Urban and peri-urban forestry as a valuable strategy towards African urban sustainable development

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Sustainable Natural Resources Management in Africa's Urban Food and Nutrition Equation

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Cover exterior:
Ouagadougou, Burkina Faso's capital city, West Africa. Photo credit: Anouk Zijlma.

Wives of fishermen in Dakar, Senegal act as "brokers" helping them sell to local vendors. Photo credit: Errol Barnett

Vegetables are abundant in Senegal. Photo credit: Errol Barnett

Herding cattle in Burkina Faso. Photo credit: Rita Willaert.

A woman working in her farm. Photo credit: Karl Burkart

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Forests along the banks of Niger river. Photo credit: anonymous

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Enhancing natural resources management for food security in Africa

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Sustainable Natural Resources Management in Africa's Urban Food and Nutrition Equation

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Message to Readers

Bukar Tijani[1]

The world population is inexorably moving from its 7 billion mark in 2011 and will exceed 9 billion by 2050. Where most people live will have changed dramatically by that time: while in 2010 only about half were living in cities, by 2050 this ratio will be over two-thirds, at almost 70%. Much of this increase will take place in the rapidly growing cities of developing countries, most notably in East Asia, South Asia and sub-Saharan Africa[2]. According to the UN Population Fund "the fastest urbanizing region is Africa with a current urban growth rate of 3.2 per cent per annum".[3] From its "least urbanised" current image, more than half of Africa's 1.2 billion people will be urban by 2050.

Keeping its tradition of exploring major emerging issues, *Nature & Faune* has chosen to dedicate this edition to looking at the implications of this rapid urbanization and its implications for urban food and nutrition security, focusing on the specific roles of sustainable management and utilization of natural resources in Africa's fast changing urban food and nutrition equation. Eighteen articles examine and address the challenges that continuing urbanization brings to food and nutrition security in Africa's urban centres in the context of sustainable natural resources management and utilization. The articles highlight the complementary role of natural resources in urban food and nutrition security with agricultural production remaining at the core. The editorial draws attention to the options of structuring agricultural production systems and promoting agricultural enterprises as being relevant in anticipating the changing issues of urban food security. It argues that it is difficult to achieve urban food security at individual country level, and thus endorses the view that urban food security is most likely achievable when regional approaches are strengthened. It suggests adopting joint agricultural and natural resources management policies within the African region as a way forward.

The special feature in this edition highlights the contribution of trees, shrubs and other woody plants to food and nutrition as acknowledged in the first ever "State of the World's Forest Genetic Resources" report published by FAO in June 2014. Also under the Special Feature, Martin Nganje points to the fact that forests contribute directly towards food security and improved nutrition on the African continent through their non-timber forest products. Moreover, he examines how forests contribute towards food self-sufficiency in ways other than through their edible parts. Michela Conigliaro , Simone Borelli and Fabio Salbitano in turn provide some examples of how the efforts towards the protection and restoration of forests and tree cover in and around African cities can make a substantive contribution to alleviating poverty and reducing malnutrition and in ensuring a more environmentally and socio-economically sustainable urban development. Under the feature "FAO Activities and Results" Alison Hodder, Yota Nicolarea and Wilfried Baudoin look at the activities of an FAO-assisted project in the Democratic Republic of the Congo focussing on the management of renewable natural resources and illustrating how their optimal uses can contribute not only to enhanced food security in the cities but also yield significant environmental benefits. Eunice Njoroge and her team highlight the contribution of forest plantation establishment and livelihood improvement scheme to enhancing food security in Kenya. Roger Leaky echoes the preceding convictions in an Opinion Piece in which he delves into the elements of multifunctional agriculture. He discusses a novel approach developed by researchers in Cameroon that is based on the integration and domestication of indigenous fruit and nut trees into agroforestry systems that rehabilitate degraded farm lands, promote food and nutritional security and create income generating opportunities for both rural and urban populations.

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[2] *http://communitascoalition.org/pdf/Zero_Draft_Linkages_Rural_Deve_Forster.pdf*

[3] *http://www.fao.org/fileadmin/templates/FCIT/PDF/FoodAgriCities_Oct2011.pdf See also: UNFPA, 2007. State of the world population. (http://www.unfpa.org/swp/2007/)*

This edition also discusses non-African experiences that have come to be "domesticated" in Africa. In this regard, Festus Akinnifesi and Najla Veloso show how Brazil's model of school feeding and family farming are inextricably linked to improved wellbeing of both school pupils and family farmers, especially in the urban areas. Openness to practices from elsewhere is also an important element in achieving Africa's goals to: eradicate hunger, food insecurity and malnutrition; eliminate poverty; and achieve sustainable management and utilization of natural resources.

In addition some authors in this edition discuss ways in which sustainable management of forests, water, fish resources and soil respond to the challenges and opportunities posed by Africa's urban food security and nutrition. The article by Ann Gordon and Cambria Finegold takes a look at fish consumption trends in Africa and notes decline in per caput consumption despite total increase, suggesting sluggish growth in access by consumers. Gordon and Finegold link all this – both challenges and opportunities - to the rapid urbanization and ask whether concentrated demand could be a driver of change. Francesco Maria Pierri and Craig Chibanda discuss the potential of family farming in feeding a growing urban population in African countries.

In a related perspective, Hugues N'Gosso presents the strategic role of non-wood forest products (NWFP) in food security and nutrition among urban populations in Central Africa, stressing the importance accorded to NWFPs in the Convergence Plan of the Central Africa Forestry Commission (COMIFAC) and to their potential contribution to achieving some of the Millennium Development Goals. Paulinus Ngeh and his colleagues bolster the argument by examining key elements of empowering local communities and indigenous people to become not only the primary stakeholders but also the primary caretakers and custodians of wildlife and ecosystems in the on-going attempts to regulate the demand for bushmeat in cities in Cameroon. Clayton Mashapa and coworkers present a good case for Zimbabwe, alluding to the attitudes of urban and peri-urban households towards some wild fruits entering urban markets from natural forests and their potential for value-addition.

Increased attention to conceptualizing food insecurity and measuring it in a timely manner is as crucial as preventing unsustainable resource use. The Voices of the Hungry (VoH) project piloted the Food Insecurity Experience Scale (FIES) through the Gallup World Poll ® survey in four African nations (Angola, Ethiopia, Malawi and Niger) in 2013 to measure the severity of food insecurity based on people's self-reported experiences. Using data collected from Angola as an example Elizabeth Graham, Meghan Miller and Sara Viviani show how the FIES makes it possible to analyse comparatively the food insecurity situation for different groups within a population, such as urban versus rural, or male versus female. This is a key feature that should help in assessing where food insecurity is more severe, and in devising evidence based solutions to eradicate food insecurity while protecting the environment.

But where is the place of information communication technology in all this equation? Sarah Bartlett shares how a mobile platform built in Ghana, is tackling the challenge of feeding Africa's increasing urban population by providing technology to help individuals and organizations increase production, efficiencies, and revenues.

Augustin Chi Muam draws attention in Cameroon to the pertinence of determining the legal status and ownership of urban forests in Cameroon, and thus their legitimacy. And Kam-Yogo joins in to point to the need for a legal framework for the seed sector in Cameroon to promote farm produce which maintains freshness a little longer instead of decaying very fast.

Finally, this edition casts the spotlight on Democratic Republic of Congo (DRC) as the country under focus. Follow Ruhiza Boroto as he gives his views on water resources management in urban and peri-urban horticulture in DRC. I invite you to visit the link page and go more deeply into some of the resources that inspired the articles on the menu. Happy reading!

Editorial

Sustainable natural resources management in Africa's urban food and nutrition equation

Fulgence Bayebila Muwala[1], Marcel Useni Kembolo[2] and Xavier Mwambimba Farhay[3]

A major challenge

Today, food and nutrition in urban areas have become a challenge for governments in general and for those in sub-Saharan Africa in particular. One of the key causes is a very high population growth in the cities due to a high birth rate on the one hand, and to influx of people from rural areas on the other hand (Pierre Vennetier, 1990). It is particularly problematic that African cities are urbanising poverty rather than becoming locations of concentrated purchasing power and productive economic activity which can, through their demand, stimulate agriculture in their hinterlands. Africa's inability to produce enough food partly explains large increase in food prices, which then becomes another culprit in Africa's urban food insecurity and malnutrition. The spikes in food prices on international markets reached 4% between January and April 2014 as compared to the year 2013, and the highest increases recorded are over 18% for wheat and more than 12% for maize (World Bank 2014; Food Price Watch Report, May 2014). These price hikes have contributed to famine which is a manifestation of extreme poverty. There is an urgent need to develop production systems that restore the livelihoods of the rapidly increasing urban populations, while preserving natural resources.

As we enter the twenty-first century, the growing imbalance in the relationship between human populations, natural resources, the environment and development has become one of the top concerns for the future of humanity. The world population is expected to reach 9 billion inhabitants by 2050, of which 70% will be city dwellers. Most cities with a high population growth are found in low-income countries in Asia and Africa where the population is young. Over the next 10 years, the population of sub-Saharan African cities is expected to increase by almost 45% and reach between 320 and 460 millions. Kinshasa, the capital city of Democratic Republic of the Congo - one of the poorest countries in the world - is currently one of the fastest growing megalopolis (FAO, 2014). This increase in urban population leads to a growing concern among international institutions regarding solutions to food insecurity and malnutrition in Africa's cities.

The absence of a structured and integrated agricultural policy in African countries is disturbing. African governments have always declared agriculture as a top priority. In 2003 they committed through the Comprehensive African Agriculture Development Programme (CAADP), to increase the percentage of their national budget's contribution to the agricultural sector to at least 10% by 2008 (Somma, A., 2008). However, by 2007 out of the 53 African countries, only seven - Burkina Faso, Cape Verde, Chad, Ethiopia, Malawi, Mali and Niger - reached that goal (NEPAD, A. 2008). Very often, these governments emulated the collective-peasant-farms experience of Kolkhozy and Sovkhozy of the former Soviet Union[4], but over time, these experiences were unfruitful. Efforts should rather be galvanized to facilitate the creation of small and medium sized farm enterprises as well as maintaining or creating agricultural access roads. In several African countries, the budget allocated to the agricultural sector is still lower than 10% of the national budget. Again, only eight African countries (Algeria, Angola, Benin, Cameroon, Malawi, Niger, Nigeria, and Togo) have satisfied the Millennium Development Goals (MDGs) number one target to halve the proportion of hungry people. Their progress was measured between 1990-1992 and

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[4] *Kolkhoz (plural kolkhozy) were a form of collective peasant farms in the Soviet Union. Kolkhoz existed along with state farms or sovkhozy.*

2010-2012, against benchmarks established by the international community at the UN General Assembly in 2000 (FAO, WFP and IFAD. 2012). These statistics portray an insecure food, nutrition and agricultural system in most African countries.

Options for urban food and nutrition security

- **Adopting joint agricultural and natural resources management policies**

A sustainable and diversified food production in sufficient quantity and quality is the first step towards food and nutrition security. And everyone should have access to an adequate quantity of healthy and culturally acceptable food (IFPRI, 2006). But the weak and import oriented economy of most African countries does not really facilitate the development of the needed infrastructure to improve food production systems. Most African countries have become net importers over the past twenty years, because of insufficient agricultural investments, especially in research and development, and extension services, and also due to the disappearance of relevant public institutions (e.g. marketing agencies) that supported the sector (UNCTAD, 2008). Moreover, the lacklustre political will in individual African countries confirms the viewpoint that food security is difficult to achieve at the level of a single country in the continent. Convinced about this point of view and in response, African countries created the Africa Solidarity Trust Fund (ASTF) in 2013. The ASTF is seen as a mechanism through which higher-income African countries can contribute to food security on the continent by helping other countries and regional organizations to eradicate hunger, malnutrition and rural poverty and to sustainably manage and use natural resources. The Trust Fund has been placed under FAO management. In this context, the Director General of FAO signed agreements to allocate primary funding of 2 million US dollars each, to six countries (Ethiopia, Malawi, Mali, Niger, Central African Republic and South Sudan) to implement action plans under the Trust Fund. This initiative can be seen as a practical contribution to implement measures African leaders agreed to in July 2013 under the theme: "Towards African Renaissance: Renewed Partnership for Unified Approach to End Hunger in Africa by 2025 within the CAADP Framework" (FAO, 2014) - participants to the January 2014 ministerial round table held in Addis Ababa were inspired by this initiative designed to eradicate hunger in Africa.

Indeed, it is necessary for African governments, especially those of sub-Saharan Africa, to develop new strategies and make considerable effort to intensify their agricultural programmes to feed their people in a context of climate change challenges and the looming food crisis anticipated by 2050 in Africa. To that effect, Africa's governments and the civil society and businesses need to adopt joint agricultural and natural resources management policies within the African Union beyond the current food security clusters of the REDD+ process, in order to help the countries that are lagging behind. If Africa as one whole entity is considered too big and diverse to seek a joint policy, it could be achieved through pulling together under the various agroecological zones in the continent. In addition, African governments and the various stakeholders and development partners need to establish in their different countries, agricultural production poles as well as adequate road networks around urban areas to ensure adequate supply of and access to food products.

- **Controlling urban population explosion**

Is the rapid growth of urban population simply a villain or a saint in Africa's urban food and nutrition equation? Urban populations in a sense could be seen as an opportunity for food security. Cities present challenges but also opportunities to concentrate demand and make it easier to service provided Africa creates and consolidates adequate urban food systems. Mega cities are significant sources for consumption and hence food demand. In addition, they can sustain food diversity, stimulate shorter value chains and urban agriculture, fuel new forms of procurement and possess the potential of optimizing resources allocation, infrastructure and residues recycling. A strong approach integrating all the aspects of the food system helps to strengthen cities-regions food systems. It also consolidates the rural-urban interface, reinforcing connections between rural providers (producers) and urban consumers (Marielle Dubbeling, 2013). But all this would be easier to achieve if Africa were not urbanising poverty – large numbers of the urbanised poor offer only potential concentrated demand. For increased urban population to create an opportunity for food security urban dwellers must gain purchasing power.

The preceding notwithstanding, it is widely acknowledged that controlling the rapid population explosion prevailing in most urban areas in Africa is

important in the quest for achieving its food and nutrition security. This is more so given the poverty of most residents which deprives city administrations of the revenue-raising capacities they need to upgrade weak infrastructure in most urban areas in Africa, making it almost impossible for African cities to take advantage of the opportunities offered by mega cities mentioned above. The poor state of agricultural access roads, food processing and distribution network, nutrition and health agencies as well as running water, waste, transport and energy systems are all indicators of a degraded set-up. Governments could take corrective measures to improve birth control, to contain rural exodus and to raise incomes. Establishing sound agricultural programmes and generating rewarding employment in rural areas could trigger the opposite of rural exodus.

- **Sustainable management and use of natural resources**

Natural resources management alludes to the adequate and conscious use of biological or mineral resources needed to sustain human life and its economic activities. These resources are subdivided into: (i) renewable resources that can be considered inexhaustible only if their harvest rate is lower than the available net productivity - the regeneration rate of water, soil, forest, pasture, biodiversity, maritime fisheries being higher than the rate of its depletion; and (ii) non-renewable resources: mineral raw material and fossil fuels produced by deposits formed during the geological history of the Earth and corresponding to a stock that is essentially finite and *exhaustible*. Over the past few decades, biological resources, renowned for their renewability, are being so intensely extracted and used that they do not have time to regenerate adequately. The pressure exerted by man on these resources has reached frightening levels such that not only productivity (the "interest") but also the above-ground biomass needed to maintain the resource (the "capital") are rapidly consumed. The same holds true for water which is an intrinsically recyclable resource, or even soils which are naturally renewable due to their natural dynamic process. Not only is groundwater exposed to increased pollution but its current use is more akin to mining than to the use of a recyclable resource. In view of the population growth, water availability has become insufficient in 55 developing countries worldwide. Soil erosion due to poor cultural practices, deforestation and overgrazing could lead to the loss of 30% of the world's arable land if nothing is done to stop this trend (Francois Ramade, 2014).

Thanks to its geographical location, the African continent has several alternatives to face down the projected urban food security crisis through agriculture. This is especially so because Africa is home to the world's second largest forest reserve (Congo basin), rich in biodiversity and is endowed with vast savannahs suitable for developing intensive agriculture. It is believed that despite climate change which affects the region, its governments, under the leadership of the African Union, can collaborate and maintain special relations beyond their differences in order to promote cross-border, technological and commercial exchanges, and thus enable adequate supply, to urban areas, of agricultural products and non-wood forest products needed for food security and nutrition. From the perspective of nutrition, food diversity is the cornerstone to ensuring adequate nutrition and food security for urban and rural populations. Agricultural and food policy of African governments should be based essentially on two pillars; (i) agricultural production and access to food with all the aspects of processing, storage and distribution, and (ii) the harmonious and controlled management and use of natural resources as well as biological diversity.

Several food and nutrition development projects formulated in many African countries have proven their efficiency. These include the "*Urban and Periurban Horticulture*" project in the Democratic Republic of Congo (DRC) which enabled increase in vegetable production from 148,000 to 330,000 tons between 2005 and 2011 and supplied 10 cities in the country (FAO, 2010a). There was also the project on "*Mobilizing and strengthening the capacity of small and medium size enterprises involved in the non-wood forest products sector in Central Africa*" involving Cameroon and DRC . The experiences of West African countries in harmonized agricultural policy and forest resources management should also impress upon African governments the need to contain the ominous crisis in urban areas by establishing, facilitating and/or restoring small and medium size enterprises (SMEs) involved in the agricultural and renewable natural resources sector in order to revitalize agricultural production and biodiversity-related regeneration.

Recommendations for future action

Considering that food and nutrition in urban centres, especially in sub-Saharan Africa, are likely to become a real challenge over the coming decades, there is a need to:

- Integrate management of agricultural landscapes that promotes sustainable production intensification and able to care properly for the renewable natural resource base;
- Create production poles around cities, develop urban and periurban agriculture, maintain agricultural access roads and consolidate the rural-urban interface to ensure connections between rural suppliers (producers) and urban consumers;
- Facilitate the development of suitable urban food systems that take into account the heterogeneity of the demand;
- Stimulate urban development that integrates food supply, and create adequate legal frameworks for the growing, harvesting and processing of agricultural and non-wood forest products by small and medium sized enterprises to ensure the sectors' sustainable management and viability of the products;
- Create incentives for agricultural production by reducing or eliminating taxes on these products;
- Subsidize agricultural products and non-wood forest products harvesting and processing sectors;
- Create, facilitate and consolidate urban-rural and crossborder exchanges of these products among African countries;
- Create employment opportunities in rural areas to curb rural exodus and facilitate the return of new city dwellers back to rural areas.

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Special Feature

Contribution of trees to urban food supply: Lessons learned from the first-ever edition of "The State of the World's Forest Genetic Resources"

Albert Nikiema[1]

Summary

Forest and trees enhance landscapes, and enhance and protect ecosystems and production systems. Forest genetic resources, (FGR), can be defined as the heritable materials essential to ensure the continued productivity, services, adaptation and evolutionary processes of forests and trees. The contribution of trees, shrubs and other woody plants to food and nutrition was acknowledged in the first State of the World's Forest Genetic Resources published by FAO in June 2014. It reported that more than 1500 woody species provided food and other non-wood forest products used for local consumption or traded in rural and urban markets and/or through regional or international export. An important number of these food products, which included fruits, leafy vegetables, vegetable oil, nuts, have been recorded as part of the common diet of both rural and urban populations. It was noted that some of them e.g. baobab (Adansonia digitata) and moringa (Moringa oleifera) leaves, were highly nutritious. However these valuable resources are undervalued and there is a lack of adequate information and data to support development programmes and policies related to them.

*The first **State of the World's Forest Genetic Resources** report, which deals with the conservation and sustainable use of forest genetic resources, was presented to the FAO Conference in June 2013 prior to finalisation and publication a year late. The report, presents baseline information for monitoring the progress in managing available forest genetic resources at national and global levels. The implementation of the Global Plan of Action will help fill the gap in information on FGR while raising awareness on their importance and it will further contribute to improving their conservation and management for the benefit of the present and future generations.*

Besides enabling improved wood production, adequate use and management of forest genetic resources can enhance the production of fruits, nuts, vegetables and other food products from trees and shrubs managed in forest or in agricultural lands. These products contribute to the food intake of people in rural as well as in urban areas. Along with the increasing urban populations over time, there is a growing demand of food products from trees and shrubs. Efforts in breeding and domestication needs to be adequately supported, in order to improve the quality and quantity of production and to better ensure sustainable management of the resources. Conservation and sustainable management of forest genetic resources is a prerequisite for enhancing the production of food derived from forest plants, including woody species.

Introduction

Forests and trees enhance and protect landscapes, ecosystems and production systems. They provide goods and services which are essential for the survival and well-being of all humanity. Forest genetic resources, the heritable materials contained within and among trees and other woody plant

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species that are of actual or potential economic, environmental, scientific or societal value, are essential to ensure the continued productivity, services, adaptation and evolutionary processes of forests and trees.

The first ever State of World's Forest Genetic Resources was published by FAO in June 2014. The document will serve as an information and knowledge base for action at national, regional and international levels in support of conservation, sustainable use and the development of forest genetic resources (FAO, 2014). It presents information drawn from 86 country reports of which 31 are from Africa. The country reports were prepared based on guidelines provided by FAO, using a participatory approach that allowed the involvement of all stakeholders at national level. The report includes information on products and services which forest and trees provide and highlights the importance of genetic resources for sustaining and improving their management and sustainable use. Apart from wood which was reported by most countries as the main forest product, food products such as fruits, vegetables, nuts and other non-wood forest products was considered essential to the livelihood of people living in rural as well as in the urban areas.

The Global Plan of Action, derived from the State of the World report, outlines action needed at country, regional and international levels to better conservation, sustainable use and development of FGR.

This short paper, presents some highlights on the contribution of trees and other woody plants to the provision of food, based on the data and information available in the State of the World's Forest Genetic Resources report (FAO, 2014a) and some other publications, and stresses the urgent need for the conservation and better management of forest genetic resources.

Contribution of trees and shrubs from forests and farmland to food security and nutrition

Beside the prominent perception of forest as providers of timber, fuel wood and wood for pulp and paper, Non Wood Forest Products (NWFP) including food is increasingly regarded as essential for the livelihood of people and national economies (FAO, 2014a)[1]. Dawson *et al*. (2014), for example, reported that approximately 90 billion $US worth of food and other NWFPs were harvested annually from forests and trees in developing countries. The FAO 2010 Global Forest Resources Assessment concluded that in most tropical regions the most important use of NWFPs was food (FAO, 2010a). According to Franzel et al (2008) who conducted a study in West Africa, food was identified by farmers as the most important use of priority tree species compared to timber and medicine. The country reports on the state of forest genetic resources, identified in total 1 528 tree species as being actively managed for NWFPs. Of these 621 were listed by countries of the African region. However this number is far from being accurate, as countries usually only reported species with high economic value at national level while often ignoring species which might be important locally.

The top twenty species reported for their use as NWFPs in the African region are presented in Figure1. The first four species indicated in the figure are mentioned by more than 20 African countries as being managed specifically for food.

[1] *Forest products others than wood are commonly designated as non-wood forest products (NWFP), and in this paper the term NWFP is used to designate plant based products with a focus on food from trees and other woody plants.*

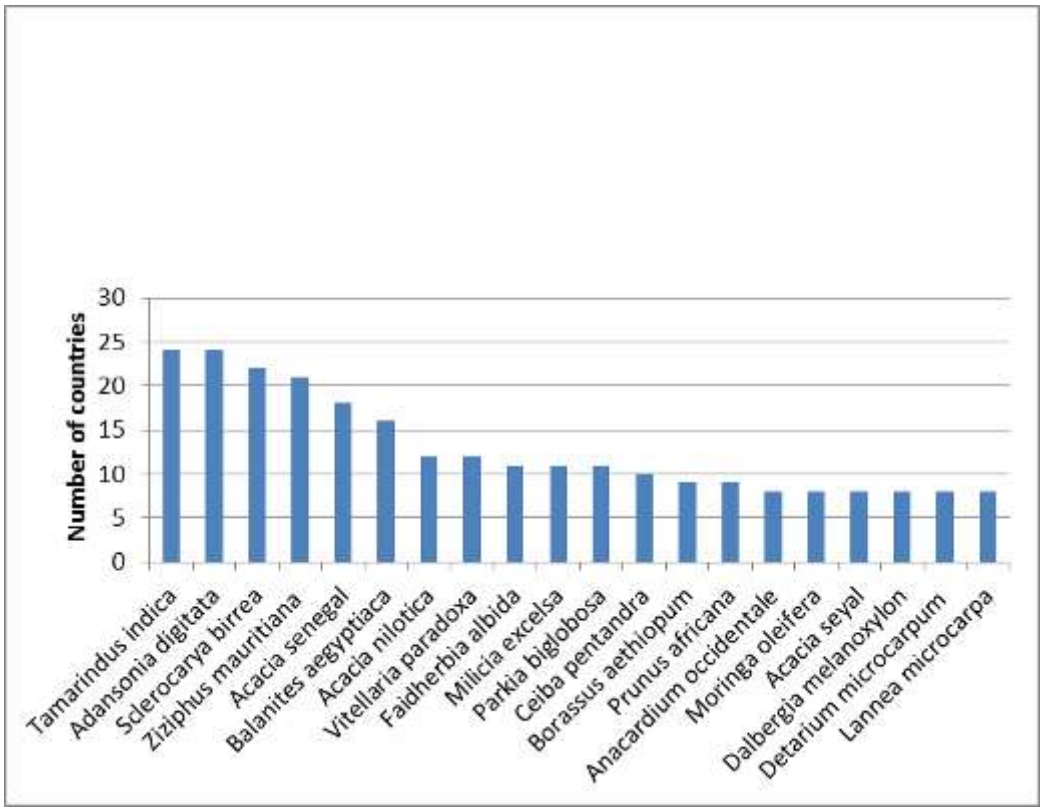

Figure1. The top 20 species reported by countries in the African region as providers of NWFPs. Of these 15 were reported as being specifically managed for food (NB. Anacardium occidentale and Moringa oleifera are originally from BRAZIL and INDIA respectively).

