Indigenous fruits are food for the local people who sell only the excess produce.

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About the ICRAF-West and Central Africa

The World Agroforestry Centre (ICRAF)West and Central Africa (WCA) region is an integration of the former Sahel and African Humid Tropical regions, realised in 2006. At present, these regions are being referred to as nodes. The WCA region covers a vast geographical area made of 21 countries with a population of about 340 million people and covers a surface area of about 1200 million hectares.

It has two major agro-ecological zones namely: the Sahelian zone, which is a semi-arid landscape stretching from Chad to Senegal, and the Humid Tropics spreading along the coast and extending to the central part of Africa.

The region’s activities are carried out in the Sahel and in the Humid Tropics zones.

The region is ICRAF’s flag bearer in Participatory Tree Domestication and tree biodiversity conservation, which aim to enhance the livelihoods of smallholder farmers through increased income and non-income benefits from indigenous trees and shrubs.

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For the last ten years scientists across ICRAF West and Central Africa region have been working relentlessly to provide answers to some of the problems facing local communities especially in the domain of marketing of agroforestry tree products which we strongly believe holds great prospects for poverty alleviation. Due to hard work, commitment and emphasis on quality science, we are seeing the fruits of our years of research. We are happy that the region has made giant strides in the domain of vegetative propagation and marketing of Agroforestry tree products, and we do not intend to stop or lie on our laurels.

Millions of people across WCA rely on cash crops like cocoa, coffee, cotton and rubber for their livelihoods. As years go the small scale farmers increasingly become vulnerable due to the fluctuating prices of these crops in the world market. Despite their hard work, poverty and hunger are still part and parcel of their daily lives. To be able to break the yoke of poverty, we introduced and developed the innovative concept of Participatory Tree Domestication (PTD) in the region. Put simply, PTD refers to the means by which rural communities select, propagate and manage trees according to their own needs, in partnership with scientists, civic authorities and commercial companies. It is usually oriented at specific local markets and encompasses the use of both indigenous knowledge and genetic selection based on scientific principles. Today we are delighted to see thousands of farmers in the region using this approach to domesticate a wide range of high-value indigenous fruit trees and medicinal plants. With this approach, farmers are able to integrate selected trees with known characteristics into different cropping systems. By so doing, we are achieving the diversification which is crucial for the sustainable management of the Congo Basin, which loses about 1.49 million hectares of forest each year.

In Cameroon, we were able to finalise research work on a cracking machine for Njansang (Ricinodendron heudelottii). In fact fruits from this species are labour intensive for our farmers when extracting the value kernels from the hard coke. Thanks to Mushagalusa Tele, a Douala-based engineer we were able develop a Njansang cracking machine which famers intensively use today.

This was particularly relevant since farmers were hitherto producing Njansang only for home consumption whereas there is a large market in the cities. We had to look for ways to help them in that direction. And on 1st April 2010 six Njansang cracking machines were donated to six farmer groups in Centre, South and East regions of Cameroon. The acquisition of these machines put smiles on the faces of thousands of women in the forest zone of Cameroon who in
the past sustained injuries due to the very labour intensive nature of cracking Njansang manually, using sharp and dangerous objects. What used to take them several weeks to crack manually is now a matter of minutes with the machines. The handing over of the Njansang cracking machines was the crowning of a long relationship with the local population.

In the area of marketing, farmers have been mobilised to embark on group marketing for some Agroforestry Tree Products like Kola and Njansang. Market Information Systems which provide price and quality information to farmers and traders have also been introduced in certain parts of the Cameroon. These developments have led to considerable improvement in market access and increase in income for poor rural farmers. This is expected to continue in other parts of Cameroon and also in the Democratic Republic of Congo.

Considerable work has been done on the commercialisation of *irvingia spp*, *Gnetum africanum*, honey, *safou* and *cola spp*. Similar work is on priority indigenous fruit trees and medicinal plants in DRC, Nigeria and Mali. Assessment of the impact of PTD on the livelihood of local population clearly indicates that many farmers could easily send their children to secondary schools and even universities without facing the difficult of paying school fees compared to the situation before involving in Participatory Tree Domestication. Most farmers have rebuilt their houses, some have bought motor bicycles or acquire radio or television, indicating that their standards of living have changed for the better. Thus, more smile on their faces.

These achievements would not have been possible without the sincere commitment of our partners in the front-line the many NGOs and farmer organisations who work relentlessly to disseminate the results of our research.

This is the opportunity to express our deep gratitude to the main donors IFAD, USDA, the Belgian Development Cooperation, EU, CFC, DANIDA and BMZ for their continuous support. We are also grateful to our strategic partners particularly the NARS of Cameroon, Democratic Republic of Congo, Nigeria, Ghana, Niger, Mali, Senegal, Burkina Faso and different universities of the region for their great collaboration.
Group Sales and Marketing Performance of Kola in North West Region of Cameroon

By Amos Gyau, Zac Tchoundjeu, Divine Foundjain-Tita, Ebenezer Asaah and Charlie Mbosso

Introduction and background

Kola (Cola Spp) is an important crop for people living in the North West Region of Cameroon. The crop is used for a number of purposes including food, medicine, art work and sold to generate income. Given the importance of this crop, there is a pressing need to improve its management base so as to increase productivity and enhance the benefits in a more sustainable manner to rural communities who are mostly smallholder farmers.

