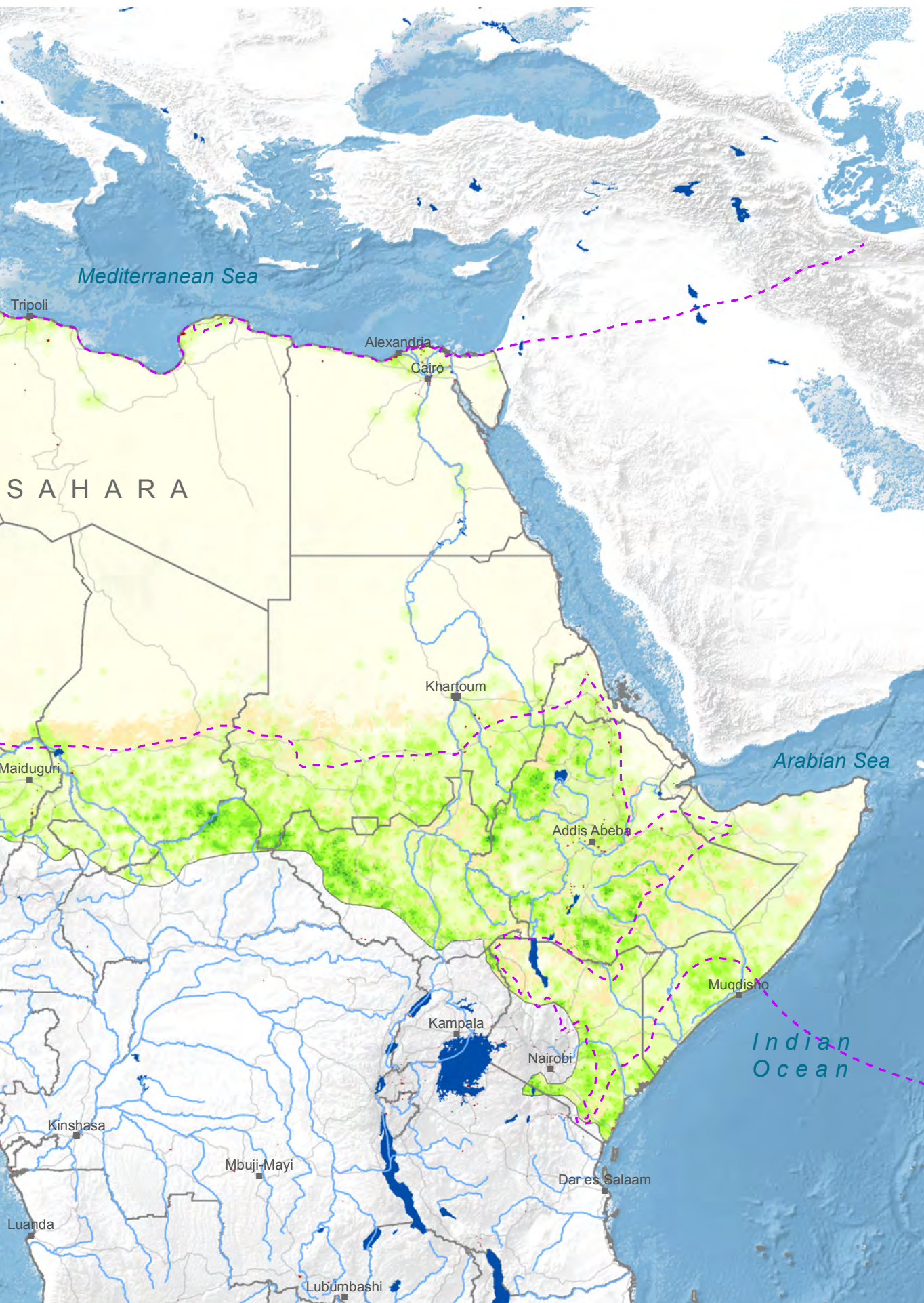
HIGH

LOW

Dark green shows forest land, cropland, wetland and settlements with high restoration needs and opportunities. Light green represents areas with low or no need/opportunity for restoration.

- Major cities (> 1,000,000)
- Urban areas (Natural Earth)
- Rivers (Natural Earth)
- Main roads (Natural Earth)
- Annual precipitation (400 mm) isoline
- Lakes (Natural Earth)
- Areas dominated by grassland (> 90%)
- Shaded Relief from SRTM radar data (CGIAR)

Figure 1 Landscape restoration needs and opportunities in Africa's dryland



The resulting estimate means that an average of 10 million ha need to be restored per year if we want to achieve the restoration of the ambitious 166 million ha target as a contribution to the SDG Agenda by 2030. The restoration opportunity map and its resulting numbers has become, since its public release, a reference to illustrate and emphasize the challenges ahead in restoration across the GGW, and the need for bigger investments.

This methodology could be refined and expanded to cover all of Africa — particularly, Africa’s drylands, at continental and country levels to inform and help monitor AFR100 commitments and achievements against assessed baseline.