Food products harvested from the above trees and shrub species include wild fruits, vegetables (e.g. leaves, flowers), nuts, vegetable oil, spices, tubers and others. *Some of these plant products such as baobab (Adansonia digitata) and moringa (Moringa oleifera) leaves have been acknowledged as being highly nutritious (Powell et al. 2011;* Thurber and Fahey, 2009*).* With the exception of the exotic species, wild food plants used to be traditionally collected for domestic consumption in the rural areas in Africa for very long times?. This reality is changing along with the current high population growth and the rapid urbanisation that is taking place in most African countries which has meant that there is nowadays a growing demand for food items from wild plants also in most African cities.

Food products from wild trees and shrubs are extensively sold in the urban markets all over Africa and they contribute significantly to the daily diet of urban people. In Burkina Faso, for example, food products from 16 tree and shrub species have been recorded in 6 urban markets in Ouagadougou, with products from *Vitellaria paradoxa, Parkia biglobosa, Tamarindus indica* and *Adansonia digitata* being the most popular ones (Nikiema 2005). Similar information can be found from other west and central African countries which share the same traditional food habits as Burkina Faso, *e.g.* Niger, Mali, Chad, Nigeria, Senegal. Data from these countries are reflected in Figure 1, which lists the top twenty species of the African region for the provision of non-wood forest products. Out of the twenty species shown in Figure 1, fifteen provide food items which are important for both rural and urban populations.

In Central Africa, *Irvingia spp., Ricinodendron heudelotii, Dacryodes edulis and Gnetum africanum* have been reported as important species. NWFPs provided by these species are

sold in urban markets or exported, and most of them are contributing to the daily diet of urban populations in the region (Tabuna, 2007; Manirakiza, 2007).

Urgent need to conserve and better manage genetic resources

All food resources mentioned above are still harvested from wild or semi domesticated plants and very little has been done to understand their genetic diversity and conservation status, which are important for their sustainable management and conservation.

The combined effect of human activities such as, inadequate land use, overexploitation of the forest and tree products and lack of regeneration has in many cases led to serious threats to specific species and individual plant populations (FAO, 2014a). The growing demand for food products from forests and trees still relies largely on harvesting from wild resources and this will rapidly lead to a bottleneck on the supply side if appropriate management measures for improving production are not undertaken. Of the estimated 80 000 to 100 000 trees species that exist in the world, information on only about 8 000 species was provided in the first State of the World's Forest Genetic Resources Report. Of these 2 360 species were reported as being actively managed, 3 997 species were reported as being threatened at the species or genetic level, and some 2 300 species were reported as being conserved *in situ* and/or *ex situ* (FAO, 2014a). The relatively low overall number of species reported on by countries and the weak access to sound information, point the finger to the fact that there is still a long way to go in documenting important food trees, which is a basic provision for their conservation and sustainable management.

Furthermore, knowledge on intra-specific and inter-population genetic variation of food trees will be required to support improvement and domestication of economically important species, however, only a few species have been characterised so far at the genetic level. Examples of recently domesticated forest food species are Tamarind (*Tamarindus indica*). jujube, also called Sahel apple (*Ziziphus mauritiana*), moringa (Moringa oleifera) and safou (*Dacryodes edulis*), Selected cultivars of these species are now grown in many tropical countries for fruit and vegetable production, mainly to supply urban markets.

Conclusion

The first State of the World's Forest Genetic Resources report highlights the fact that many countries lack sufficient information on the status of the genetic resources of tree and shrub species to adequately support the development of programmes and policies on FGR conservation and management. Many countries confirmed the important contribution of forest trees and shrubs to food security and to the livelihood of people, including urban populations through the provision of fruits, nuts, vegetables and resins, generally harvested from wild forest plants.

The production of these valuable goods could be greatly improved in quantity and quality if improvement, domestication and conservation programmes were developed and implemented more widely. Such programmes must be based on sound data and information on FGR within the countries. A small number of fruit and food producing trees are presently propagated and planted, mostly in the vicinities of cities to benefit from urban markets (Nikiema et al 2008, Anegbeh et al 2005). As noted above these include tamarind, jujube (Sahel apple), moringa and safou,

The strategic priorities identified by The Global Plan of Action for the conservation sustainable use and development of FGR, which are based on the information in the State of the World's Forest Genetic Resources report, presents a framework for action at country, regional and international levels (FAO, 2014b). Its implementation will help fill the gap on information on FGR while raising awareness on

their importance and thus helping to improve their conservation and management for the benefit of present and future generations.

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Linking forests to food security in Africa: Lessons and how to capture forest contributions to semi-urban and urban food security

Martin Nganje[1]

Summary

It is widely acknowledged that forests contribute directly towards food security and improved nutrition on the African continent through their non-timber forest products. They also contribute towards food security in ways other than through their edible fruits, nuts, seeds, leaves, resins and gums. This paper examines how forests contribute towards food self-sufficiency in ways other than through their edible parts. It is presented in two parts; the first describes observed direct links between forests and food security in the semi-urban and urban setting by analyzing the evaluation reports of forest projects in the Inner Niger Delta of Mali. The second part reviews research, whose results reveal linkages between a particular forest management approach i.e. the Modified Taungya Scheme, with improved availability of subsistence food in the increasingly urban setting of the Vandeikya Local Government Area of the Benin State of Nigeria. Experiences, lessons learned and scientific facts are highlighted with a view to help in decision making especially related to investments in sustainable forest management when targeting food security and improved human nutrition.

Introduction

Improving agricultural production through the Green Revolution was a major driving force in several African countries in the sixties. Oil palm, rubber, cocoa, coffee and banana were grown in the heart of the Congolian and Guinean moist forests of Central and West Africa; Arabica coffee and tea thrived on the Ethiopian highlands and in the East African Rift Valley, and cotton was grown in the rangelands of the Sahel. Local biodiversity was in peril as agro-industrial plantations replaced forests, wetlands and rangelands. In several countries, governments took the lead in these activities through state-owned enterprises, such as: "Zambia Coffee"; "the Uganda Tea Authority"; "HEVECAM" (Rubber) in Cameroon; "PALM-CI" (Oil Palm) in Côte d'Ivoire and others. The liquidation and or privatization of these enterprises following extensive public sector reforms in the 1980s and 1990s coincided with the Rio Earth Summit of 1992 and the establishment of a number of related environmental Conventions. The most relevant for this paper is the Convention on Biological Diversity which focused on the conservation and sustainable management, and use of biodiversity, and especially the Non-legally Binding Instruments on All Types of Forests, also agreed during the Rio Summit. Implementation of activities such as sustainable management of forests, guided by the referred instruments, placed major attention on poverty alleviation and food production. The following section assesses some evaluation reports of such activities or projects in terms of their contribution to food security in the semi-urban and urban settings.

Experience linking the presence of forests to food security in the semi-urban and urban setting, case of the Inner Niger Delta of Mali

Since the early 1990s natural resource management projects in the Inner Niger Delta of Mali have successively targeted forest rehabilitation and food security in rural, semi-urban and urban communities around the Delta. The link between forests and food security, narrated here is based on a number of project evaluation reports, including that of the "*Conservation of the Environment of the Inner Niger Delta of Mali*: 1985 - 1988 (IUCN – Mali, 1989)"; *"Support project for the management of humid areas in the Inner Niger Delta of Mali:* 1999 – 2001, (Gawler et al. 2002)"; "*Support project for the management of flood ecosystems in four zones of the Inner Niger Delta of Mali – PAGEIT*: 2004 – 2008 (Yafong et al. 2009)"; and the "*Rehabilitation of Degraded Ecosystems of the Inner Niger Delta of Mali – REDDIN*: 2009 – 2011 (Nienta et al. 2012)". The authors describe the Inner Niger Delta of Mali, as an area of 35,000 km² extending from the semi-urban town of Djenné along the Niger River through the town of Mopti to the ancient city of

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Tombouchtou. It is the largest continental wetland in West Africa and the second largest in Africa after the Okavango Delta of Botswana. It is characterised by seasonal floods corresponding with the height of the fishing season, and low tides corresponding with the height of the grazing, swamp rice and vegetable cultivation season. During low tide, the Delta produces the highly appreciated pasture species – *Echinochloa stagnina* of the grass family, locally called "Bourgou", and alluvial soil exploited in the cultivation of swamp rice and vegetable species, marketed in townships of the Delta. In these regards the Delta produces between 40,000 to 130,000 tons of fish annually, sustaining the livelihood of 80,000 fishermen and generating employment for another 300,000 people even as five million herds of cattle visit it annually for grazing.

Photo 1. "Alternative hydrological regimes" showing sheep grazing under the flood forests around Youwarou of the Inner Niger Delta of Mali during low tide. Photo credit: Martin NGANJE, 2007

About 500,000 rural, semi-urban and urban dwellers depend for their livelihood on the conditions offered by flood cycles of the Delta (Beintema et al. 2001). Acknowledging the role of forests in the food security of the people of the Delta is a relatively recent revelation!

In the 1950s the Delta had more than 20 viable forest blocks predominantly composed of *Acacia kirkii* trees. These constituted the roosting and nesting site for millions of more than 350 species of birds including water-fowls and waders, of which 118 were migratory species of paleo-arctic and afro-tropical origin (IUCN – Mali, 1989). As urbanization around the Delta increased, and exacerbated by climate change and variability (such as the drought of 1982/83), people began cutting the trees to make space for more *bourgou* pasture and swamp rice cultivation, while curling tree branches and foliage for the provision of domestic energy and cattle fodder. After the drought, only 8 out of the 20 forest blocks remained, dwindling to 2 viable blocks in the late 1980s (IUCN – Mali, 1989). Ecological assessments conducted between 1984 and 1988 revealed that the number and variety of migratory bird species visiting the Delta had dwindled over the years in direct proportion to the reduction of their roosting and nesting sites provided by the *Acacia kirkii* trees. It was also observed that fish yields were now persistently low during the flood season while *bourgou* pasture at low tide was consistently of questionable quality even as vegetable and swamp rice yields were less significant compared to the past (IUCN – Mali, 1989). "Aha" – the link was found!

The missing element was the several tons of bird droppings, rich in nitrates and phosphorus, constituting feed for fish and enriching the Delta floor with "natural" fertilizer that enhanced vegetable and rice yields, and pasture for livestock during low tide (IUCN – Mali, 1989; Beintema, J. A. et al. (eds.) 2007: p.31). The birds also fed on the insect pests of vegetables and cattle, thereby contributing to the improved health of these resources. Successive evaluation reports of Delta projects, and project reports, indicate that following the discovery of the forest and bird link, 577 hectares of forests were conserved and restored in the Delta in the 1990s, (IUCN – Mali 2002: p.2), a further 434 hectares were planted or regenerated by the PAGEIT project (Yafong et al., 2009: p.104) and another 20 new hectares to a total of 1,113 hectares were conserved by the REDDIN project (Nienta, et al., 2012: p.31). In terms of socioeconomic impacts, the evaluations (e.g. Yafong et al., 2009: p.41) variously reported that the restoration of forests has led to increased visits by migratory birds and other wildlife to the Delta. This has further led to: increased fish availability due to more fish feed from bird droppings; improved cattle yield including more milk for children due to more tree fodder and *bourgou* pasture; increased farm yields due to improved soil fertility from bird droppings; and improved nutrition due to the larger variety and quantity of vegetable crops cultivated especially by women.

Photo 2: "The bird shit story" showing flood forests of the Inner Niger Delta of Mali during high tide, with some cattle egret birds. Photo credit: the PAGEIT Project, 2005

Research revealing how a forest management technique can favor increased food production in the semi-urban and urban setting, case of the Vandeikya Local Government Area in Nigeria

As population increases on fixed land with limited water resources in the midst of threats of drought from climate change and variability, and as the use of agrochemicals is challenged by green economy approaches, the role of forests in meeting the food and nutrition needs particularly of urban communities in Africa will become more apparent. This role is known albeit with relatively limited scientific documentation and economic justification. This section presents results from research, revealing the direct contribution of forests to more food production in an increasingly urban environment. It is based on the findings of a rare Taungya research, by Adegeye et al. (2011) in the Vandeikya Local Government Area in Nigeria.

Taungya has been described as an organized intercropping system that combines woody tree species with food crops in the early years of plantation development, by communities usually on government land (Nair 1985; 1991; Acheampong et al. 2014). Community members lacking arable land enter a convention with government forestry officials to plant their annual crops (and trees for government) on fertile national land, to be vacated when the tree canopy starts shading light off the annual crop. The system was introduced in Africa from Burma (Myanmar) in the 1930's to 1960s, and abandoned in several African countries (such as Ghana in 1984) as it recruited powerful city dwellers who failed to respect their commitments even as government forestry services lacked capacity to adequately supervise the conventions (Acheampong et al. 2014). Recently however, the system has been reintroduced and is picking up steam, adopting a participatory approach, (the "Modified Taungya Scheme), that dispenses better benefit-sharing arrangements for beneficiaries.

In their research, Adegeye et al. (2011) compared the yields of farm crops in Taungya plots with those in non-Taungya plots, under fairly uniform edaphic and climatic conditions. The research captured average dried crop yields over a period of 5 years for Taungya (crops, and trees i.e. *Gmelina arborea*, Teak and Faidherbia species) and non-Taungya crops, as follows:

Table 1. Comparative Crop Yields for Modified Taungya and Non-Taungya Plots in Kg/ha

Crop	Taungya kg/ha	Non-Taungya kg/ka
Dried Yam Chips	1223,33	1075,00
Dried Cassava Chips	1698,33	1372,67
Un-milled Rice	1155,00	833,33
Dried Sweet Potatoe Chips	1471,67	923,33
Maize	1133,33	710,00
Unshelled G/nuts	1083,33	756,67
Soybeans	620	408,33

Source: Adapted from Adegeye et al. (2011)

The preceding analysis reveals that Taungya crop yields were consistently higher than those of the non-Taungya crops. Although it is not evident that all Taungya schemes will produce outstanding results; depending on the cultural techniques used, the fact that this tree-based system provides an opportunity for landless semi-urban and urban city dwellers to engage competitive food production, justifies the positive link between trees and subsistence farming.

Discussion and lessons

The preceding sections reveal that forests contribute directly towards food security in semi-urban and urban settings in ways other than through their edible fruits, nuts, seeds, leaves, resins and gums. The first section, on forests and birds reveals that trees and forests contribute towards food self-sufficiency in ways that may not be easily obvious. The simple function of roosting site for birds when underestimated and whole forests removed eventually set in motion, a spiral of poverty and hunger in neighboring communities and townships of the Inner Niger Delta of Mali. When the forests were restored and the birds came in, agriculture, fishery and livestock husbandry flourished again with reported positive impacts on food security and nutrition. The lesson is that great care should be taken before eliminating forests. It is partly for this reason that environmental conventions require impact assessments before undertaking investments in forest milieu. However, in our African context where impact assessments at the community level are not common, it may be unrealistic to advise farmers to leave entire forests on arable land. Notwithstanding, careful thought needs to be engaged to ensure that agricultural development takes both forest shade-loving and sun-loving crops into consideration. The second section of this paper i.e. the Taungya research, revealed the benefits of such crop and forest mixtures especially as the disappearance of forests when associated with dwindling water resources, threatens the survival of some agricultural species. Examples include the shade-loving cocoyam (*Xanthosoma sagittifolia*) among subsistence crops, and the shade-loving cocoa (*Theobroma cacao*) among cash crops. The impact of such threats can embrace the ultra-urban setting as demonstrated by the chocolate industry, largely dependent on the cocoa crop.

Conclusion and Proposals

This paper has revealed that forests can contribute towards food security in the semi-urban and urban settings of Africa through their simple presence. They can also contribute towards food self-sufficiency through well planned cultural arrangements with agricultural crops. This can produce win-win situations between environmental conservation and agricultural development. The examples narrated in the two sections of this paper can be replicated through the following proposals:

- More ways in which forests contribute towards food security and nutrition other than through their edible parts should be investigated, documented and disseminated in order to build a culture of environmental conservation while reaping other benefits in Africa's rural, semi-urban and urban societies. Examples include the placement of beehives in forests for honey production, the use of tree trunks as live-stakes for agricultural vines i.e. *Piper nigrum*, the organized grazing of livestock in the forest understory for beef production, and more. Forest contributions towards food security though generated for the most part in the rural and semi-urban settings, are sought and sold in the continent's urban centers, where they contribute towards food self-sufficiency.

- While it may appear overly demanding considering the context of our societies, to request individuals or farming groups in rural and semi-urban communities to undertake impact assessments in forest areas prior to agricultural investments, a feasible approach would be to encourage agricultural and forestry extension services to collaborate, and based on the context, advise on cultural arrangements that could be profitable for both agricultural crops and forests. Sustainable schemes will contribute towards constant food supply and consequent food security in urban areas, which constitute market outlets for the ensuing products.

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Photo credit: N. Palmer, the International Center for Tropical Agriculture (CIAT)

Opinion Piece

Sustainable natural resources management in Africa's urban food and nutrition equation: An African solution to the problems of African agriculture

Roger R.B. Leakey[1]

Summary

In response to requests by farmers in Cameroon, a novel approach has been developed by researchers in Cameroon that is based on the integration and domestication of indigenous fruit and nut trees into agroforestry systems that rehabilitate degraded farm land, promote food and nutritional security and create income generating opportunities for both rural and urban populations. The benefits have been impressive and so the need now is for up-scaling. This initiative now needs the support of African policy makers.

Introduction

Most people recognize that tropical trees produce important commodities like rubber, coffee, cocoa, tea, and of course quality hardwood timbers like mahogany. Many also recognize that trees protect hillsides and watersheds from erosion so ensuring that clean water supplies are maintained and that rivers don't flood towns and silt up dams. Increasing media attention to climate change has also alerted the general public to the importance of trees and forests as repositories of carbon. Likewise, the media has done a good job of explaining the role of trees and forests in the protection of wildlife. As a result, many people recognize the importance of conserving areas of forest and woodland.

Fewer people know that trees play an even more critical role in the ecology of our habitat. By providing perennial vegetation with a height of up to 60m they create a forest structure with a host of ecological niches above- and below-ground, characterized by a range of microclimates. These niches are colonized by other organisms such as bacteria, fungi, worms, termites, spiders and small herbaceous plants. The organisms filling these niches each have their own complex food chains and life cycles. Together they diversify the ecosystem. Through their lives and deaths they recycle nutrients and water and engage in the ecological balancing trick that maintains ecosystem health and resilience. These are the processes that lead to ecological functionality and sustainability.

In the past, as hunter-gatherers, we all depended on wild trees as an important source of nutritious foods, medicines and other everyday products. The advent of modern agriculture has changed this situation in two ways. Firstly, huge areas of forest have been cleared to make way for farming – either food crops or cash crops for export - grown as monocultures. This change of land use has resulted in the loss of the valuable natural resource of useful local tree species; and secondly, in parallel, the focus on fields of starch-rich staple food crops has led to the loss of traditional foods from the diet of many local people without the provision of many alternatives. This loss is serious for the millions of people in developing countries who still depend on these products. Although a few fruit trees, such as mangoes, pawpaw, citrus, bananas and avocados have been introduced from other parts of the world they do not really fill the gap left by the loss of local trees and associated species.

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The importance of the traditional local products is evident if you visit rural or urban markets in tropical countries. There you will typically find products from tree species that are unfamiliar to non-locals. These products are widely sold and traded in cities, towns and villages. This is especially the case where many people cannot afford to buy imported products from industrial countries. Low prices however are not the only reason that people buy these forest products. There is still a strong affinity for them because they are traditionally important foods and medicines which still have great cultural significance and, in effect, provide a life support system. The problem is that the wild resource of these products is dwindling.

Tree foods - the way forwards

These useful tree species, sometimes described as Famine Foods, are inadequately recognized by most people in industrialized countries. This seriously underestimates the real importance of many wild fruits and nuts which, in reality, are a mainstream source of nutrition in their production season and are widely traded locally, regionally and sometimes internationally. Twenty or thirty species come straight to mind, among them are: Safou (*Dacryodes edulis*), Galip nut (*Canarium indicum*), Bush mango (*Irvingia gabonensis*), Marula (*Sclerocarya birrea*), Bitter kola (*Garcinia kola*) and Eru (*Gnetum africanum*). In addition, a glance at any book about tropical trees quickly illustrates that almost every tree species has some important use, and often multiple purposes well beyond just 'famine food'. In addition to the utility of these trees for cooking fuel, building materials, wood and timber, a high proportion of these uses are medicinal and nutritional – in other words essential for everyday health.

In 1992 it was recognized by a conference held in Edinburgh that deforestation was leaving millions of rural and urban people in the tropics without important tree products. These people have to be self-sufficient as they do not have access to commercial products, social services, or even to employment. The Edinburgh meeting led to a worldwide initiative to domesticate some of the priority species as new cash crops for cultivation by poor smallholder farmers of the tropics. The World Agroforestry Centre (ICRAF) has led this initiative working directly with farmers in Cameroon (Figure 1). Today about fifty indigenous tree food species are being domesticated as new crops also to provide nutritious and tasty dietary additives to otherwise starch-based diets of maize, cassava, yams, plantains, etc. In addition, because their products are commonly sold and marketed both locally and regionally the cultivation of these species is generating income and empowering communities to become self-sufficient (Leakey, 2012). Furthermore, as is most impressively seen in Cameroon, local people are also starting to process some of the products, making it possible to sell them further afield, as well as 'out-of-season'. Value-adding in this way is starting to create employment and business opportunities at a small scale, which further adds to the income-generating opportunities for local people. Money earned can be used to educate children, pay medical costs, improve farm infrastructure like the provision of clean water, to buy livestock and fertilizers, and many other things to make life better (Asaah et al., 2011).

The tree domestication and agroforestry initiative described above is based on a request from local farmers for help to rebuild the resource of local trees producing useful products on their farms (Tchoundjeu et al., 2006; 2010). This innovative request for assistance to cultivate traditionally-important indigenous tree species producing fruits, nuts, leaves and medicinal products has actually provided a key which unlocks the "Rural Development Syndrome" (relief from hunger, malnutrition, poverty, social injustice, environmental degradation and loss of ecological services).

Sustainable intensification of agriculture

A list of 12 principles from this initiative was presented at a recent Food and Agriculture

Organization workshop on Food Security in Rome (Leakey 2014a). These lessons are based on the delivery of Multifunctional Agriculture to simultaneously rehabilitate degraded farmland and diversify poor smallholder farming systems using the indigenous tree species that the farmers in Cameroon requested, while simultaneously improving the livelihoods of local communities and enhancing food security from staple food crops by rebuilding the agroecological functions that restore soil fertility and health (Leakey 2013a). These principles point the way to an integrated rural development through the sustainable intensification of tropical agriculture, rural business development for economic growth, and the enhanced well-being for billions of marginalised people. The model developed is designed to make sure that the farmers are the almost instant beneficiaries of the research, while urban communities gain access to traditionally important foods, as well as to employment in small local industries adding value to the new farm products.

Impact

Interestingly, one consequence of the above is that some youths have decided to stay in the community rather than seek urban employment because they can see a future in their villages. Benefits address many of the constraints arising from the failure of modern agriculture - malnutrition, poverty and environmental degradation, including climate change. These are the same constraints that are responsible for the loss of productivity, the global food crisis and hunger experienced by nearly half of the world population.

Conclusions

Through initiatives like those described above the importance of reintroducing trees into the landscape is becoming an obvious way to diversify and enrich farming systems and to enhance the livelihoods of some of the most marginalized and vulnerable people. This climate-smart 'agroforestry' approach also has important environmental benefits as trees protect and enrich soils and watersheds; promote and conserve wildlife from the microbe to the top predator; sequester carbon to mitigate climate change and add resilience to our ecosystems - especially our agroecosystems

Figure 1. Farmers of the Rural Resource Centre of RIBA in Bui, Cameroon, expressing their enthusiasm for agroecological services from trees and agroforestry tree products (AFTPs) which have transformed their lives

(Leakey 2013a; 2014b). These are all impacts which the world needs in abundance if we are to protect our environment and overcome the scourge of poverty, malnutrition and hunger. Trees are crucial to all our lives and support for tree domestication is urgently needed to scale up these efforts to a meaningful scale.

In the initiative described, African farmers aided by African scientists have developed a model for rural development in Africa (Leakey, 2013b). Hopefully, African decision and policy makers will pick up on this initiative and promote it to improve the life of Africans in the future. If so, and if we put our minds to it and put our money where our mouths are, this could be the "kick-off" to a match were we start scoring many of the Post-2015 Development Goals through an explosion in an African approach to sustainably intensified family farming in Africa and beyond.