Market access proponents argue that for small holders to thrive in a global economy there is the need to shift the focus from production based programmes to that of marketing based interventions (Barham and Chitemi, 2009). In tune with this perception, much development related programmes have facilitated the establishments of new and strengthening of existing farming groups as a means to enhance farmers’ market access through group marketing and extension market related innovation activities in many parts of Cameroon (Facheaux et al, 2006).

This article assesses the effect of group sales on the marketing performance of Kola using the Collective Action Theory (CAT) as a framework for analysis. The article recommends strategies for future implementation of collective action activities by managers of Governmental and Non Governmental Organisations working to improve farmers’ livelihoods. Twantoh Mixed Farming Common Initiative Group (MIFACIG) was used
as case study for this research. A qualitative research approach is used to obtain in depth information about the operations of the farmer groups in the selected villages.

The methodology is clearly delineated from the previous studies on collective action of farmers such as Barham and Chitemi (2009) which are predominantly quantitative in nature. In view of the limitations of traditional quantitative bases for knowledge (Goulding, 1998, Somogyi et al, 2010), the qualitative research approach which is adopted

The case study- MIFACIG

for this study is quite relevant. This article examines the effects of group sales on the marketing performance of Kola using the case of Twantoh Mixed Farming Common Initiative Group (MIFACIG) in the North West region of Cameroon. MIFACIG is a farmer group created in November 1993 with the objective of alleviating poverty through sustainable agriculture, job creation and capacity building.

The groups’ headquarters is in Belo and its activities are spread out in all 4 sub-divisions of the Boyo division in the North West region. Its area of intervention in terms of land size is estimated at about 85 square kilometres with varying radii of between 11 and 45 km from Belo. Membership is estimated to comprise about 40 individuals divided into two categories namely Capacity building members and Lay members

A nine-man team heads the executive bureau of the group. MIFACIG is a member of a union of 40 common initiative groups under the umbrella ITFU (Ijim Trees Farmers Union).

The activities of MIFACIG are centred on: agroforestry, bee-keeping, growing of medicinal plants, domestication of fruits and agroforestry species, environmental protection, gender and development. Its main partners as of now include ICRAF, Support Services for Grassroot Initiative for Development (SAILD), International Circle for the Promotion of Creation (CIPCRE), and the American Peace Corps.

Since the year 2005 the association has embarked on group sales in which they sell products including kola. The main objective of the group is to better access markets and improve their livelihoods.

Theoretical framework-The collective action theory

The main theoretical framework adopted for our analysis is the Collective Action Theory (CAT). By definition, collective action is an action taken by a group (either directly or on its behalf through an organization) in pursuit of members’ perceived shared interest. Vermillion (2001) defines collective action as a coordinated behaviour of a group towards a common interest or purpose. We adopt the collective action model by Barham and Chitemi (2009) as shown in Figure 1 as a basis for our analysis. According to the model, farmer groups are represented under a social structure.

This includes a number of factors affecting a group’s ability to enact successful collective action initiatives such as the group’s asset configurations, composition and characteristics. The Partner Agencies (PAs) intervene to enhance human capital in the form of marketing skills, business acumen and other training. The PAs also provide some groups with market linkages to other chain actors.

The model further reveals that farmer groups also carry out collective action initiatives without linkages
In analysing our research objective, we adapt the collective action framework by Barham and Chitemi (2009). From the PA, the performance outcomes represent the extent to which groups have improved their market situation and results in positive livelihood outcomes.

**Methodology**

**Operationalising the model**

To operationalise the Barham and Chitemi 2009 model for the case of MIFACIG, a qualitative research methodology was adopted. Our main focus was to examine the main antecedents of the collective action in the study area which according to the model is determined by the social structure. Subsequently, we also examine the effects of collective action on the marketing performance.

In operationalising the model, social structure was assessed using variables such as education, social capital and group assets. Collective action was undertaken to be the group sales by the farmers. As our objective is to examine the influence of the group sales on marketing performance, performance outcome as shown in the model was conceptualised to be the marketing performance which includes the number of farmers involved in the group sales, price level which is a reflection of the group’s negotiation abilities and the quantity of products sold by existing members.

PA intervention was taken to be the intervention by ICRAF and other NGOs working in the area. Therefore, in the subsequent parts of the paper, we will examine how in the context of MIFACIG, social structure and activities of NGOs influenced group sales and its subsequent influence in improving quantity of kola sold, price perceptions and the number of farmers involved. The method used for operationalising all the variables involved in the model is farmers perceptions based on the recall of pre and post intervention situations.

**Sample selection**

Data was collected from farmers involved in the MIFACIG using stratified sampling procedure. Villages in the project areas were selected so as to have a spatial representation of the entire project area in the region. Next, the villages with the highest number of farmer groups were
identified and taken as a sample village. Overall, 19 villages were selected and a total of 38 groups were involved. From the 38 groups, we interviewed 50 members individually with 1 or 2 key informant members selected from each of the 38 groups.