2. Restoration in action: using a five-step community-based restoration model

To implement restoration work, FAO has developed a five-step, comprehensive model for large-scale dryland restoration in support of the GGW (Sacande, 2016; Sacande and Berrahmouni, 2016). The effort is backed by FAO’s “Global guidelines for the restoration of degraded forests and landscapes in drylands: Building resilience and benefiting livelihoods” developed through a process involving experts from different dryland countries and regions that led to the compilation of lessons learnt from different restoration projects and programmes,

analyzing factors of success and failure. The usefulness and application of these guidelines were tested in 10 countries including in Great Green Wall intervention area of Senegal, during an international validation workshop held in 2013. This comprehensive model includes the following elements to be implemented (not necessarily in chronological order):

- **In-depth consultation to assess the needs of communities and their preferences** for useful and diverse plant species (trees, shrubs, grasses) underpinning the communities’ restoration objectives (fig.2).



Figure 2 Consultation to assess the needs of communities and their preferences. Nigerien Forestry Officer gathering information from the local community about their needs in terms of plants to be reintroduced by a planting campaign in Tera, Niger

- **Integrating science and research with farmers' practices:** this includes working with seed centers to make quality seed available for propagation of biodiverse and adapted restoration material; inoculation of seeds and plant seedlings' roots with mycorrhiza and bacteria to boost the vigor of the restoration material

and increase its chances of survival and development in the constraining environment (i.e. drought).

- **Direct involvement of local communities, with support from technical experts and partners, - in restoration operations,** including: (i) collection and mobilization of seeds

with technical guidance from seed centers and technical experts, (ii) land preparation using water harvesting techniques and soil conservation and management, planting and seeding operations, and establishment of village nurseries (Figures: 3a b, c, d).



Figure 3a



Figure 3b



Figure 3c



Figure 3d

- **Management and monitoring of the areas under restoration,** including measuring performance, impacts and benefits.

- **Continuous capacity development** for local farmers to become self-sufficient in all operations and development of non-timber forest products (NTFP) ; to become recognized as “village technicians”; and

to become organized and skilled producers with an entrepreneurship level to produce, process and market their products.

By 2019 the AAD project will have 35 000 ha of degraded

land under restoration by local communities. This corresponds to 0.25% of the total AAD project area across the six countries. So far, 325 villages where 70 000 farmers, half of them women, are involved and directly participate in the activities on the ground. The restoration work aimed to benefit and transform the lives of 500 000 people and includes:

- (i) assisted natural regeneration when possible,
- (ii) manual and mechanized land preparation and water harvesting techniques (see figure 4), and
- (iii) planting of 110 woody and herbaceous species using more than two million seedlings and over 40 tons of seeds mobilized by the national seed centers and trained villagers for direct sowing. It is noteworthy that seed centers, such as those in Mali and Kenya, are contributing to quality seeds' mobilization in response to the huge need for forest and fodder seeds to meet restoration project targets.

3. Generating livelihoods: developing a value-chain approach as an incentive for enabling sustainable land management and restoration over the long run.

Developing a value-chain approach is critical in restoration to address some of the key drivers and consequences of deforestation and land degradation — particularly,

poverty, lack of economic opportunities, and scarcity of natural and financial resources. Key to successful restoration is finding ways to lift communities out of poverty and improve livelihoods, using restoration as a catalyst for developing plant-based jobs and income generating activities.

FAO has developed a methodology called "Market Analysis and Development (MA&D)" to help organize communities in producer group organizers and build their institutional, entrepreneurial and technical capacity to set up successful small enterprises for sustainable production, processing and marketing of forest products (FAO, 2015).

AAD project has therefore included and implemented as part of its restoration model the following activities:

- organizing consultation workshops in 2015 and 2016 with communities of the 6 AAD countries to enable them express and reflect on their preferences of species to be used for restoration including those with high socio-economic value as highlighted in section 2 above. (Sacande and Berrahmouni, 2016).
- conducting training for trainers in 2017 on FAO's MA&D methodology, targeting potential facilitators to lead communities groups and guide them through the methodology;

- organizing interested communities, with support of the trained facilitators, into producer associations and small-scale enterprises. This involved supporting them in identifying potential non-timber forest products (NTFP), and their sustainable harvesting, processing and marketing using the MA&D, methodology.

Guided by the MA&D participatory approach, village communities involved in AAD project selected a total of ten NTFPs for developing their livelihoods. Those include honey, *Balanites* oil, fodder (see figure 5), and natural gums. Currently project coordination, technical teams and partners are working with the communities to establish the planned small-scale enterprises for sustainable production, processing and marketing of their selected NTFPs.

Furthermore, existing professional networks linking producers and markets can provide a good opportunity to bring this potential to scale. The Network of Natural Gums and Resins in Africa (NGARA), for example, developed a framework of priorities for 2017-2030, with support of AAD and other partners. NGARA aims to position African producer countries and partners as major global players in the sustainable production, processing and marketing of gums and resins (NGARA, 2017).



Figure 5 Tera, Bajirga, Niger - Farmers charging their carts to transport hay to Tera weekly market.

4. Helping farmers, particularly women, gain access to appropriate technologies when possible, to bring restoration to the required scale.

New methods, updated tools and adapted technologies can mean greater efficiency and rapidity in large scale restoration of highly degraded lands in particular in the very constraining environmental context of the drylands. The FAO Global guidelines for the restoration of degraded forests and landscapes in drylands highlighted the importance of the use of well tested technologies such as the plough (Delfino – figure 4) that mimics the traditional manual digging of half-moons used for water harvesting and land preparation and that was tested in the Sahel by FAO through a project run between 2003 and 2010 called

“the Acacia Operation Project” (FAO, 2010; FAO, 2015).