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Articles

Urban and peri-urban forestry as a valuable strategy towards African urban sustainable development

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Summary

Increasing urban populations necessarily imply an increasing demand for food and basic services, posing major infrastructural, social, environmental and economic challenges for local administrations. In most African cities, rapid urbanization has outpaced the capacity of urban settlements to provide dwellers with essential services and goods. The urbanization process has thus largely been translated into unsustainable production and consumption patterns, depletion of natural resources, decreasing access to adequate water, food, energy sources, job opportunities and sanitation facilities as well as increasing poverty and inequality. By providing ecosystem services, products and public benefits in and around urban settlements, urban and peri-urban forestry can help respond to needs and threats posed by an increasing urban population. Planting and managing urban and peri-urban trees and forests is a valuable strategy to increase energy, food and income provision for urban dwellers. However, making positive results sustainable requires the full integration of urban forestry into urban planning and development agendas, which should include long-term strategies, firm and continuous commitment from governments, and full involvement of the stakeholders. This paper provides some examples of how the efforts towards the protection and restoration of forests and tree cover in and around African cities can make a substantive contribution to reducing poverty and malnutrition and to ensuring a more environmentally and socio-economically sustainable urban development.

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Urban growth in Africa

Africa is predicted to show the fastest urban growth on the planet over the next decades: by 2050 urban population is expected to increase from 414 million (in 2011) to 1.26 billion, accounting for 58 per cent of the entire African population (UN-HABITAT, 2014). Migrants escaping from conflicts and seeking refuge in urban and peri-urban areas, and farmers abandoning their lands because of the negative effects of climate change will be the main actors of this demographic change. Some cities in the Sahel region are already experiencing higher rural-urban migration and populations movements are likely to intensify in the future (Biermann and Boas, 2010).

In this difficult context, numerous city regions in Africa have to also cope with the effects of climate change such as increasing floods, droughts, coastal erosion, water supply decrease and storms, which are severely affecting urban systems and their resource-providing regions (Potts, 2012a).

Population growth, degradation and lack of urban governance and planning are severely affecting the natural resources on which urban dwellers rely for their livelihoods (UN-HABITAT, 2014). Availability and access to food and bioenergy in urban and peri-urban areas have become one of the most crucial challenges of the 21st century (UNCSD, 2012).

The increasing demand for energy, food and housing combined with the lack of management plans have led to the unsustainable exploitation of urban forests and green space and to their conversion to built-up areas in the proximity of human settlements in Africa with a consequent deterioration in the quality and stability of lands and soils, increasing food insecurity and decreasing water quality (Fuwape and Onyekwelu, 2010; FAO, 2012a; Abd'razack and Muhamad Ludin, 2013; Akinyemi and Nzakamwita, 2014).

In the light of this, the aim of this paper is to highlight the potential role of urban and peri-urban forests in increasing the environmental and socio-economic sustainability of African urban development, as well as in supporting cities to address the increasing needs and challenges of an exponentially growing urban population.

Urban and peri-urban forestry: a valuable strategy towards a sustainable urban development

Urban and peri-urban forests are a valuable source of goods and ecosystem services in and around cities, and play an important role in socio-economic and environmental sustainability. In many African cities, people traditionally planted trees around their houses for the wide range of products and services they provide (Carter, 2002).

- Economic and livelihood values

Urban and peri-urban trees and forests are readily accessible sources of wood and non-wood products, such as woodfuel, food, fodder, timber, natural remedies. Woodfuel, both as fuelwood and charcoal, accounts for over 80 per cent of all domestic fuel in Africa and is projected to continue being the main source of domestic energy in the region over the next decades (FAO, 2012a). Although urban and peri-urban forests are unlikely to fulfill all citizens' needs, they play a key role in sustainable urban woodfuel systems and in protecting natural forests from overexploitation.

Localized urban food production reduces the costs of distribution systems needed if food is transported from rural areas. In West Africa, urban forestry practices such as the collection of wild edible plants, planting of fruit bearing street trees and establishment of multifunctional or medicinal public parks have contributed to an improvement in food security (Fuwape and Onyekwelu, 2010). There is evidence of positive relationship between tree cover and dietary diversity in Africa, with children living in in areas with more tree cover having more diverse and nutritious diets (Ickowitz *et al*., 2013).

By acting as windbreaks, protecting the soil, and storing water, forests help mitigate the effect of climate change in peri-urban agricultural areas. This contribution is particularly relevant in arid and semi-arid areas of West Africa, where windbreaks are established to protect houses and agricultural land (Fuwape and Onyekwelu, 2010).

Urban forests can boost a green economy model through the creation of new job opportunities (e.g. nurseries, gardening, food production, timber and bamboo industry). Products such as wood and bamboo can be used for sustainable buildings using renewable and recyclable materials, providing good insulation and good resistance to earthquakes.

- Environmental and biodiversity values

Trees in urban areas stabilize soils and absorb excess stormwater, mitigating the effects of severe weather events. In many states of Nigeria, trees planted in erosion prone areas enhanced water percolation and reduced runoff and soil erosion. Forest cover in steep slopes in Ghana, Ivory Coast, Benin, Togo and Nigeria has reportedly protected the landscape from gully erosion (Fuwape and Onyekwelu, 2010). The conservation and management of healthy tree systems around cities can contribute to the protection of watersheds and water reservoirs by combating erosion, limiting evapotranspiration and filtering pollution. Trees intercept particles and gaseous pollutants, and store carbon. Trees can increase the supply

and availability of nutrients in the soil (Buresh and Tian, 1997). In dryer zones – especially in the Sahel – urban trees and forest are valued for their contribution in fighting desertification and protecting cities against wind and sand storms (Sène, 1993). Finally, if properly planned and managed, urban forests can play an important role in the conservation of the natural areas surrounding the city, by reducing the impact of urbanization on natural landscapes and hosting biodiversity.

- Social and cultural values

Green spaces can increase social cohesion by providing places for people to meet, beautify central and suburban areas, thus reducing social, environmental and housing inequities between urban dwellers. A survey conducted in Lomé highlighted that its dwellers perceive the role and the importance of trees in urban and suburban areas for embellishment (61%) and aesthetics (33%) but also for improvement of living conditions (4%) (Polorigni *et al.*, 2014). Trees can reduce public health costs by cooling the environment, reducing pollution, and producing oxygen. In Sahelian countries, for example Burkina Faso, trees are planted around houses and public institutions to mitigate the heat (Fuwape and Onyekwelu, 2010).

Restoring and protecting the African urban and peri-urban forests

The efficient management and restoration of urban and peri-urban forests in and around urban areas is essential to ensure an economic, environmental and social development of African cities.

In Burkina Faso, the UN-Habitat's Cities and Climate Change Initiative (CCCI) established eight green corridors in Bobo-Dioulasso to connect the city with the surrounding peri-urban forests. The project aimed to reduce greenhouse gas emissions and local temperatures, as well as to improve the resilience of the inhabitants by increasing incomes and diversifying food supply. Green open spaces, peri-urban forests and traditional market gardens are now a permanent feature of Bobo-Dioulasso's expanding green mosaic (UN-HABITAT, 2014).

The Nouakchott Green Belt was originally established in 1975 to protect the urban environment and supply woodfuel. It is now being rehabilitated and extended through an FAO project to ensure stability and renovation of the existing green cover. The establishment and management of new urban and peri-urban forests is also planned (Berte *et al.*, 2010).

The dune fixation implemented along the Senegal Grand Coast and the peri-urban plantations established around the cities of Niamey and Tahoua in Niger for environmental protection and remediation (FAO, 2001) are interesting examples of climate change adaptation strategies implemented in the region.

Several cities in Africa are establishing and conserving forests to reduce water runoff, protect drinking water resources and process wastewater (FAO, 2001). In Kiambu County, Nairobi, the depletion of urban forest areas caused a severe reduction in the city's water supply leading the local government to plan the restoration of the three peri-urban forests protecting water catchments.

In Brazzaville (Louembé, 2010), FAO implemented a project aimed at developing a Priority Action Plan to prevent and control erosion. If properly implemented, this Plan will optimize the management of the urban system and improve inhabitants' living conditions. In 2008, FAO developed the Woodfuels Integrated Supply/Demand Overview Mapping (WISDOM) platform to map surplus and deficit areas in local supply/demand and to identify potential sustainable woodfuel supply zones (FAO, 2008). The methodology was applied by FAO to the city of Bangui and N'djamena, providing input for the development of strategies and action plans promoting urban and peri-urban forestry in these cities (FAO, 2009; 2011; 2012b; 2012c).

Discussion

Planting urban and peri-urban forests has proven to be a valuable strategy throughout the continent. However, when actions are not supported by an enabling socio-economic and policy context, positive results do not last long (FAO, 2012a). FAO itself funded a number of 'green-belt' projects in Africa, on the outskirts of Ouagadougou, Kinshasa, N'Djamena, Nouakchott and Maputo, among others. However, where traditional fuel use patterns, site conditions, local knowledge, preferences and uses were not considered, projects were unsuccessful (Carter, 2002).

Implementation of urban forests contribution to African urban development requires long-term strategy and planning, strong commitment and investments from governments, full involvement of dwellers and stakeholders, development of adequate land-use policies, research and information exchange, best urban forestry practices promotion and sharing, integration of forestry into urban planning and development.

While trees can provide multiple benefits, not all benefits can necessarily be realized at each site (Wolf, 2004). Inadequate understanding of the wide range of benefits, costs, and expected outcomes of urban forests and trees management options may drastically reduce their contribution toward improving urban environments and quality of life (Nowak *et al*., 2006). Management plans should be site specific, aimed at optimizing the benefits needed by that specific community (Nowak *et al*., 2006). In the light of this, urban forests can be adequately planned only if the members of the community are directly engaged in planning, designing, establishing and maintaining the forests.

Implementing efficient communication and awareness raising strategies is essential. The National Arbor Week is held in South Africa every September (since 1983) to raise public awareness on the value of trees in economic, social and environmental sustainability of cities. The event, organized jointly by local government institutions, non-government organizations and community-based organizations, receives major publicity and public participation throughout South Africa.

For urban forest oriented policies to be supported, communities and decision-makers must be made aware of the benefits and of the long term economic returns of urban forestry. It was determined that tree resources and green infrastructure can provide, throughout their lifetime, benefits worth two to three times the cost of establishment and care (Chen and Jim, 2008; Dumenu, 2012).

Appropriate policies defining rights and responsibilities with regard to the management of urban trees should be developed by governments. According to article 33 of the Cameroon Forestry Law (Law No. 94/01 of January 20, 1994 on the Regime of Forestry, Wildlife and Fisheries), for instance, urban communities in Cameroon must ensure 800 m^2 of green forest space each 1,000 inhabitants. This obligation aims to address the lack of forest areas around larger cities.

National strategies aimed to strengthen the overall contribution of urban forests to urban development also play an important role. Morocco, for instance, has put in place a national strategy to protect and sustainably manage urban forests, maximize their contribution to a socio-economic and environmental sustainable development of cities, raise public awareness on the vital role urban forests plays for their wellbeing (Haut Commissariat aux Eaux et Forêts et à la Lutte Contre la Désertification, 2010).

Conclusions

Trees are critical productive and protective elements in and around urban settlements, particularly in urbanizing developing regions of Africa, where their role is expected to even increase as a result of rapid urbanization.

In order to respond to the needs of a growing African urban population, it is important that decision-makers include sustainable management of urban and peri-urban forests in national development strategies and programmes.

The examples provided in this -article show that coherent efforts by governments and communities in the protection and restoration of forests and tree cover in and around African cities, coupled with good governance policies, can make a real contribution to reducing poverty and malnutrition and in ensuring a sustainable exploitation of tree resources.

Africa's population is still well below the 50 per cent urban threshold. Its urban population growth has been very rapid over the last decades, but its "take off" is yet to come and will occur over the next thirty years, when the urban population is projected to nearly triple and swell to 60% of the total population.

This implies that it is still possible to adjust current approaches to urban development. Given the rapidly changing global conditions, looming resources scarcity and the need to move towards greener and more sustainable development options, Africa has the opportunity to take the lead in innovations towards greener, healthier and more sustainable urban environments. In many of the region's urban areas, this would require regulatory changes, to promote urban sustainability with greater equity and resilience (UN-HABITAT, 2014).

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How trends in fisheries trade and production threaten the nutrition of Africa's urban poor

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Summary

With growing trade in fish products (the global export value of fish and fishery products expanded by 103.9% in real terms between 1986 and 2006 (FAO, 2009)) and developing countries the most important player in those exports, there is increasing concern about the possible effect of this trade on developing country consumption and nutrition (e.g., Delgado et al., 2003, Allison, 2011 and Béné, 2008). This is particularly the case in sub-Saharan Africa (SSA), where there is persistent poverty and food insecurity amongst urban populations, low per capita levels of apparent food fish consumption (7.6 kg per capita in 2007 versus the global average of 16.9 kg) but historically high dependence, in some countries, on fish as a source of animal protein[3]. Climate change projections, moreover, suggest that African nations may be amongst the most vulnerable to climate-induced changes in the fisheries sector (Allison et al., 2009). This paper examines fisheries consumption trends in Africa and implications for the urban poor.

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Tel.: +44 1491 832111 *The authors are grateful to Alan Pulis, who assisted with data analysis, and The WorldFish Center and the World Bank, for their support of the research on which this article is based. However, the views expressed are those of the authors and should not be taken to represent those of the WorldFish Center or the World Bank.*

[3] In many SSA countries it contributes more than 20% of animal protein supply; in The Gambia, Ghana, Equatorial Guinea and Sierra Leone, fish contributes at least 50% of total animal protein intake (FAO, 2009).

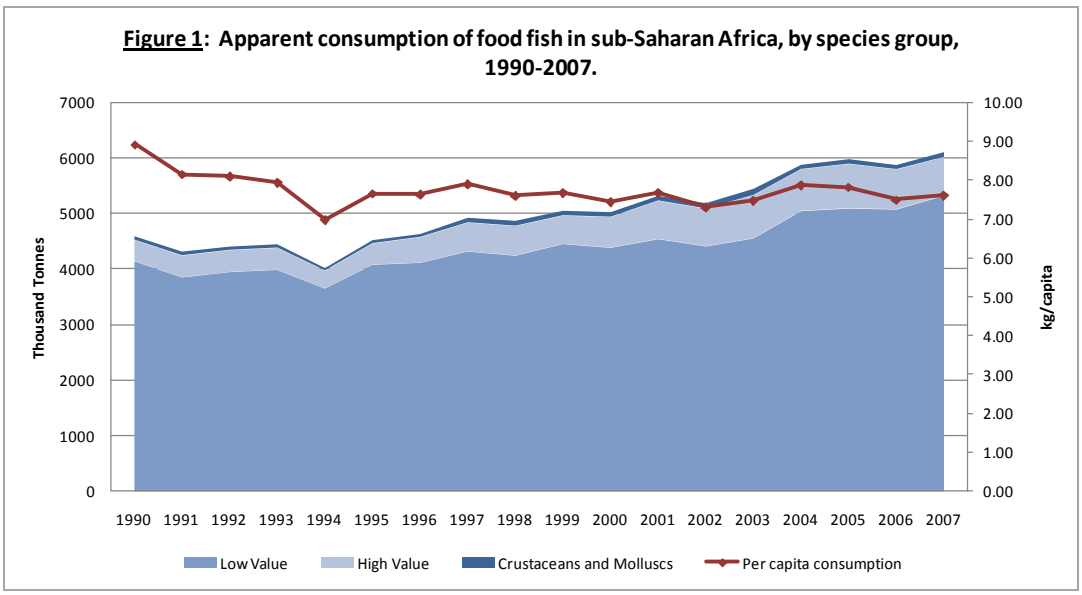
Fish consumption in sub-Saharan Africa

Between 1990 and 2007, aggregate consumption of food fish in Africa increased from roughly 4.5 to 6 million tonnes, but apparent per capita consumption declined by around 1% per annum, falling from 9 kg per capita to 7.6 kg[4]. At least 85% of fish consumption (by volume) is of so-called low value species (mainly small pelagics and freshwater small indigenous species (SIS)), from capture fisheries and imports. Intra-regional trade is important: 23-38% of import value (1998-2008) is sourced within the region and some studies suggest this may be significantly under-reported (see examples in Gordon *et al*., 2013). Aquaculture is growing but accounts for a very small share of consumption. See Figure 1.

The regional headline data conceal sharp differences between country groups. Eight countries and 44% of the SSA population account for 67% of "low-value" fish consumption. Just five countries (Nigeria, Ghana, Côte d'Ivoire, Cameroon and the Democratic Republic of Congo) account for 84% of the total SSA import value of low-value fish (2000-2007)[5]. Most SSA countries consume less than the global average and the lowest level consumers (countries where per capita fish consumption is less than 10 kg per annum i.e., 33 of the 47 countries) include many countries with both low and rapidly declining consumption (a drop of 3% per annum between 1990 and 2000 and only very modest subsequent "recovery" (of 0.3% per annum, 2000-2007)).

[4] Analysis is exacerbated by patchy and sometimes unreliable data. The work presented here builds on FAO data, supplemented by other studies where indicated. Consumption is an aggregate of production and imports, less exports and fish used for non-food purposes. Fish consumption data are usually reported on a live-weight equivalent basis (i.e., the filleted or dried product actually eaten weighs less than indicated by such data).

[5] Africa accounts for 24% of global imports of small pelagic food fish (by volume); Nigeria and Ghana are the world's largest and 3rd largest importers respectively.



The largest fish importing countries are all in West and Central Africa, with historically important marine fisheries and well-established patterns of fish consumption. In recent years, this region has also been the focus of significant Illegal Unregulated and Unrecorded (IUU) fishing activity – by foreign offshore fleets and by local vessels. Pressure on fish resources seems to have led to increasing volumes of relatively low value small pelagic fish imports, whilst also driving further investment in unsustainable fishing practices. (Ghana, for instance, has witnessed the increasing use of lights, small mesh sizes and longer trips, as well as the emergence of its own so-called China-China fleet). Whilst IUU fishing is receiving a lot of attention from international and national authorities, it remains expensive and challenging to address.

The role of fish in the nutrition of the urban poor in sub-Saharan Africa

Africa has traditionally been very dependent on plant source protein. Food legumes and cereals contribute an average of approximately 10% and 60% of dietary protein respectively, compared with developing world averages of 7% and 45%. This contribution has been relatively constant over the period 1994-1996 to 2006-2008, with modest declines observed in the importance of cereal sources. (Akibode and Maredia, 2011). The consumption of animal source protein (fish, eggs, meat including bush meat, and milk products) is secondary. The relative importance of different animal source foods varies with agro-ecological systems and in general urbanization tends to be associated with greater dietary diversity.

Nevertheless, fish is an important dietary component throughout much of Africa. Low value fish products are widely consumed by vulnerable groups in urban and rural areas of sub-Saharan Africa, albeit often in small quantities, providing readily bio-available protein and micronutrients, and constituting an excellent source of long-chain polyunsaturated fatty acids (PUFAs). Though staples dominate the diets of the poor, the consumption of fish, in addition to being a rich source of essential nutrients in its own right, increases the bioavailability of proteins and micronutrients from plant-source foods in the rest of the diet. Consumption of even relatively small quantities of fish can make major contributions to child survival, as well as physical and cognitive development, with the gestational period and first 24 months of life particularly critical. Low value fish products are particularly accessible to the poor as they are generally more affordable than other animal-source foods, can be

purchased and divided into very small quantities (often used in stews and sauces) and, due to the processing methods used (e.g., smoking, drying), are easy to store and transport without cold chain infrastructure.

Fish consumption patterns vary widely between different income groups, between urban and rural areas, between agro-ecological zones, and within households. Fish tends to be replaced by increasing consumption of meat, eggs, and more expensive fish products in higher income groups.

Africa is urbanizing faster than anywhere else in the world (3.2% per annum, with Nairobi, Niamey, Lomé and Dar es Salaam all growing at rates in excess of 4%, 2000-2005). Half of Africa's population (1.2 billion) will be urban by 2050 (UN Habitat, 2008). However, some of the lifestyle shifts usually associated with increasing urbanisation (e.g., access to reliable electricity and refrigeration, and enhanced dietary diversity) could be expected to be less evident in Africa amongst the region's significant numbers of urban poor. More than 50% of the urban population in the poorest countries lives below the poverty line and 60% of sub-Saharan African's urban population are slum-dwellers (ibid.); many countries in eastern and southern Africa, as well as Nigeria, have urban Gini[1] coefficients of more than 0.5 (and cities in Kenya, Namibia, South Africa and Botswana all have extremely high income inequality). Note too that many of Africa's largest cities are coastal (meaning that imports are not subject to significant onward shipping costs).

This pattern of urbanization with high levels of poverty has a number of consequences for fish consumption:

- It helps concentrate demand for low-value food fish – whether sourced locally or imported;
- it does not create significant opportunities for income generation and employment in the local fisheries sector via a large-scale shift higher value fish products (although where other conditions are suitable, it is driving more investment in aquaculture, e.g., in Nigeria and Ghana); and
- when combined with pressure on fish resources and hence upward pressure on prices, it is likely to lead to increasingly polarized patterns of consumption – where the urban poor and rural non-fishing populations (facing higher transportation costs) consume less fish.

Those polarized patterns of consumption are already evident in the country-level data (see above).

The outlook for fish consumption in Africa

Maintaining per capita fish consumption in SSA at 2007 levels would imply an increase in aggregate fish consumption of 65-90% by 2030. Clearly, given growing regional and global pressure and competing demands on fish resources, low income consumers are likely to lose out, with worrying consequences for the nutrition of the poorest groups. This is particularly critical because of the role played by even small quantities of fish in increasing the bioavailability of proteins and micronutrients from plant source foods. Rising real prices of staples (so important for Africa's urban poor) will further reduce fish consumption, as it is customary for poor households to reduce dietary diversity in response to food price stress.

Policy implications

The policy implications are broad-ranging, e.g., to make better use of existing fish resources (improved management regimes and enforcement, reduced post-harvest losses, equitable and effective management of fisheries access agreements and integrated approaches to food and nutrition security), promotion of aquaculture where conditions permit and

[1] The Gini coefficient (also known as the Gini index or Gini ratio) is a measure of statistical dispersion intended to represent the income distribution of a nation's residents. This is the most commonly used measure of inequality. The coefficient varies between 0, which reflects complete equality and 100 (or 1), which indicates complete inequality.

measures to facilitate trade. There is also a need to improve the information base for a better understanding of nutrition of the urban poor and the resources on which it depends.

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Family Farming: A sustainable solution to feeding a growing urban population in Africa

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Summary

This article discusses the potential that family farming has in feeding a growing urban population in African countries. With one in four people estimated to be undernourished in Africa (FAO, 2013b) and a rapidly increasing urban population, the continent faces the challenge of finding a sustainable solution to addressing hunger and malnutrition. Family farming, despite present low productivity levels, is responsible for 70% of Africa's food supply. There is potential to increase productivity of family farms and to develop effective farming models that can, on one hand, help feed the growing urban population whilst on the other hand improving the lives of the many family farmers in the rural areas and preserve natural resources. Creating a favourable policy environment for family farmers will enable them to strike a balance between increasing productivity and ensuring environmental sustainability.

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Introduction

The world has witnessed unprecedented urban population growth, and in 2008 the world's urban population became larger than its rural population (FAO, 2013a). Currently, about 52% of the world's population lives in the cities and this percentage is expected to grow to about 70% by 2050. Africa, which continues to have a predominately rural population, is expected to have more than half of its population living in urban areas by 2050 (Forster, 2013).

With around one in four people estimated to be undernourished in Africa, one of the major challenges that the continent faces is that of finding a sustainable solution to addressing hunger and malnutrition (FAO, 2013b).

Family farmers can play an important role in feeding a growing urban population whilst on the other hand improving the lives of many rural households, provided that an enabling policy and investment environment is put in place.

FAO defines Family Farming as follows: "Family Farming is a means of organizing agricultural, forestry, fisheries, pastoral and aquaculture production which is managed and operated by a family and predominantly reliant on family labour, including both women's and men's. The family and the farm are linked, co-evolve and combine economic, environmental, social and cultural functions." In Africa, most of the (over) 70% people living in rural areas practice family farming and 60 percent of the "farms" are smaller than one hectare (Lowder et al, 2014).

The United Nations declared 2014 as the International Year of Family Farming (IYFF) in order to achieve an enabling environment, raise the profile of family farming as a key component in eradicating hunger and poverty and consequently helping to achieve food security and improve livelihoods. The IYFF is a golden opportunity to leverage political commitments and the necessary public and private sector investments required to address hunger, rural poverty and the challenges associated with unsustainable pattern of urbanization.

Role of family farming in feeding Africa

The challenge of feeding Africa's growing urban population lies in striking a balance between increasing productivity and ensuring social and environmental sustainability. Africa's average agricultural production is the lowest in the world and countries in the continent are faced with higher world food prices than those experienced before the 2007 food crisis. Increasing agricultural productivity in Africa is crucial to meet domestic food requirements.

There are three characteristics that position family farmers as key to meet such challenge. Firstly, most rural poor in Africa are family farmers and they are already the main food suppliers, hence any successful food security policy focussing on enhancing their capacities will improve both their livelihoods and local food supply. Secondly, family farmers spend their incomes mostly within local and regional markets, therefore agricultural policies that increase productivity and improve access to markets, in tandem with social protection policies, will increase family farmers' incomes and spur rural development, by creating also non agricultural job opportunities, which will alleviate pressures on agriculture. This has to be paired with holistic rural development strategies, to help retain young people in agriculture and stem unsustainable migration into cities. Finally, family farmers, in contrast to large scale plantations and others mono-cropping schemes, frequently run diverse multi-cropping agricultural systems which contribute both to a balanced diet and the safeguarding of the Africa's agro-biodiversity.

