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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 with the Upper Guinea area emerging as a third node of the region. 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, in Upper Guinea and in the Humid Tropics zones, known as the Nodes of the region.

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.

The region has witnessed a change of leadership since 1st January 2009. Dr Zac Tchoundjeu is the new ICRAF – WCA Regional Coordinator. Dr Harold Roy-Macauley has moved to Guinea as Representative of the Node, while Dr Antoine Kalinganire is the Sahel Node Representative.

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Research activities carried out in the different nodes of the World Agroforestry Centre (ICRAF) West and Central Africa (WCA) region are guided by the region’s strategic direction for 2008 to 2012, which is perfectly in line with the compelling new ICRAF strategy. The WCA region is ICRAF’s flag bearer in Participatory Tree Domestication, Tree Biodiversity Conservation and Climate Change, which it promotes with the objective of enhancing the livelihoods of smallholder farmers. This annual report focuses on the improvement of the livelihoods of the rural poor. The articles chosen for the report show how agroforestry science has been engaged in developing technical, institutional and policy innovations for increasing income and non-income benefits and conserving biodiversity.

In the Sahel node, most of the project activities with an average life span of three years, ended this year. Efforts were made and are still on-going to streamline the node in order to improve operational efficiency and revitalize the research portfolio. The Humid Tropics node saw its efforts bearing fruits with a significant increase in its research portfolio. Activities in the Upper Guinea node, which were focused in Guinea, were maintained and expanded to Sierra Leone. Our acknowledgement goes to the United States Agency for International Development (USAID), United States Department of Agriculture (USDA), the International Development and Research Centre in Canada (IDRC), the International Fund for Agricultural Development (IFAD), the Directorate General for Development (Belgium), German Ministry for Economic Cooperation and Development (BMZ) and the European Union (EU), which have been the major donors supporting our activities.

We also strengthened our relationship with the West and Central Africa Council for Agricultural Research and Development (CORAF/WECARD) through the signing of a Memorandum of Understanding, during its General Assembly Meeting held in June 2008 in Yaounde, Cameroon. It is expected that this will not only reinforce the strategic partnerships with National Agricultural Research Systems in the region but will also facilitate the use and impact of our international public goods research. We are happy to note that scientists in the region have been recognised for their research efforts by their peers, with two best poster awards under GRP 1 and 3 poster presentations and second best poster award under GRP 3 poster presentations, during the ICRAF annual science meeting held in March, 2008.

As we look ahead into 2009, we are expecting to strengthen relationships with our traditional donors and partners and also develop relationships with new donors and partners. We are also looking forward to strengthening the quality of our scientific research, which will allow us to deliver better results in the future. We intend participating fully in the 2nd World Congress of Agroforestry and the Annual Science Meeting to be held in Nairobi respectively in August and September 2009, and take the opportunity of sharing our experience and highlighting important research work realised in the region with our partners.

Finally, we would like to acknowledge all those who directly and indirectly have helped us to realise our achievements during 2008 as well as our committed staff members.
Contribution of vegetative propagation in the selection of superior safou

By Ebenezer Asaah, Zac Tchoundjeu and Alain Tsobeng

"Until recently, Dacryodes edulis (safou) were only multiplied by seed resulting in extremely heterogeneous trees and fruits of diverse quality. However, this paper reiterates that safou trees of vegetative origin produce uniform fruit traits compared to those of seedling origin”.

Introduction

Dacryodes edulis (Don H. J. Lam) (Safou), is an indigenous fruit tree in the humid forest of Central Africa and the Gulf of Guinea. It has laudable nutritive pharmaceutical, cosmetic, melliferous and ecological importance. It is found around homesteads, in cocoa and coffee farms, in fallow land and in crop fields. Marketing studies conducted in the late 90’s indicated that of the four main non-wood forest products in the southern part of Cameroon, safou is the most important in terms of volumes sold and income from its trade. Available literature indicates that 2,324,1 tons safou were sold at about 1,049 million FCFA in 9 big markets in Cameroon (Awono et al., 2002). At the regional level, the trade of safou lacks empirical data just like is the case with many local species of economic value. However, important volumes of fruits are sold to neighbouring countries like the Republic of Congo, Gabon, Equatorial Guinea and Nigeria. Safou is even traded on the international market. Tabuna (1999), in his paper focusing on marketing of non-wood forest products of central Africa in France and Belgium, highlighted that annually, 105 tons of safou was exported from Central Africa to Europe. Consequently, the market for safou is in full expansion regionally and internationally. None withstanding, Awono et al. (2002) identified considerable fluctuation in the market price of safou that could be partially attributed to major differences in fruit quality and the lack of standards for quality control. This suggests that buyers find fruit quality important.

So far, D. edulis is principally multiplied by seed, resulting in extremely heterogeneous trees that often give rise to fruits of diverse quality. Earlier, researchers reported that D. edulis was not amenable to vegetative propagation. More recently, vegetative techniques of propagation from stem cuttings and marcotting have been developed and used successfully with earlier and quality fruit yields (Tchoundjeu et al., 2006). However, there is need to characterize safou and come out with distinct varieties to meet growing user needs. This paper presents highlights of a study characterizing safou from selected planted trees of vegetative and seedling origins. The objective of the study was to combine the contribution of selection and vegetative propagation towards the development of safou varieties that could be promoted for cultivation on farm (Leakey et al., 2002).
Methodology

This study builds on methodologies developed and tested in previous characterization studies (Waruhiu et al., 2004 and Leakey et al., 2002 for D. edulis; Atangana et al., 2002 for Irvingia gabonensis) of indigenous fruits to quantify tree-to-tree variation in fruit traits. However while these studies focused on mostly naturally occurring trees on farms, the current study is on selected planted trees of seedlings or vegetative origin - (marcots, juvenile cuttings) in seed and fruit orchards in Yaounde and Mbalmayo, humid forest of South Cameroon. Thirty (30) mature fruits were picked per tree from a total of 497 trees and the following fruit parameters were assessed: fruit mass, length, width, pulp thickness, epicarp and mesocarp colour. Coefficients of variation (CV) were used to describe variation in fruit traits, while correlation coefficients were used to determine the relationship between pairs of fruit traits.