Figure 4 - Workers in Djibo, Burkina Faso preparing Delfino tractors to start ploughing.

Ten to fifteen hectares (10 to 15 ha) daily can be treated with the Delfino, in contrast with the traditional 1 ha daily treated manually by 100 people.

Under AAD, FAO has invested with partners, in the training and procurement of 2 Delfino units

for large scale restoration work in villages of Burkina Faso and Niger. As a result, much larger areas of barren and lateritic land were treated. The use of the Delfino, relieved women of the very demanding manual land preparation activities. As a result, women can now turn to other types of productive work, such as seed collection, planting and caring for the restored areas; harvesting of fodder and other products; honey production, etc. Once the land is well prepared by the Delfino, women are supported in developing agroforestry systems on the treated areas growing vegetables, fruits and native plants/ trees and grasses that provide nutritious food for themselves and their children.

1 <http://www.fao.org/dryland-forestry/projects/past-projects/acacia-operation-project/en/>

5. Creating opportunities for peer-to-peer capacity development and south-south cooperation

The AAD project has helped foster south-south cooperation between communities, institutions and partners. Workshops in technical and evaluation practices, as well as in regional and inter-regional technical restoration methods, have involved the six GGW country teams as well as other GGW countries. This also helped to mobilize technical knowledge and improve capacities in seed mobilization from other countries, such as Mali and/or Kenya.

AAD also contributed to development of the online Dryland Restoration Initiative Platform (DRIP) expected to be launched by mid- 2018 for the compilation and exchange of lessons learned, monitoring and sharing information on strategies, and impacts of restoration initiatives including the AAD. The platform can be used by African restoration practitioners and decision makers committed to the GGW and the AFR100 to compile their experiences and learn from other examples as well as report on their past, current and future initiatives.

Conclusion

The AAD restoration approach has proved successful when measured by the mobilization of communities, and the benefits they have already generated in the early years of implementation. These include harvesting and selling of fodder (figure 5); income generated by the trained village technicians who are producing and selling

seedlings and seeds to the benefit of restoration projects. Village technicians have become reliable partners for restoration sustainability, by collecting seeds and setting up village nurseries as well as farming in the restored agroforestry systems.

To respond to the huge potential and commitments for restoration in the GGW or AFR100, a mix of restoration strategies including assisted natural regeneration, planting through direct sowing or seedlings, can be used depending on socio-economic and environmental challenges and opportunities.

Besides the mobilization of quality seeds that was well addressed through AAD, a number of challenges arose. These include the non-systematic respect of and follow-up on the planting technical instructions including the planting period. Planting needs to be done on time and in the right place to maximize availability of water for seeds and seedlings.

Furthermore, municipalities have a crucial role to play in securing land to farmers and producer groups to enable sustaining gains of restoration. The example of Tera Municipality in Niger or Dori and Djibo in Burkina Faso showed that this challenge can be addressed.

While the COGES (management committees) were set up successfully, these still need to be sustained and facilitated by technical field experts and the trained farmers. The COGES membership needs to be increased and gender balance secured. The COGES has a fundamental role to play in

securing the maintenance and management of the restored areas including through their protection from livestock. The latter can compromise and lead restoration efforts to failure. To address this challenge, AAD has built on existing solutions and mechanisms such as the use and reinforcement of existing laws as well as periodic surveillance and patrolling by the villagers themselves. AAD has also incorporated in its restoration planning approach, elements to minimize risks of failure. For example, during the selection process of areas to be restored, the proximity to villages and settlements was considered among the criteria to take into account, this makes patrolling and surveillance more doable. In addition, the consultation with communities and the communities' driving role in defining and stating their restoration objectives, needs and preferred species have proven to be a guarantee for protection and sustainability.

The issue of compilation of baseline and monitoring (in the field and satellite such as with collect earth) remain high in the agenda of large scale restoration initiatives such as the GGW or the AFR100. We believe that there is an urgent need to work with countries and all actors involved in restoration, to harmonize tools and methods for use by all stakeholders in a cost-effective and transparent manner to allow accountability, monitoring and evaluation of restoration investments on the ground.

It has been highlighted in the villages of AAD intervention that restoration action alone is not enough to lift communities out of poverty or build their resilience.

People often lack access to other important basic needs such as water, health services, social protection schemes, therefore, other development partners and sectors need to be brought early on in the process as one project or one sector cannot do it alone to address those development and social challenges in the Great Green Wall.

Looking ahead to the 2018 restoration campaign, the six countries that have been the focus of FAO's efforts through AAD — Burkina Faso, Ethiopia, Gambia, Niger, Nigeria and Senegal — have committed to restore an additional 18 000 ha, so as to complete the restoration of the total area planned (35 000 ha) by 2019. Furthermore, the AAD approach is being expanded to other GGW countries such as Eritrea, Mauritania and Sudan with the financial support of Turkey through a new project by name "Boosting Restoration, Income, Development, and Generating Ecosystem Services (BRIDGES)"¹. This will be sowing new restoration sites to grow and build, step-by-step, the Great Green Wall.