Qualitative research methodology using unstructured interviews were used. This is against the background that the traditional research methods are considered to be limited in applicability and scope for agribusiness research compared to qualitative research methods including case studies (Stern et al., 1998, Bitsch, 2005). The questions were basically linked to farmers’ opinions and perceptions about the group sales, composition of the groups, their motivation for involving in the group activity and group assets. Furthermore, questions about farmers’ perception of their marketing performance including the quantity of the products they sell, price levels and number of people involved in the group sales were also asked. The results of the data were recorded, transcribed and grouped according to the research objectives.

Results, conclusion and implications

The main findings of the study is that group maturity, social and ethnic ties, existence of internal rules and youthfulness of the group members influence farmers decision and capacity to organise in groups. Furthermore, group sales also improve marketing performance. These findings have some implications for managers of NGOs and development organisations.

One of the main implications of this study is that for group sales in particular and collective action in general to work, organisations should try to target the action or intervention to existing groups instead of trying to create new groups. This can be important since existing groups might have motivations other than the intervention to put themselves together. Such groups are more likely to be sustainable even after the intervention. This will therefore help to take away the case of many development related projects which usually die after the intervention ceases.

The above therefore suggests that where alternative or competing groups need to be chosen for an action or intervention, the group with many years of existence should be given the priority all things being equal. This is because such groups might have more experience in organisation of collective action than their newer counterparts. The above suggestion also implies that where a group is required for a particular intervention and there is no existing one, then it will be important for the organisations involved to sensitised the population in the area about the existence of their problem and the benefits that will accrue to them if they organise themselves into groups. It is expected that the farmers involved might be able to appreciate the need for the collective action themselves in order to keep it sustainable.

Finally, social norms, internal rules and regulations are also found to enhance group actions for the case of MIFACIG. This therefore suggests that in order to enhance effective performance of group sales, members must be made to adhere to some standards including enacting rules and regulations to guide membership of the activity. It is expected that this will help to reduce disputes and misunderstandings among group members which will eventually improve performance.

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Production and marketing studies were initiated in order to better understand the prevailing production and marketing activities. These studies indicated that, traditionally, indigenous fruit were collected freely and consumed by the rural population. As time went by, local producers mainly women and children who live on marginal lands and the handless population started businesses to subsidize their household incomes (Falconer, 1990; Agyemang, 1994; Cavendish, 1997; Kadzere and al, 1998). In Cameroon, commercialisation is among the most important income generating activities. With a view of increasing benefits from agroforestry products to farmers, ICRAF’s research has been focusing on the cultivation and marketing of njansang since 2003. Group sale is one of the mechanisms put in place to facilitate the connexion between actors in the sub-sector, mostly between traders and producers. The approach also aims at solving some organizational constraints in the njansang sub-sector.

As one of ICRAF priority species, *Ricinodendron heudelotii* has a lot of potentials in Cameroon among which markets and commercialization of kernels (Ndoye et Ruiz Pérez, 1997 and Tabuna, ...
1999). After six years of efforts to promote group sales of njansang, there is no clear picture about its impact on the livelihood of the people. Against this background, this article aims to assess the benefits of group sales to rural communities. We assess the effects of group sales on njansang commercialisation in terms of number of producers involved, quantities sold, prices obtained and income generated in pilot sites in Akonolinga area, Centre region of Cameroon.

Traditional, small farmers sold their crops at the farm gate to intermediaries, often at low prices (Falchamps and Vargas-Hill, 2005). However, innovation at marketing arrangements can transform in favour of smallholders (IFAD, 2001), and producers organization are well-positioned to take advantage of this new approach. In addition to filling in the gaps created by market imperfections, the case studies in this issue show that collective action can open up new opportunities for smallholders by introducing innovation to existing value chain or creating entry ways into new markets.

Approach of group sales

Inventory of available quantities and market decision

Marketing officers at group level have the responsibility to follow members’ production from flowering to kernel drying. In some villages, the group decides when kernel extraction begins as to avoid individual sales. After kernel extraction, the group holds a meeting to estimate the quantities available for group sales.

In general, the producer group decides to hold a group sale when at least 135 kg of njansang is available or if at least ten members are ready to sell. Sometimes, if three or four group members have an urgent situation to solve, they can ask for a market.

Price negotiation and fixation of market day

For price negotiation, one group member calls a third party who facilitates the process (either ICRAF or a relay organisation). According to the quantity available, the facilitator contacts a trader association and proposes a telephone communication for price negotiation between the group and the traders. When the two parties agree on a price, they set a date and place for the transaction to take place. Generally, such a market is planned not later than one week after price negotiation. We expect that with time when trust will have established, the facilitator’s role will reduce, and producers and traders may contact each other directly.

Methodology

For the estimation of the quantity of the product, we employ a two-stage estimation framework. We assume that producers who have logbook register their information on production and sales after group sales. Logbook is the first stage and at the second stage, we directly mentioned information when group sales occurred.

Between 2005 and 2010, we distribute logbook to group members of six villages in the centre region of Cameroon (Epkwassong, Ondeck, Nkoloboudou, Ebassi, Loum, Melen) involved in marketing activities with ICRAF. Each year, we organized two or three group sales.
Results

In 2007, njansang quantities for group sales increased significantly. Producers were enthusiastic and participated in all steps of the process. They were able to keep their njansang until the day of group sales thanks to a guarantee fund. Between individual sales and the first group sales, benefits doubled.