Results and Discussions

Fruit mass (FM), fruit width (FW), pulp thickness (Pth) and fruit length (FL) were significantly (p<0.001) correlated with the pulp mass (PM). Fruit mass had the highest coefficient of correlation (r=0.976) with pulp mass, closely followed by fruit width (r=0.877). Correlation between the epicarp colour (EC) and mesocarp colour (MC) was low (r=0.103). High correlation between fruit mass and fruit width on one hand and pulp mass on the other hand shows that fruit mass and fruit width are the most suitable estimators of pulp mass which is the comestible part of the fruit. These results corroborates with earlier findings by Waruhiu et al. (2004) that fruit width was more correlated with pulp mass than pulp thickness and fruit length. This therefore suggest in general terms that safou fruit mass and width (i.e. heavy and large fruits) respectively is synonymous to the volume of fruit pulp (mesocarp) in either selected or naturally occurring trees. This could explain the relationship these traits (fruit mass and size) have with the unit price of safou in retail markets.

Tree-to-tree variation in fruit mass, fruit length, fruit width and pulp thickness observed among sampled trees was further analyzed at the level of tree origins (vegetative versus seedlings) and trees of the same origin. The results indicate that variability of fruit traits amongst trees obtained from seedlings was significantly (p<0.001) greater than that for fruits obtained from cuttings and marcots (Figure 1).

<table>
<thead>
<tr>
<th>Table: Variability in fruit characters for different propagation techniques</th>
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<tr>
<td>Parameter of variability</td>
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<td>FL (mm)</td>
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<td>FW (mm)</td>
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<tr>
<td>FM (g)</td>
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<td>Pth (mm)</td>
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Figure 1: Coefficients of variation in fruit traits for trees of seedling, cuttings and marcots origin.
Germlasm Development

Lower variability in fruit traits amongst trees of vegetative origin (marcots and cuttings) could be explained by the exactitude with which vegetative propagation techniques transfer heritable parental traits to offspring.

No considerable correlation was established between skin and pulp colour indicating that the colour of the safou pulp can not be forecasted by observing the skin colour. This explains why fruit vendors often cut safou fruits to display the pulp colour and entice buyers.

CONCLUSION

From this study it is evident that safou trees with high fruit masses combine other interesting fruit traits, such as mass width, length and pulp thickness. In addition, safou trees of vegetative origin produce uniformer fruits compared to those of seedling origin. The tree-to-tree variability in fruit traits indicates that some trees can have fruits poor in one trait, but extremely good in another trait. Therefore this study allows to identify ‘elite’ trees from initially selected trees in seed/clonal orchards which, through controlled pollination between identified elite clones, could take advantage of specific combining abilities of unrelated superior clones and produce more superior safou clones with heterosis in desirable traits that exceed wild or parent population.

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Enhancing the delivery of improved tree planting material through small-scale nurseries in rural areas

By Dr Ann Degrande

“The tree domestication programme assisted small-scale nurseries in becoming professional and more client-oriented. Achieved through a dual approach of technical training and business support, it is recommended that tree planting initiatives should adopt this approach so that small-scale nurseries in rural areas can ensure the delivery of improved tree planting material to resource-poor farmers.”

Participatory tree domestication in support of tree planting

Many reforestation and tree planting programmes are recording mitigated results. In spite of considerable investments in large tree nurseries, the total number of tree seedlings produced is often below expectations. The distribution of these plants from the nursery to places suitable for tree planting is not only costly, but often considerably reduces the survival rate of the plants. Furthermore, the number of trees effectively planted in farmers’ fields is low and their mortality rate may be high for lack of maintenance.

Tree domestication, being a participatory process where communities engage in all steps of tree selection, multiplication, integration and marketing, is offering an alternative approach to tree planting and is expected to overcome some of the difficulties highlighted above. However, one of the prerequisites for larger uptake of tree domestication is the availability of tree planting material of suitable quality, in sufficient quantities, within proximity and at affordable prices.

Encouraging the set-up of small-scale nurseries

ICRAF and partners have encouraged the establishment of small-scale tree nurseries in rural areas of Cameroon, the Democratic Republic of Congo and Nigeria since 1998. From the onset, all participating farmer groups were trained in the different propagation techniques and their skills were continuously upgraded through technical assistance and follow-up from research and extension services. These pilot tree nurseries, apart from being experimental units, soon became centres for training and diffusion of tree propagation techniques.

In the beginning, nursery production was low and the plants produced were shared amongst the members of the nursery group. Then, some nurseries progressively had surpluses and started selling the plants to other farmers but more so to urban elites. During the period 2004-2006, about half of the plants produced in the nurseries were planted in the fields of group members and about one-third was sold. However, most of the groups operating these nurseries lacked the business skills that are required to turn a “subsistence-oriented” nursery into a “viable enterprise”. Therefore, training sessions on enterprise development were organised and a business plan was drawn up for nurseries, considered having commercial potential.

The above suggests that a network of small-scale tree nurseries in rural areas would facilitate resource-poor farmers’ access to improved tree planting material. Farmers could join nursery groups to learn tree propagation techniques and to benefit from plants produced in the group nursery. Or, they might prefer to buy improved planting material of their choice in small-scale nurseries, not too far from their homes.
Evaluating the efficiency of small-scale nurseries in delivering tree planting material

In 2008, the World Agroforestry Centre examined the efficiency of such small-scale nurseries in the production and distribution of improved tree planting material. To this effect, nurseries that have been created under the tree domestication programme in the West and Northwest regions of Cameroon were compared with nurseries in similar agro-ecological and socio-economic conditions, but that had not been in contact with participatory tree domestication.

The results confirm that nurseries using the domestication approach provide tree planting material that responds better to farmers’ needs in terms of quantities, species and propagation methods used. Figure 1 shows that the total number of plants sold for the period 2005-2007 was higher in the nurseries within ICRAF’s intervention zone (Boyo and Nde divisions), compared to the nurseries with no links to ICRAF (Mezam and Haut-Nkam divisions). Nurseries under the tree domestication programme have a greater diversity of tree species and use vegetative propagation methods more often. For example, from the 22 tree species recorded in nurseries in the Western Region, nurseries in Haut-Nkam (outside ICRAF intervention zone) produced only 8. None of the nurseries in Haut-Nkam and Mezam multiply by rooting of cuttings and only one nursery had produced grafts and marcots. The source of the material used in plant production is more diverse in nurseries under the tree domestication programme. In addition to non-selected vegetative material and seeds obtained from fruits with desired characteristics that are used by all, nurseries in Nde and Boyo divisions source their stock plants, scions and seeds also from research centres (ICRAF, IRAD) and often share material with other nursery groups through nursery associations.