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For further information, see:

AAD Website: www.fao.org/in-action/action-against-desertification

FAO Dryland forestry website www.fao.org/dryland-forestry

¹ <http://www.fao.org/in-action/action-against-desertification/news-and-multimedia/detail/en/c/1051386/>

LINKS

The coming storm

"The Coming Storm", is a new investigative report about impact of industrial agriculture on Congo Basin forests.

An investigative report released 12 March 2018 documents the destruction of the forests of the Congo Basin for industrial palm oil and rubber plantations. The Coming Storm, released by the London-based non-profit organization Earthsight, reveals that five-hundred square kilometres of forest has been bulldozed in the last five years and that the destruction is set to accelerate, as high-level corruption and some of the regions' most notorious logging companies combine to create a toxic mix. Earthsight Projects include:

<https://www.earthsight.org.uk/coming-storm> The Coming Storm: How Secrecy & Collusion in Industrial Agriculture Spell Disaster for the Congo Basin's Forests

www.thegeckoproject.org Investigative reporting on land deals, corruption and rights

www.timberleaks.org The inside scoop on suspect wood

www.bad-ag.info Monitoring illegal conversion of forests for agribusiness

Choice Cuts: How European & US BBQs are fuelled by a hidden deforestation crisis in South America

www.timberinvestigator.info Helping Activists and Communities Investigate Illegal Logging & Trade

Read more: <https://www.earthsight.org.uk/coming-storm>

Source: Sam Lawson, Director of Earthsight www.earthsight.org.uk

The exceptional value of intact forest ecosystems | Nature Ecology & Evolution

"The exceptional value of intact forest ecosystems" is an important paper published online on 26 February 2018 in *Nature Ecology & Evolution* (2018) and available by subscription on website - <https://www.nature.com/articles/s41559-018-0490-x> Authors include James E. M. Watson, Tom Evans, [...] David Lindenmayer (28 authors in total).

As the terrestrial human footprint continues to expand, the amount of native forest that is free from significant damaging human activities is in precipitous decline. There is emerging evidence that the remaining intact forest supports an exceptional confluence of globally significant environmental values relative to degraded forests, including imperilled biodiversity, carbon sequestration and storage, water provision, indigenous culture and the maintenance of human health. Here we argue that maintaining and, where possible, restoring the integrity of dwindling intact forests is an urgent priority for current global efforts to halt the ongoing biodiversity crisis, slow rapid climate change and achieve sustainability goals. Retaining the integrity of intact forest ecosystems should be a central component of proactive global and national environmental strategies, alongside current efforts aimed at halting deforestation and promoting reforestation.

Read more: <https://www.nature.com/articles/s41559-018-0490-x>

Drought-hit Ethiopia moves to protect its dwindling forests

Ethiopia is enlisting the cooperation of people in and around its forests to manage woodland better, hoping to protect the country from the effects of climate change while boosting development prospects for its population of 100 million. The government of Africa's second most populous country has set an ambitious aim of reducing poverty and becoming a carbon-neutral economy by 2025, in part by transforming the way rural landscapes are managed. Its Climate Resilient Green Economy strategy aims to meet half of its target reduction in carbon emissions by adding 5 million hectares (12.4 million acres) of forests by 2020 – just three years from now – and restoring 22 million hectares of degraded landscapes by 2030.

Read more: <https://www.reuters.com/article/us-ethiopia-forest-population/drought-hit-ethiopia-moves-to-protect-its-dwindling-forests-idUSKBN19P190>

Source: Elias Gebreselassie Chilimo, Ethiopia (Thomson Reuters Foundation) -

Women are championing mangrove conservation in Nigeria.

A women-led civil society group in Nigeria is empowering women and the whole community to protect Nigeria's extremely productive but disappearing mangrove forests, which provide abundant services to the marine environment and people.



Nigeria's first women-driven mangrove restoration project by Jude Fuhnwi

Read more : https://www.birdlife.org/worldwide/news/women-are-championing-mangrove-conservation-nigeria?utm_source=sidebar&utm_medium=topnews

The Global Landscapes Forum

The Global Landscapes Forum (GLF) is the world's largest science-led platform on sustainable land use. It has connected 3 000 organizations and 25 000 people through their gatherings in Warsaw, Lima, London, Paris, Marrakech and Jakarta - with 32 million others online. The GLF is greening Africa through the AFR100 and Latin America through Initiative 20x20. It is fighting to save the world's peatlands through the Global Peatlands Initiative and shares a positive vision of what the peatlands of the Democratic Republic of Congo can look like if all work together.

Read more: <http://www.globallandscapesforum.org/about/what-is-glf/>

Carefully managed fires can enhance biodiversity in Africa's fragile savannas

The burning of biomass, including wood and organic matter, has played a critical role in the management of Africa's savannas for millennia, helping control undesirable plant species, facilitating access to new growth forage, and eradicating pests and parasites.

You can find this piece at: http://www.globallandscapesforum.org/hero_teaser/carefully-managed-fires-can-enhance-biodiversity-in-africas-fragile-savannas/

Scaling-up forest and landscape restoration and sustainable land management in Niger and Burkina-Faso

Land degradation is threatening the productive potential of the world's landscapes, impacting the livelihoods of billions of people. Through formal commitments and voluntary initiatives, such as the Bonn challenge pledge, countries worldwide are actively engaging to stop further degradation, and restore their ecosystems for a wide range of benefits. FAO supports them in meeting this ambition and alleviating the obstacles towards large-scale restoration.