Creating a favourable environment for family farmers to ensure food security

Despite widespread perceptions, to the contrary, family farmers can be productive (FAO, 2012) if they are supported through the creation of a favourable environment. The Africa Regional Dialogue on Family Farming held in November 2013 underlined that the low levels of productivity characteristic of many family farmers across the continent were mainly due to limited access to capital inputs and high levels of risk from environmental factors such as drought, land tenure problems and poor access to markets. According to Dixon *et al* (2001), dealing with poverty and hunger in much of the world means confronting the problems that small farmers and their families face in their daily struggle for survival. This emphasizes the need for adoption of policies that favour and promote family farmers and helps them increase their productivity in a sustainable manner. There may be a wide spectrum of such policies in action, depending on the financial capacity and the political commitment of the governments as well as the peculiar ecological conditions of each country. However, there is no doubt that a minimum package should include access to affordable credit, insurance schemes that protect family farmers against price volatility and weather related shocks, and government programmes that enhance linking family farmers to markets.

There is also a need to strengthen development programmes through research and attracting added technical assistance, and related funding. Finally, it's worth noting that strengthening family farming representation in policy making processes is key for the policies to be effective. Policy dialogue is a very important aspect of any agricultural development strategy for it creates the sense of ownership and social alignment necessaries for the policies to be socially endorsed , claimed and monitored.

Experiences from other regions and countries, particularly Brazil, show that the support for family farmers can yield positive results. A decade ago Brazil started to implement a public procurement system that guarantees the participation of family farmers in the national Food Purchase Programme (PAA), the National School Food Programme (PNAE) and Institutional Purchases. The procurement system has strengthened family farming by facilitating the participation of family farmers in a market with fair prices, thus promoting access to food for the most vulnerable segments of the population and stimulating local development (ACI et al, 2013).

However, it cannot be overstated that across the African continent, as in many other developing and developed countries, women engaged in family farming face gender-specific constraints. Despite women bearing the burden of home care and performing a great deal of agricultural activities, their contribution is not mirrored in terms of benefits earned and decision making power. This is epitomized in inheritance and land tenure rights, where titles are most often prerogative of men, whether in customary or formal institutions. Many studies in sub-Saharan countries hold that there is a productivity difference between men and women

because of unequal access to inputs, assets and services (FAO, 2011).
Closing the gender gap in family farming can produce significant gains by increasing agricultural productivity, reducing poverty and hunger and promoting economic growth (FAO, 2011).In addition, creating a favourable environment for young farmers is essential for assuring a high generational turnover in agriculture and lowering rural-urban migration.

Conclusion

Confronting the challenges of feeding Africa's growing population requires a model that goes beyond focusing on just productivity, but addresses poverty, sound natural resource management and sustainable development. Family farmers have an enormous potential to sustainably feed Africa's growing urban population, but to do this they require support from all stakeholders in order for them to address the challenges faced. The momentum raised by the IYFF can be maintained and translated into favourable policies in Africa thereby enabling family farming to play a key role in eradicating hunger and feeding the growing population.

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The strategic role of non-wood forest products in food security and nutrition among urban populations in Central Africa

Hugues N'Gosso[1]

Summary

Non-Wood Forest Products (NWFPs) play a vital role in the sustainable development of populations in Central Africa. The importance accorded to NWFPs in the Convergence Plan of the Central Africa Forest Commission (COMIFAC) and to their potential contribution to achieving the Millennium Development Goals gives them a strategic relevance for the food security and nutrition of populations, including those living in urban areas.

The diagnostic of food insecurity in urban areas shows that this woe is the result of several interconnected factors related to, among others, the purchasing power, road infrastructures, and NWFPs management. To overcome this challenge, a global approach-based strategy is necessary. In fact, in addition to considering the interconnected factors of urban food insecurity, there is a need to establish and implement a global strategy for the sustainable management of NWFPs with the involvement of women in decision making.

Introduction

Non Wood Forest Products (NWFPs) play a strategic role in the sustainable forest ecosystems management in Central Africa sub-region. As the subregion (like other parts of the planet Earth) is experiencing the adverse effects of climate change and the rapid increase in urban populations, NWFPs could play a significant role for the sustainable development of countries in the Congo basin in general, and the food security of its population in particular. Indeed, forest food helps in overcoming seasonal food shortages and scarcities due to extreme climate events, natural disasters, man-made conflicts and other shocks (Arnold *et al.,* 2011).

To demonstrate the strategic dimension of NWFPs, this paper will first address the significance given to NWFPs by the Forest Commission of Central Africa (COMIFAC) and their potential contribution in achieving the Millennium Goals (MDGs). This will be followed by a diagnosis of food insecurity in the cities by highlighting its NWFPs-related causes.

The third step will be to provide an overview of NWFPs management in Central Africa, highlighting the constraints that still impede the efficient implementation of COMIFAC's guidelines on the subject in spite of the numerous existing initiatives. Finally the paper will focus attention on a strategy based on the system approach to enhance the NWFPs sector and to contribute to the food security and nutrition of urban populations.

Strategic role of Non Wood Forest Products

Non Wood Forest Products (NWFPs) play a strategic role through their significant contribution to achieving the millennium development goals (MDGs) and to the food security, nutrition and health of rural and urban populations. This is probably the reason why they have a special place in 8 of the 10 strategic areas of COMIFAC's Convergence plan. In effect, NWFPs offer income generating activities, contribute to the food security, nutrition and health of rural and urban populations in addition to their crucial role as 'safety nets' in times of food crisis (Tieguhong *et al.,* 2009). It should also be noted that NWFPs facilitate the concomitant development of the three pillars of sustainable development as illustrated in Table 1 below.

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Table 1: *Advantages of Non Wood Forest Products in sustainable development*

Sustainable development pillars	Advantages of Non Wood Forest Products (NWFPs)
Social	Local handicraft development; Enhancement of local food products; More balanced and affordable food and nutrition
Economic	Development of income-generating activities; Increase of agricultural productions; Ecotourism development; Improvement of rural populations' purchasing power
Ecological	Floristic and wildlife biodiversity indicators; Anti-poaching and human-wildlife conflict management; Enhancement of forest ecosystems and hence the need for their conservation and sustainable use.

This strategic role of NWFPs has further increased with demographic expansion and the increasingly obvious emergence of poverty in the main cities of Central Africa. Indeed, some edible NWFPs have good nutritional value such as njansang (*Ricinodendron heudelotii*) or nkoumou (*Gnetum spp*). Others such as the African locust bean tree (*Parkia biglobosa*) or wild mango nuts (*Irvingia gabonensis*), in addition to their nutritive role, facilitate quality diet for urban populations through their aromatic appeal. In fact, the marketing channel of most edible NWFPs shows that the harvest is done in rural areas while the consumption is done on a grander scale in our cities.

Diagnosis of food insecurity in urban areas

The causes of food insecurity are multiform and include among others: the increase in poverty in rural and urban settings, demographic expansion in urban areas, the poor condition of road networks, the absence of sustainable and participatory management and use of NWFPs, etc. Another cause is related to the low involvement of women in decision making processes in managing the NWFPs sector despite the crucial role they play in harvesting and processing wild edible plants harvested in the forest, as well as in cooking household meals using forest foodstuff for soups, stews and producing condiments (FAO, 2013).

Indeed, despite the scarcity of data and analytical research done on gender roles in the NWFPs value chain (FAO, 2013), in most cases, edible NWFPs remain the prerogative of women.

In addition to the factors mentioned above, there is also the poor organization of NWFPs markets. NWFPs producers or collectors are not organized in associations to periodically and regularly market their forest products in the cities.

Non Wood Forest Products sustainable development strategies

Following this brief analysis of food insecurity in urban areas, a strategy based on the system approach is necessary to solve this woe and includes:

- Taking into consideration upstream, a number of independent factors (purchasing power, communication network between the rural areas and the cities, populations' health, nutritional value of the food consumed, food habits, etc.);
- Paying special attention to women as they are the primary responsible for feeding the household; and
- Organizing producers or collectors into associations in order to minimize the high costs of transporting products to urban

centres due to the poor condition of the road network.

However, to improve the distribution of NWFPs to urban households, there is a need to make prior arrangements, including:

- Adopting a holistic approach to NWFPs management by increasing the involvement of women, the youth and local populations in decision making processes;
- Organizing NWFPs markets at national, sub-regional and international levels;
- Promoting the domestication of NWFPs in research institutes;
- Improving rural infrastructures, especially road networks linking rural areas to urban centres;
- Taking into account NWFPs in forest observation and research, especially in the establishment of permanent plots to ascertain the regeneration dynamics of the species that produce them;
- Speeding up the internalization of COMIFAC's guidelines on NWFPs, especially their management regulatory and legal framework; etc.

Conclusion

By strengthening the resilience of populations, NWFPs enable them to face several challenges including food deficits related to climate change events, impoverishment, the socio-political instability and food insecurity in central African cities. Women, as the major actors of food and nutrition, should be at the center of decisions regarding the sustainable management strategy of NWFPs. Thanks to their practical experience, they are in the best position to make concrete proposals for the optimum distribution of NWFPs in urban areas.

However, for an improved dissemination of NWFPs to urban households, there will be a need to:

- Strengthen the management capacity of stakeholders in the NWFPs sector;
- Organize its actors in groupings to avail themselves of facilities offered by the State (subsidies, loans, etc.);
- Organize information and awareness campaigns on NWFPs;
- Organize weekly markets for edible NWFPs, etc.

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The demand for bushmeat in cities in Cameroon

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Summary

The prices of bushment in Yaoundé and other towns in Cameroon have increased greatly in recent years. As compared with prices 15 years ago, the price of one kilogram of bushmeat in Yaoundé is at least twice the price at the source, with meat of some species recording a tenfold increase. This increase is mainly driven by a rise in demand as a result of population growth, especially in the cities. More than 23 000 kg of bushmeat was recorded during the present study. Some of the species sampled such as; gorilla (Gorilla gorilla), elephant (Loxodonta africana), and Nile crocodile (Crocodylus niloticus) dwarf crocodile (pythons (Python sps) are protected under the Cameroon wildlife law and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The Bushmeat vendors sampled were mainly women (79%) and 86% of these vendors had ethnical links to populations living at key areas (mainly forest) from which the bushmeat is harvested. Most of the bushmeat sold ended up in local restaurants, commonly called 'chop bars' (55%), 15% in standard restaurants and the remainder was for personal consumption. It is estimated that the bushmeat recorded during this study constitute about 50% of the bushmeat that actually entered Yaoundé. The remaining 50% of the bushmeat is sold in hidden (informal) markets or lost due to poor transport and storage methods. The demand for bushmeat in urban centres in Cameroon is expected to continue to increase in tandem with urban population increase. Meeting this need, of importance to food security, while at the same time trying to conserve biodiversity - including protected species- will require a multidisciplinary approach and the collaboration of all stakeholders. Empowering local communities and indigenous people to become not only the primary stakeholders but also the primary caretakers and custodians of sources of bushment should therefore be the ultimate goal of all future initiatives aimed at ensuring food security in which bushmeat is an important component. This empowerment should aim at progressively devolving power and governance of the bushmeat harvesting sites to the local communities.

Introduction

The commercialization of bushmeat has increased significantly in the past few decades driven by demand (Bennett *et al.* 2007), mainly from urban areas (Chardonnet *et al*. 1995). This has resulted in a significant increase in the unregulated hunting of wild animals for meat, and to a situation now commonly known as the 'bushmeat crises' in the Congo Basin. The rapidly increasing urban population therefore means an increase in demand and hence increase in exploitation of wild animals to satisfy the market. Bushmeat is an important source of protein for both rural and urban households but the indiscriminate and uncontrolled exploitation of this resource, driven by increasing population in cites, has negative impacts on biodiversity, and further endangers threatened species. This paper presents recent work undertaken on bushmeat exploitation and commercialization by staff of WWF-CCCPO (the Cameroon Country Programme Office of the World Wildlife Fund for Nature) and the wildlife trade monitoring network TRAFFIC (Trade Records Analysis of Flora and Fauna in Commerce[4]) in Cameroon. The overall objective of the studies was to deter the illegal exploitation and trade in bushmeat. Specific objectives included: monitoring of trends of availability of bushmeat in the markets, educating traders and raising general public

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[4] *http://www.traffic.org/*

awareness on bushmeat, supporting government law enforcement efforts through data and information generation, and sharing and putting in place a bushmeat monitoring system.

Description of study area

The review is based on work done in Yaoundé, located in the Centre Region of Cameroon, and in 7 smaller towns in the South Region of Cameroon. Yaoundé is the capital city of Cameroon with a population of 1.5 million. The South Region has a population of approximately 640,000 inhabitants.

Methodology

Desk studies to review information on commercialization of bushmeat in Cameroon was followed by weekly surveys of key bushmeat markets identified in Yaoundé and the seven smaller towns in the South Region of Cameroon, over a period of one year (May 2011 to May 2012). Survey methods included interviews of stakeholders, administering questionnaires, filming and taking pictures with hidden cameras. A sub-regional workshop was also organized to develop a bushmeat monitoring system aimed to harmonize the collection and analysis of data in the Congo Basin.

Results

The list of species recorded in one of the main markets during the study with corresponding weight and protection status, based on Cameroon wildlife laws are presented in table 1: Some of the species sampled and protected by both the Cameroon wildlife laws and the CITES.

A total of 52 vendors were sampled during the study, 41 in Yaoundé and 11 in the seven smaller towns in the South Region. More than 23 000 kg of bushmeat was recorded in the six main markets sampled in Yaoundé, constituted of 10% of totally protected species (list A) according to the Cameroon wildlife laws, 30% of list B species (partially protected species), and 60% of list C species (species which can be harvested with permission). Figure 1 shows some of the species seized by law enforcement officers in the course of this study.

Figure 1: Tons of bushmeat in a market in Yaoundé. Some of the species sold are protected under Cameroon wildlife law and the CITES (Photo: WWF-CARPO-Anne Ntongho)

Table 1: List of species and the total quantity sampled in one of the main markets in Yaoundé during the survey. *A=totally protected species, B =partially protected and C can be harvested with permission*

Common name	Scientific name	Protection status	Total weight (kg)
Preuss monkey	*Cercopithecus preuss*	A	536
Drill	*Mandrillus leucophaeus*	A	344
Marine turtle	*Dermochelys coriacea*	A	25
Water chevrotain	*Hyemoschus aquaticus*	A	61
Red fronted gazelle	*Gazelle rurofrons*	A	170
Yellow backed duiker	*Cephalophus sylvicultor*	A	77
De Brazza's monkey	*Cercopithecus neglectus*	A	10
Giant Pangolin	*Manis gigantea*	A	50
Agile mangabey	*Cercocebus agilus*	A	81
Eastern black and white Colubus	*Colubus gueraza*	A	25
Grey parrot	*Psittacus erythacus*	A	
Elephant	*Loxodonta africana*	A	340
Sitatunga	*Tragelaphus spekei*	A	90
Bush buck	*Tragelaphus scriptus*	B	30
Buffalo	*Syncerus caffer*	B	1622
Genet	*Genetta sps*	B	77
African civet	*Vivera civetta*	B	88
Nile crocodile	*Crocodylus niloticus*	B	135
Tortoise	*Kinixys erosa*	B	354
Monitor lizard	*Varanus ornatus*	B	1121
Bay duiker	*Cephalophus dorsalis*	B	1079
Python	*Python sps*	B	130
Bush pig	*Potamocherus porcus*	B	2378
Linsang	*Poiana richardsonii*	C	180
Little spotted cat	*Leopardus tigrinus*	C	20
Blue duiker	*Cephalophus monticola*	C	1997
Pangolin	*Phataginus tricupsis*	C	1718
Grass cutter	*Thryonomys swinderianus*	C	1338
Mona guenon	*Cercopithecus mona*	C	362
Red eared guenon	*Cercopithecus erythrotis*	C	50
Putty nosed guenon	*Cercopithecus nicitans*	C	170
Hare	*Lepus spp*	C	1170
Porcupine	*Atherurus africanus*	C	1193
Viper	*Vipera spp*	C	371
African palm civet	*Nandinia binota*	C	142
Unidentified smoked spp-mainly monkeys	*Cercopithecus spps*		3285.5

Seventy nine percent of the vendors were female and 21% were male. Eighty-six percent of the vendors had ethnical links to populations living near the forest areas from which the bulk of the bushmeat is harvested. The price of the bushmeat varied from about $5/kg for a smoked antelope to $85 for a live monitor lizard (Ntongho, 2012)[1]. The price of one kilogram of bushmeat in Yaoundé is at least twice the price paid at the source, with some species recording even a tenfold increase. The price of one kilogram of bushmeat in Yaoundé has more than doubled as compared with the prices recorded in 1998 by Bahuchet and Loveva-Baillon (1998). Fifty-five percent of the bushmeat sold in the cities end up in local restaurants commonly called 'chop bars', 15% in standard restaurants and 20% for personal consumption (Dame, M.M.H 2012). It is estimated that the 23 000 kg of bushmeat recorded in the present study constitutes about 50% of the bush meat sold in the city of Yaoundé. The remaining 50% is sold in hidden markets, exported or lost due to poor transport and storage methods. It is also believed that about 60% of total bushmeat harvested is consumed locally by the communities at the harvest sites.

Discussion

The total urban population of Cameroon in 2010 was estimated at just over 10 million. Fifty three percent the 10 million urban population is found in two Regions, littoral which includes Douala (2.8 million) and Centre which includes Yaoundé (2.6 million). Thirty four percent of this population, which corresponds to some 3.4 million people, was recorded in the city of Douala (1.9 million) and the city of Yaoundé (1.5 million). Fifty eight person of the urban population Centre region is found in Yaoundé while 68% of that of the Littoral region is located in Douala. This urban population is expected to grow at a rate of 3.3% per annum (MINEPAT, 2010). As indicated above, 86% of bushmeat vendors had ethnic ties to the forest areas from which the majority of the bushmeat was harvested. Since some of the urban migrants are from bushmeat source areas, one can easily understand the demand for bushmeat in the cities and why this demand is expected to increase with increasing population in cities. Although the average per capita urban consumption of bushmeat is smaller in urban areas, the increasing size of the urban population means that the aggregate urban consumption is usually higher than the aggregate rural consumption. Edderai and Dame (2006) identified 15 markets and 145 restaurants and cafeterias selling bushmeat in Yaoundé and providing occupation for 249 people, 84.4 % of these being women. Nasi and Van Vliet (2011) indicated that if bushmeat consumption in the Congo Basin was to be replaced by locally produced beef, an area as large as 25 million hectares might have to be converted from forest into pastures. Achieving sustainable harvest of bushmeat is therefore the best available option compatible with biodiversity conservation, local livelihoods, food security and food self-sufficiency. However, in order to meet the increasing demands for bushmeat now and in the future and to ensure sustainable use and harvesting, the commercialization of bushmeet needs to be combined with better knowledge of the use and trade of bushmeat, the strengthening of legal frameworks, and the provision of food and livelihood alternatives for both rural and city dwellers. It is in light of the above that the wildlife monitoring network TRAFFIC, in collaboration with conservation partners in the Congo Basin, has developed a bushmeat monitoring system that will provide ecological, social and economic data and information on the status and trade of bushment to all stakeholders, especially policy makers (Ringuet *et al*., 2010). Through this system credible data and information on the status of production and trade in bushmeat will be collected and analyzed as a basis for effective action to ensure sustainable bushmeat harvest to meet the ever increasing demand, especially from urban Centres.

Conclusions

The demand for bushmeat in urban centres in Africa will continue to increase in tandem with urban population growth. Although there are already ongoing initiatives aimed at meeting the demand for bushmeat and sustaining the conservation of wildlife such as, the establishment of wildlife sanctuaries, creation of community hunting zones, listing of threatened species for protection and the promotion of wildlife domestication, challenges in the sector are still staggering. Meeting the increasing demand for bushmeat, of importance to food security, while at the same time as trying to conserve biodiversity - including protected species- will require a multidisciplinary approach and the collaboration of all stakeholders, including governments and donors. This participatory approach is important because the

government, which has the primary responsibility to guarantee food self-sufficiency for its citizen and also for the conservation of wildlife, has not got sufficient resources to effectively accomplish this dual task. Multi-stakeholder partnership needs to be encouraged due to the fact that local communities, adjacent to and/or living within wildlife habitats, where most of the harvesting occur, are the primary stakeholders of these resources. Empowering local communities and indigenous people to become not only the primary stakeholders but also the primary caretakers and custodians of sources of bushment should therefore be the ultimate goal of all future initiatives aimed at ensuring food security in which bushmeat is an important component. This could involve, *inter alia*, the progressive devolution of total power and responsibilities for the governance and management of bushmeat harvesting sites to the local communities by the government.

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Increasing demand on natural forest products in urban and peri-urban areas of Mutare, Eastern Zimbabwe: Implications for sustainable natural resources management

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Summary

We assessed how urban and peri-urban households in Mutare, eastern Zimbabwe utilise natural forests in relation to harvesting of wild fruits. A sample of 260 people inclusive of household heads and students were selected, and questionnaires were administered for data collection in May 2014. Our results indicated that the majority of households benefited from consumption and sale of indigenous wild fruits for improved household income, although the extent varied among households. Sustained harvesting of wild fruits from natural forests could help enhance food security in the study area. However, we noted that there was a lack of awareness among the locals of the importance of natural forests and the conservation of wild fruit trees. Thus, we recommend that the utilization of natural forests as a source for food needs to be regulated through a participatory approach, inclusive of local people in order to ensure that the use of wild fruits and natural forests is environmentally, socially and economically sustainable.

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Introduction

People in Africa periodically rely on wild fruits to supplement their diet and to generate household income (FAO, 2011). In many developing countries, including Zimbabwe, natural forests are an important resource for the provision of ecosystem services with environmental and socio-economic benefits related to employment opportunities, household income, and food and nutrition security (Maghembe *et al*., 1994; FAO, 2011).

Accordingly, before any community-based natural resource management programme is introduced and implemented in a particular area, it would be important for planners to understand the nature of forest resources available to locals, their socio-economic characteristics and the attitudes of locals towards natural forests and their products. In Zimbabwe and similar African developing countries, assessments of the state of natural resources and available forest products in urban and peri-urban areas are often limited, as the main focus in this regard has been given to rural areas. In this present study, we examined the following: (i) attitudes of urban and peri-urban households towards natural forest, (ii) their dependence on natural forest, and (iii) their views on natural forest management, using a case study of Mutare, eastern Zimbabwe.

Materials and methods

The study was conducted in May 2014 in peri-urban and urban areas of Mutare City, eastern Zimbabwe. The climate of Mutare is cool and warm, with an annual rainfall ranging from 700-

1050 mm, and a mean annual temperature range from 11 to 28 °C. Mutare lies within an agro-ecological zone which contributes significantly to large and informal markets of fruits and vegetables (Mashapa *et al*., 2014). The present study area was divided into three sub-areas: (i) the Zimunya-Marange peri-urban area, (ii) peri-urban Stapleford-Vumba eastern highlands afro-montane forests, and (iii) the Mutare urban area.

A stratified random sample was used comprising 200 household heads and 60 high school students selected from the study area in accordance to Mashapa *et al*. (2013). Data were collected through interviews following the methods as outlined by White *et al.* (2005). The interview guide contained questions about local peoples' perception on natural forests, collection of wild fruits, fruit marketing and their contribution to household income and food security. In addition, focus group discussions were held with the vendors and key interviews were held with traditional leaders. Responses were summarised using descriptive statistics (Statsoft, 2001).

Results and discussion

Attitudes of local people towards natural forests in peri-urban and urban Mutare

Ages of about two-thirds of the respondents (*n* = 175) ranged from 30 to 60 years and 4% (*n* = 10) were over 60 years. However, less than one third (*n* = 75) of the respondents were less than 30 years old. Our study results revealed that most people in the study area were educated as 73% (*n* = 146) of the household heads of the study respondents had received at least primary education. About 75% (*n* = 150) of the respondents, inclusive of the household heads for school children were not formally employed and involved in smallholder agriculture. Age, education and employment status variation factors likely influence peoples' attitudes towards natural forests and the use of natural forests products. The urban and peri-urban households included in the study generally had a positive attitude towards the natural forests and wild fruits (Table 1). These results are consistent with the findings of Campbell (1987) on the attitudes of local people towards natural forests and wild fruits. Pertaining to sale of wild fruits and its contribution to household income, the majority of respondents (55%, *n* = 143) indicated a monthly household income ranging between US$45 and US$76 with maximum earnings made during the wet seasons (September-March). However, 45% (*n* = 117) of the respondents were not involved in sale of wild fruits. Young people and the formally employed people attached less value to wild fruits for household income, even though they appreciated the importance of natural forests to livelihoods.

Table 1: Attitudes (positive) of locals people towards natural forests in peri-urban and urban Mutare, Zimbabwe (*n* = 260)

Variable	Number	%
Natural forests play an important role in providing wild fruits and contribute to improved household income	232	89.2
Natural forests must be protected from threats of fires, over-harvesting and poor methods of harvesting of wild fruits	232	89.2
Natural forests must be protected and resources should be made available for this purpose	229	88.1
Natural forests are an important natural economic factor	193	74.2
Natural forests are an important source of non-wood products	115	44.2

Marketing of wild fruits was mostly carried out by women who used the receipts to purchase household goods and food, while a few school children (*n* = 19) were involved in sale of wild fruits, especially during school holidays. Natural forests play an important role in providing wild fruits and contributing to household income thereby improving household food and nutrition security in peri-urban and urban areas. Similar findings have been presented in earlier studies in Africa by Tallantire & Goode (1975) and Fleuret (1979). Our findings suggest that natural forests could be helpful in strengthening the local food industry and the food processing sector. This in turn, would create economic opportunities for the local people as wild fruits like guava (*Psidium guajava*) are finding their way into the canning food industry in Mutare City. At Birchenough Bridge, a centre which is 120 km from Mutare, baobab (*Adansonia digitata*) fruits are processed for pulp product like baobab juice, while oil is processed from baobab seed.