The clientele of nurseries with ICRAF intervention is more diverse, including farmers from the communities where the nurseries are located, but also from far beyond. As shown in Figure 2, clients of nurseries benefiting from ICRAF’s intervention have a higher level of satisfaction in terms of quality, propagation method, quantity and timing than clients from nurseries outside ICRAF’s intervention zone. The former also said to be satisfied with the post-sales services rendered, such as technical information, assistance with planting and replacement of dead plants. Nevertheless, prices of vegetatively propagated material, especially marcots, were considered too high by the majority of clients and are the most prohibitive factor for non-clients.

Towards a community-based system of delivering improved tree planting material

The study clearly demonstrates that the tree domestication programme has assisted small-scale nurseries in becoming more professional and more client-oriented. This has been achieved through a dual approach of technical training and business support. It is thus recommended that tree planting initiatives should adopt this approach so that small-scale nurseries in rural areas can ensure the delivery of improved tree planting material to resource-poor farmers. On the other hand, research should continue to look for ways of reducing production costs and improving nursery productivity to remove the price barrier that is still holding farmers from buying high quality planting material.
Improving livelihoods through agroforestry

**Figure 1:** Trend in nursery production over 3 years (average number of plants produced per nursery) in respectively Nde, Boyo, Haut-Nkam and Mezam divisions.

**Figure 2:** Client satisfaction in nurseries within ICRAF intervention zone (Nde and Boyo) and outside ICRAF intervention zone (Haut-Nkam and Mezam).

For more information, contact Ann Degrande, a.degrande@cgiar.org
Generating knowledge for better management, use and conservation of native trees and shrub species by rural communities in the West African Sahel
the case of Prosopis africana

By John C. Weber, Carmen Sotelo Montes and Antoine Kalinganire

“Prosopis africana trees with faster growth tend to have denser wood though the magnitude of the correlations between wood density and growth traits varied among provenances. Correlations suggest that selecting faster-growing trees at ~13 years would increase wood density slightly in the next generation”.

Introduction

Rural communities in the West African Sahel use more than 100 native tree and shrub species, and most of these species provide wood for construction, energy and other uses. In order to enhance sustainable management and conservation of these species, tree domestication programs must have information about genetic variation in tree growth, wood density and other commercially important traits; correlations between tree growth and wood density; and genetic control (heritability) of growth traits and wood density. In regions with pronounced environmental gradients in rainfall, like the West African Sahel, tree populations may exhibit continuous (clinal) variation in tree growth, etc. in relation to these gradients. Clinal variation is generally assumed to reflect adaptive differences among the populations, so domestication programs could take advantage of this adaptive variation. Tree growth is important because if determines the volume of wood produced, and also reflects the size of the root system which is particularly important for survival in semi-arid zones like the West African Sahel. Wood density is a key trait because it is often correlated with other commercially important, wood-quality traits and tree growth. For example, denser wood tends to be stronger and stiffer. In addition, density and other wood properties tend to be under stronger genetic control than growth traits, so selection based on wood density may be more effective than selection based on tree growth rate.

Prosopis africana is particularly valuable for its wood and other essential products. The wood is moderately dense and very resistant to termites and fungi, making it useful for construction poles and planks, mortars, pestles, and handles for farm implements. The wood also has high heat content and is considered one of the best for firewood and charcoal. Its leaves, succulent branches and pods provide fodder for farm animals, which is essential during the long dry season. Its leaves, branches, bark and roots are also used for several traditional medicines. In some areas, particularly in Niger, people use the fermented seeds as a food condiment (“soumbala”), so there is a thriving market for the seeds in these areas. Unfortunately, the abundance of P. africana has decreased dramatically in many areas due to excessive harvesting of its products, little or no management of natural regeneration, and mortality due to the increasingly hotter, drier conditions in the region.

In this chapter, we report on studies of variation in tree growth, wood density and survival in P. africana in Burkina Faso and Niger. The objectives were to (a) evaluate correlations between tree growth and wood density and (b) determine if the traits increased from the more humid to the drier parts of the sample region. Additional results are given in the two articles cited as key references.

Materials and methods

Details about seed collection, experimental design of the provenance/progeny test, tree measurements, methods for determining wood density and statistical analyses are given in the articles cited as key references.
Seed was collected from 275 trees in 28 locations (provenances) in the Sahelian ecozone of Burkina Faso and Niger, and used to establish a provenance/progeny test at one relatively dry site (ICRISAT Sahelian Centre) in Niger in 1994. Mean annual rainfall decreases from south to north and from west to east in the seed collection area. Tree height, stem diameter (over bark at 1.3 m) and survival were evaluated at 11 and 13 years, and basic density of the wood was also evaluated at 13 years.

**Results and discussion**

P. africana grew slowly and had high mortality (40%), but produced relatively dense wood in the provenance/progeny test. Means were 3.8 m for tree height, 5.4 cm for stem diameter and 606.3 kg/m³ for wood density. Figure 1 illustrates the variation in stem diameter among trees.

Trees with faster growth tended to have denser wood. For example, the Pearson correlation coefficient between wood density and tree height was 0.38 (P < 0.001), based on all trees at 13 years. The magnitude of the correlations between wood density and growth traits varied among provenances: for example, the correlation between density and height ranged from 0.226 (P > 0.05) to 0.575 (P < 0.001). Correlations suggest that selecting faster-growing trees of P. africana at ~13 years would increase wood density slightly in the next generation, and this could be increased by selections in provenances with higher density-growth correlations. This must be considered as a tentative conclusion pending future research.

Provenances from the drier parts of the sample region had greater growth, wood density and survival than provenances from the more humid parts of the sample region. This was demonstrated by simple or multiple linear regression analysis, where provenance means for survival, growth and wood density were regressed on provenance mean latitude and longitude (all regression coefficients P < 0.01). Assuming that these clines reflect adaptive variation, and considering the fact that some computer models project a drier climate in the Sahel during the 21st century, it would be prudent for tree domestication and conservation programs to collect P. africana seed from the drier parts of the region for planting and conservation in the West African Sahel. Specifically, we recommend that transfers of germplasm should only be made from north to south, and from east to west: transfers from the more humid to the drier parts of the region should be avoided.