In the Sahel, sustainable land management and restoration have been central to policies and projects for long. Natural resources are the base for livelihoods in the area, with a high dependence of local populations on their exploitation for food, fuel and feed. With recent regional and sub-regional initiatives, such as the African Forest Landscape Restoration Initiative (AFR 100) and the Great Green Wall Initiative for Sahara and the Sahel, the momentum for restoration is expanding.

In this context, FAO, through its Forest and Landscape Restoration (FLR) Mechanism, signed in early 2018 an agreement with the French Fund for the Global Environment (Fonds Français pour l'Environnement Mondial or FFEM) focusing on restoration in the Sahel. That project, benefiting from co-finance from the Action Against Desertification project (AAD), the Korea Forest Service, and the Agence Française du Développement (AFD), will be implemented over 4 years by FAO in

partnership with national and international organizations.

Aimed at upscaling restoration by empowering local initiatives in Niger and Burkina Faso, the project aligns with and reinforces ongoing decentralization processes in the two countries that led to increased responsibilities devolved to the level of the “communes”. In particular, the project will focus on channeling investments for restoration and for income-generation through the budget of communes, in collaboration with dedicated national agencies such as ANFICT (Niger) and FPDCT (Burkina Faso). The project will in particular strengthen the Communal councils with technical agents and capacities, and the local processes of planning, financing and monitoring of restoration and income-generating activities.

In addition to facilitating local finance mechanisms to implement restoration activities, the project will support mainstreaming innovative technologies for

monitoring the impact of restoration on the ground, mobilizing finance and sharing best practices. Among the innovative technologies to be tested, the project will adapt the Collect Earth Open Foris tool to the local context, and facilitate a participatory diagnosis, and biophysical and socio-economic monitoring of progress. With improved monitoring of progress towards the ambitious pledges made, evidence of impact is expected to generate additional support and inspire emulation.

More information on the Forest and Landscape Restoration Mechanism of FAO is available at: <http://www.fao.org/in-action/forest-landscape-restoration-mechanism/en/>

Online community of practice: developing capacity for forest and landscape restoration

Faustine Zoveda¹, Maria Nuutinen², Carolina Gallo Granizo³ and Caterina Marchetta⁴

Many organizations are now using online training and knowledge-sharing activities to increase the reach and to harmonize the quality of their capacity building worldwide. The rapid spread of the internet among more people and into more places has created unprecedented opportunities for online learning and exchanges to be used in development cooperation. In 2017, for example, 67 percent of young people between the ages of 15 and 24 were using the internet in developing countries. Even in the least developed countries there were still 30 percent of young people using the internet (see for: ITU, 2017; in comparison to: World Economic Forum, 2015; UN News Centre, 2015). The key target audience of forest and landscape restoration (FLR) activities, the development practitioners, including planners working in agriculture, are now using the internet and can access online learning opportunities.

The newly established online Community of Practice for Forest and Landscape Restoration hosted its inaugural online knowledge-sharing forum: “Innovative Approaches for Monitoring Forest and Landscape Restoration” with a webinar and a facilitated email-based discussion in November–December 2017. The activity was organized by the FAO Forest and Landscape Restoration

Mechanism under the umbrella of the Collaborative Roadmap for Monitoring FLR in partnership with Global Partnership on Forest and Landscape Restoration (GPFLR).

Communities of practice is a concept that was developed by Etienne Wenger in 1998 to better understand social systems that facilitate learning. Communities of practice are

networks of individuals who share the same interests and are motivated to learn together through regular communication. Creating such communities online allows members to share ideas and information with greater ease than ever before (see Image 1 showing location of members of the Online Community of Practice for Forest and Landscape Restoration).



Image 1: Location of members of the Online Community of Practice for Forest and Landscape Restoration (May 2018, 790 members). Source: Screenshot from the Dgroups platform

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While the knowledge-sharing forum was aimed at developing participants' knowledge and their capacity to understand monitoring in FLR, the online community of practice on FLR continues to communicate and exchange information long after the forum is over.

The following is a summary of the content of the webinar and of the email exchanges that followed it, highlighting a few of the main learning points to emerge:

The knowledge-sharing forum focused on three main questions:

- 1) What innovative technologies exist for monitoring?
- 2) How can innovative tools be used for monitoring FLR?
- 3) How can we ensure that people participate and use these tools in their monitoring activities?

There were 422 people enrolled in the knowledge-sharing forum, with 45 percent of them working in Africa. The participants came from more than 100 countries, and more than half were involved in FLR activities before the forum. Approximately 40 percent of participants were women and 60 percent men. The participants indicated that they were particularly interested in learning about available methods and tools for monitoring FLR in a cost-effective manner. Many of them were already familiar with tools such as GIS or remote sensing applications such as Collect Earth.

Catalina Santamaria (from the Convention on Biological

Diversity Secretariat, and who is also Vice-Chair of the GPFLR) opened the webinar with a statement about the ambitious restoration targets set by countries. It is critical that advances be monitored, she said, to support the restoration efforts and to communicate the achievements related to such national and international commitments.