Africa is known for food security and livelihood strategies of traditional societies which rely on a wide variety of wild foods from natural forests and diversification of activities related to food provision, as exemplified by the early societies of hunter-gatherers from the wilderness (Scudder, 1971). Hunter-gatherer livelihood is a society in which most food is obtained from wild plants and animals, in contrast to agricultural societies, which rely mainly on domesticated species. Many African tribes continued their hunter-gatherer ways of life, although their numbers have continually declined, partly as a result of pressure from growing agricultural and pastoral communities (Scudder, 1971). Interestingly, respondents stressed the need for protection of wild fruit trees from veld (bush) fires, overharvesting and poor methods of harvesting. Veld fires lead to die-off and dieback of the woody vegetation while overharvesting and poor harvesting practices lead to its gradual degradation.

Extent of reliance of locals on nearby natural forests for wild fruits

Respondents showed great dependence on the following natural forests for several socio-economic benefits:

- the afro-montane forests of Stapleford-Vumba mountains,
- riparian woodlands of Sakubva-Odzi River basin, and
- the patch Miombo woodlands in semi-arid areas of Zimunya-Marange communal lands surrounding Mutare City

About 70% (*n* = 182) of the respondents were recognized as users of natural forests to meet their wood fuel needs and for the collection of wild fruits (Table 2). Similar perceived benefits in an urban setting, particularly, in terms of wood fuel have been reported by Muboko *et al.* (2014) in Harare, Zimbabwe. People in the study area become more alert as fruit harvest time during the rainy season draws near, and there is usually a scramble for wild fruits when the fruit ripens. At this time, most of the highways are characterised with men and women who sell an array of wild fruits. In most parts of the study area it was reported that roads would have a high volume of trucks ferrying wild fruits to mainly urban centres. The main destination for wild fruits in the Mutare urban area is the open Sakubva market, which serves as a wholesale centre for urban fruit and vegetable vendors (Mashapa *et al*., 2014). A number of wild fruit species also enter the food processing industry for food and drinks, for instance the baobab and guava fruits. The baobab tree has multiple uses and is appreciated throughout Africa as food and medicine, as well as being used in veterinary services (Buchmann *et al*., 2010). A number of wild fruit tree species namely; wild loquat (*Uapaca kirkiana*), guava, baobab, dunks/Indian plum (*Ziziphus mauritiana*), chocolate berry (*Vitex payos*), and velvet African medlar (*Vangueria infausta*), have been commercialised by traders who sell them in towns and cities in Zimbabwe.

Table 2: Extent of reliance of locals on the nearby natural forests in Mutare urban and peri-urban, Zimbabwe (*n* = 260)

Purpose of dependence on natural forests/woodland	Number	%
Other non-timber natural forests products	208	80.0
Wood fuel from the nearby natural forestry	195	75.0
Wild fruits harvesting	182	70.0

Our results highlighted that the commonly consumed wild fruits in the study area were wild loquat, guava and baobab. These wild fruits were reported to have a good local market share which is linked to improving income of those households involved in sale of wild fruits. Baobab dry fruit pulp was reported to contain 2.3% protein, 0.3% lipids and 75.6% carbohydrates (Manfredini *et al*., 2002). The study respondents mentioned that cooked baobab fruit pulp could be a substitute for their starch component of food, especially during drought and household food deficit periods. Concerning minerals, Buchmann *et al*. (2010) reported high calcium (4310 mg/100g), magnesium (2090 mg/100g), and phosphorous (733 mg/100g) contents in baobab fruit pulp. Sidibe and Williams (2002) stated that the daily recommended dose of vitamin C (65 mg per day) can be obtained from 23 g of baobab fruit pulp. Hence, the daily saturation of the vitamin C pool in the human body (140 mg per day) requires only 50 g of baobab fruit powder. Wild loquat fruit is processed to produce a refreshing beverage and a variety of local beer and wines, juice and jams in Malawi, Zambia and Zimbabwe. In Zimbabwe, a private company is producing jam from wild loquat fruit (Akinnifesi *et al*., 2004). Wild loquat fruit is very low in calories; provide just 47 calories per 100g but is an excellent source of vitamin-A (i.e., provides 51% of daily recommended levels of this vitamin per 100g) and phenolic flavonoid antioxidants (Akinnifesi *et al*., 2004). Furthermore, wild loquat fruit is also a good source of iron, copper, calcium and manganese. Gutierrez *et al*. (2008) reported that guava is rich in dietary fibre and Vitamins C, with moderate levels of folic acid and a single common guava fruit containing about four times the amount of vitamin C as an orange fruit. Given the nutritional value of these three wild fruits (baobab, guava and wild loquat), this can explain their demand on both the market and for household consumption in peri-urban and urban Mutare, Zimbabwe.

Implications for sustainable natural forest management and wild fruits conservation from a local perspective

Responses revealed that lack of awareness among local people of the importance of natural forests and the conservation of wild fruit trees is threatening the sustainability of natural forests (Table 3). Natural forests were reported to be shrinking and wild fruits diminishing as forests were being cleared to expand agricultural fields in the study area. Elsewhere, in Masvingo, Zimbabwe, Kaeser-Hancock & Gomez (1985) found that communal farmers were no longer consuming certain wild fruits owing to the disappearance of these species from the natural vegetation. Owen (1982) recorded the same phenomenon in Chiweshe, Matibi and Tsholotsho communal areas of Zimbabwe. The study respondents reported that poor methods of harvesting wild fruits were negatively impacting sustainability of the fruit trees. In most cases, wild fruit harvesting had been done through shaking the tree or throwing of objects at the crown, or hitting the stem to dislodge the fruits. For instance, because of such inappropriate harvesting methods, most baobab, wild loquat and dunks/Indian plum trees had big scars and wounds on the stem, jeopardizing future fruit production. Natural forests and wild fruit trees are threatened by

"the tragedy of commons" (Hardin, 1968), i.e., individual households overexploit natural forests and harvest wild fruits in an unsustainable manner. Therefore, utilization of natural forests needs to be regulated in order to manage wild fruit trees and natural forests in an environmentally, socially, and economically sustainable way.

It is interesting to note that African tradition prohibited the cutting of fruit tree species such as wild almond (*Berchemia discolour*), monkey orange (*Stychnos spinosa*), water-berry (*Syzygium cordatum*), and marula (*Sclerocarya birrea*). These could not be cut under any circumstances, and they were considered "sacred". Unfortunately, weakening the powers of traditional leaders, losses of cultural values, and economic hardship have led to the breakdown of some of these positive socio-ecological biodiversity conserving values and practices, hence, negatively affecting natural resource conservation.

Fruit trees in natural forests

Table 3: Local peoples' perspectives on sustainable natural forest management in urban and peri-urban Mutare, Zimbabwe (*n* = 260)

Variable	Number	%
Contributions of local people to natural forest management and conservation are essential	228	87.7
Lack of awareness of local people of the importance of natural forests and the conservation of wild fruit trees	227	87.3
Poor methods of harvesting wild fruits	225	86.5
Natural forest management and conservation are essential for agricultural development	206	79.2
Obtaining permission from the responsible authorities would be essential for cutting trees for firewood and timber	203	78.0

Conclusions and recommendations

Our results indicate that natural forest resources are important for the livelihoods of a high proportion of people in the urban and peri-urban area of Mutare, Zimbabwe, with households benefitting from consumption and sale of indigenous wild fruits, although the extent varied among households. Age, education and employment status variation factors likely influence peoples' attitudes towards natural forests and their reliance on sale of wild fruits for household income, hence, it is important to evaluate these factors in future studies, together with research on market dynamics. Based on the present study findings, we recommend the following: (i) planning and conducting well targeted extension programs for education, training and capacity building of local people on sustainable community-based natural forest management and conservation, (ii) allocating more financial resources to natural woodland and forests management and conservation, and (iii) improving the current natural resources management systems to ensure increased participation of local people in the management, development, and conservation of natural woodland and forest resources. These recommendations are in line with many earlier findings which have advocated adopting participatory approaches and effective communication strategies for conserving natural woodland and forest resources (Gandiwa, 2011; Mashapa *et al*., 2013).

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Piloting the Food Insecurity Experience Scale (FIES) in Africa, south of the Sahara: Assessing food insecurity severity to support policy solutions

Elizabeth Graham, Meghan Miller and Sara Viviani[1]

Summary

While efforts have been significant towards eradicating extreme poverty and hunger, many people across the globe continue to face hunger and food insecurity. Increased attention to conceptualizing food insecurity and measuring it in a timely manner is crucial, as also to prevent unsustainable resource use. The Voices of the Hungry[2] *(VoH) project piloted the Food Insecurity Experience Scale (FIES) through the Gallup World Poll ® survey in four African nations (Angola, Ethiopia, Malawi and Niger) in 2013, to measure the severity of food insecurity based on people's self-reported experiences. Using the data collected in Angola as an example, we show how the FIES makes it possible to comparatively analyse the food insecurity situation for different groups within a population, such as urban versus rural, or male versus. female. This is a key feature that will help in assessing where in the world food insecurity is more severe, and in devising evidence based solutions to eradicate food insecurity while protecting environments.*

Food Security and Natural Resource Management

The links between natural resource management and food security are vast. Environmental degradation may result in reduced productivity and food availability, while food insecurity may drive over-exploitation of limited resources as people resort to unsustainable practices to address immediate needs. This complex relationship has been described as a "vicious cycle" or "downward spiral" (IFAD, 2014) and calls for increased attention to identifying and addressing food insecurity in a timely manner, to help prevent unsustainable resource use. In the context of climate change and economic crises, it is especially important to monitor food security as populations adapt to new conditions and constraints. Reliable and timely food security measurement is key both to understanding links between natural resource management and people's access to food and to guide action.

Voices of the Hungry (VoH) and the FIES: An Innovation in Food Security Measurement

The complex nature of food security, and its various effects on people and their environment, makes reliably identifying food insecure populations essential for policy action. FAO's *Voices of the Hungry* (VoH) project is an innovative approach to measuring the severity of food insecurity throughout the world (FAO, 2014). To do this, VoH uses the Food Insecurity Experience Scale (FIES), a survey tool that asks questions directly to the respondent related to their experiences in accessing food. The FIES builds on existing experience-based food insecurity scales such as the Household Food Security Survey Module (HFSSM), the *Escala Latino Americana y Caribeña de Seguridad Alimentaria* (ELCSA), and the Household Food Insecurity Access Scale (HFIAS). These tools are based on well-grounded empirical research that revealed how

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[2] *The Voices of the Hungry (VoH) project is an innovative approach to assist countries in developing the capacity to generate and to access timely and valid information on the severity of food insecurity as experienced by individuals in the population. This initiative, employed by the Food and Agriculture Organization of the United Nations (FAO), aims to establish a new global standard for measuring food insecurity experience that is valid, endorsed at the international level, and used for global and country monitoring to generate globally valid indicators to monitor progress in eradicating hunger and food insecurity in more than 150 countries every year. The data used to inform the results presented has been collected in 2013. The VoH team is located in the FAO headquarters office at via delle Terme di Caracalla, 00153, Rome, Italy.*

food insecurity – specifically, limited access to food at the individual and household level – manifests itself in predictable behaviours and recurrent experiences like: facing uncertainty/anxiety regarding the ability to procure food, having to sacrifice food quality, or reducing food quantities. The items that comprise the FIES questionnaire ask people directly to report on the occurrence of such experiences (Ballard, 2014) By conceptualizing food insecurity as a latent trait, and measuring it through the lens of people's experiences, the FIES allows computing estimates of the number of people experiencing food insecurity at various levels of severity that complements tools used to measure other aspects of food insecurity, such as food availability, dietary energy intake, or anthropometric outcomes.

It is important to note that the questions do not ask respondents to report on the *causes* of their food insecurity condition; rather, the FIES is meant to detect the occurrence of particular experiences. A qualifier ("because of lack of money or other resources") is included as a means of preventing affirmative answers given for reasons that have nothing to do with food insecurity, such as for example fasting for religious reasons or adapting diets due to medical conditions.

Designed to be cross-culturally valid in both developed and developing countries, the FIES will allow for global comparisons of food insecurity severity. The questionnaire is easy to administer, is cost-effective and requires minimal training of interviewers. Data collection and analysis are relatively quick when compared to other indicators, allowing for timeliness in reporting.

Table 1. The Food Insecurity Experience Scale (FIES)
(Version included in the 2013 round of the Gallup World Poll® in Angola, Ethiopia, Malawi and Niger)

Now I would like to ask you some questions about your food consumption in the last 12 months. During the last 12 MONTHS, was there a time when:		
Q1. You were worried you would run out of food because of a lack of money or other resources?	0 No 1 Yes	98 DK 99 Refused
Q2. You were unable to eat healthy and nutritious food because of a lack of money or other resources?	0 No 1 Yes	98 DK 99 Refused
Q3. You ate only a few kinds of foods because of a lack of money or other resources?	0 No 1 Yes	98 DK 99 Refused
Q4. You had to skip a meal because there was not enough money or other resources to get food?	0 No 1 Yes	98 DK 99 Refused
Q5. You ate less than you thought you should because of a lack of money or other resources?	0 No 1 Yes	98 DK 99 Refused
Q6. Your household ran out of food because of a lack of money or other resources?	0 No 1 Yes	98 DK 99 Refused
Q7. You were hungry but did not eat because there was not enough money or other resources for food?	0 No 1 Yes	98 DK 99 Refused
Q8. You went without eating for a whole day because of a lack of money or other resources?	0 No 1 Yes	98 DK 99 Refused

Results thus far confirm the suitability of a data collection vehicle such as the Gallup World Poll® and the robustness of the analytic methods developed by FAO to obtain the food insecurity measures. All items included in the scale have passed rigorous tests of internal validity as elements of a coherent measure along a single dimension of severity and are found to possess good discriminatory power in identifying cases at different levels of food insecurity severity.

Potential usefulness and limitations of the FIES

The FIES is a flexible tool that can be applied with minor adaptations to different contexts. It can be administered at the individual or household level, with the possibility of disaggregating results by gender and/or subnational groups, such as urban and rural populations. Repeated application of the FIES on the same population makes it possible to monitor trends and changes in food insecurity severity over time and to deepen our understanding of the determinants and outcomes of food insecurity. The underlying causes of food insecurity and hunger, in fact, are multiple complexes, and the FIES can be used together with other indicators to identify risk factors and consequences of food insecurity, helping to build a better understanding of the complex phenomenon of food insecurity.

The FIES can also be used to inform decisions for targeting programmes and resources. While it would not be appropriate to use it to identify individual beneficiaries for programmes, assessing food insecurity at different degrees of severity can assist in identifying vulnerable sub-populations or geographic areas and inform decisions regarding investments for scaling up successful projects.

Finally, the FIES can potentially be used also to assess the impact of a food security policy. If applied before and after an intervention, it allows detecting changes in the severity of food insecurity, helping to evaluate the effect of the programs.

It is important however to keep in mind that the phenomenon of food insecurity encompasses much more than what the FIES captures; it includes aspects ranging from social, economic and agriculture policies at the national and international levels, to food production conditions, livelihood strategies, basic sanitation, food habits and nutritional status at the household level. While use of the FIES allows detecting the presence of the problem and its distribution, other important data, such as that coming from reliable agricultural statistics, is necessary to inform policies.

Pilot results: the case of Angola

To illustrate the potentials of using FIES data to analyse food insecurity, we consider the data collected in Angola. Data were collected through the Gallup World Poll® survey in 2013, together with a set of demographic variables, and used to compile the profiles of food insecurity of the urban and rural populations (Figure 1).

The vertical axis in the diagram indicates the estimated percentage of individuals in the national urban and rural adult population, respectively, who have experienced food insecurity at a level of severity equal to or greater than the one measured on the horizontal axis, which indicates possible values of thresholds on a scale of severity. For example, with the provisional data and thresholds depicted in the diagram, about 70% of the adults in Angola who live in a rural area would be classified as having experienced moderate or severe food insecurity, a percentage that drops to 55% in the urban population.

The solid parts of the curves extend over the range of severity captured by the current version of the FIES. It covers a broad range of severity, however not up to the very extreme end, suggesting that one or two additional items might be needed in future applications.

To refer to raw scores, i.e., the number of questions in the FIES to which people have responded “yes”, is a very simple, yet rigorous

way of classifying cases. The greater the number of affirmative answers, the more severe is the estimated condition. To calculate the prevalence of food insecurity at different levels of severity, thresholds can be defined at levels of severity that correspond to those associated with different raw scores. For example, in Figure 1, thresholds have been set in correspondence of raw scores equal to 3 and 7. The corresponding prevalence rates can be thus read on the vertical axis. The first threshold corresponds to the level of severity of a respondent who would have a 50% probability of having responded affirmatively to the item "ate less than you think you should" or "skipped a meal", which are found to be similarly severe experiences in Angola.

The second one corresponds to that of a respondent who has a 50% probability to affirm the most severe item in the scale ("went without eating a whole day"). This is still a rather moderate level of severity, as it comprises also the condition of people who have experienced it rarely over the previous 12 months. The dotted parts of the curves show how the food insecurity profiles might be extended once one or two more severe items will be added in future applications.

The results from the 2013 pilot in Angola thus show that 71.9% of the rural population have experienced forms of moderate or severe food insecurity in the previous year, while only 54.8% of the urban population were in a similar condition. The percentages drop to 37.4% and 26.5%, respectively, when considering only the more severe forms of food insecurity. The higher prevalence of food insecurity in the rural population confirms the unfortunate, well-known reality that rural people, who grow most of the food in the country, are also those who struggle more in accessing adequate food.

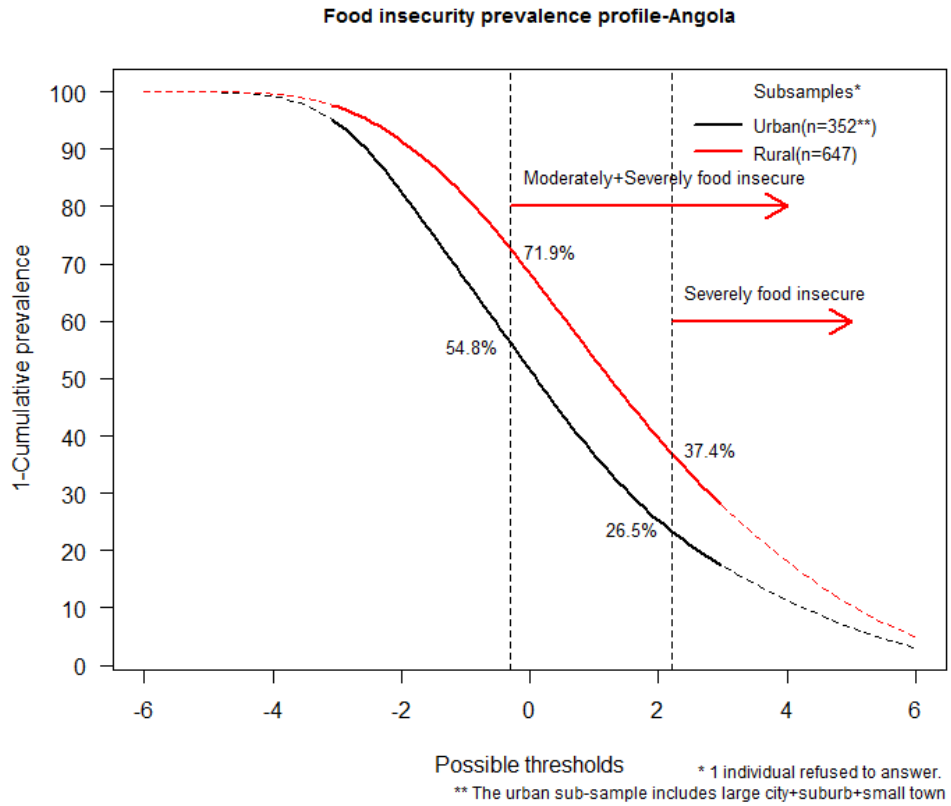

Figure 1. Prevalence profile for the adult population split as urban and rural in Angola

Way Forward

The *Voices of Hungry* project will allow FAO to obtain timely and valid information on the severity of food insecurity, at national level, and on a global scale. Starting in 2014 and annually thereafter, the FIES will be included in the Gallup World Poll®, a nationally representative survey carried out in more than 150 countries. In this way, it will be possible to provide, for the first time, cross-country comparable national estimates of food insecurity prevalence at different levels of severity. The data collected will be used to monitor trends within and across regions, and to track progress towards achieving international goals for eradicating hunger. The FIES will aid in monitoring progress towards a possible target on food security included in the Post-2015 Sustainable Development Goals.

The potential of experience-based measures in contributing to improved food security governance has been well documented recently by Perez-Escamilla, who highlights "accountability, transparency, inter-sectoral coordination and a more equitable distribution of resources," as potential benefits (Perez-Escamilla, 2012). The information gained by the FIES can increase public awareness of food insecurity and influence governance at national, regional, and municipal levels.

The FIES is a unique opportunity to build a better understanding of the complex phenomenon of food insecurity and to inform policy aimed at improving the well-being of all populations.

New information will be made available at http://www.fao.org/economic/ess/ess-fs/voices/en/.

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Using mobile technology to improve incomes and food production across Africa: The Esoko experience

Sarah Bartlett[1]

Summary
Esoko, a mobile platform built in Accra, Ghana, is tackling the challenge of feeding Africa's increasing urban population by providing technology to help individuals and organizations increase production, efficiencies, and revenues. Here we share the technology solution and objectives as well as quantitative and qualitative evidence of how mobile platforms like Esoko can positively affect production systems.

Introduction

As the African population continues to grow rapidly, practitioners and researchers are seeking to better understand what can be done to ensure that present and future generations feed themselves. This is particularly true in growing urban environments, with more than half of Africa's increasing population estimated to be urban by 2030[2]

A multi-pronged approach is necessary to ensure the continent is ready for this unprecedented and rapid transformation. While others focus on crop sciences, nutrition, governance and environmental protection, the mobile platform known as Esoko[3] is concentrating on improving the efficiency and effectiveness of production systems through the use of technology.

New and emerging technology platforms like Esoko are useful forces to combat known challenges in agricultural markets; challenges that will only increase as urban populations grow. The basis for these platforms is that the free flow of information to and from rural production areas could transform the sector and everyone in it. Studies like Vodafone/Accenture's research Connected Agriculture[4] show the potential of using mobile technology to tighten supply chains, improve production, and increase revenues for everyone from smallholder farmers to exporters.

Mobile technologies open up channels for communication, with the ability to quickly and inexpensively move information from one actor to the next - buyers to outgrowers, rural agents to headquarters, government to smallholders, and so on. Mobile penetration rates and access are improving each year[5] yet mobile phones have not yet been fully harnessed to make the agricultural sector more efficient and productive. Esoko hopes to change that.

Esoko platform and objectives

Esoko is a private initiative that began as TradeNet in 2005, with the encouragement of FAO, and in partnership with FoodNet[6] in Uganda. Focused on agricultural marketing, it provided the technology solution to collect and share current market prices via SMS and the web to stakeholders. In 2005 TradeNet signed a three-year agreement with USAID's MISTOWA program to adapt the product and make it available to their target beneficiaries with the aim to increase regional trade in West Africa by 20%.

In 2009 TradeNet rebranded as Esoko (name derived from Swahili word "Soko" for market; the "e" representing electronic), switching to a new platform with a broader set of tools. Today, the platform can be used anywhere and with any mobile network. Esoko is directly managed through offices in Ghana and Kenya and through a reseller network, with

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[2] *State of the World Population (2007): 11. UNFPA. <http://www.unfpa.org/swp/2007/presskit/pdf/sowp2007_eng.pdf>.*
[3] *Esoko Platform. Web. <www.esoko.com>.*
[4] *Connected Agriculture: The Role of Mobile in Driving Efficiency and Sustainability in the Food and Agriculture Value Chain (2011): n. pag. Vodafone and Accenture. <http://www.vodafone.com/content/dam/vodafone/about/sustainability/2011/pdf/connected_agriculture.pdf>.*
[5] *Sub-Saharan Africa Mobile Economy 2013 (2013): 4+. GSMA. <http://gsma.com/newsroom/wp-content/uploads/2013/12/GSMA_ME_Sub_Saharan_Africa__Report_2013.pdf>.*
[6] *CGIAR's FoodNet. Web. <http://www.foodnet.cgiar.org/>.*

representatives in seven other countries offering local strategy and training to clients.

Esoko's tools don't focus exclusively on agricultural marketing as TradeNet did; they also help individuals and organizations increase production and efficiencies. This broadened focus is essential to future urban food security– increased access to markets alone cannot feed growing populations. The integrated solution now offers advice to farmers (market prices, weather forecasts, and growing tips) as well as solutions to businesses (marketing products, monitoring activities, and sourcing goods). The platform itself includes advanced profiling capabilities, automatic and personalized SMS alerts, buy and sell offers, bulk SMS messaging, SMS polling, Android knowledge bases and more. Esoko's partners and clients are projects and agribusinesses who use the platform to reach their rural members, suppliers and clients. See Table 1 for Esoko's overall objectives.