Evolution of the number of farmers involved in njansang group sales

From 2005 to 2007, the number of njansang producers joining group sales increased gradually thanks to regular group activities (Fig 1). However, these numbers dropped in 2008, which was a transition year between two phases of the project and external support stopped temporarily.

Evolution of the total quantity of njansang sold in group

Total quantity of njansang sold in group peaked in 2006 and then gradually decreased to stabilize in 2008 and 2009 (Fig 2). This can be explained by the availability of a guarantee fund in 2006 which allowed producers to resist selling individually before the date of sales to solve urgent matters. Quantities sold in group have been very low in 2010 because of individual sales.

Evolution of the njansang unit price (Fcfa/kg)

Njansang unit prices obtained through group sales are increasing with the years (Fig 3). This can be partially attributed to an improvement in farmers’ negotiations skills and to better information on price evolution in urban markets, which allows choosing an appropriate moment for sales.

Revenues generated by different producer groups in Akonolinga area through njansang group sales from 2005 to 2010 are presented in Fig 4. Epkwassong, with the highest number of members, has been able to generate the highest revenues every year, except for the year 2010 because here group sales have not yet been organised.
Gender in njansang group sales

Except for Loum where men’s participation in group sales was higher, women were the main actors in njansang group sales in 2010 (Fig 5). Nevertheless, Figure 6 indicates that average quantities sold by men in Loum and Epkwassong are much higher than that sold by women. This shows that men who enter the njansang sub-sector, previously considered as an exclusively female activity, are taking this activity seriously.

Conclusion and Recommendations

The results above suggest that the approach of group sales has positive effects on the number of producers involved in the commercialisation of agroforestry tree products, in term of quantities sold, unit price obtained and consequently on producers’ revenues.

However, a number of issues need to be resolved to sustain the activity.

The availability of a guarantee fund in 2006 allowed producers to mobilize large quantities for group sales. However, the group has not been able to sustain this quantity after the guarantee fund was removed indicating that local capacity to pre-finance the activity has not been built. On the other hand, traders complain about not having enough capital to buy large quantities.

This requires further investigation into the possibility of adapting existing micro-finance mechanisms to suit requirements of the njansang sub-sector.

The experience shows that with appropriate training and some facilitation, producer groups can effectively negotiate prices with traders. A simple market information system that allows for
sharing of information between producers and traders could further improve transactions.

There is need to strengthen the linkages between producer groups and traders’ associations, build trust and eventually develop formal contracts between traders and producers. This however can only be attained when producer groups will be able to accurately estimate the quantities available for group sales.

Therefore the need for emphasis to develop mechanisms to collect information on production at household level (number of trees exploited by producers, yield, quantities of kernels extracted) and to avoid individual sales by group members.

Acknowledgement

Special thanks to the Belgian Development Corporation for financing the project.

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In the Democratic Republic of Congo (DRC), non-timber forest products (NTFPs) are important for both rural and urban populations, but its products are not well known. It is difficult to know precisely the number of NTFPs exploited in Kinshasa as well as their prices (Ndona, 2004; Toirambe, 2005). The world’s growing interest in biodiversity has recently engendered a systematic inventory of the multitude of products that can be extracted from the forest (FAO, 2001). Consequently, there is an urgent and indispensable need to carry out studies of plant and fungal NTFPs sold in the markets of Kinshasa, and more specifically in East Kinshasa, in order to ensure traceability and specification, so as to build up a reliable database aimed at sustainable management. It is against this backdrop that this study has been carried out.

**Methodology**

The study was carried out in the provincial city of Kinshasa, which is located between latitudes 4° and 5° south and longitudes 15° and 16° east (UNDP/UNOPS, 1998). Therefore, Kinshasa, our country’s major city, plays a leading role in the national economy. The vegetation of

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**Inventory of Non-timber Forest Products of plant origin sold in Kinshasa, DR Congo**

By Apollinaire Biloso Moyene, A. Degrande and John Mafolo

**Introduction**

In the Democratic Republic of Congo (DRC), non-timber forest products (NTFPs) are important for both rural and urban populations, but its products are not well known. It is difficult to know precisely the number of NTFPs exploited in Kinshasa as well as their prices (Ndona, 2004; Toirambe, 2005). The world’s growing interest in biodiversity has recently engendered a systematic inventory of the multitude of products that can be extracted from the forest (FAO, 2001). Consequently, there is an urgent and indispensable need to carry out studies of plant and fungal NTFPs sold in the markets of Kinshasa, and more specifically in East Kinshasa, in order to ensure traceability and specification, so as to build up a reliable database aimed at sustainable management. It is against this backdrop that this study has been carried out.

**Methodology**

The study was carried out in the provincial city of Kinshasa, which is located between latitudes 4° and 5° south and longitudes 15° and 16° east (UNDP/UNOPS, 1998). Therefore, Kinshasa, our country’s major city, plays a leading role in the national economy. The vegetation of
Kinshasa consists mainly of grasslands, dotted with shrubs. It is being highly degraded by the development of the city. The city counts 5 260 000 inhabitants, with a population density of 528 inhabitants per Km² (Biloso, 2008).