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REFERENCES


Baobab leaves: reliable source of Vitamin B2

Baobab leaves form an important part of the local diet in Sahel countries and elsewhere in Africa. Existing leaf nutritional data and agroforestry performance information are based solely on Adansonia digitata L., the baobab of continental Africa. The introduction potential of Adansonia species from the center of diversity in Madagascar and from Australia remains untapped.

To assess this potential, the mineral contents and B1 and B2 vitamin levels of dried baobab leaves were determined for five-year old trees of A. digitata, A. gibbosa (A. Cunn.) Guym ex D. Baum, A. rubrostipa Jum. & H. Perrier (syn. A. fony Baill.), A. perrieri Capuron and A. za Baill. grown in an introduction trial in Mali. Nutritional data were evaluated for survival and vigour to determine promising germplasm. Leaf vitamin and crude protein contents were highest in the Madagascar species, especially A. rubrostipa (B1 88 mg 100 g-1, B2 187 mg 100 g-1, protein 20.7 % dry weight).

However, the local species far outperformed the introductions in survival, tree height, basal diameter and resistance to termites. We suggest grafting as a way of harnessing the vigour of well-adapted local baobab varieties to the superior nutritional profiles of A. rubrostipa and others. Cross-species grafting tests in Adansonia were successful with more than 90% survival 6 months after planting, thus creating new agroforestry possibilities with different scion/rootstock combinations.

Ber: the Sahelian sweets

Ber or Indian jujube belongs to the genus Ziziphus of the family Rhamnaceae. Ziziphus mauritiana is a moderate sized fruit tree. The natural distribution of ber extends from central Asia to Africa. In West Africa, it occurs in all countries in the Sahel. Farmers ranked it as one of the most preferred fruit tree species, but the fruits are very small. Therefore, farmers are interested in Indian and Thai varieties that produce large and tasty fruits. Thus, the introduced cultivars were nick named ‘Pomme du Sahel’ following the exceptional big size of their fruit.

However, existing fruit tree germplasm performance is reduced in terms of production, as a result of the use of non-improved plant materials by farmers aggravated by pests and diseases of introduced cultivars and selected materials. Thus, there is a need for further selection and improvement. There is indeed a danger of disease and pest attacks when fewer varieties are massively propagated. For ber alone, it was for example observed that fruit borers, fruit flies, leaf and fruit eaters were mostly infecting the Indian cultivars. Infestation starts with fruiting or at fruit maturity. Moreover Zonocerus variegatus L. (Pyrgomorphidae) is one of the major pests that attacks this species, and has been reported as a limiting factor to the cultivation of most improved varieties of ber in the Sahel.

This explains the need to introduce a wider range of planting material for rural farms and nutritional banks in rural, peri-urban and urban contexts; and the creation of new adapted and more tolerant varieties for the Sahel.

For more information, contact Antoine Kalinganire, a.kalinganire@cgiar.org
Local ber (Senegal). Mean annual fruit production: 7 kg per tree; 2100 fruits per kg.

Sotubata (ex-Thailand). Mean annual fruit production: 28 kg per tree; 25 fruits per kg.

Kaithi (India). Mean annual fruit production: 21 kg per tree; 25 fruits per kg.

Umran (India). Mean annual fruit production: 21 kg per tree; 25 fruits per kg.

ICRAF 07 (ex-Thailand). Mean annual fruit production: 25 kg per tree; 28 fruits per kg.

ICRAF 04 (ex-Thailand). Mean annual fruit production: 30 kg per tree; 32 fruits per kg.

ICRAF 09 (ex-Thailand). Mean annual fruit production: 36 kg per tree; 15 fruits per kg.

ICRAF 08 (ex-Thailand). Mean annual fruit production: 38 kg per tree; 16 fruits per kg.

ICRAF 06 (ex-Thailand). Mean annual fruit production: 40 kg per tree; 15 fruits per kg.

ICRAF 02 (ex-Thailand). Mean annual fruit production: 27 kg per tree; 36 fruits per kg.

ICRAF 05 (ex-Thailand). Mean annual fruit production: 30 kg per tree; 28 fruits per kg.

ICRAF 03 (ex-Thailand). Mean annual fruit production: 30 kg per tree; 30 fruits per kg.

ICRAF 01 (ex-Thailand). Mean annual fruit production: 28 kg per tree; 37 fruits per kg.

Gola (India). Mean annual fruit production: 26 kg per tree; 22 fruits per kg.

Ben Gourion (India). Mean annual fruit production: 24 kg per tree; 23 fruits per kg.
Improving small producers’ revenues through the development of small and medium size NTFP enterprises in Central Africa and Cameroon

By Dr Honoré Tabuna

Introduction

The main activity of poor rural populations in Central Africa in general and in Cameroon in particular is the production of traditional agricultural products such as cassava (Manihot esculenta), and non-timber forest products (NTFPs) such as okok or eru (Gnetum africanum) and safou (Dacryodes edulis). One of the solutions for combating poverty and improving farmer income is the development of small and medium enterprise (SME) using NTFPs such as processing enterprises. The development of strategies for improving the revenue of small producers, therefore, targets different actors in the system such as nursery operators, producers, SME and consumers (Figure 1).

Since 2005, ICRAF has been involved in several research activities on enterprise development in Cameroon, Gabon and Equatorial Guinea, including (i) studies on sub-regional and international commerce in traditional agricultural products and edible NTFPs, and (ii) studies on the consumption of ndo’o or odika (Irvingia gabonensis) in Libreville (Gabon).

Results of these studies are summarised below:

Consumption of NTFP in big cities better understood
- The determinants of consumption of odika in Libreville and in Equatorial Guinea identified
- The determinants of the consumption of dried safou in Yaounde identified

Derivate NTFP products identified and diagnosed
- Transformed products from safou, njansang, ndo’o and okok diagnosed

SME involved in NTFP sub-sector diagnosed
- Profile and functioning of exporters of safou assessed
CONCLUSION

The results presented above provide information on enterprises involved in the commercialization of NTFPs as well as on their outlets. This information is indispensable for the design of appropriate strategies that will help these enterprises to grow and hence, improve the income of NTFP producers in the sub-region. These strategies should guide the Governments of Central African countries in developing links between the private sector and small producers and by doing so improve their poverty reduction strategies.

