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GUINEA AGRICULTURAL MARKET LINKAGES ACTIVITY

CHILI PEPPER PRODUCT DEVELOPMENT PLAN

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CHILI PEPPER PRODUCT DEVELOPMENT PLAN

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CONTENTS

Executive Summary	1
Introduction	5
Analysis	16
Product Development Plan	21
Conclusions and Recommendations	26
Annexes	
Annex A	28
Annex B	33
Annex C	35
Annex D	37

EXECUTIVE SUMMARY

As the Chemonics/GAMLA project approaches the end of its activities, a series of Product Development Plans (PDP) were created with the goal of guiding future donor agencies or other institutions on the potential for improving production and marketing of targeted horticultural commodities and forest products. The following PDP examines the potential for transforming the production, processing, and marketing of birds-eye chili in Guinea from a household, rudimentary level into a market-oriented commercial activity.

Field visits were conducted to the major birds-eye chili producing areas in Guinea along with visits to wholesale markets, national agricultural research centers, and nongovernmental organizations involved in chili production or processing and marketing. International buyers and exporters of birds-eye chili were contacted to determine the potential for finding an overseas market for Guinea's product. The information gathered indicated that current production of birds-eye chili would not be competitive on international (European, North American, etc.) markets due to a combination of factors including:

- The quality of chili produced does not meet international market requirements set for chili used for culinary purposes in that it is not dried in a hygienically sound manner, and therefore is likely to contain high levels of microbial and other unacceptable contaminants, e.g., aflatoxin.
- Guinea's birds-eye chili are highly heterogeneous in genetic makeup and appearance, whereas the international market requires uniform dried fruit in size, shape, and color.
- Current prices paid for birds-eye chili used for industrial purposes (primarily capsaicin extraction) are too low to justify the transport and other costs associated with exporting products from Guinea to international markets. Moreover, the price paid for birds-eye chili on domestic and regional markets is higher than found on the international industrial market, namely in the vicinity of US\$1/kg (versus US\$2.50 on local and regional markets).

Guinea could potentially be a competitive producer of certified organic birds-eye chili provided a number of conditions (summarized below) are met.

Two basic value chains exist: the local market and regional markets, each of which is currently profitable, and show considerable scope for improvement of profitability through further and continued refinement of the model. Local field production costs have been calculated to be above 4,500 Guinean Franc (GNF) per kilogram (kg). This results in a gross margin on the local market of around 2,000 GNF per kg of birds-eye chili for the producers. Considerable scope exists for increasing returns and margins, including: direct linkages between producers and wholesalers eliminating the middle men (collectors) and improving quality and quantity of dried chili produced by smallholders, both in *tapades*, rice, and other staple intercrops.

The most lucrative market for Guinea's chili peppers, especially those produced in the Foutah Djallon region, is across the border to the north in Senegal. The gross margin goes

as high as 17,000 GNF per kg. The problem is that most of the gross margin goes to intermediaries (rural and urban collectors) and wholesalers for their costs (packaging and other aspects of conditioning together with sales costs) and their profit margin, with little trickling down to the producers. Moreover, Guinea can only sell in the Senegalese market when chili peppers from Benin and Burkina Faso are absent from the market as their products are more uniform in color and size, have better presentation, and fetch higher prices. Considerable potential growth exists for increasing returns and margins not only as seen in the case of the local market, but also in moving up the high-end price bracket of the market chain in Senegal.

In domestic and regional markets, Guinea's birds-eye chili are highly appreciated for their superior quality in terms of pungency and aroma. Numerous constraints were identified at the production, harvest, post-harvest, and handling levels that reduce both the quantity and quality of birds-eye chili currently produced in the country. All can be addressed and, given provision of adequate technical assistance, resolved, as is described in the recommendations listed below.