The data for this study was collected through a combination of data collection approaches, including bibliography, interviews, semi-structured interviews and field observations.

The population sample for the surveys included 200 respondents. This study on the inventory of NTFPs of plant and fungal origin sold in markets in the Eastern part of Kinshasa was carried out from 05/08/2009 to 02/30/2010.

Findings and Analysis

The inventory NTFPs of plant and fungal origin sold in markets in East Kinshasa to ensure traceability revealed 69 NTFPs, including 62 plant species and 7 fungal species. The 62 NTFPs of plant origin were identified in 39 families. The main NTFPs that are highly commercialised include *Gnetum africanum*, *Pteridium aquilinum*, *Dioscorea praehensis*, *Zingiber officinale*, *Cola acuminata*, *Anisophyllea quangensis* and *Megaphrynium macrostachyum* (*Sarcophyrum arnoldianum*), *Garcinia kola*, and among the fungal species they are *Auricularia* sp and *Termitomyces striatus*. The average price per kilogramme is estimated at $US4.2 for *Gnetum africanum*, $US0.3 for *Pteridium aquilinum*, $US0.5 for *Dioscorea praehensis*, $US1.5 for *Zingiber officinale*, $US7 for *Cola acuminata*, $US1 for *Anisophyllea quangensis*, $US0.84 for *Megaphrynium macrostachyum* (*Sarcophyrum arnoldianum*), $US3.1 for *Garcinia kola*, and for fungal species at $US10.26 for *Auricularia* sp and 4.5$US for *Termitomyces striatus*.

NTFPs sold in the markets of East Kinshasa come mainly from the Bandundu Province, 34.5 percent, and from Bas-Congo, 26 percent, followed by 25.5 percent from Kinshasa, 9 percent from *Equateur*, 4 percent from Kasai, and 1 percent from the East Province.

In Kinshasa, leaves are predominantly used, representing 27.5 percent, followed by fruits and seeds at 21.5 percent, mushrooms at 16.5 percent, stems 15 percent, barks of trees 2.5%, and 5% of other plant parts such as latex and processed products. Two out of ten people belong to organisational structures.

This study reveals that 84 percent of the respondents have this as their primary activity, hence as their main source of livelihood.

Meanwhile, 16 percent of them consider it as a secondary activity and follow the seasonal harvest of such products. In addition, 53.5 percent of the respondents actually export NTFPs as opposed to 46.5 percent who do not. Of all the NTFPs inventoried, 14 percent are processed products, 29 percent can be processed while 57 percent are not convertible.

Most of the actors involved in the sale of NTFPs in Kinshasa often get their supplies from the following markets: marché de Pascal (18.5 percent), followed by the Batéké plateau (18 percent), Kianza (13 percent), Matete (12.5 percent) Gambela (5.5 percent), Liberté (5.5%), Agence (5 percent), Kingasani (4.5 percent), and Rond Point Ngaba (4 percent).

Indeed, most operators or traders in NTFPs are women, and they are between 20 and 49 years old. They are generally secondary school leavers and most of them are married. Their secondary activity is housekeeping, which implies that the exploitation and marketing of NTFPs is a source of livelihood for their households. Moreover, this
Figure 1 below illustrates the outlets and the various municipalities reputed for the sale of NTFPs in the Eastern part of Kinshasa and the geographic coordinates of these points of sale.

Map 1: Geographical co-ordinates of the different NTFPs sales points in East Kinshasa.
situation is justified by the lack of employment (Tollens and Biloso, 2006), the absence of companies that can create jobs and the fact that the formal private sector has ceased to exist, compounded by the reduction, in real terms, of the salaries of State employees, posits the PRSP (2006).

Non-wood forest products (NTFPs) are used on a daily basis. Thus, the suburban cities of the DRC are now encroaching on mosaic suburban forest. This phenomenon can essentially be accounted for by demography and the process of urbanisation (Feltz, 2009). The consumption of these products in the urban areas can be explained by three main overlapping reasons.

To begin with, there is widespread poverty which is a major socioeconomic problem (PRSP, 2006). There is the demand from the urban poor who have no other means of subsistence, and then there is the element of weak State institutions.

The inability of the State to provide basic goods and services compels urban populations to adopt alternative strategies for survival (Biloso, 2008). NTFPs contribute in no small way as source of livelihood for households (Nkwembe, 2006).

This assertion is justified by a large majority of people, particularly women, who engage in this activity as it enables them to fight against ever growing poverty due to the low salaries paid in the formal sector dominated by men, and the lack of financial resources in general (Biloso and Lejoly, 2006).

Traditional knowledge about the medicinal use of some plants, natural insecticides or extracts to repel insects, natural products for the regeneration of edible plants etc., are all original information that can contribute to the testing and development of new strategies for a long-term management of the environment on respectable human and social basis (Posey, 1996; Leigh, 1995).

Conclusion

This work focused on an inventory of NWFPs of plant and fungal origin sold in markets in East Kinshasa, with the aim of ensuring traceability. Undeniably, NTFPs play a very important role in the lives of the rural and urban populations of the DRC. Not only are they widely consumed, but they also have an economic value on the local, national, and international markets. The exploitation of NTFPs contributes appreciably to the incomes of households involved in the sector.