Table 1: Esoko's overall objectives

Objective	Output	Process
1 **Improve revenues**	- More transactions - Better margins per transaction - Increased profits overall	Set up farmers to receive automatic prices, offers and weather information. Use SMS to save on communication and travel costs. Build web profiles to encourage trading, accountability and credibility.
2 **Improve trading efficiencies**	- Shorter supply chains - Faster procurement - Better market intelligence	Use SMS advertising to reduce middlemen in procurement and speed up time to market. Use SMS polling to gather data from field. Sign up farmers to get SMS alerts on critical market data.
3 **Better access to markets**	- Improved distribution techniques - New & additional markets	Link farmers to new markets via SMS. Promote direct SMS prospecting and marketing. Build public web profiles for associations, FBOs and SMEs.
4 **Advocate improved standards**	- Common standards & grades defined	Define commodities, standards, and grades for use on Esoko.
5 **Attract foreign investment**	- Public profiles of companies online - More transactions/investments to increase production.	Use Esoko's international profile to advertise and attract foreign businesses to local organizations. Leverage web & SMS advertising.
6 **Improve government outreach**	- Transform extension networks	Build customized Android knowledgebases for extension agents to carry into the field.
7 **Improve access to credit**	- Profiles, reputation, history, referrals	Capture farmer data on transactions, advertising and profiling to help them package data and history as a risk-reduction strategy when seeking finances and loans.

Source Table 1: Esoko

Impact and usage

Both anecdotal and quantitative evidence suggests that the use of mobile platforms to share and collect information with farmers can increase revenues, production and efficiencies. The following research and case studies help to illustrate the potential mobile services have along varied supply chains.

Farmers

Today Esoko clients are branching out beyond price information and are also experimenting with more sophisticated content services for farmers like weather and agricultural tips. But linking farmers to market through market prices via SMS remains a key component of the platform. Generally, farmers surveyed report 1) tracking prices and following trends so they know when to sell 2) knowing price variations between markets, therefore travelling to the best market to sell and 3) having increased negotiation power--knowing what goods are worth gives confidence to bargain or wait for better offers.

In 2010, The French National Institute for Agricultural Research (INRA) compared 600 users and non-users in the North of Ghana, with results showing a consistent and quantitative increase of 10% in farmer revenues[1]. New York University is finalizing a two-year randomized control trial with 1,000 farmers in Ghana's Eastern Region on the impact of SMS price alerts on marketing behavior, with results due in late 2014. With the additional income earned, smallholder farmers report either improving their property, paying school fees, or reinvesting in their farming businesses to increase production.

A third party has not yet tested sharing localized weather forecasts and disease/input/business advice over SMS to help smallholders improve incomes and yields. But qualitative evidence is emerging. One case is with Novus Uganda, a feed company who uses Esoko's profiling and Bulk SMS service to differentiate themselves from their competitors by sharing best practices with their customers. One recipient reported his egg production increasing by 30% after following the nutritional advice he received in an SMS from Novus.

Sara Maunda made $130 instead of $27 on her groundnut sale in Malawi using Esoko prices over SMS. Photo source: Esoko

Organizations

Agribusinesses and associations using Esoko are seeing improved efficiencies and increased production.

ASNAPP (Agribusiness in Sustainable Plant Production) in Ghana used the Buy & Sell matchmaking service to source from local collectors. They decreased time to market by almost half, reduced the number of actors in the supply chain from five to three, and increased profits for everyone from the collector all the way to the exporter (with an average increase of 33% for the collector).

The UNPMB (Union Nationale des Producteurs de Mangue du Burkina), one the largest mango association in Burkina Faso, used profiling and Bulk SMS to coordinate fly spraying across the region. That coordination helped them extend their harvest by two months and their yearly production by 3,000 metric tonnes. They also used SMS polling to get feedback on a new spray, with an 80% grower response rate.

Chitsosa Trading, an SME in Malawi, used Bulk SMS to improve their speed to acquire and sell goods. Reaching their suppliers via SMS, they were able to better organize pickups and saved $350 a month on operational costs, which they threw straight back into the business. That's an estimated

[1] *Subervie, Julie. Evaluation of the Impact of a Ghanaian Mobile-based MIS Using a Quasi-experimental Design. Cirad Research on Esoko. French National Institute for Agricultural Research (INRA), 2011. <http://www.slideshare.net/Esoko/cirad-research-on-esoko>*

increase in turnover of $350,000 in five years, not only benefitting Chitsosa but also the producers who increase production to meet demand and the consumers who rely on a consistent food supply.

Conclusion

Esoko and others are just beginning to understand how mobile technology can decrease waste and increase production for an increasingly urbanized continent. The International Rice Research Institute's mobile soil quality information system[1] is indicative of the varied uses of mobile being introduced to this end. Many will find that the technology itself is the easy part; scaling and deploying those technologies remains the challenge. But with more and more organizations understanding how their stakeholders *and* bottom lines will benefit, mobile technology will no doubt play a huge role in ensuring that future African generations are fed.

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Legal status of urban forest resources in sudano-sahelian zone of Cameroon

Augustine Muam CHI[1]

Summary
Combating desertification and providing fuel wood for energy for preparation of food are especially important in the Sudano-Sahelian zone of Cameroon where vegetation cover and soils are threatened by erosion. It is however crucial to determine the legal status of such activities, and to define the ownership of urban forests, thus their legitimacy. The 1994 Cameroon Forestry Law states that urban forests are under the jurisdiction of Councils. This same law regulates the use of urban forests for fuel wood both for subsistence and for commercial use, with a view to ensuring the sustainability of these resources.

Introduction

Urban forestry can be referred to as the careful care and management of urban forests, i.e. tree populations in urban settings for the purpose of improving the urban environment. Costello (1993) defined urban forestry as "the management of trees in urban areas". This simple and logical statement is further defined as follows: "management" includes the planning, planting and care of trees; "trees" include individuals, small groups, larger stands of trees (e.g. green belts) and remnant forests; "urban areas" are those areas where people live and work (can be defined as areas where 500 or more people live). Urban forests can thus be defined by their location in or near urban areas and by their multi-functional character, providing shade, amenity values, vegetation cover and soil restoration, fuel-wood for food preparation, etc. Urban forestry in a developing country context including Cameroon will thus refer to: the establishment, management, planning and design of trees and forest stands in or near urban areas to combat desertification, provide firewood for energy needs, and provide other goods and services, as outlined above. According to the National Environment Action Plan of Cameroon (1995) vegetation cover and soils are most threatened by erosion in the Sudano-Sahelian region, and its reclamation is determinant in maintaining the fragile ecological balance of the Sudano-sahelian zone, hence calls for urgent measures.

The question that comes foremost to mind is who or which institution(s) owns urban forest once these have been established. This question needs to be addressed, and this is the focus of the present paper. It is crucial to clarify this question to guarantee sustainable management of urban forests if they are to meet their intended role to fight against desertification while simultaneously meeting the fuel/energy needs of a burgeoning population in the Sudano-Sahelian zone of Cameroon[2].

Review of Sudano-Sahelien Zone

According to the Cameroon National Environment Management Plan (1995) ecologically, the Sudano-Sahelian Zone, which comprises the Major Ecological Regions of the Mandara Mountains, and the Far-North Region and Benoue Plains, is faced with the permanent threat of desertification due to climate constraints and man-induced soil erosion. Administratively, today, the Sudano-Sahelien Zone in Cameroon corresponds to the Extreme-North and North Regions of Cameroon. The fragile ecology of this zone is subjected to the effects of drought and pressure on land in densely populated areas, while human populations in the areas rely on fuel wood as their only source of energy. According to Clement Njiti, the Peace Corps associate director for agro-forestry and environment, 78% of Garoua residents rely on firewood for cooking; outside the town, firewood is the only source of fuel. That this Northern area is plagued by the significant loss of original wooded savannah due to seasonal shifting cultivation and large scale cutting of wood for domestic energy use (Hanson, 2008), which

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[2] *The population in the Sudano-Sahelian zone of Cameroon is estimated at 2.5 million inhabitants in 2002, and it will increase to 3.6million in 2010 and more than 5.1 million in 2015 (MINEF, 2004)*

contributes to soil degradation accentuating impacts of drought and desertification .

International Law obligations and Urban Forestry

Considering the environmental stakes in the Northern zone of the country, Cameroon participated in negotiations and signed the United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD) in 1995. To implement this Convention, the country adopted a 2004 National Action Plan to Combat Desertification (PAN/LCD) which embraced and integrated other National Action Programs aimed at sustainable development and related to the fight against desertification. Amongst these programs were the 2005 Forest and Environment Sector Program (PSFE) which provided both for reafforestation and sustainable management of wood and energy resources. The PSFE program, to be implemented through pilot projects in urban areas of the Northern parts of the country, notes that actions to combat desertification shall essentially be composed of reforestation and management of existing forest resources (MINEP, 2004). The Minister of Forestry (MINFOF) charged with the execution of the PSFE is quoted to have said in Garoua on 16th August 2008; "I have come to plant trees – that is why I have left my jacket and tie in Yaounde, as he launched the tree planting campaign in the North of the country. The Minister and his staff planted one hundred trees as a bulwark against the rapidly encroaching desert (Hanson, 2008).

It would be recalled that in the early 1980s, about 10 million trees were planted within the framework of "Operation Green Sahel", in an effort to stop the advancing desert. However, this program ended abruptly due to a generalized economic crisis in the country. Some of the repressive methods employed within the project – including seizures of wood and charcoal and detaining people suspected of illegal wood-cutting were counterproductive, as the desert continues to move steadily south. The "Operation Green Sahel" continued in 2009 and 1,600.000 trees were planted in some towns in the Logone and Chari, Mayo-Dany and Mayo Kani Divisions. Each of these tree sites has an area of over 1000 hectares. Maroua and its environs were also involved in this operation, and operation "Make Maroua, the University and its Environs Green" was launched by the Speaker of the Cameroon National Assembly for the planting of 6.000 trees. An accurate up-to-date assessment of the impact of the above tree planting efforts on halting desertification and enhancing fuel wood availability has not been carried out. This can be attributed to the absence of any serious and consistent attempt, to define the legal status or ownership of the urban forest resources in Sudano-Sahelian zone.

Ownership of Urban forests established and defined by national law

One of the most important aspects of Cameroon's 1994 Forestry Law is the division of its forestlands into two domains – the permanent forest estate (DFP) and the non-permanent forest estate (DFNP)[1]. A good example of non-permanent forest estate is 'Community Forest'[2]. The permanent forest estate includes 'State owned production and protection forests in the public or private domain of the state', and 'Council Forests' which may be designated for production or protection and which are in the private domain of a Council[3]. Therefore, urban forest, as defined above and based on its location, falls within the jurisdiction of Councils[4]. The Cameroon law on decentralization applicable to Local Councils provides that Councils have as mission, the development of their locality and amelioration of the living conditions of its population[5]. For example, the Council of Dimako in the East Region of Cameroon within 7 years (2004-2010) generated the sum of 931.371.931 (about 186.274.386 dollars) from forest exploitation and distributed it in accordance with previously established quota (e.g. 50% investment and 30% functioning budget, 10% for regeneration of the forest and 10% to village communities). Some investment budget was used in the electrification of villages, public areas and the town (Cuny, 2011). Regeneration will combat desertification while local electrification serves as alternative energy to fuel wood. Judging from the disproportionate distribution

[1] Articles 20-39 of Law No. 94/1 of 20/1/94 to lay down Forestry, Wildlife and Fisheries Regulations

[2] Is forest space given to and managed by local communities.

[3] Council Forest means any forest that has been classified on behalf of Local Council or has been planted by the local council.

[4] Only 6 CFs have been gazetted, compared to 182 Community Forest in 2010 (Cuny, 2011).

[5] Article 3(1) of Law No.2004/017 of 22 July, 2004.

quotas above, inference is that councils use forest revenues to finance investment and functioning budgets rather than reinvest in sustainable management of the forest.

Rules governing the exploitation and sustainable use of Council/urban forest.

As concerns the permanent forest estates (DFP), the 1994 Forestry law regulates the exploitation of Council forests for both subsistence and commercial use, aimed at ensuring their sustainability. Subsistence wise, the law demands that Cameroonians holding personal felling authorization[1] may fell a limited number of trees in Council forests to meet personal needs, especially for firewood and building timber[2]. Commercial wise, exploitation permits[3] for the collection of fire wood shall be granted on the basis of a dossier[4], and those holding a permit for fire wood collection shall start exploitation only after payment of the corresponding taxes and upon subsequent notification and permission by the local representative of the Minister in charge of Forestry (MINFOF). Exploitation shall concern only produce and quantities specifically designated in the exploitation permit[5]. At the local or regional level, exploitation permits for firewood shall be granted by order of the competent governor after consultation with a Regional Technical Committees[6] of which mayor(s) of the Council(s) concerned are/is represented[7].

Conclusions

It is established that urban forest, by virtue of its location, is Council Forest. Revenue generated by Councils from the sustainable management and exploitation of urban forest, can be reinvested in forest regeneration. This plowback is in compliance with the provisions of Cameroon national law and the international agreement to combat desertification. The revenue yielded may also be used to provide electrification to serve as alternative energy to fuel wood. The sustainability of forests in Sudano-sahelian zone of Cameroon is predicated on its sustainable use (subsistence or commercial) thanks to the 1994 Forestry law that deals with issues of ownership and regulates exploitation of forest resources.

[1] An individual felling authorization in this law, shall mean an authorization issued to a natural person to cut wood not exceeding 30 gross cubic meters for personal, non-commercial use.

[2] Article 94(1) of Decree No. 95/531/PM of 23/8/95 to determine conditions of implementation of forestry regulations

[3] An exploitation permit within the context of this law shall mean an authorization to exploit or harvest specific quantities of forest products in a given zone. The products concerned may be special products, firewood or poles for commercial ends.

[4] Article 91(1 & 4) of the 1995 Forestry Decree

[5] Ibid Article 92(1)

[6] Ibid. Article 86(4)

[7] Ibid. Article 93(1)

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The importance of adapting the legal framework in the seed sector of Cameroon to promote sustainable farm production to supply urban centres

Emmanuel D. Kam-Yogo[1]

Summary

The legal framework of the seed sector in Cameroon should promote 'sustainable' seeds, that is, seeds that can ensure decay-resistant harvests. Seeds' sustainability could have an impact on the sustainability of harvests. A harvest comprised only of sustainable produce will enable an improved supply of urban centers in foodstuffs. Currently, the large urban centers of Cameroon are faced with serious challenges in foodstuff supply because a significant part of the harvest rots in the farms or decays while being transported from the farm to the market, hence the need to readjust the legal framework in order to promote the type of seed that can ensure sustainable productions resistant to rapid rotting.

Introduction

The good quality of farm produce very often depends on the quality of the seeds used. We observe that most of the agricultural production in rural areas rots before reaching the cities. In view of the rapid decay of agricultural produce, it appears wise to focus, at legal level, on promoting quality seeds that will produce sustainable harvests that can withstand the risk of decay or rapid degradation during transportation from the village to the city[2]. This would enable to keep most of the produce in good condition in urban markets to meet the food needs of urban dwellers. The seed industry should thus readjust towards combating the rapid decay of farm produce. To that end, the legal framework should initiate new mandatory standards. Seed activity is defined as "any intervention which consists in producing, packaging, importing, exporting or marketing seeds" [3]. Therefore, it is necessary that seed-related laws and regulations be rigorous to enforce a seed production system that yields resistant harvests. The needed adjustments should be made regarding seed activity reporting, seed transactions and the certification and interventions of the various institutions.

The need to amend the law on reporting seed activity

Reporting seed-related activities is provided for, namely regarding the production, packaging, marketing, importation and exportation of seeds of all species and categories. When the Ministry of Agriculture receives an activity report, it should conduct a technical survey covered by the reporting person within sixty days. This survey should lead to the approval or rejection of the specifications provided for by the law[4]. This survey should establish the requirements regarding sustainable seeds to the attention those who report their seed activities.

Amendments are necessary at this level to enact new requirements that could be integrated in the law to facilitate or enforce:

- The development of decay-resistant varieties;

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[2] *There could be more decay-resistant varieties. The existence of such varieties does not compel the actors of agriculture to use them. Thus, there is a need for legal rules to compel each stakeholder to use it or found himself/herself on the wrong side of the law. This is how the law should play its deterring role in the agricultural domain as in all the other areas of a society's life.*
[3] *Article 2 of Law n° 2001/014 of 23 July 2001 on Seed Production and Marketing.*
[4] *Article 6 of Law n° 2001/014 of 23 July 2001.*

- Research on genetics advancement to improve the productivity and quality of harvest in order to ensure the sustainability of agricultural production;
- An improved balance between available scientific research and the level of sustainability of seeds produced.

The Seed Law should be adapted to require individuals and corporate bodies involved in seed activity to use the most recent scientific findings regarding resistance so as to produce seeds suitable for sustainable agriculture, that is, agricultural production that naturally resists to decay.

In the same vein, standards applying to imports should also be enacted. Thus, only seeds that conform to the new standards should be imported. Consequently, all imported seeds should be subjected to an appropriate control when entering Cameroon in order to ascertain their conformity with the current standards on seeds.

Thus, the seed-related activity certificate should be issued only to those who comply with the legal requirements.

The need to amend the legal rules in the seed transactions register

There exists a register[1] on the transactions of seeds produced, imported, exported or sold to any natural or legal person involved in seed-related activities.

Seed producing establishments should submit to a few requirements including:

- Holding a register of transactions indicating by chronological order the quantities of seeds produced, kept, sold and the date of each operation by species, variety and category;
- Reporting to the Ministry of Agriculture, at the beginning of each cropping season, the program of seed production by species, variety and category, as well as the quantities stored.

Seed importers, exporters and traders should:

- Keep a record of transactions indicating, by chronological order, for each seed species, the variety and category, the quantities bought, kept or sold;
- Submit to the Ministry of Agriculture, at the beginning of each quarter, an overall record of operations conducted during the past quarter as deducted from the material accounting.

The amendment of the law regarding the transactions register should aim at requiring seed producers to liaise closely and formally with research institutes and to demonstrate the inclusion of more recent scientific findings in the area of seed activity. Moreover, importers and traders should also prove the compliance of their seeds with current sustainability standards in Cameroon.

I- The need to adjust seeds certification and quality control rules

Seed companies are expected to report their crops to the Ministry of Agriculture at the beginning of each cropping season.

Certification is dependent on the inspection of nurseries, seed multiplication plots and seed packaging centres. This inspection consists in:

- Verifying the conditions of implantation and seed crops planting;
- Verifying the isolation of seed plots;
- Controlling the purity, cleanliness and health of seed farms;
- Detecting and eliminating off-type seeds and sources of pollution factors;
- Obtaining samples to analyze their specific purity, variety purity, germination, moisture, viability and health.

It is necessary for this certification to take into account the most recent scientific findings

[1] *Article 7 of Law n° 2001/014 of 23 July 2001.*

regarding seed production for sustainable agriculture. To that effect, specific technical regulations should specify for each species or group of species and for each category of seeds, the most rigorous conditions of production to achieve sustainability.

Finally, each institution should insist on the production of sustainable seeds. The Seeds Fund created in 2005[1] should be used for the financial promotion of sustainable seeds. Also, the *Conseil National des semences et obtentions végétales* – CONSOV (National Seeds and New Plant Variety Council) created in 2005[2] should also be an instrument in promoting sustainable seeds.

The law should be adjusted to refuse certification to those producing seeds that do not qualify under sustainable agriculture.

Conclusion

There is no denying that rural areas produce a large quantity of foodstuffs that do not always reach the cities due to the lack of infrastructures which makes it very difficult to transport farm produce. This challenge has led to the decay of some delicate products. Therefore, there is a need to make agricultural products sustainable from the seed stage. This means that they should be able to stand days-long transportation without decaying. These products would enable a permanent supply of cities in foodstuffs.

Urban agriculture is not obvious in Cameroon due to the fact that most Cameroonian cities do not have agricultural areas but only residential, industrial and commercial areas. This research on 'sustainable' seeds should be supported by an adequate legislation in the areas of production, packaging and distribution of agricultural seeds across the country.

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[1] See Decree n° 2005/169 of 26th May 2005 on the creation, organization and management of Seed Fund.
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Urban and peri-urban food security and nutrition in Kenya

Eunice N. Njoroge[1] and Clement P. Ngoriareng[2]

Summary

Kenyan cities and towns like those in most African countries are faced with the challenge of rapid growth both in terms of population and physical expansion. The majority of the dwellers in these urban centres are low income earners with inconsistent sources of income. The inconsistency in income sources impacts negatively on the dietary landscape for the people, contributing to malnutrition and food insecurity. The Kenyan Government has responded to food security crises through major policy intervention such as subsidizing farm inputs e.g. fertilizers and seeds. Urban areas rely on food produced in rural areas. Increasing rural food production will likely lower food prices for city dwellers. Forest Plantation establishment and livelihood improvement scheme (PELIS), formally known as shamba system, has contributed to enhancing food security. Nevertheless, the government should encourage its citizen to diversify their eating habits to other food and avoid over-reliance on maize. Training and education of farmers is an important part of the overall strategies.

Introduction

The cities and towns in Kenya, like many others in Africa, are growing rapidly and so is the population in general. Kenya's population now stands at 40 million with the urban population accounting for about 35 percent of the total out of which 70 percent live in slums. Kenya's urban population grew by 4% in 2010. Only about two thirds of the estimated 40 million people in Kenya are considered to be food secure. The other one third suffers from chronic food insecurity and poor nutrition.

Food security is a situation where people have access to sufficient, safe and nutritious food, which meet their dietary and food preferences for an active and healthy life. Unfortunately, food insecurity and malnutrition prevails in all high density urban areas in Kenya, and they have serious negative effects, especially on the urban poor. Official estimates indicate over 10 million people are food insecure with majority of them living on food relief. In addition, most households have limited choices of other food stuff. Maize being the staple food due to the food preferences is in short supply. Thus, reduced dietary diversity and increasing malnutrition continues to be a key challenge. Moreover, majority of the dwellers in these urban centres are low income earners with inconsistent sources of income. The inconsistency in income sources impacts negatively on the dietary landscape for the people, contributing to malnutrition and food insecurity. Indeed, many urban poor resort to coping strategies such as eating one meal per day or smaller amounts of meals.

Indeed, high food cost coupled with inconsistent sources of income, is a big challenge for urban dwellers. According to research carried out by A. Mwangi and D. Forever, (1996), the urban poor in Kenya spend 60-65% of their income on food. Low income earners, have to choose between buying food and paying for housing. In some cases, some peri-urban residents engage in small scale farming. Crops mostly grown include kales, beans, Irish potatoes, sweet potatoes, arrowroots, cowpeas and bananas, all of which contributes to urban food consumption. Unfortunately, majority of them produce food only for their own consumption. Further, a few peri-urban dwellers engage in small scale livestock production.

In Kenya, the current food insecurity problem is attributed to several factors, which include frequent drought in most parts of the country; unreliable rainfall; high cost of food production due to high cost of inputs especially fertilizers; displacement of farmers in the high potential agricultural areas following the post-election violence in early 2008; skyrocketing prices of food commodities and low purchasing power due to high level of poverty. Due to high cost of food production, farmers have

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resulted to applying no or less quantity of inputs such as fertilizer, pesticides and fungicides than recommended amounts.

Approaches for addressing food shortages in urban areas in Kenya

The Government of Kenya has responded to food security crises through major policy interventions. In 2012, national food and nutrition security policy, which stipulates policies and strategies aimed at addressing chronic hunger and malnutrition currently affecting millions of citizens was launched. Consequently, government and development agencies implementing food and nutrition programmes use the policy to guide the planning and implementation of food security and nutrition interventions aimed at reducing incidences of extreme hunger and malnutrition across the country. Ministry of Special Programmes also distributes food to vulnerable populations. Furthermore, a national urban and peri-urban agriculture draft policy of 2010 is in place to guide, spur further growth as well as sustain the development of the subsector.

Furthermore, the Government has consequently developed a number of policies to facilitate increased farm production, through issuing subsidized farm inputs especially fertilizers; providing farmers with planting materials and seeds especially of draught tolerant which can be grown in arid and semi arid areas; initiating irrigation dam projects; opening up of free trade within the East African Community; imports food from other countries to satisfy the demand; provision of rural credit for farming; and improvement of rural infrastructure. In line with this, the Government, through County governments, has embarked in improving infrastructure especially road networks to enhance transportation of food products from the rural areas to urban dwellers.

In addition, Kenyan government through the Ministry of agriculture is promoting urban and peri-urban agriculture, to improve food access among the urban poor. However, urban areas rely on food produced in rural areas. Increasing rural food production will likely lower food prices for city dwellers. Recognizing this, the Government introduced tree planting and forest Plantation Establishment and Livelihood Improvement Scheme (PELIS). PELIS is a modified form of 'Taungya' system or 'shamba' system, which for a long time has been used by the Government of Kenya to establish forest plantation where forest adjacent communities benefit from cultivating food crops in the forest, while the forest authority benefit from establishment of forest plantation at low cost. PELIS has also played a big role in providing other significant benefits such as making arable land for the landless and thus contributing to food production. Crops mostly grown include Irish potatoes, maize, cabbages, kales, peas, beans, onions and carrots. N. Mwatika, (2013), found out that PELIS farmers in Gathiuru forest were able to produce an average of 87 bags of potatoes per acre per year which enhanced food security.