For more information, contact Honoré Tabuna, h.tabuna@cgiar.org

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Market Approach and Enterprise Development

Marketing strategies to improve farmers’ revenue in the Humid Tropics

By Charly Facheux

“Improving livelihoods of rural populations could be challenging. Through the use of the sub sector approach that emphasized capacity building, technology development, team-building and enterprise promotion techniques at the community level, many farmers were able to improve their livelihoods.”

Introduction

Institutions pursuing a sustainable livelihoods’ approach often face the challenge to develop strategies that can significantly increase rural household income. In the humid tropics of West and Central Africa most households get more than 75% of their income from on-farm activities. Therefore increasing rural income should pass through a diversification of income earning options, thereby reducing farmer dependence on cash crops sold only on the international market. This paper outlines methodologies used by the World Agroforestry Centre (ICRAF) in the Humid Tropics of West and Central Africa to improve the income earning capacity of rural smallholder households from non timber forest products (NTFPs). Market studies are conducted alongside enterprise research and development to enable the farmer households to get the best possible returns on their indigenous fruits and culinary products.

Problems faced by farmers

Though viable national, regional and international markets exist for NTFPs, farmers encounter difficulties in achieving good returns from their produce. Factors that contribute to low returns include:

- Lack of support infrastructure (poor transport, roads, and communications infrastructure) is a major constraint to the commercial development of NTFPs in the area.
- Farmers have limited access to material and financial resources. This restricts their opportunities to increase their scale of production in order to reduce transaction costs and to invest in efficiency increasing and value adding technologies.
- Farmers have limited technical skills, no access to training on production and processing, and no access to information on market requirements.
- Inability to sell in group: Farmers have few entrepreneurial skills and are accustomed to individual marketing
- Inability to wait out season: Upon harvesting, there is extreme financial pressure on the farmers to immediately sell their crop, even when prices are at their seasonal low
- Lastly, individual farmers lack bargaining power and as a result there is no equal distribution of value added among the actors in the market chain, especially in the case of seasonal and highly perishable agricultural products.

Methodology developed to improve farmers’ entrepreneurial skills

Since 2003, ICRAF and partners in Cameroon have developed an innovative approach to assist farmers develop marketing skills and knowledge. The main objective was to empower farmer households to market agroforestry tree products in groups, through the development of viable marketing strategies. A sub-sector approach, meaning the analysis and development of all activities undertaken by a multitude of actors to produce, harvest, and process, sell and consume a product, was followed. This approach emphasized capacity building (collective action, financial and conflict management), technology development (tree domestication and post-harvest technologies), team-building and enterprise promotion techniques at the community level, as is illustrated in figure 1.
In addition, stakeholder meetings were organized in order to build linkages and trust between producers and traders. Other major action points in the organisation of group sales were the assessment of product availability (quantity and quality) by the producer organisation in advance, in order to raise interest among traders, and the agreement on prices between producers and traders. Another important component of the approach has been the harvest and post-harvest technology research.

**Results obtained**

Based on the skills acquired, farmers decided to use the group sales strategy for the marketing of their products. They were right as they succeeded to make a lot of profit, as illustrated in figure 3 for the case of njansang.

1- Taking the case of njansang as an example, in 2005, farmers received 709,075 FCFA (about USD 1,420) from the sale of 833 kg of njansang, while in 2006; they received 2,826,000FCFA (about USD 5,652) from the sale of 3,000 kg and in 2007 received 2,472,150FCFA (about USD 4,945). This implies that, as a result of a suitable marketing strategy, the farmer group not only obtained higher unit prices, but also considerably increased the quantities sold.

2- They could sell a substantial part of their harvest at once, since the traders who were invited had enough cash to purchase great quantities. The successes achieved this far, especially that of forming a consolidated group working towards the same objective, have trickled down to the entire community and even to neighbouring ones.

3- During the group sales, farmers succeeded in applying negotiation skills to convince traders to buy at a relatively higher price compared to what they obtained in the past. The same farmers graded their produce according to quality norms demanded in the market, following traders’ recommendation during farmer–trader workshops. All these resulted to the njansang farmers realizing an average 31% increase in their selling price as compared to what they would have received through individual sales.

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Policies and Natural Resource Governance

Disconnects between policy and legislative provisions and practice on native tree use, access and management in Sahel with special reference to Mali

By Antoine Kalinganire, Thomas Yatich, John Weber and O, Samaké

“Incompatibility between the forestry laws and the livelihood-based interests of the local communities provide a window of opportunity and a framework around which reform can be organized. This could make way for a joint management of parklands.”

Joint management strategies necessary for the survival of parklands

Policy reform in retrospect

Policy and legislative reforms within the realm of natural resource governance, especially on the access, use and management of native tree species have varying impacts on the interests of different stakeholders. In Mali, the reform agenda which started in the 1990s was aimed at recognizing the rights of citizens to land resources, devolving power to regional and local levels, creating an enabling policy context and providing a framework for engaging citizens and forging new-strategic partnerships for natural resource management.

The Malian Forestry Law sought a balance of social, economic and ecological options through the pursuit of legal provisions on forest encroachment, on-farm protection of native trees, usage rights of adjacent communities, use of fire for managing forests and the management of parklands, instruments of enforcement and consequences associated with non-compliance. Despite the exclusion of parklands from formal forestry governance under this law, access, use and management of trees within these agroforestry systems are still regulated by the Forest Service. The continual application of stringent rules on the access, use and management of on-farm trees is guided by the need to “avoid running the risk of anarchy in the management of resources”. This provides a window of opportunity and a framework around which the reform of the Forestry Law can be organized.

In countries where regime structures have recognized and mainstreamed local conventions into land, tenure and forestry laws, local institutions and NRM partnerships have evolved. In Niger for example, access, use and management of native trees have been improved because the Forestry Law is coherent with traditional practices of agroforestry. In this case natural tree regeneration, adoption of improved tree management practices and other sylvicultural practices have been attributed to the recognition of local communities’ rights and integration of local conventions in natural resource use. Given forward-looking provisions of the Malian Forestry Law and lessons from the Niger case, why have the Malian agroforests continued to degenerate...
rather than regenerate? In order to understand the effects of the different provisions of the Forestry Law and Policy on native tree use, socio-cultural and local economic conditions of local communities, we carried out an action research study in the Sahel.

The objectives of the study were to identify impacts of (a) local natural resource policies, (b) land and tree tenure, and (c) access to trees on the use, management, domestication and conservation of native trees and shrubs.