All these factors underscore its importance in the fight against food insecurity and poverty reduction. Overexploitation and harvesting...
methods used do not favour commercial sustainability of NTFPs and even contribute in the extinction or depletion of resources. NTFPs are demonstrably diversified in terms of their sources, supply, role and importance. Marketing of NTFPs is a significant source of income for traders, which guarantees their daily survival and fight against hunger. For the exploitation of NTFPs to contribute in reducing poverty and improving living conditions in the Democratic Republic of Congo, the results of this study could be disseminated to policy makers, politicians, donors, NGOs, research departments, and partners, in a bid to raise awareness on the importance of forest products in the lives of rural communities and the need to include them in strategic programs to reduce poverty developed by the State.

In the light of the foregoing, conducting more in-depth research will make it possible to identify methods and strategies that would guarantee sustainable exploitation of NTFPs in the DRC, as it is the case in the rest of the world.

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More than chocolate: Diversifying cocoa agroforests for higher profitability in Cameroon


Introduction

One of the main tree-based systems in the West and Central Africa region is the cocoa plantation (*Theobroma cacao* Linn.). However, cocoa prices on the world market have been fluctuating significantly and farmers have been actively searching to diversify this system for more sustained income generation (Jagoret *et al.* 2008; Sonwa 2004; Hietet 2005; Todem 2005).

In this light, the participatory tree domestication programme, implemented by the World Agroforestry Centre and partners, since 1996 aims at increasing farmers’ incomes and enhancing their resilience by cultivating indigenous trees and developing strategies for marketing the produce (*Tchoundjeu et al.* 1998). Over the years, farmers have used tree domestication skills to diversify their cocoa plantations with “domesticated” trees. However, the impact on their livelihoods has not yet been evaluated.

Therefore, a study to determine the financial profitability of cocoa agroforests enriched with domesticated trees was carried out in 2009.

Objectives

**Global Objective:**
to evaluate the financial profitability of cocoa agroforests

**Specific Objectives:**
- to estimate the profitability of traditional and
enriched cocoa-based systems

- to determine the optimal mix of trees that allows maximum profitability in the most diversified cocoa-based agroforest
- to simulate the profitability of the most enriched agroforest in terms of number and types of domesticated trees integrated

### Methodology

#### Study site

The Cocoa Production Basin of Centre Cameroon, because it is an area where cocoa yields are declining, thus needing strategies to increase

<table>
<thead>
<tr>
<th>System</th>
<th>Species</th>
<th>Density</th>
<th>System</th>
<th>Species</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>T. cacao</td>
<td>1111</td>
<td>C+S+M</td>
<td>T. cacao</td>
<td>1111</td>
</tr>
<tr>
<td></td>
<td>D. edulis</td>
<td>0</td>
<td></td>
<td>D. edulis</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>I. gabonensis</td>
<td>0</td>
<td></td>
<td>I. gabonensis</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>R. heudelotii</td>
<td>0</td>
<td></td>
<td>R. heudelotii</td>
<td>0</td>
</tr>
<tr>
<td>C+S</td>
<td>T. cacao</td>
<td>1111</td>
<td>C+S+N</td>
<td>T. cacao</td>
<td>1111</td>
</tr>
<tr>
<td></td>
<td>D. edulis</td>
<td>70</td>
<td></td>
<td>D. edulis</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>I. gabonensis</td>
<td>0</td>
<td></td>
<td>I. gabonensis</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>R. heudelotii</td>
<td>0</td>
<td></td>
<td>R. heudelotii</td>
<td>16</td>
</tr>
<tr>
<td>C+M</td>
<td>T. cacao</td>
<td>1111</td>
<td>C+M+N</td>
<td>T. cacao</td>
<td>1111</td>
</tr>
<tr>
<td></td>
<td>D. edulis</td>
<td>0</td>
<td></td>
<td>D. edulis</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>I. gabonensis</td>
<td>70</td>
<td></td>
<td>I. gabonensis</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>R. heudelotii</td>
<td>0</td>
<td></td>
<td>R. heudelotii</td>
<td>16</td>
</tr>
<tr>
<td>C+N</td>
<td>T. cacao</td>
<td>111</td>
<td>C+S+M+N</td>
<td>T. cacao</td>
<td>1111</td>
</tr>
<tr>
<td></td>
<td>D. edulis</td>
<td>0</td>
<td></td>
<td>D. edulis</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>I. gabonensis</td>
<td>0</td>
<td></td>
<td>I. gabonensis</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>R. heudelotii</td>
<td>16</td>
<td></td>
<td>R. heudelotii</td>
<td>16</td>
</tr>
</tbody>
</table>
productivity.