Given these findings, three models are proposed for developing the birds-eye chili sector in Guinea. The first model is oriented toward small scale producers and producer organizations targeting the domestic market and the second is directed toward small scale producers and producer organizations targeting regional markets in general, and Senegalese markets in particular. Given the advantage of using minimal agricultural chemicals for birds-eye chili production in Guinea, the country has the potential to produce certified organic chili for the international marketplace, for which there is a demand and a remunerative price for a high quality product. International organic agriculture regulations are extremely strict, however, so the mere absence of chemicals on crops would not immediately qualify Guinea's birds-eye chili producers for organic certification. Given the traceability, documentation, and cost requirements for obtaining organic certification, this option would be restricted to commercial producers or producer organizations with the financial and human resources needed to achieve organic certification. The third model, therefore, outlines what would be required to set up commercial scale production of certified organic birds-eye chili destined for culinary usage on international markets. These requirements include adequate land to allow for a proper rotation and, at the same time, production of sufficient quantities of dried birds-eye chili to fill at least a 20 foot container of export quality product per year, significant infrastructure investment (solar dryers, grading/storage sheds), as well as farm managers experienced in organic agriculture regulations and an adequate number of staff to handle all the production, harvesting, processing, and packaging requirements.

Regardless of which market Guinean birds-eye chili producers target, all could significantly boost the quality and quantity of dried chili by following a series of recommendations including: selecting seeds from uniform, high quality, disease free mother plants; grading the fruit at harvest into different quality categories; using improved drying techniques (ranging from lifting drying mats off the soil and protecting the chili peppers from contamination by birds and other animals, to using artisanal solar dryers developed by a Guinean researcher); storing the dried chili in clean packaging on

pallets in a dry, insect and rodent free environment; and, practicing pest and disease preventative measures at the production level. Disseminating these recommendations to birds-eye chili producers requires trained extension agents (either national, nongovernmental, or private) who can train the producers and provide them with regular follow-up monitoring of their mastery and adaptation of improved production and post-harvest handling techniques. This task cannot be carried out by the current state-sponsored extension service, as it lacks both sufficient personnel and the means to reach farmers on a regular basis.

The quality of birds-eye chili reaching Guinea's wholesale markets would be greatly improved if not only the above practices were followed, but if wholesalers could avoid purchasing chili peppers that have been moistened by producers and/or middlemen, a current practice used to add weight to (and therefore increase the amount of money received for) the chili. Wholesalers who stock birds-eye chili for any length of time before marketing them could also improve the quality and value of their product by storing it in clean, dry, insect and rodent-proof sheds and on pallets. Wholesalers and retailers would add value to their chili if proper grading of the product is practiced (starting at the harvesting stage, as described above, with further grading according to color and size of the fruit by the wholesalers/retailers) as well as improved packaging. The latter is of particular importance for birds-eye chili destined for the regional markets, where chili from Benin is currently more competitive than chili from Guinea, despite the lower pungency of the Benin chili, simply because they are packaged in transparent plastic bags, carrying a label, with only the small, deep red chili selected for sale on the regional markets.

The information Guinea's birds-eye chili producers need to improve the quality and quantity of their chili is, for the most part, already available from research institutions in the region. It is recommended that the national research centers mandated to cover fruit crops make an effort to establish linkages with these other institutions in general, and become a member of the West African countries assisted by the World Vegetable Center's Sub-regional Program based in Bamako, Mali. In the near future, it would be useful for the Guinean researcher most experienced in chili production and processing to conduct a joint study with members of the International Center for Research in Agro-Forestry's (ICRAF) program based in Labe to investigate aspects such as the price premium that would have to be paid to producers as an incentive to grade their chili at harvest and use improved drying techniques to have a higher quality product which could then be sold on regional markets, and whether value-added warrants these additional efforts. The ICRAF program has funding to conduct such studies, but as it is closing in September 2007, it is essential that this opportunity be seized as soon as possible.

Given the considerable amount of financial and human capacity development that would be required for such a venture, only those individuals and associations capable of meeting all the requirements should attempt to go into certified organic birds-eye chili production. Should entrepreneurs or producer associations capable of undertaking certified organic production of birds-eye chili be identified, there is the possibility of funding or providing

technical assistance from a few international organizations, such as the African Development Foundation and the International Trade Center.