**Outcomes of the study**

The study revealed the following key issues:

- There are incompatibilities between and among different provisions of the forestry and land laws. Overall, the interests of the state received higher priority than the livelihood-based interests of local communities, despite government’s policy to balance social, economic and ecological options.

- Use of police (the ‘military’) to enforce the Forestry Law instilled fear in the local communities. Communities however recognize the important role that the forestry service plays in protecting native tree species, seeing forest agents as ‘necessary evils’ (villagers’ communication during fieldwork).

- There are varied impacts. The sustainability appraisal, the perceptions on the current utilisation of native trees and the extent to which the different provisions of the forestry law influence different basic aims and objectives under the three-point criteria (ecological, socio-cultural and economic conditions) varied considerably across villages.

- The Forestry Law focuses on classified and protected forests, but is vague on the management of native trees on agricultural land. Restrictions on access, use and management of on-farm protected trees has inhibited natural regeneration because farmers clear natural regeneration of protected tree species (e.g. Vitellaria paradoxa, Karité) before they are visible to government agents.

- Degradation of classified and protected forests is rampant because of government’s lack of capacity and strategic partnerships with the local communities to enforce the law.

- Land is held in trust by the government and protected trees on-farm are strictly protected by the State. Stringent regulations on access, use and management of protected native trees have affected farmers’ investments on tree management as well as the pursuit of other sylvicultural practices. On the contrary, local communities, as per customary law, believe that the land is theirs. Such a ‘clash’ between statutory law on land tenure with customary law has adversely affected access, use and management of native trees.

- There are disconnects between the implementation of policy provisions and practice. Communities indicated to the research team that individuals from other villages cut trees in forests adjacent to the villages with no action taken by foresters even after reporting. This has had negative impacts on both forests and relations between adjacent communities and foresters. Actions of distant villages have catalysed adjacent communities to deforest protected or classified forests because of the foresters’ inaction.

- Villagers agreed that the permit system is critical in controlling access, use and management of protected native tree species, but contested the role of the forester in ‘military’ uniform. They agreed that if the requirements of a permit ceased, all the trees would be cleared. However they fear the forester. The respondents suggested that the foresters be sensitized on the need to work together in the management of native trees.

- Local conventions/bylaws: Local communities have bylaws, which in their opinion are more effective than the statutory Forestry Law. These are however, not recognized in the law. The Decentralization Policy provides an opportunity for their integration and the recognition and negotiation between the government and local communities in the management of agroforestry parklands. This could potentially lead to the recognition of local laws through the passing of decrees leading to improved involvement of local communities.

- Compliance with the provisions of the forestry law at village level varies notably as per site specific factors, including communities’ perceptions as influenced by the effects of stringent enforcement of the forestry law,
Policies and Natural Resource Governance

livelihood effects of the enforcement of the forest law, the typology of relationships between communities and foresters and the state of parklands and their ability to meet socio-cultural needs.

- There is no monitoring system that ensures adherence to the conditions of the permit and enforcement of the provisions of the law without favouritism and continuous cyclic review of performance.

- In the analysis of rights and responsibilities, it was clear that all the stakeholders who were identified had almost equal rights and therefore the need for the different stakeholders’ to work together in managing the parklands.

The study outlined key policy recommendations that Sahelian governments work with rural communities and other stakeholders to amend their forestry laws to:

i) facilitate negotiation support among stakeholders,
ii) operationalize decentralization and power transfer initiatives for management of agroforests,
iii) recognize and facilitate formulation and use of local bylaws to control access, use and tree management,
iv) use permits and licenses to regulate access and use of indigenous trees only in state controlled “classified” forests,
v) provide extension services to natural resources users,
vi) promote agroforestry as a business, and
vii) review land and tree tenure laws, and
vii) enhance collaborative work among Sahelian governments, development partners and research institutions.

For more information, contact Antoine Kalinganire, a.kalinganire@cgiar.org
Forest tenure bottlenecks in Cameroon: Threats to an agroforestry transformation

By Peter Mbile

“Land tenure regimes have strong impacts on agroforestry development as they determine security of long-term investments in trees and the extent to which suppliers can secure product chains and guarantee continuity. Yet as this article demonstrates, conflicts between customary and statutory entitlements present important challenges for practice.”

Context: problems with the transition to modern agroforestry

From pre-independence the droit de hache (right of first occupant) has been the rule-of-thumb for acknowledging land ownership under customary entitlements in much of the forest zones of Cameroon. Traditional property rights arrangements create a complex of overlapping individual and group rights on the same resource. Such rights, generally inherited from the father are transmitted to sons, often excluding daughters. Rather than being clarified, constraints in customary rights to tree and forest resources appear to have been compounded by statutory laws.

Consider that all naturally growing trees in Cameroon belong to the State, even on land under smallholder cultivation. Such lands can be declared ‘reserved’ or ‘protected’ for the purpose of conservation or regeneration within customary use zones (van den Berg & Biesbrouck, 2000: 46)

Customary tenure is officially tolerated but is not legal. User rights to forests and trees are permitted, but explicit commercialization of forest products (fruits and nuts, raphia, bamboo, rattan, firewood, etc) requires official permission. Most smallholder forest farmers in Cameroon do not own land certificates. Permission is required to plant trees, while private ownership of planted trees is only officially recognized on titled land, otherwise ‘ownership’ is acknowledged on “land with visible signs of human presence”.

With community forests coming onto the scene since the 1994 forest and wildlife laws the question of ‘legality’ of access, use, ownership and trade rights to tree products has improved somewhat. Yet, there remains no way of distinguishing tree products from community forest lands and those from protected areas, private or other State forests. These confusing tenure situations continue to present major constraints to local communities and to agroforestry transformations, largely because the latter requires:

(i) unrestricted access to land on which to plant trees; with enforceable long-term ownership and management rights strong enough to exclude intruders and facilitate long-term business agreements with choice partners,

(ii) sustained supply of products from both planted trees and naturally growing stocks entering into markets legitimately (without harassment) and with secure, recognized chains of custody protected by statutory law,

(iii) a supporting policy environment sensitive to constraints in customary law, and to new proposals to strengthen local ownership, performance, continued protection for use and trade rights to diverse tree products

To generate empirical information to better understand how to support these requirements, pilot research was carried-out to develop testable hypotheses.