Bernadette Arakwiye (WRI) made a presentation about Collect Earth and explained how it is used for monitoring restoration in Rwanda. Collect Earth collects data and makes analyses of high-resolution satellite imagery. FAO and partners developed Collect Earth using the Open Foris initiative. It includes several free and open source tools such as the application Collect Mobile. Stakeholders participate in 'Mapathons' to map land use and land use change and to interpret the data. Though Collect Earth facilitates the process, it requires that people be trained in monitoring so the data can be used efficiently. Data must also be validated in the field.

Collect Earth has proven particularly successful in landscapes with sparse tree cover. Arakwiye reported that, based on WRI's experience, Collect Earth and the Open Foris suite are user-friendly, cost-effective and sustainable. She recommended using Collect Earth in collaboration with local stakeholders who have good knowledge of the local context and environment, and she recommended developing their capacity.



Photo: Students from the University of Kisangani, Democratic Republic of the Congo, measuring and taking note of the diameter and length of harvested rattan in the Yoko Forest.

Alan Grainger (University of Leeds) introduced Citizen Observatories, which is a form of participatory environmental monitoring with great potential for monitoring restoration. Citizen volunteers collect data using smartphones, which empowers them as environmental monitors. Data collected are transmitted to sensors, stored in databases and disseminated through website portals. Cobweb, WeSenseIt, Landsense and Ground Truth 2.0. are all good examples of Citizen Observatories, which are useful for monitoring challenging features of landscapes and for complementing other forms of remote and ground-based monitoring. Grainger clarified that the resolution of Citizen Observatories is suited to small-scale projects, but can easily be linked to regional and national scales. The Citizen Observatories require many highly motivated

citizens and ongoing capacity development efforts to improve data accuracy. Grainger concluded that accessible and user-friendly web interfaces are important, as is disseminating the results.

Rakan A. Zahawi (University of Hawaii) discussed the use of lightweight Unmanned Aerial Vehicles (UAVs) or drones for monitoring restoration in tropical forest ecosystems as it related to results from a collaborative research project in Costa Rica. In the project, drones were pre-programmed to follow a specific flight path. A digital camera attached to the drone would take pictures of the ground. The image was then processed using a particular type of software and analysed by trained users. Drones can capture data that would normally only be possible to obtain through field surveys. They can offer a relatively low-cost method of obtaining accurate field data. Other advantages include portability, the possibility for frequent monitoring, and ease of use in rough terrain and remote places.

The speakers at the webinar concluded that FLR is gaining momentum, and that participants feel more empowered than ever. Practitioners are moving from resource-extensive monitoring approaches and limited data to lighter, more agile technologies that can collect and harness vast amounts of data. These technological advances expand the scope and increase the possibilities for cost-effective

monitoring more often and at multiple scales.

The online community members agreed that people working on monitoring will need to use a combination of tools adapted to the specific context of different field settings. For example, drones could facilitate additional data combination, complementing other approaches. Participants used their feedback forms to report that the webinar and the overall forum helped them to better understand how the presented tools and methods work in monitoring landscape restoration, and to recognize both the possibilities of these tools and their limitations. They also encouraged their colleagues to document their own innovative monitoring approaches and to share the results.

All the recorded presentations at the webinar are available through the Forest and Landscape Restoration Mechanism (FLRM) website where the knowledge-sharing forum's results have been summarized. In email-based exchanges, participants called for a holistic approach to both restoration and monitoring. Expert participants listed the main challenges they encountered while monitoring FLR, suggested approaches for including project-level monitoring results in national systems, and listed key questions to ask and tools to use in monitoring.

FAO welcomes anyone who is interested to join the Online Community of Practice for Forest and Landscape Restoration (see the links below). The team involved in the work stream of communities of practice looks forward to collaborating with a variety of partners and stakeholder groups to find efficient methods for further developing FLR in Africa, Asia and Latin America.

For more information, please contact the FLRM team at FO-FLR-Mechanism@fao.org.

- Join the online Community of Practice for Forest and Landscape Restoration: <http://www.fao.org/in-action/forest-landscape-restoration-mechanism/communities/join>
- Watch webinar videos: www.fao.org/in-action/forest-landscape-restoration-mechanism/resources/videos/monitoring-webinars
- Related resources: www.fao.org/in-action/forest-landscape-restoration-mechanism/resources/detail/en/c/1110668/
- Article: Use of communities of practice in knowledge sharing and learning in developing countries: https://link.springer.com/chapter/10.1007%2F978-3-319-70199-8_5 (Nuutinen & Leal Filho, 2018)

Making forest concessions more transparent, accountable and pro-poor

First voluntary guidelines for forest concessions in the tropics launched

The Food and Agriculture Organization (FAO) launched 10 May 2018 the first voluntary guidelines for forest concessions in the tropics to make concessions more transparent, accountable and inclusive - all for the benefit of some of the poorest and most isolated communities in the world. Over 70 percent of forests in the tropics used for harvesting timber and other forest products are state-owned or public; most of the public forests are managed through concessions that governments give to private entities or local communities. Forest concessions have existed in many of the world's poorest nations for decades, but their contributions have not always been positive. While they have generated more jobs and better income for people in remote areas, in many cases, they have also left behind a trail of degraded forests and tenure conflicts, says the new Making forest concessions in the tropics work to achieve the