“Domesticated” tree species

Selection criteria:
- presence in the area
- market potential
- farmers’ preference

Species:
- *Dacryodes edulis* (G. Don) H.J. Lam. (safou)
- *Ricinodendron heudelotii* (Baill.) Pierre et Pax. (njansang)
- *Irvingia gabonensis* Baillon. (bush mango)

Data collection tools

- Interview with resource persons to determine yields, prices, etc.
- Ex-ante profitability analysis using enterprise budget; cost/benefit analysis; Net Present Value (NPV); Internal Rate of Return (IRR)
- Optimisation and Sensitivity Analysis using GAMS 21.3

Different systems compared

Eight scenarios: different theoretical combinations of cocoa and “domesticated” tree species, following recommended densities (Table 1) in the different strata (Figure 1).

**Figure 1: Different strata used to determine densities**

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>cocoa (3m x 3m)</td>
</tr>
<tr>
<td>2</td>
<td>safou + mango (12m x 12m)</td>
</tr>
<tr>
<td>3</td>
<td>njansang (17m x 17m)</td>
</tr>
</tbody>
</table>

Source: Mbile et al. (2007)

Results

Results showed that the traditional system was not profitable and that only the enriched systems had an acceptable NPV (Fig 2). However, the different systems did not have the same level of profitability. The system enriched with safou, ndo’o and njansang had the highest NPV.

The calculation of the Internal Rate of Return showed that, apart from cocoa only, all systems...

**Figure 2: Net Present Value**

![Figure 2: Net Present Value](image)
had IRR values close to 49%, so were profitable (Fig 3). Nevertheless, the use of the payback period propelled the “C+S+M+N” in the first position since capital invested in this agroforest was recovered after five years.

The optimal use of resources in this agroforest showed that 713 seedlings of cocoa, 35 safou, 42 mango and 10 njansang trees are sufficient to obtain a maximum profit of 3,082,171 FCFA (6850 USD).

Conclusion

Cocoa-based agroforests are only profitable when other tree species are associated. The cocoa+safou+mango+njansang system is the most interesting combination and allows an efficient use of resources according to the GAMS analysis.

It is therefore recommended that producers diversify their cocoa farms. However, there is a need to test these results on-farm and do similar studies with other species to determine their profitability as well. Hereto, a trial on cocoa-based agroforest where cocoa is associated with domesticated local trees has been established in Ngali II, a village near Yaoundé.

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Contribution of parkland trees to farmers’ livelihoods – case study from Mali

By Mbène Dièye Faye, John C. Weber, Bayo Mounkoro, Joseph-Marie Dakouo, Carmen Sotelo Montes

Introduction

Most subsistence farmers in semi-arid West Africa consider trees as an integral part of agriculture, and for centuries they have maintained a traditional land-use system known as the parkland agroforestry system. Due to their multiple uses, parkland tree species play an important role in socio-economic development and in preserving ecological equilibrium. They provide farmers with food, medicines, wood for energy and construction, fibers for roofing, and fodder for livestock. Although the contribution of these products to farmers’ livelihood is widely appreciated, it has rarely been quantified. This report discusses the main results of a study that investigated the role of parkland trees in farmers’ livelihoods.

Materials and methods

The study was conducted in nine villages in the Ségou region of Mali, which has a semi-arid climate (mean annual rainfall = 513 mm). The region (12°30’ to 15°30’ N latitude, 4° to 7° W longitude) covers a total area of about 60,000 km² with about 35,000 hectares of forest and parkland. The main sources of revenue are agriculture, livestock, fishing and forest products.
Village meetings were organized to collect general information about important parkland tree species, their products and uses (Faye et al. 2010). The procedure consisted of listing all species considered important by farmers, and registering the five main criteria that farmers used to decide whether a species was important.

Farmers then rated each species from 0 to 3 (less to very important, respectively) for each criterion. Species were then ranked based on the total score received for the five criteria. Individual interviews were conducted with all farmers identified as harvesters, processors or sellers of parkland tree products, and 74 questionnaires from 39 women and 35 men were analyzed.

The targeted information was related to species uses, revenue and the main constraints faced by farmers. The surveys were conducted from December 2007 to February 2008.

Results and discussion

Villagers identified 42 species as important (not tabled), and five criteria for deciding whether a species was important (Faye et al. 2011). Production of medicines was the most important criterion, followed by food for human consumption, products for income generation, fodder, and wood (i.e., for energy, construction, household and farm implements). The 15 most important species, based on farmers’ rankings, are listed in Table 1: all of them provide several products and services, and most of them are sources of income generation.

*Vitellaria paradoxa*, *Tamarindus indica* and *Adansonia digitata* were the most important species for human consumption. Women valued *V. paradoxa* nuts because of their high oil content and *A. digitata* leaves which are the main ingredient in a sauce that is mixed with cooked rice or millet and consumed throughout the year. Farmers consume large quantities of these products, particularly *V. paradoxa* fruits during the “hunger period” in the rainy season (June-September), when grain stores are low and the new crop has not matured.

*Faidherbia albida*, *Pterocarpus erinaceus* and *Balanites aegyptiaca* provide fodder for farm animals, fuelwood and other services. *B. aegyptiaca* wood is mainly used to make agricultural tools and domestic utensils such as mortars and pestles. All three species are important for health security: for example, *P. erinaceus* leaves are used to reduce fever and its bark is used to treat tooth ache; while the bark of *F. albida* is used to treat cough. The positive effect of species such as *F. albida* and *Guiera senegalensis* on soil fertility was also recognized. More than 50% of households obtained at least 40% of their revenue from parkland tree products. The products that generated most revenue were fruits and wood, followed by *A. digitata* leaves, *V. paradoxa* butter, *P. biglobosa*...
fruits and soap from *V. paradoxa*.