Analyses: spatial land use conflicts and performance of agroforestry enterprises

In partnership with Rights and Resources Initiative (RRI) collaborators in Cameroon, ICRAF led pilot processes to develop the hypotheses. These pilots sought overlaps between customary tenure and the 2003 zoning policy of Cameroon, and how tenure affects the performance of agroforestry enterprises.
Using Arcview 3.2a and data from version 2.0 of the GFW/WRI/MINFOF Electronic Atlas for Cameroon (2006) in the first instance, we buffered all villages within 4 km of the limits of permanent forest estates. To determine the PFE and Community catchments, we used the 3-5 km human use zones concepts (Mbile et al, 2005; van den Berg and Biesbrock, 2000; Malleson, 2000). Simultaneously, we carried out a survey of twenty community forests enterprises in the east, south and center-south geographical regions of Cameroon. In this latter analysis we adapted the Osterwalder & Pigneur (2003) Enterprise Model to analyze the structure and functioning of the community forest enterprises. We paid attention to how enterprise structure and performance were affected by the tenure regime conferred by the Community Forest policies.

Findings: tenure discrepancies and the double edge of community forest enterprises

From our analyses, a total of 2,638 village communities occur within four (4) kilometers of the limits of permanent forest estates. The estimated (hypothized) total area of community use zones, largely under different agroforestry uses stands at 6.3 million hectares. By end of 2008, only 621,245 hectares of land, comprising 9.86% of this hypothesized (de facto) community agroforestry lands had a legal title as community forests (MINFOF, 2008). The results further indicate 11 communities occurring within Communal Forests; 99 villages in Wildlife sanctuaries, 84 in Forest Reserves, 72 communities inside UFAs. These regimes have been singled out because statutorily community use of their resources is not entirely legal. However, it is everybody’s guess that the existence of such human communities within these zones is the strongest evidence yet of conflict between customary legitimacy in resources uses and statutory legality in prohibiting their use.

Secondly, our use of the Osterwalder & Pigneur (2003) Enterprise Model to analyze agroforestry enterprises focused on four (4) main aspects: (i) the stocks of products or the value propositions; (ii) the customer interface and policy environment; (iii) the infrastructure/assets and, (iv) finance and benefits flows.

Our general impression was that all communities consider the ‘community aspect’ of their agroforestry enterprises and its potential for community development to be its greatest value. Yet, difficulties in streamlining structure for more efficient functioning emerged as the major constraint to the enterprises surveyed. For instance, community ownership precludes third party involvement in raising funds with which to offset high transaction costs, in resource inventory, materials procurement and labour. Thus limitations on the forest resource base set statutorily at 5000 hectares means scale-inefficiency, which remains a major tenure bottleneck associated with the aspect of ‘resource stocks’.

The lack of flexibility in business transactions due to cumbersome decision-making imposed by community tenure also translates to a weak customer interface. Confidence building between enterprise entities and clients emerged as a major bottleneck with accusations and counter-accusations of dishonesty (Clients) and inability to deliver (Communities) being main ones. Like communities, clients are discouraged by a lack of long-term agreements. Local managers claimed that the absence of firm agreements negatively affects credit-worthiness of entities as finance houses have no way of evaluating entities’ ability to pay back loans. Most enterprises find themselves in a very weak bargaining situation, resulting in bad deals, community indebtedness on equipment, unpaid community deliveries and internal wrangling. All the entities expressed the need to control their value chains, with none demonstrating the capacity to do so. Cash flows remain epileptic and often at the behest of the occasional buyer.

The first area of change that communities seek is broadened statutory recognition of customary tenure. Secondly, they seek innovative mechanisms where forest resources stocks will remain commonly owned. They seek ways in which business transactions and benefit flows could be managed more efficiently. ICRAF and RRI partners and collaborators are committed to fully developing these hypotheses.

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Improving livelihoods in trans-boundary landscapes of Guinea and Sierra Leone through agroforestry options

By Serge Ngendakumana¹, Harold Roy-Macauley¹ and Michael Balinga²

¹ ICR AF, ² CIFOR

Livelihoods challenges

Over 40% of the population in Guinea and Sierra Leone live in extreme poverty with less than 1 USD per day. Many households depend on farming activities yet one out of three people go hungry. It is predicted that any agricultural growth leading to food security will need profound changes in present land use systems and more sustainable agricultural practices, built around annual staple crops and trees interactions (ARDRA ISE/USAID, 2004; FAO, 2007). Major challenges faced by the rural poor communities in Guinea and Sierra Leone include the following:

- Satisfying food needs especially during the critical period of July to September;
- Meeting energy needs;
- Adequate income generation from household activities.

The combination of these livelihood challenges coupled with high population growth in these countries have led to increased pressure on natural resources. This pressure has been observed to be more pronounced in high value biodiversity trans-boundary forest areas, where there are intense cross-border activities and, therefore, high risk of conflicts amongst populations living in and around forest areas.

Agroforestry interventions as a possible solution

Agroforestry interventions with a strong potential to improving land-use practices offer opportunities for addressing agricultural productivity challenges; increasing woody biomass and fuel stocks while providing year round income to communities (Garry et al., 2006). Various reports and policy documents have recommended the application of agroforestry options in trans-boundary sites (Anonyme, 1996). Results obtained from studies carried out between 2005 and 2007 by the World Agroforestry Centre and CIFOR, in classified forests in Guinea, confirmed the important positive effect of agroforestry practices in improving natural resource management and livelihoods of forest communities (Ngendakumana et al., 2008). Scaling out these options in trans-boundary sites in Guinea and Sierra Leone could contribute to improving natural resources management and livelihoods and eventually reducing the risks of conflicts.

Approach

In 2008, ICR AF and its partners in Guinea and Sierra Leone launched a project aimed at improving livelihoods of rural communities and biodiversity conservation, through the development of impact oriented NRM guidelines, tools and approaches. A rapid participatory diagnosis involving 35 village communities was conducted in order to identify community priorities, constraints to enhanced agricultural productivity, and potential agroforestry options, which could be tested to improve both livelihoods and biodiversity conservation. Geographic Information Systems (GIS) techniques were used to situate study units within target sites, selected according to predefined criteria. Preliminary analysis was done using spreadsheets and spatial analyses (ArcGIS 9.0) to analyse land use practices.