2030 Agenda: Voluntary Guidelines. (<http://www.fao.org/3/i9487EN/i9487en.pdf>)

Making forest concessions in the tropics work to achieve the 2030 Agenda: Voluntary Guidelines



Read more: <http://www.fao.org/news/story/en/item/1128150/icode/>

Other forestry news from Africa

Kenya - <https://www.businessdailyafrica.com/analysis/ideas/Forest-debate-needs-proactive-solutions/4259414-4330912-nsytn0/index.html>

West Africa - https://www.expatica.com/fr/news/country-news/France-Cameroon-Congo-CAR-Gabon-company-forestry-bankruptcy_1740191.html

Zambia - <http://allafrica.com/stories/201803060569.html>

FAO commits to supporting forest conservation projects in West Africa: <http://www.fao.org/africa/news/detail-news/en/c/1118320/>

Forest elephant Gabon:

An account with some nice photos of attempts to photograph the elusive forest elephant in Gabon and to record the work of the local park rangers who are being supported temporarily by British soldiers.

Announcement

Access to Global Online Research in Agriculture (AGORA) programme

Since 2003, the Food and Agriculture Organization of the United Nations coordinates the Access to Global Online Research in Agriculture (AGORA) programme, which provides free or low-cost access to books and major scientific journals in agriculture, forestry, fisheries, climate, food security and related biological and environmental sciences to public institutions in low and middle-income countries.

Up-to-date research is of great need to find evidence, share findings and inform about teaching, practice and public policy. By providing access to current journals and books from the world's leading academic publishers, AGORA aims at improving the quality and effectiveness of agricultural research, education and training in low and middle-income countries and, in turn, improve food security.

AGORA is part of Research4Life, which is a public-private partnership between World Health Organization (WHO), Food and Agriculture Organization of the United Nations (FAO), United Nations Environment Programme (UNEP), World Intellectual Property Organization (WIPO), International Labour Organization (ILO), Cornell and Yale Universities, technology partners, the International Association

of Scientific, Technical and Medical Publishers and more than 190 science publishers.

National institutions in eligible countries may register for AGORA and Research4Life. Eligible non-profit institutions include universities, colleges, research institutes, government offices, extension centers, local NGOs, teaching hospitals and national libraries; and access may be free or at low cost.

Through AGORA and Research4Life, researchers, policy-makers, tutors, students and extension specialists have access to important, high quality and current scientific online information in the areas of agriculture, forestry, fisheries, climate and food security (AGORA), health (HINARI), environment (OARE), law (GOALI) and innovation and technology (ARDI). Nature & Faune was added to AGORA, in 2016, and the journal is appreciated for the content on wildlife, protected area management and the sustainable use and conservation of natural resources in Africa

For more information: <http://www.fao.org/agora/> and <http://www.research4life.org/>

Contact: AGORA@fao.org

Landscape restoration in Africa: prospects and opportunities

A Global Landscapes Forum (GLF) event to strengthen technical, economic, financial, institutional and human capacities for landscape restoration implementation

WHEN: August 29 - 30, 2018

WHERE: United Nations Office, Nairobi, Kenya

SOCIAL: #thinklandscape #glfnairobi2018

Read more: <http://events.globallandscapesforum.org/nairobi-2018/>

Africa's unsung scientists finally get their own journal to spread research

A new journal to showcase Africa's often-overlooked scientific research has been launched to give the continent's scientists better global recognition.

"Scientific African" will be the first "mega-journal" in Africa. It was unveiled in Kigali early April 2018 at Africa's biggest science conference, the Next Einstein Forum (NEF) conference, and the first issue is scheduled to be published at the end of the summer 2018.

Its editor, Dr Benjamin Gyampoh, said the journal would address the problem of African scientists going unrecognised for pioneering

work because they lacked access to quality publications.

"There are many reputable journals but there is a low number of Africans publishing in them partly because the costs are so high," Gyampoh said. "We are reducing these costs while providing a platform for world-class research, across different disciplines and on par with any published around the world." The publication will highlight pioneering work of scientists searching for cures to diseases like HIV and malaria and solutions to climate change

Read more: <https://www.theguardian.com/global-development/2018/apr/10/africas-unsung-scientists-finally-get-their-own-journal-to-spread-research>

Source: *The Guardian* (International edition) - 10 Apr 2018

Analysing European public and private actions to tackle imported deforestation

CDP's new policy brief explores how the consumption of commodities in Europe is driving deforestation abroad and gives recommendations for a join approach between producing and consuming countries to tackle deforestation. Key points:

- It is estimated that a little under 25% (by value) of all agricultural commodities from illegal deforestation in international trade are destined for import to the European Union.
- While there are regulations and commitments in

Europe to halt deforestation related to some specific commodities such as timber and palm oil, scant progress has been made in tackling the embodied deforestation of soy and cattle.