Indeed, five steps and initiatives have been identified to ensure improved food security of growing urban populations. Step one is to acknowledge that poverty and related food insecurity and malnutrition issues are serious urban development problems with national and international security ramifications. The second step addresses, the need of farmers to acquire requisite skills and resources to begin to address these problems. The third step stresses the need to build linkages between domestic food production and urban markets, paying special attention to the employment, health, and nutritional needs of the urban poor. The fourth step emphasizes that, universities and international agricultural research centers should focus more of their research on food security and nutrition needs of the urban poor; and the fifth step acknowledges the importance of ensuring that, the NGO (Non-Governmental) community, donor and development agencies work closely together with the Kenyan government to address urban problems of rural poverty, food insecurity, and malnutrition

Conclusion

Food insecurity and malnutrition prevails in all high density urban areas in Kenya, and they have serious negative effects, especially on the urban poor. Recognizing the need for a specific food security and nutrition management strategy for urban areas, the Government of Kenya launched a national food and nutrition security policy to address chronic hunger and malnutrition. Further, a number of policies are in place to facilitate increased farm production, through improving infrastructure such as roads; issuing subsidized seeds and fertilizers; importing food from other countries to satisfy the demand; initiating irrigation dam projects; promoting urban and peril-urban agriculture to improve food

access among the urban poor, among others. Indeed, urban areas rely on food produced in rural areas. Increasing rural food production will likely lower food prices for city dwellers. The tree planting and forest Plantation establishment and livelihood improvement scheme (PELIS), has significantly contributed to enhancing food security.

Recommendation

Training and education of farmers by agricultural extension officers is an important part of the overall strategies to help farmers produce short-cycle crops such as tomatoes, vegetables and beans; adopt greenhouse farming; carryout water harvesting; as well as control pest and diseases. Further, construction of food storage facilities, improvement and maintenance of feeder roads in rural areas, promoting agro-processing and value addition is also essential. The government should offer incentive for citizens to accept farming as a career vis a vis white-collar jobs, as well as encourage its citizen to diversify their eating habits to other food and avoid over-reliance on maize.

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Farmers holding freshly harvested cassava (Manihot esculenta). Murango, Kenya
Photo credit: © Bill & Melinda Gates Foundation/Frederic Courbet.

Country Focus:
Democratic Republic of Congo

Water in urban and peri-urban horticulture in Democratic Republic of Congo

Ruhiza Boroto[1]

Summary

The challenges of demographic growth, accelerated urban migration coupled with the food crisis of 2008 have increased the reliance on food produced from urban and peri- urban horticulture. The cities of the Democratic Republic of Congo (DRC) have particularly resorted to urban and peri-urban agriculture with a measure of success. The National Support Service for Urban and Peri - Urban Horticulture (SENAHUP) in DRC in collaboration with the Food and Agriculture Organization of the United Nations (FAO), with Belgian funding, has demonstrated over a decade the contribution of urban and peri -urban horticulture to food security while, at the same time, boosting the local economy through job creation and substantial income generation. The success of this intervention has made the DRC a reference for urban and peri- urban horticulture which is set to be replicated in other African countries.

In a quest to achieve a greater integration of horticulture with urban landscapes and sustainable development, the following actions are proposed:

- *Consolidating the gains from past interventions in the DRC and providing a platform to promote and integrate national and international partnerships;*
- *Integrating horticulture in the context of urban and peri- urban landscapes from a perspective of urban water catchment management in the broader context of urban planning and taking into account environmental and health considerations,*
- *Providing a framework for an enabling environment, involving other role-players in the urban and peri- urban horticulture value chain, including those involved in urban planning and landscaping and the private sector at different stages, to facilitate synergy of benefits.*

This discourse advocates for a proactive, innovative and integrated approach in urban and peri urban horticulture as it relates to water management by embracing the unique opportunities offered by rapid urbanization in Africa, as illustrated by the case of the Democratic Republic of Congo and its capital city, Kinshasa and considering the consequences of not taking diligent action and the complexity of the inter related intervention areas.

Introduction

The Democratic Republic of Congo is the size of Western Europe and is endowed with rich natural resources: water, arable land, forestry and minerals and mostly, its ingenious people. Population growth stands at 2.6% per annum, with a population that has grown from 50 millions in 2000 to more than 68 millions 10 years later. This demographic growth is mostly centered around cities.

Projections are that in 2050, 60% of the world population will be living in cities. This brings the double challenge of safe housing and food security. The rate at which many cities are growing outpace the capacity of planners to provide essential services such as housing, food, transport, education and health. In parallel with formal settlements, informal settlements (with different standards of housing) are increasing around cities, mostly in the developing world.

Kinshasa, the capital city of the Democratic Republic of Congo, is an illustration of this pattern, it has seen its population grow from approximately 300 000 to close to10 millions in the space of 50 years (between 1960 and 2010)[2]. Today, Kinshasa is, together with Cairo and Lagos, one of the three African cities with a population of more than 10 millions (UN DESA, 2014). The city has mostly

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[2] *No census was undertaken in the D R Congo since 1984, these are estimates from various sources.*

grown informally and the provision of services has hardly followed its expansion.

The First Status Report on the State of Urban and Peri Urban Horticulture in Africa (FAO, 2012) gives a detailed account of how horticulture has developed in Kinshasa over the decades, mimicking the city's population growth and socio-economic conditions, in response to various pressures, including urban migration, lack of adherence to the colonial plans for the expansion of the city, global economic crises, and increased demographic movements towards cities, exacerbated by the civil war. The country's authorities have attempted, in this context, to provide guidance to the development of horticulture in the country through various mechanisms, including the creation of a National Support Service for Urban and Peri - Urban Horticulture (SENAHUP) which, as a service of the Ministry of Rural Development, has been the main counterpart of the FAO, the international organization providing technical guidance.

A success story: National Support Service for Urban and Peri - Urban Horticulture (SENAHUP) project in Democratic Republic of Congo

Rapid urbanization, like in many other low income countries, has resulted in high levels of unemployment and poverty and in malnutrition. In this context, the project "Appui au développement de l'horticulture urbaine et péri-urbaine in the DRC[1]" reached through its activities, 16000 producers and created approximatively 60 000 jobs along the value chain. Through its three phases the project reached five cities: Kinshasa, Lubumbashi, Mbanza-Ngungu, Kisangani and Likasi (FAO, 2010). A more detailed account of the achievements of the project is provided elsewhere in this issue (Hodder A *et al*, 2014). Of particular interest is the case of the site of Tshamalale, on a 6 ha area on the western outskirts, of Lubumbashi, with regard to securing access to safe water, and at the same time, protection from heavy rains.

Other countries were later targeted to benefit from this positive experience. These include Burundi, Côte d' Ivoire, Madagascar and Rwanda. These gains are now set to be replicated in other countries such as through an African Solidarity Trust Fund horticulture project targeting six countries: Cameroun, Chad, Congo, Equatorial Guinea and Sao-Tome and Principe.

Integrating water and horticulture in urban landscapes for sustainable development

With urban migration set to increase in Kinshasa and other African cities, the needs for food security, job creation and income generation will continue to increase. Beyond the proven potential of urban and peri- urban horticulture to respond to these needs, long term interventions, using an urban water catchment as a management unit, are required to:

- prolong these gains in cities where urban and peri- urban horticulture has been a success, starting by Kinshasa to further showcase the sustainability of these interventions
- integrate horticulture in urban planning using an urban catchment management perspective within which the water cycle provides options for management and opportunities for optimizing the use of resources,
- provide the required enabling environment, including a representative consultative platform, institutional arrangements and adequate policies and laws.

These proposed interventions are further discussed below:

1. Ensure that the gains from past interventions are not lost in the DRC and that they can be successfully replicated elsewhere. This might require specific actions depending on the problems that will be identified. Thus, a situation assessment of the sustainability of these gains would be a starting point. The assessment will answer to questions such as:
    - Are the horticulture activities initiated by the project still continuing like during the project?
    - Is food still being produced at the same levels?
    - Are the jobs created sustained and is income still generated and what are the impacts of the project?
    - Are there any new issues that have emerged that the project might have overlooked, with regard especially to interaction with the water cycle?

[1] *This title is translated into English as "Support to the development of urban and peri urban horticulture in the Democratic Republic of Congo"*

2. Ensure that horticulture is well integrated with urban and peri- urban landscapes from a perspective of water resources in urban catchment management context, by initiating relevant actions. The following questions will be addressed:
    - how is horticulture integrated in urban planning?
    - using an urban water catchment management approach, what are the interactions between urban processes and horticulture that can be streamlined in urban planning from an architectural, water (surface and groundwater), land and waste management perspective ?

During a workshop facilitated by the author at the Salon de l'Architecture, Immobilier, Bâtiments et Travaux Publics (SARIBAT) in Kinshasa in June 2014, the participants, consisting mostly of architects, agreed on the following actions for the sustainable utilization of water in agriculture in urban and peri urban catchments, considering impervious surfaces, liquid and solid wastes:

- Use Domestic Rainwater Harvesting for horticulture which can be enacted in by-laws
- Collect water through in-field and ex-field Rainwater harvesting within urban catchment management - including drainage – plans
- Protect urban and peri-urban rivers against pollution, including buffer zones, to ensure safe water for agriculture
- Protect urban and peri- urban aquifers from pollution
- Ensure safe use of waste water for agriculture
- Do not use potable water for agriculture
- Use of domestic solid and liquid waste for composting and bioenergy
- Consider other sources of energy of domestic use or for urban and peri urban agriculture, such as solar power for pumping groundwater
- Create a consultative platform for sustainable urban planning
- Piloting the above actions in one urban and one peri-urban catchments in Kinshasa

3. If horticulture has to become an integral part of urban and peri urban planning, then an enabling environment needs to be put in place. Is there a framework for involving other roleplayers in the horticulture value chain, including those involved in urban planning , landscaping and water resources and wastewater management, and the private sector at different stages, to establish synergies that facilitate an integrated approach and synergy of benefits.

Consequences of not taking action

While the gains achieved by horticulture in Kinshasa and the other cities in the DR Congo are recognized, several risks need to be taken into consideration and mitigated against, considering that wider adoption of urban and peri urban agriculture holds proven hazards such as documented for the city of Accra in the case of faecal exposure (Keraita B & Amoah P, 2011). Using water catchment management in the context of integrated urban planning and landscaping, the following need to be considered with regard to horticulture:

- Disturbed landscapes: erosion, land degradation, loss of lives due to land slides or contamination from solid wastes
- Increased risk of water borne and other diseases such as malaria, bilharzias and cholera
- Exposure to several forms of contamination, bacterial or from other sources such as polluted air from cities which deposits particles on vegetables,
- Threat to water quality (from surface and groundwater) and unsafe use of wastewater for agriculture with of risks of contamination
- Increased long term risk of other diseases due to prolonged consumption of contaminated vegetables
- Loss of opportunities to optimize water from various sources
- In the case of Kinshasa, continued loss of biodiversity of urban rivers as recognized by participants during the SARIBAT workshop who lamented the disappearance of fish in some of the city's rivers.

In sum, a bold approach is required to avoid all possible consequences of poor management of the interactions between water resources, horticulture

and urban and peri-urban planning and landscaping. If possible, it could be an opportunity for restoration of urban ecosystems and mostly, showcasing how to do things better in the future, in the face of increasing pressure.

The way forward: exploring opportunities of a urban water catchment approach

A plan of action is therefore required, based on a water catchment management approach integrated in urban planning. Thus, it is proposed to pilot this approach in two existing urban and peri urban catchments in Kinshasa, and draw lessons for:

- Possible corrective actions and promotion of good practices, along the integrated chain of actions – design of residential houses, possible retrofitting of rainwater harvesting gutters and cisterns or tanks, sanitation, drainage, household and community landscaping, treatment of solid waste, land use, all aimed at optimizing the long term benefits of urban and peri urban horticulture, among other benefits
- Blending coherently horticulture in urban landscapes in future developments
- Identification of needs for policy, laws and by-laws
- Sensitization of stakeholders at all levels, including the private sector, and providing for an institutional framework
- Gradual implementation of a sustainable urban and peri urban horticulture that is well embedded in urban water catchment planning and management and producing more food, responding to food security issues, job creation and employment creation while ensuring environmental sustainability , social equity and health.

It is now time to take further action; it is time to invest in the implementation of the above proposed actions and efforts to mobilize resources to this end are under way. Emphasis is on the use of an integrated urban water catchment management approach to carry out urban and peri urban horticulture in Kinshasa.

The proposed project is still on the drawing board, but will be operationalized once funds are available. It should serve as a pilot project providing lessons that will further assist other cities that are embarking on the same path to: improve food security, create decent jobs, generate income, while contributing to environmentally sustainable urban landscapes.

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[1] *This is translated in English as ' Water and urban and peri urban agriculture in the 21st century'*

FAO Activities and Results

Management of natural resources by the urban and peri-urban horticultural sector: The experience of an FAO-assisted project in the Democratic Republic of the Congo[1]

Alison Hodder[2], Yota Nicolarea[3] and Wilfried Baudoin[4]

Summary

Urban and peri-urban agriculture in the Democratic Republic of the Congo (DRC) is part of the national agriculture development strategy. Through a twelve-year project to support the development of urban and peri-urban horticulture in five cities in the country, important steps have been taken for the sustainable development of the sector and its formal integration into the urban development planning process. To address the different challenges this article describes the 5-S approach adopted by the project, in line with FAO's "Growing Greener Cities" policy guidelines, which relate to: (i) Securing fertile land by solving land tenure issues, and securing the availability and access to water of good quality to allow for irrigation and intensified year-round production activities, (ii) Securing the quality and safety of produce while protecting the environment, (iii) Securing the empowerment and capacity of different partners and stakeholders of the value chain (iv) Securing market outlets and stimulating demand, and (v) Securing political commitment and institutional support to ensure the consolidation and future expansion of urban and periurban horticulture in line with the urbanisation process[5]. The article looks at the activities of the project focussing specifically on the management of natural renewable resources and illustrates how their optimal uses can deliver not only enhanced food security but also significant environmental benefits.

Introduction

Although the Democratic Republic of Congo is endowed with vast natural wealth – water, arable land and minerals, it is unfortunately one of the most food insecure countries in the world. This has resulted from the painful years of political instability, a violent civil conflict and a five-year regional war, which have left its population deeply impoverished and food insecure (FAO, 2012, p. 58). The Government and the international community, aware of the gravity of the situation, focused their support on agricultural projects and programmes to address food availability and access. During this difficult period, resourceful and resilient citizens revived an age-old survival strategy: across the country's cities, urban dwellers began growing vegetables and root crops around their dwellings, and on vacant lots along roads and any water points.

Areas dedicated to market gardens within and around cities also expanded rapidly. Many of the new growers were displaced rural people who had settled in the city's outskirts in search of security. For the national government and FAO, this spontaneous growth of urban and peri-urban

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[1] The article draws on content from FAO published materials on project GCP/DRC/028/BEL and FAO's "Growing Greener Cities" - Programme for Urban and Peri-urban Horticulture. Citations to these materials are referenced in the text. A full list of on-line references is provided at the end of the article.

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[5] For a broader perspective on FAO's approach to the sustainable development of urban and peri-urban horticultural sector, see also http://www.fao.org/ag/agp/greenercities/en/approach/index.html

horticulture presented an opportunity to address the country's immediate needs for food and to sow new seeds of hope. Together, they launched a project to strengthen a vibrant urban and periurban horticulture sector that would contribute to urban food security, improved nutrition and sustainable livelihoods now and in the future (FAO, 2010a, p. 3).

In the years ahead, the country will face a new challenge. Its population is growing by more than 2.6 percent a year, rising from 50 million in 2000 to 68 million just one decade later[1] (FAO, 2010a, p. 2). Some 23 million Congolese now live in one hundred cities and towns, stretching from Africa's Great Lakes to the mouth of the Congo River. Their number is expected to reach 40 million by 2025, due to population growth and migration from rural areas. Most of the urban population depends on informal employment, lives below the poverty line, and is highly vulnerable to food price surges. Even before the cost of staples rose by 50 percent in 2008/09, the less poor of the urban dwellers could afford only one meal a day (FAO, 2012, p. 60). As in many other low-income countries, rapid urban population growth in DR Congo is accompanied by high levels of poverty, unemployment and malnutrition.

Urban and peri-urban horticulture in DR Congo and implications for natural resources

Urban and peri-urban horticulture improves a country's preparedness to bear the impact of massive and rapid urbanization (FAO, 2010b, p. 1-4).

The project described here, funded by Belgium, focused on five cities: Kinshasa, the country's capital city and the second largest city in sub-Saharan Africa with a population of 8.7 million; Lubumbashi, the country's second largest city (population: 1.5 million); Kisangani (population: 810 000); Likasi (population: 370 000); and Mbanza-ngungu, a hilly city of 100 000 inhabitants located some 120 km southwest of Kinshasa[2].

In and around these five cities, some 150 000 tonnes of vegetables are now produced every year on some 4, 500 hectares. Overall, the project helped supply fresh and nutritious produce to about 11.5 million urban residents and consolidated employment and income, for 60 000 people (FAO, 2010a, p. 2; 25).

Although there was great potential for horticulture in and around these five cities, where sizeable areas of fertile land suitable for vegetable production were available, major constraints such as lack of secure tenure over land used, limited access to water and inadequate irrigation and drainage, hindered the sector's sustainable development (FAO, 2010a, p. 4).

Most small-scale gardeners cultivated vacant lots, without permits or land titles from the municipal authorities. In Kinshasa, even growers' cooperatives had no legal title to the land they cultivated. Without secure tenure, growers' livelihoods were precarious and the incentive to invest in production was weakened. Floods seriously hampered production at the height of the October-May rainy season, while the lack of irrigation reduced the cultivable area during the dry months of June-September. Women used to fetch water in buckets from sources up to 500 m from their plots, and some growers used untreated wastewater to irrigate their land (FAO, 2010a, p. 5).

A series of interventions were needed to tackle these important challenges and strengthen the sector's productive base. With FAO's technical support, overall guidance by the Ministry of Rural Development's National Support Service for Urban and Peri-urban Horticulture (SENAHUP) and financial assistance from Belgium and the GCP/DRC/028/BEL project, a firm governing structure has been put in place to support project activities and ensure political and institutional commitment. FAO has worked with the government at national, provincial and city level to support market gardeners and help put in place a process for sustainable development of urban and peri-urban horticulture.

Secure access to land by growers was achieved by means of consultations with the municipal authorities, and the registration of existing market garden areas and their users (FAO, 2010a, p. 6). In total, secure land tenure to 1 225 ha was

[1] See also: social indicators included in the *2013 World Statistics Pocketbook Country Profile: Democratic Republic of the Congo* (http://unstats.un.org/unsd/pocketbook/PDF/2013/Democratic%20Republic%20of%20the%20Congo.pdf)

[2] Launched in June 2000, the project was extended to a second phase starting in October 2004 and to a four-year third phase from January 2008. Funding totalling US$10.4 million has been provided by Belgium (FAO, 2010a, p. 3).

guaranteed through leases, permits and zoning. Facilitated by the project activities, market gardens were protected from urban sprawl by permits obtained through the municipal authorities. A typical example is the Naviundu market garden scheme, one of the oldest community garden schemes in Lubumbashi. When the first growers began cultivating amaranth in the rainy season there in 1996, the area was sparsely inhabited. Today, its 8.5 hectares are surrounded by new homes. With the help of the project, the growers' right are protected from urban sprawl by land use permits secured for agriculture obtained through the municipal consultation committee (FAO, 2010a, p. 8). In 2004, the project built a small dam to divert stream water to the market garden scheme and developed an irrigation network that allowed year round production. Growers now cultivate a diverse range of crops, including okra, Chinese cabbage, onion, tomato, celery, and leek. As a result of intensification the scheme employs up to 400 casual labourers and total annual yield has tripled for 25 tonnes to 75 tonnes per hectare.

In 2010, FAO took stock of the project's achievements since 2000. Its activities reached more than 16 000 small-scale growers producing vegetables on 1.900 hectares. The project sites accounted for more than half the total area dedicated to commercial horticulture in the five cities (FAO, 2010a, p. 25).

Upgrading irrigation infrastructure and flood control significantly increased the amount of vegetables produced. By 2010, more than 50 water control works were in place, providing irrigation and drainage for 1 500 ha of market gardens in the five cities. Small-scale irrigation systems helped reduce watering times, the introduction of drip irrigation extended water availability, and the construction of small dams allowed growers to expand the cultivable area but also to extend the cropping period into the dry season. As a side benefit, the project secured safe drinking water for neighbouring communities (FAO, 2010a, p. 10).

Through farmer field schools, the project introduced improved cultivation methods that led to better quality and significant increases in vegetable production and growers' incomes. Market gardeners began to cultivate more profitable crops, such as spring onions, celery, eggplant, cabbage and tomato, in addition to traditional leafy vegetables, such as amaranth, sweet potato, sorrel and spinach (FAO, 2010a, p. 10).

An external evaluation of the project found that it had boosted horticulture production, employment and growers' incomes, thanks mainly to the expansion of irrigated areas, better control over irrigation and drainage, intensification of the production and diversification to more profitable species for year round supply of the market. In both Kinshasa and Lubumbashi, the average income of market gardeners participating in the project increased from US$ 160 to US$ 600 (FAO, 2010a, p. 11).

A typical example of the how the project was instrumental in providing access to new markets is illustrated on what happened at the Tshamalale site on a 6 ha area on the western outskirts, of Lubumbashi. With the technical and financial support of the project three growers' associations dug five wells 5m deep to tap into that area's rich groundwater resources. Then they used a project loan facility to buy a low pressure drip irrigation system and install tropical greenhouses to protect the crops from the heavy rains and insect pressure. This allowed them to grow a diversity of crops viz. tomatoes, cabbages, green beans, onions and zucchini all the year round. The area currently produces around 2, 5 tonnes of produce a week, for sale mainly to the city's supermarkets, which used to import fresh vegetables from Zambia and South Africa (FAO, 2010a, p. 26).

Environmental improvement

With adequate guidance and support urban and peri-urban gardeners can grow more and better quality produce while preserving the urban agro-ecosystem and contribute to the beautification and greening of neighborhoods with significant benefits to the environment.

Growing crops within and around the cities not only protects natural resources but also adds to them. Eco-friendly cultivation using less fertilizer, less pesticide and less water helps cities grow more fruit and vegetables while preserving its natural resources and lowering contamination risks (FAO, 2012, p. 11).

Periurban green belts protect environmentally fragile land from unregulated urban growth thus containing urban sprawl and improving landscapes and the

quality of life of citizens (FAO, 2010a, p. 2). The proximity of urban and periurban production and short supply chain, reduces the need to transport produce from distant rural areas, thus generating fuel savings and reducing air pollution (FAO, 2012, p. 17).

Treating wastewater for re-use in urban and peri-urban horticulture through a "circular" approach, in which secondary resources, such as wastewater, are recovered and reused, adds to the urban water management and provides safe water for horticulture[1] (FAO, 2012, p. 10). Drip irrigation and rainwater harvesting also reduce the demand on urban water supplies. In addition, maintaining green zones in urban areas helps maintain good soil structure and porosity which improves aquifer recharging and reduces runoff preventing landslides and flooding (FAO, 2010b, p. 11).

Conclusions

Thanks to its low start-up costs, the high nutritional and high market value of its produce, urban and periurban horticulture provides for a real opportunity to improve livelihoods for the urban poor, including in particular, those newly arrived from rural areas. It generates further employment along the value chain from producer to consumer. Building a sustainable urban and periurban horticulture sector provides a basis for good governance by fostering closer collaboration among central government and decentralised municipal authorities (FAO, 2010a, p. 2; see also, FAO, 2010b, p. 13).

Developing sustainable market gardens to serve cities requires that policymakers recognize the sector's current contribution and future potential to the urban food supply, urban livelihoods and the environment. Protecting land and water for market gardens, and encouraging growers to adopt eco-friendly "Save and Grow" farming practices[2] that produce more, results in reducing food contamination risks and protecting the environment (FAO, 2012, p. 3). Last but not least, urban and periurban horticulture strengthens the social links and forms healthy communities – vegetable gardens provide vulnerable and socially excluded groups with food, income and a shared enterprise, and are a constructive channel for young people's energy and innovative capacity (FAO, 2010a, p. 2).

It is expected that the demand for fruits and vegetables will continue to increase, in line with the expanding urban population. This engenders opportunities for urban and periurban horticulture, which in turn requires attention and support and protection on behalf of national and decentralised authorities to ensure its sustainability.

The way forward

Action is needed to steer urban development towards greener cities that contribute to food and nutrition security, decent work and income, a clean environment and good governance for all citizens. To help achieve that goal, FAO launched in 2000 a multidisciplinary initiative, "Food for the Cities", which aims at ensuring the access of urban populations to safe food and a healthy environments. FAO's Programme on "Growing Greener Cities" is a key component of this initiative. It helps governments and city administrations to optimize policies, institutional frameworks and support services for urban and peri-urban horticulture, to improve production and marketing systems, and to enhance the horticulture value chain (FAO, 2010b, p. 16). Governments are encouraged to capitalise on the positive results yielded from urban and periurban horticulture in support of national food and nutrition security strategies and to safeguard this productive sector of agriculture through its integration in the urban planning and development process.

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[1] See also: Factsheet prepared by FAO's Water Development and Management Unit (http://www.fao.org/docrep/016/ap524e/ap524e.pdf)

[2] *See also: Save and Grow Factsheets (http://www.fao.org/ag/save-and-grow/en/factsheets/index.html)*

Bringing Brazil's school feeding best practices to scale in Africa and Latin America

Festus K. Akinnifesi[1] and Najla Veloso[2]

Summary

This article explores how Brazil's School Feeding Programme (SFP) offers a "triple-win" southern solution that is being shared with countries in Africa and Latin America: it provides a wide range of social protection benefits in both urban and rural areas, including i) improving the nutrition and health of millions of young school pupils; ii) helping to reduce absenteeism, especially among children of poor families, and improving the pupils' ability to learn and concentrate. The programme also offers food and nutrition education for school children and the opportunity to develop a foundation for healthy eating habits; and iii) providing a guaranteed market to family farmers. This is being done through various modalities, including technical assistance, policy dialogues and seminars, modular and semi-virtual training of different actors.