Main findings

Agroforestry systems

The following three main agroforestry systems were identified in trans-boundary landscapes: (i) mixed cropping system made of annual crops and naturally regenerated tree species which form parks of Vitellaria paradoxa, Parkia biglobosa, Elaeis guineensis, Pterocarpus eronanceus, Borasus
sp. Afzelia africana, evolving into complex agroforests; (ii) mixed agroforestry systems evolving from planted tree, intercropped with food crops; these are “home gardens” and farms made up mostly of fruit trees such as mangoes, citrus, pears, plantains, palm trees, cola, tecks and acacia; and (iii) semi-natural agroforestry systems made of planted and naturally growing tree species. Farmers cherish this system, which allows them to make their own choices and combinations according to their needs, values and priorities in order to generate continuous revenue, fuel for energy, and food for the household.

Constraints linked to agricultural production and solutions

Participatory identification and validation of key agricultural production constraints and solutions with communities in the study area, raised issues such as low yields for existing cultivars, loss of soil fertility, inadequate technical skills and insufficient support from government extension agents. Solutions identified included introduction of higher yielding or shorter cycle varieties, training in tree planting and follow-up techniques, integration of agroforestry innovations and capacity building for agriculture and forestry support agents or community champions to provide services to communities.

Farmers’ priority agroforestry options

Priority agroforestry options declared to enhance productivity, by farmers and communities in both Guinea and Sierra Leone, included associations of high value trees such as grafted mangoes, avocado, citrus, cashew, palm trees and Gmelina inter-planted with improved varieties of NERICA rice, improved groundnut varieties such as FLEUR 11 and ICG (FDRS) 4, which are important as food staples and income sources. Onions (SIVAN F1 and YELLOW TEXAS) and pepper were also identified as major income generating crops. Men’s priority options for enhancing productivity included rice, oil palm, improved fruit trees (pear, cola tree, citrus, and mangoes) and timber species such as Tectonia grandis and Gmelina arborea. The third set of priorities in terms of agroforestry options emerging from this study was land demarcation and protection options such as live fences and tree hedges to mitigate tenure related conflicts. Findings also highlighted alternative options for soil fertility restoration and land protection, preferred by women, and fodder trees and shrubs on farm for improving livestock production, preferred by men.

Perspectives

More information must be generated using innovative approaches and tools in order to examine the market value of these options and to mainstream technical and legal constraints relative to land use and tenure. Furthermore, gaining more knowledge on farming system models and enabling policies remain critical to ensure that policy makers and stakeholders make more informed decisions towards agroforestry system resilience and increased productivity in trans-boundary areas of West Africa.

For more information, contact Serge Ngendakumana, s.ngendakumana@cgiar.org
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Peer-reviewed scientific articles


Books, Book chapters and Proceedings


Improving livelihoods through agroforestry


**Reports**


Swallow, B. M. van Noordwijk, S. Dewi, D. Murdiyarso, D. White, J. Goekowski, G. Hyman, S.Budidarsono, V. Robiglio, V. Meadu, A. Ekdinata, F. Agus, K. Hairiah, P.N. Mbble,

**Working papers**


**Training Material**


Improving livelihoods through agroforestry


Z. Tchoundjeu, E. Asaah, A. Degrande, A. Tsobeng, M.L. Mpeck et A. Eyebe. 2008. La Domestication Des Arbres Agroforestiers; Module II : Culture et Gestion des Arbres Agroforestiers En Champ, Yaoundé, Cameroun


**Student dissertations**


**Donor Reports and Public Awareness Material**


## Ongoing Projects in ICRAF-WCA

### Humid Tropics Node
- Promoting Rural Innovation through Participatory Tree Domestication (IFAD)
- Increasing Small-scale farmer benefits from Agroforestry Tree Products in West and Central Africa (Belgian Development Cooperation)
- Agricultural and Tree Products Program in the West And North West Regions of Cameroon (USDA)
- Central African Regional Programme for Environmental Landscape Program, led by African Wildlife Foundation (CARPE-USAID)
- Linking Futures: Economic Opportunities, Livelihoods and Ecological Sustainability Programme in the Campo Ma’an Landscape, Cameroon (WWF)
- Land Use Assessment (RRG)
- Promoting Development of Economically Viable Rubber Small Holdings in West Africa (CFC)
- Mobilising And Reinforcement of The Capacity of SMEs Involved in NTFP in Central Africa, led by FAO (EU)
- Livelihoods and Landscape Strategy (IUCN)
- Action de Gestion Durable des Forets en Intégrant les Populations Pygmées Baka, led by BTC (EU)

### Sahel Node
- ALUCCSA: Adaptation of Land Use to Climate Change in Sub-Saharan Africa (BMZ)
- JATROPSA: Domestication of Jatropha Curcas for Oil Production on Smallholder Farms in the Sudano-Sahelian Region with Focus on Mali (DANIDA)
- SCAP: Smallholder Conservation Agriculture Promotion in West and Central Africa (IFAD)

### Guinea Node
- Landscape Management for Improved Livelihoods in Transboundary Areas of Sierra Leone and Guinea (USAID)
# Staff List

**Staff List as at December 2008**

<table>
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<th>Name</th>
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### Upper Guinea Node

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<td>Ahmed Diogo Bah</td>
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<td>Thierno Djoubairou Bah</td>
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### Sahel Node

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Dr Antoine Kalinganire</td>
<td>Global Research Project 2 Leader</td>
</tr>
<tr>
<td>Dr John Weber</td>
<td>IFAD Project Coordinator</td>
</tr>
<tr>
<td>Dr Faye Mbene</td>
<td>Agro-Economist</td>
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<tr>
<td>Guindo Fada Diall Gouro</td>
<td>Regional Finance Officer</td>
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<tr>
<td>Gatta Ibrahim Aly</td>
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<tr>
<td>Ibrahim Toure</td>
<td>IT Specialist</td>
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<tr>
<td>Kone Brehima</td>
<td>Scientific Officer</td>
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<tr>
<td>Mounkoro Bayo</td>
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<td>Samaké Ouodiouma</td>
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<tr>
<td>Dia Mamadou</td>
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<tr>
<td>Amadou Niang</td>
<td>MDG Project Director West and Central Africa</td>
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<tr>
<td>Ibrahim Tounkara</td>
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<td>Maiga A. Camara</td>
<td>MCI Project Manager</td>
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<tr>
<td>Rafael Flor</td>
<td>Agriculture and Environment. Advisor</td>
</tr>
<tr>
<td>Diarra Mamadou</td>
<td>Regional Investment Promotion Specialist</td>
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