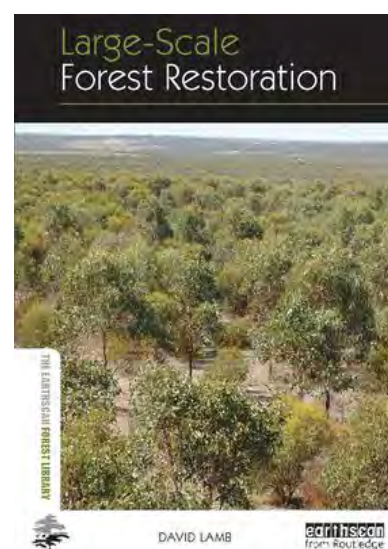
- Among disclosers to CDP, almost 75% companies with links to soy production have identified sufficient sources of sustainable soy. But only around half of companies asked by major shareholders or purchasers responded to CDP's questionnaire - suggesting that policies to improve disclosure and long-term risk assessment could have significant impacts on addressing deforestation.
- The briefing recommends that European countries work together with producing governments to create sustainability criteria for commodity imports, adapt existing regulation like the EU Timber regulation for other commodities such as soy and cattle, and use EU and national public procurement to enforce better standards and align governmental supply chains with the Paris Agreement and UN SDGs.

Explore the research and read the full briefing at: http://b8f65cb373b1b7b15feb-c70d8ead6ced550b4d987d7c03fcdd1d.r81.cf3.rackcdn.com/cms/reports/documents/000/003/270/original/Europe_Forests_Policy_Brief_2018_Final.pdf?1522742737

Share this brief with others that may be interested in this topic, and through social media channels with the hashtag #CDPForests.

Source: Laura Jungman. Forests Policy Manager, CDP +44 (0)20 3818 3907 | +44 (0)79 3665 5418 | Twitter: laurajungman | Skype laurajungman www.cdp.net

Featured Authors



Large-scale Forest Restoration

New in Paperback: Large-scale Forest Restoration by David Lamb © 2014 – Routledge 302 pages | 61 B/W Illus.

For details see: <https://www.routledge.com/Large-scale-Forest-Restoration/Lamb/p/book/9780415663205>

Source: Tim Hardwick Senior Commissioning Editor Earthscan from Routledge

Routledge/Taylor & Francis Group 2 Park Square Milton Park Abingdon

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Theme and deadline for next issue

Africa's inland aquatic ecosystems: how they can increase food security and nutrition

Sustainable food security, nutrition and livelihoods are high on the agenda of every individual, family, national, regional and international organization. With the human population rising to nine billion by 2050, sustainable livelihood supporting systems are a prime focus for the global community with both governmental and non-governmental organizations getting increasingly engaged in addressing the issues. The Sustainable Development Goals¹ (SDGs) aim inter alia at ending poverty and protecting the planet, including life under water (SDG 14). However, under the Blue Economy and the Blue Growth Initiatives attention prioritises the seas and oceans; it seems our freshwater lakes, rivers, reservoirs, wetlands and other freshwater bodies may have been largely left out. This apparent SDGs oversight is particularly lamentable because in only a few decades the current overfishing in the open seas will almost certainly have overwhelmed their recovery potential. Attention will then invariably have to turn to inland freshwaters to fill the gap.

Africa would therefore be well-served by bucking the global trend through immediately increasing its focus on sustainable management plus artificial enrichment of these inland aquatic resources, so that they can become more central to achieving food security, nutrition and livelihoods. The next edition (i.e. December 2018 edition) of *Nature & Faune* journal will focus on this particular aspect; it will adopt the term "inland aquatic ecosystems" to embrace wetlands (from upland wetlands acting as sponge areas for rivers to lowland ones providing various goods), rivers, lakes and reservoirs, all of them with huge biodiversity resources. It will offer space for discussion, debate and sharing of experiences on how best to succeed under the theme: **"Africa's inland aquatic ecosystems: How they can boost food security and nutrition."**

This special issue will offer a dedicated platform to concerned members of broad society as well as institutional

and individual specialists (such as hydrologists, natural and social scientists, fisheries professionals, biodiversity experts and limnologists) to share their thoughts. The special issue will cover the value/contributions of diverse aquatic systems to food security, nutrition and livelihoods. Authors are invited to submit original contributions of four to five typed pages, i.e. two to three printed pages; their sharing of experiences will enrich knowledge on the sector all over the African continent.

We encourage authors to write on the potential and reality of freshwater ecosystems' contribution to food security, nutrition, livelihoods taking account of gender and youth dimensions. Lay persons will no doubt wish to highlight their main concerns and what they see as prime opportunities to manage these resources, including how communities view aquatic systems and utilize their products. Specialist authors can complement this

by drawing upon freshwater science and socio-economic expertise to give in-depth considerations of sustainable management and resource enrichment for fisheries, aquaculture, ecosystem services, biodiversity (including mangroves and invasive species). We need their thoughts on threats to freshwater systems, such as wetland degradation, pollution, importance of seasonal floods and the impacts of large dams, and climate change etc. They can usefully also address cross-cutting issues such as the roles of water bodies in agriculture and in livestock, resilience.

Please send your manuscript(s) by email to the following addresses:

nature-faune@fao.org and
Ada.NdesoAtanga@fao.org

Deadline for submitting manuscripts for the next issue is 1 October 2018.

¹ The Sustainable Development Goals (SDGs), otherwise known as the Global Goals, are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.

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Nature & Faune journal is an indexed 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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