Introduction

Brazil's agricultural and food security transformation, including its long history of successful national programmes that have impacted on millions of people has continued to attract increasing global attention (Cabral, 2012). Established over 50 years ago to provide food for poor children, Brazil's school feeding programme has been transformed over the past few years. Access to school meals has become a universal right under Brazilian law. By 2012, Brazil's national feeding programme reached some 45 million students in 250,000 schools that now get at least 30% of their daily nutritional needs when they attend school. School feeding programmes are globally recognized, as an increasingly important scalable social inclusion, social protection and safety-nets that aim at providing dietary, health and educational benefits to school pupils.

Although most countries in Latin America and Africa already had some form of school feeding programme – consisting, in some cases programmes that are, in many cases *ad hoc,* involving a segment of the students population and rarely meet the recommended nutritional standards. The purpose of this article is to show how Brazil's model of school feeding and family farming are inextricably linked to improved wellbeing of both school pupils and family farmers, especially in the urban areas.

A South-South partnership for change

Since 2009 Brazil has been sharing its successful experience, knowledge and best practices on School Feeding Programmes with 13 countries in Latin America. More recently, the school feeding experiences are being shared in three countries in Africa, including Ethiopia, Malawi, and São Tomé and Príncipe. Great advances have been made in recent years to mainstream and strengthen school feeding programmes in Latin America and Africa. The project on strengthening School Feeding Programmes is a tripartite South-South initiative involving the Brazilian government, the Food and Agriculture Organization of the United Nations (FAO), and a growing number of countries in Latin America and Africa. First, the initiative seeks to help countries strengthen their School Feeding Programmes, based on the experience in Brazil. Second, it builds the skills and knowledge of people involved in school feeding programmes at every level, from central government to the councils and local schools. Third, it generates and shares technical knowledge and best practices in the framework of FAO's South-South Cooperation programme, as a way to boost local economic development.

The role of school gardens

School gardens are playing an increasingly important role in public schools. Many schools have had gardens for a long time, but they have not assumed an important teaching role until recently.

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Incorporating food and nutrition education into the school curriculum through school feeding programme is an important step in helping children to make healthy food choices. Nutrition has now become part of the teaching curriculum in many schools. School children also learn how to grow food in the school gardens.

The link to family farms

Family farming, the practice which constitutes the main food source for School Feeding Programmes, involves about 500 million people worldwide, and in South America, family farming takes place on 18% of the land and produces about 40% of its food. It represents 70% of the food consumed by Brazilians. Family farming is being seen as an engine of development in Brazil, and its policies towards family farming are now increasing part of its South-South Cooperation engagement in Africa and Latin America.

School feeding in Malawi

Brazil's 2009 School Feeding Law stipulates that at least 30% of the food provided to the school feeding programme should come from family farms. Many Councils, including Joinville, Santa Catarina, are now doing even better than that. In 2010, 31% of the food supplied to public schools in Joinville came from family farms. The figure had risen to 37% by 2013 and is expected to exceed 50% – worth approximately USD 1.32 million – in 2014. "The school feeding programme has helped to transform the lives of many farmers in the urban and rural areas," says Acácio Schrueder, president of Coopaville Cooperative, whose 73 members supply food to schools in Joinville (Box 1).

School feeding in Ethiopia

Box 1. School Feeding Boosts Income for Family Farmers

For family farmers like Clyre Wiezbicki, the School Feeding programme has been a godsend. Before his local council invited farmers to supply food to the public schools, Clyre and his neighbours struggled to make ends meet. "We used to sell what we grew in the town square, but there was no guaranteed market and we didn't earn much," he recalls.

Clyre Wiezbicki's life began to change for the better in 2009 when he gained access to the institutional market. "For us, everything changed when the Council invited us to provide food for the school feeding programme," recalls Clyre. Every two weeks, Clyre delivers bread, fresh fish and vegetables to schools in Joinville. He is always paid within 15 days of delivery, either directly or through the cooperative.

Today, Clyre is growing fruit and vegetables, and supplying fish and bread, to schools in and around Joinville, a prosperous town with around half a million inhabitants in the state of Santa Catarina in southern Brazil. "My family is now much better off" he reflects. "I've been able to rebuild my house and set up a bakery. We've even been able to buy a car." Clyre is just one of some 120,000 family farmers who are benefiting from Brazil's school feeding programme.

Indeed, many countries in Latin America and Africa, have taken School Feeding Programmes well beyond proof-of-concept stage. In 2013, a joint study was undertaken by FAO-Brazil Cooperation, through the project "Strengthening of School Feeding Programmes in Latin America and the Caribbean", in eight participating countries, including Bolivia, Colombia, El Salvador, Guatemala, Honduras, Nicaragua, Paraguay and Peru, which showcased the contributions of School Feeding Programmes to strengthening children's social protection, food security and nutritional status (FAO, 2013). In terms of cost, various programmes examined in this regional study estimated that a combined budget of $940 million was devoted to these programmes in the eight countries during 2011-2012, benefiting 18 million students of different ages and educational levels. This translates to an annual net investment of $25 per student, which is by far considered a cost-effective approach. On average, students receive food during 150 days per year. These budgets are spent primarily on purchase, storage and distribution of food. The study also shows that, in most cases, the infrastructure conditions in the schools are inadequate for food preparation and consumption of the school meals. According to the report, all countries studied showed interest in sourcing food for school programmes from family farmers as a way to foster local development.

The school feeding is also twinned with another programme - the "Purchase from Africans for Africa Programme" (PAA), an innovative sourcing of food for school meals from small-scale farmers. It is reported to have benefitted over 5,000 family farmers in feeding programmes in 424 schools in Ethiopia, Malawi, Mozambique, Niger and Senegal, with some 120,000 students benefitting (FAO, 2014).

Conclusion and Way forward

Investment in school feeding programme has an increasingly important role to play as a social protection tool to ensure school children are free from hunger and malnutrition while in school, thereby improving school attendance and concentration in their learning. Moreover, the School Feeding policy allows the development of healthy eating habits for all students as well as for school community, including teachers and parents. In this way, given that children are the workforce and leaders of tomorrow, school feeding intervention has the potential to improve the livelihood of family farmers, and the quality of life of the both present and future generation. The stage is set to strengthen and bring school feeding programmes to scale in both rural and urban areas of Africa. However, questions remain, especially in Africa, as to how political commitments can be translated to concrete actions. Efforts should be geared towards improving the health, educational and nutritional benefits of food in schools. South-south and tripartite South-South initiatives provide a robust framework for sharing school feeding knowledge, experiences and best practices among governments and key actors.

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Links

Recent treatise on urban food forestry

Introducing urban food forestry: a multifunctional approach to increase food security and provide ecosystem services

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Download at: http://urbanfoodforestry.org/wp-content/uploads/2013/08/Introducing_urban_food_forestry.pdf

Urban horticulture in DRC reaps $400 million for small growers and city malnutrition drops as more affordable fruit and vegetables become available.

An FAO urban horticulture programme in the five main cities of the Democratic Republic of Congo (DRC) has taken a bite out of chronic malnutrition levels in urban areas and created a surplus with a market value of over $400 million. The programme, started as a response to mass urban migration following a five-year conflict in the eastern DRC, now assists local urban growers to produce 330 000 tons of vegetables annually.
Find the full piece at: http://www.fao.org/news/story/en/item/79813/icode/

The 5th of December declared the World Soil Day and 2015 is designated the International Year of Soils

Soil is the basis for food, feed, fuel and fiber production. Without soils it will not be possible to sustain life on Earth, and where soil is lost it cannot be renewed on a human timeline. Despite humanity's knowledge of this fact statistics has it that a third of the world's soils are degraded by erosion, nutrient depletion, acidification, urbanization, and chemical pollution. In December 2013, in an effort to raise awareness and safeguard soil resources, the UN General Assembly declared the 5th of December to be the World Soil Day each year.

More attention will be paid to soils next year as the UN has designated 2015 as the International Year of Soils.
More information at:
http://ens-ewswire.com/2014/07/25/global-action-plan-to-protect-soil-resources-approved/
Source: Environment News Service (ENS) 2014.

Resource Centres on Urban Agriculture and Food Security

The RUAF Foundation (Resource Centres on Urban Agriculture and Food Security) is an international network of seven regional centers and one global resource center on Urban Agriculture and Food Security. Focusing more heavily on urban agriculture in developing countries, the foundation publishes the Urban Agriculture Magazine and other papers, books and policy briefs about urban agriculture developments. Under RUAF's 5th Area of Work "Urban agriculture and city adaptation to climate change", RUAF supports local governments in the integration of urban agriculture and forestry into strategies for climate change adaptation and disaster risk reduction by training local staff, including food in urban vulnerability assessments and land use planning, and identifying urban agriculture and forestry models with high relevance for climate-change mitigation and adaptation (e.g., productive use of flood zones, agroforestry on landslide-prone slopes, productive rooftop gardens).
For further reading visit: http://www.ruaf.org/about-ruaf
Source: http://community-wealth.org/content/ruaf-foundation-resource-centres-urban-agriculture-and-food-security

The 2014 edition of FAO's flagship publication, the State of the World's Forests (SOFO 2014) analyses data on the socioeconomic benefits of forests, showing that well managed forests have tremendous potential to contribute to sustainable development and to promote food security.
Download : http://www.fao.org/3/a-i3710e.pdf
Previous editions can be accessed from the website: *http://www.fao.org/forestry/sofo/en/*

NEWS

HOW TO DRAMATICALLY REDUCE HUNGER - EVEN IN VERY POOR COUNTRIES

Some 60 developing countries have reduced the proportion of their populations experiencing chronic hunger by half or brought it to under 5 percent, meeting or exceeding international goals. Based on this evidence, there is a growing consensus that, with better food security and nutrition governance and comprehensive approaches, hunger can be dramatically reduced – even in very poor countries. Great care must be taken in drawing lessons from different countries, but experience shows that **three types of political initiatives have been crucial to sustain progress on food security and nutrition**. First, political commitment at the highest level is the necessary condition for successful national initiatives to reduce hunger, food insecurity and malnutrition. It is needed to make the issue a government-wide priority and to address governance bottlenecks inhibiting progress. This effort can be further supported by legally establishing a right to food.

Second, broad social participation is the amalgam that sustains these efforts, even in the face of changes of government, limited budget and socio-economic and climatic shocks. It ensures the hungry themselves are heard when programs are designed and put into motion; it enhances accountability; and it distributes the burden of implementation. Institutional mechanisms involving civil society and the private sector can make this social participation happen.

Third, ending hunger and malnutrition requires a large-scale, comprehensive approach, linking macro-economic, social, health, sanitation, environmental, agricultural and education policies. Investing in food security is a small price to pay for something that not only is an ethical imperative but also brings benefits to society as a whole in the form of healthier, more productive citizens and by triggering other development dynamics.

Looking at how different countries are responding to the food security challenges they face, three main areas of action emerge: social protection; raising productivity and net incomes of small-scale agricultural producers; and using special instruments to address nutritional deficiencies in mothers and children under five years old.

Social protection key: Social protection measures for the poor are key. When integrated with rural and agricultural development policies as well as special nutrition initiatives, impressive results often follow. It is important to remember that three quarters of the world's very poor live in rural areas, and many are themselves producers of food.

Boosting the productivity and incomes of small-scale farmers, herders and fisher folk, while promoting diversification and more sustainable practices, can reduce rural malnutrition in two ways: by improving the local availability and nutritional quality of food, and also by raising rural producers' purchasing power and supporting livelihoods. To do so requires public and private investments to increase producers' access to land, finance, productive assets and technology, as well as input and output markets adding value, both nutritional as well monetary, all along the food chain. These and other support measures do more than "protect" smallholders, a majority of whom are women; they empower them as citizens and economic agents.

Other nutrition-enhancing programmes and interventions may be required, including judicious nutrient supplementation and improvements in sanitation, hygiene, nutrition information and education, and access to health care. To prevent stunting and other forms of severe under-nutrition, it is necessary to focus on measures to address nutrition deficiencies afflicting nutritionally vulnerable households and particularly the mothers and children less than five years of age to break the vicious circle that perpetuates extreme poverty and hunger across generations.

Using school meals: These types of interventions are most powerful when used in combination. For example, school meal programmes can be designed to procure safe and nutritious food from smallholder farmer cooperatives. This, in turn, raises producer

incomes while stimulating the local supply of more diverse, nutritious and safe foods by small farmers.

Cash and in-kind transfers and other forms of social protection that raise incomes and improve diets also have positive spill-over effects, such as increasing local wages, and can enhance small producers' accumulation of productive resources, thereby stimulating production and productivity increases, both on- and off-farm.

Experiences in Bangladesh, Brazil, China, Ghana, Thailand and Vietnam, to name only a few, demonstrate that the most effective approaches to ending hunger have included most, if not all, of the measures listed above. When combined with appropriate public investments, they have yielded spectacular results for the undernourished, and for all of society.

Source: José Graziano da Silva, the Director General of Food and Agriculture Organization of the United Nations (FAO) Headquarters, Viale delle Terme di Caracalla 00153 Rome, Italy.
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FAO'S VISION OF SOCIAL PROTECTION

Social protection comprises a menu of policy instruments to improve food security and nutrition and that address poverty and vulnerability. It can be cash transfers, food aid, public works, social insurance or other means to promote social inclusion. But this is not mere social assistance. By helping rural poor better cope with shocks and hardship and better manage risks, social protection also helps stimulate productive activity and investment. As a result, through social protection, FAO puts forth efforts on both ends of food security; help the poor access food and promoting food production: a twin track approach that is needed to end hunger.

FAO can make a difference where social protection is concerned. This has been demonstrated in its programs - Cash for work, school meals, supporting family farming, all of these have spillover effects on rural communities as a whole. Moreover, by safeguarding the poor with income security, investment in production is stimulated and greater risks can be taken to increase their farm incomes, and by the same token that will increase their food security and nutrition, the welfare of their families, their communities as well as the country concerned.

Source: Brave Ndisale, Deputy Director Social Protection division; Food and Agriculture Organization of the United Nations Headquarters, Viale delle Terme di Caracalla 00153 Rome, Italy
Email: *Brave.Ndisale@fao.org*

POACHERS KILLED 100,000 ELEPHANTS IN THREE YEARS

Some 100,000 elephants were illegally killed for their ivory between 2010 and 2012, finds the first verifiable estimate of the impacts of the ongoing ivory crisis on Africa's elephant populations. Published 18 August 2014 in the journal "Proceedings of the National Academy of Sciences of the United States," the study is the first detailed assessment of African elephant illegal killing rates at population, regional, and continental scales.

Find the full piece at:
http://ensnewswire.com/2014/08/19/poachers-killed-100000-elephants-in-three-years/

Source: Environment News Service

ANNOUNCEMENTS

The Second International Conference on Nutrition (ICN2) to be convened in Rome from 19 to 21 November 2014

FAO is gearing up for the Second International Conference on Nutrition (ICN2), an inclusive inter-governmental meeting on nutrition jointly organized by FAO and the World Health Organization (WHO) scheduled to take place at FAO headquarters in Rome from 19 to 21 November 2014. ICN2 will bring together ministers and senior national policymakers from agriculture, health and other relevant ministries and agencies, with leaders of United Nations agencies and other intergovernmental organizations, civil society and the private sector to identify policy priorities on how national and global food, health and related systems and reforms can improve nutritional outcomes. It is also expected that a number of heads of state and government will head to Rome for this event. They will be spearheaded by Pope Francis, who accepted the Director-General's invitation last May.

The Conference outcome is expected to include a political declaration and a framework for action to guide its implementation, with the purpose of affirming the high-level political commitment and pro-active efforts as well as improving governance for more effective concerted actions in the fight against malnutrition. The international community has an important role to play in enabling and supporting national efforts – in the identification and evaluation of policy options, in the design of effective social protection, trade policy assessment and vulnerability and resilience analysis, as well as in developing measures to improve agricultural productivity and sustainability. José Graziano da Silva, the Director General of FAO puts it this way "We can end hunger for all. And because we can end hunger for all, we must end hunger for all".
For more information on ICN2, visit the website: http://www.fao.org/about/meetings/icn2/en/

The 2014 edition of the State of Food Insecurity in the World report (SOFI 2014) launched

On the 16th of September 2014 this year's edition of the State of Food Insecurity in the World report (SOFI 2014) was launched at a press conference in FAO headquarters in Rome. This flagship publication presents new figures on the number and proportion of hungry people in the world, and is considered the gold standard used by governments, and other development agencies. Citation: FAO, IFAD and WFP. 2014. The State of Food Insecurity in the World 2014. Strengthening the enabling environment for food security and nutrition. Rome, FAO. Download the publication from: http://www.fao.org/3/a-i4030e.pdf
For more information visit: http://www.fao.org/publications/sofi/en/

The 2014 edition of FAO's flagship publication, the State of the World's Forests (SOFO) is now available:

FAO's flagship publication The State of the World's Forests (SOFO), reports on the status of forests, recent major policy and institutional developments and key issues concerning the forest sector. It makes current, reliable and policy-relevant information widely available to facilitate informed discussion and decision-making with regard to the world's forests. This year's edition, SOFO 2014, (*http://www.fao.org/3/a-i3710e.pdf*) analyses data on the socioeconomic benefits of forests, showing that well managed forests have tremendous potential to contribute to sustainable development and to promote food security.
Previous editions can be accessed from the website: *http://www.fao.org/forestry/sofo/en/*

FAO released the report, "The State of the World's Forest Genetic Resources" in June 2014

Forests and trees enhance and protect landscapes, ecosystems and production systems. They provide goods and services which are essential to the survival and well-being of all humanity. Forest genetic resources – the heritable materials maintained within and among tree and other woody plant species that are of actual or potential economic, environmental, scientific or societal value – are essential for the continued productivity, services, adaptation and evolutionary processes of forests and trees. The first-ever edition of The State of the World's Forest Genetic Resources released June 2014, constitutes a major step in building the information and knowledge base required for action towards better conservation and sustainable management of forest genetic resources at the national, regional and international levels. The Report can be downloaded at:

http://www.fao.org/3/a-i3825e.pdf The corresponding FAO press release noted as follows: http://www.fao.org/news/story/en/item/233303/icode/ *For further information on The State of the World's Forest Genetic Resources, visit: http://www.fao.org/forestry/fgr/64582/en/*

Introducing a new FAO App that will allow handy and quick access to the latest FAO news and documents - FAONow

FAOnow is an App that has been created to make it easy to have the latest FAO news and documents at your fingertips for reading, sharing, or posting in just a few clicks. Information can be downloaded to the device so that it is available for offline use and items can also be saved as favourites for quick reference. *More information on the App is available from: www.fao.org/2/faonow.*

New Atlas of African Agriculture Research & Development launched

The International Food Policy Research Institute (IFPRI) announces the publication of a new Atlas of African Agriculture Research and Development. It is a unique compilation of geospatial data that illustrates the diverse challenges and opportunities related to agriculture, poverty, and hunger. The Atlas—produced in collaboration with a wide range of partners, including geographic information system specialists and agricultural experts at a number of CGIAR centers and other research organizations working in African agriculture—consolidates a wide breadth of data in one package. Each of more than 30 agriculture-related topics (such as soil fertility, the impacts of climate change, and market access) is illustrated with a map and text describing what the map is telling us, why it is important, and what can be learned from it. In addition, each map points to additional resources from many of the partner organizations. The Atlas provides policymakers, development planners, and those working with African farmers powerful insights on the current state of African agriculture. It is also available online as part of the e-Atlas initiative at agatlas.org.

The Atlas is accessible at: http://www.ifpri.org/publication/atlas-african-agriculture-research-development

Source: www.ifpri.org

New publication on Conservation Conflict Transformation

Just published! "Conservation's Blind Spot: The Case for Conflict Transformation in Wildlife Conservation" in *Biological Conservation*. Unaddressed or poorly addressed conflicts present increasingly difficult obstacles to effective conservation and management of many wildlife species around the world. The material, visible manifestations of such conflicts are often rooted in less visible, more complex social conflicts between people and groups. Current efforts to incorporate stakeholder engagement typically do not fully acknowledge or address the social conflicts that lie beneath the surface of conservation issues, nor do they consistently create the necessary conditions for productive transformation of the root causes of conflict. Yet, the ultimate level of social carrying capacity for many species will depend on the extent to which conservation can reconcile these social conflicts, thereby increasing social receptivity to conservation goals. To this end, conservation conflict transformation (CCT) offers a new perspective on, and approach to, how conservationists identify, understand, prevent, and reconcile conflict. Principles and processes from the peacebuilding field inform CCT and offer useful guidance for revealing and addressing social conflicts to improve the effectiveness of conservation efforts. The Human-Wildlife Conflict Collaboration (HWCC) has adapted and demonstrated these principles for application in conservation through capacity building and conflict interventions, transforming how many practitioners in the conservation field address conflict. The article discusses current limitations of practice when addressing conflict in conservation, define conflict transformation, illustrate two analytical models to orient the reader to the benefits of CCT, and present two case studies where CCT was applied usefully to a conservation-related conflict.

More Information at: http://www.sciencedirect.com/science/article/pii/S0006320714002778

Source: Francine Madden, Executive Director, Human-Wildlife Conflict Collaboration (HWCC), 2020 12th St. NW #506, Washington, Dc 20009

Email: francine@humanwildlifeconflict.org

Theme and Deadline for Next Issue

The next edition of *Nature & Faune* journal will feature short articles linked to the general theme of enhancing gender equality in the management of Africa's renewable natural resources. This is consistent with the journal's mission of improving natural resource management for food security. Both FAO and the African Union Commission are strongly committed to gender equality and women's empowerment. In recent years, gender issues have been at the center of high level consultations in Africa and elsewhere in the world. The recent African Union Summit of Heads of States in Malabo, Equatorial Guinea endorsed the theme of the January 2015 Summit of the African Union as: "Year of Women's Empowerment and Development towards Africa's Agenda 2063". Year 2015 also coincides with the Beijing plus 20 Conference which will commemorate the 20th anniversary of the Fourth World Conference on Women in Beijing and review progress in implementing the Beijing Platform for Action[1]. This edition of *Nature & Faune* journal is a contribution of Food and Agriculture Organization of the United Nations (FAO) to these processes.

The significance of gender equality has been widely recognized in sound management of renewable natural resources such as water, fish, soil, forests, wildlife and livestock for the realization of food security, poverty eradication, sustainable livelihoods and economic prosperity. In Africa, most women, men, youth, small-scale subsistence producers, family farmers, and landless agricultural workers depend on renewable natural resources for their subsistence and income. To illustrate this, research suggests that trees and forests are more important to rural women's livelihoods than to those of men. In Madagascar, poor women in one community earned 37% of their income from forest products, compared to 22% earned by men. In East Africa, fuel wood scarcity has led to a reduction in the number of meals cooked in poor households[2]. Worldwide, women and girls are predominantly tasked with fetching water for the 1.1 billion people without safe drinking water, and this is particularly true in Africa. In many societies, livestock ownership and management is based on gender. Camels are regarded as wealth and prestige and insurance against drought in Somalia. Ownership (mainly by men) is clan based; hence, the sale of female camel requires permission from the clan (Nori 2010)[3]. Furthermore the "Voluntary Guidelines on the Responsible Governance of Tenure of Land Fisheries and Forests in the Context of National Food Security"[4] calls upon States to ensure that women and girls have equal tenure rights and access to land, fisheries and forests independent of their civil and marital status, and provide policy, legal and organizational frameworks that are non-discriminatory. The Guidelines further invite States to address the obstacles faced by women and girls with regard to tenure rights, and to take measures to ensure that legal and policy frameworks provide adequate protection for women; and that laws that recognize women's tenure rights are implemented and enforced. It advocates that States facilitate the full participation of users of land, fisheries and forests in tenure governance, including in the formulation and implementation of policy, law and decisions on territorial development.

Cognizant of women, men and youth different needs and use of renewable natural resources, the editorial board is inviting authors to contribute articles that

[1] The Beijing Platform for Action is an agenda for women's empowerment that was adopted during the Fourth World Conference on Women

[2] http://www.fao.org/gender/gender-home/gender-programme/gender-forests/en/

[3] Nori, m. 2010. The golden udder: marketing milk from camels in Puntland, Somalia. *In* LPP, LIFE-Network, IUCN-WISP & FAO, eds. *Adding value to livestock diversity – Marketing to promote local breeds and improve livelihoods*, pp. 99–106. FAO Animal Production and Health Paper. No. 168. Rome (available at http://www.fao.org/docrep/012/i1283e/i1283e00.htm)

[4] http://www.fao.org/fileadmin/user_upload/nr/land_tenure/pdf/VG_en_Final_March_2012.pdf
http://www.fao.org/fileadmin/user_upload/nr/land_tenure/images/VG_Informal_aid.pdf

explore good practices and policy options with regards to: ensuring women and youth's full participation in sustainable natural resources management and enjoyment of socio-economic benefits from these resources; securing their tenure rights so that they can manage and use natural resources; adopting more efficient, sustainable and labor saving production techniques to reduce women's workload and increase their productivity; promoting business development and employment opportunities for women and youth through small-scale enterprises and producer organizations; highlighting opportunities to empower women and youth to make greater contribution to the economy through sustainable use of renewable natural resources.

Deadline for submission of manuscript(s) and other contributions is 1st November 2014.

Cameroon's non-timber forest products (NTFP): Dacryodes edulis Photo credit: Rebecca Selvarajah

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