The average annual revenue from parkland tree products varied between 20 and 646 US$ per year, and contributed as much as 73% to the annual household revenue (Table 2).

The greatest revenues were obtained from households in villages that had better access to large markets. The income was mainly used by men to cover wedding expenses, purchase agricultural equipment and repair or purchase new equipment for transportation, whereas women spent their income primarily on food, clothing and children’s school fees. Not all trees in parkland agroforests have a market value. Some trees provide intangible benefits such as soil-fertility improvement, erosion control and shade and/or cultural benefits (e.g., traditional meetings that are held only under specific trees, or use of a particular part of a tree to “protect” houses and family members). Further research is needed to explore several issues. For example, what is the contribution of fuelwood from parkland trees to household revenues? On-going research on five tree species in five regions in Mali indicates that there is considerable variation in fuelwood properties, and this has potentially significant economic and environmental implications (Sotelo Montes et al. 2011). For example, *G. senegalensis* had the best and *Piliostigma reticulatum* had the worst fuelwood properties of the five species. Fuelwood properties of *B. aegyptiaca*, *Combretum glutinosum* and *P. reticulatum* were better in drier regions, while those of *Ziziphus mauritiana* were worst in the driest region. In addition, tree growth and some fuelwood properties varied with rainfall gradients across and within regions. Given projected climate change and fuelwood demand, seed from drier

### Table 1. Priority tree species and uses selected by villagers in the Ségou region of Mali.

<table>
<thead>
<tr>
<th>Species*</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Vitallaria paradoxa</em></td>
<td>Human food, wood, medicine, sale</td>
</tr>
<tr>
<td><em>Tamarindus indica</em></td>
<td>Human food, fodder, medicine, sale</td>
</tr>
<tr>
<td><em>Adansonia digitata</em></td>
<td>Human food, soil fertility improvement, medicine, sale</td>
</tr>
<tr>
<td><em>Ziziphus mauritiana</em></td>
<td>Human food, fodder, medicine, sale</td>
</tr>
<tr>
<td><em>Balanites aegyptiaca</em></td>
<td>Human food, fodder, medicine, wood, sale</td>
</tr>
<tr>
<td><em>Faidherbia albida</em></td>
<td>Soil fertility improvement, fodder, wood, medicine, sale</td>
</tr>
<tr>
<td><em>Pterocarpus erinaceus</em></td>
<td>Human food, fodder, medicine, sale</td>
</tr>
<tr>
<td><em>Parkia biglobosa</em></td>
<td>Human food, fodder, medicine, sale</td>
</tr>
<tr>
<td><em>Pterocarpus lucens</em></td>
<td>Fodder, wood, sale</td>
</tr>
<tr>
<td><em>Boscia senegalensis</em></td>
<td>Human food, medicine, fodder, sale, wood</td>
</tr>
<tr>
<td><em>Saba senegalensis</em></td>
<td>Human food, medicine, sale</td>
</tr>
<tr>
<td><em>Lannea microcarpa</em></td>
<td>Human food, wood, medicine, sale</td>
</tr>
<tr>
<td><em>Sclerocarya birrea</em></td>
<td>Human food, wood, medicine, sale</td>
</tr>
<tr>
<td><em>Cordyla pinnata</em></td>
<td>Human food, medicine, wood</td>
</tr>
<tr>
<td><em>Guiera senegalensis</em></td>
<td>Medicine, wood, fodder, soil fertility improvement</td>
</tr>
</tbody>
</table>

*Species are listed according to villagers’ rankings.*
Acknowledgements

This research was supported by the International Fund for Agricultural Development (IFAD). The authors thank participating farmers for their contributions to the research.

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Figure legends: Selling butter produced from *V. paradoxa* fruits, leaves *A. digitata* and fruits of *B. aegyptiaca* in the market (photographs by Mbène Dièye Faye).

Table 2. Contribution of tree products to average annual revenues in the Ségou region of Mali.

<table>
<thead>
<tr>
<th>Village</th>
<th>Household average</th>
<th>Percent of household total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safiexo</td>
<td>$605</td>
<td>41 %</td>
</tr>
<tr>
<td>Mantana</td>
<td>$646</td>
<td>40 %</td>
</tr>
<tr>
<td>Samene</td>
<td>$480</td>
<td>42 %</td>
</tr>
<tr>
<td>Sadian</td>
<td>$270</td>
<td>39 %</td>
</tr>
<tr>
<td>Sokoro</td>
<td>$214</td>
<td>73 %</td>
</tr>
<tr>
<td>Dona</td>
<td>$134</td>
<td>59 %</td>
</tr>
<tr>
<td>Kango</td>
<td>$64</td>
<td>33 %</td>
</tr>
<tr>
<td>Kolobele</td>
<td>$57</td>
<td>26 %</td>
</tr>
<tr>
<td>Ngolobougou</td>
<td>$20</td>
<td>48 %</td>
</tr>
</tbody>
</table>
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