INTRODUCTION

The Guinea Agricultural Market Linkages Activity (GAMLA) is a USAID funded contract executed by Chemonics International Inc. Project implementation began in June 2005 and will end in December 2006. The primary objective of GAMLA is to increase market-driven production, processing, and sales of selected agricultural and forest products. Secondary objectives include identifying longer-term opportunities for agribusiness development in Guinea, key policy constraints and solutions to agribusiness development, and water technologies that could have a significant impact on rural income generation.

Guinea's potential as a regional and international exporter of horticultural crops and forest products has long been recognized. The country has modern port facilities in Conakry, several weekly flights to major European markets, and near ideal growing conditions for a host of tropical products demanded by regional and European markets. Guinea's potential, however, has mostly remained untapped, due, in large measure, to the absence of effective linkages along the farm-to-market commodity chain.

One horticultural crop already produced in Guinea and with potential for bringing increased revenues to some of the poorest regions of the country is birds-eye chili, more specifically *Capsicum frutescens*, called *petit piment* in Guinea. While significant volumes of the crop are produced and exported to neighboring countries, production and post-harvest handling techniques used are rudimentary, and the resulting yields and quality of dried birds-eye chili are well below what could be achieved. The reasons for targeting this particular variety of chili or hot pepper include the fact that its harvest is extremely labor intensive, which offers an advantage for countries such as Guinea where cost of labor is relatively inexpensive (compared to South Africa, for example). It is sold (including to export markets) in a dried form, and is relatively less perishable than varieties such as Scotch Bonnet/Habanero or Serrano, which are less desirable as dried products. Finally, other traditional sources of African birds-eye chili from places such as Malawi and Zimbabwe have undergone significant reductions in production over recent years due to climatic problems or economic difficulties.

The following study was conducted to formulate a product development plan (PDP) for birds-eye chili in Guinea, including creating a road map for the further development of this important subsector. As GAMLA is ending, this product development plan is targeted to an audience outside of USAID. The following PDP is intended to provide a useful guide for activities that investors, exporters, local NGOs, and international organizations can follow to address these product development constraints and take advantage of product development opportunities for birds-eye chili in Guinea.

Background

Production of *petit piment* (*Capsicum frutescens*, known as birds-eye chili or Tabasco in English; *Langue d'Oiseau* in French) has been traditionally practiced in Guinea for at least the past century.

Natural conditions are favorable to birds-eye chili production in the following regions of Guinea: Maritime Guinea, the Foutah Djallon, Upper Guinea, and Forestland Guinea.

While considered a highly marketable crop, birds-eye chili has never been reported to be produced on a large scale. Instead, it is grown around homesteads, intercropped with staples such as rice and maize, partially consumed locally as a condiment and partially sold (primarily in the dry form) on local and regional markets.

In Guinea, the main production zones known to produce marketable surpluses of birds-eye chili are:

- Sikhourou, Madina Oula, Labaya, and Kolaboui in Maritime Guinea;
- Lélouma, Kankalabé, Dionfo, Konah, Koïn, Donghel Sigon, and Timbi Madina in the Fouta;
- Kankan, Kouroussa, Dinguiraye, and Siguiri in Upper Guinea;
- Kissidougou, Boola, and Lola in Forestland Guinea.

The main production season for birds-eye chili in Guinea is August to October. However, harvesting often continues through March, with crop growth supported by residual soil moisture. Production ceases when the soil moisture is depleted.

Current Situation

Exports. Guinea's birds-eye chili is sold on the domestic market and overland exported to neighboring countries in the form of dried chili.

Current export levels are estimated to be between 1,500 and 2,000 tons exclusively to the regional markets around Guinea, especially Senegal. Sierra Leone is the second largest importer of Guinean dried chili, followed by Liberia and The Gambia. Unfortunately, there is no documentation on existing volumes, or of the potential scale of demand in those markets. The main diffusion markets are located in the large urban centers of Conakry, Kindia, Mamou, Labé, Kankan, Siguiri, and N'Zérékoré where wholesalers export not only to Senegal, Sierra Leone, Liberia, and The Gambia, but also to Guinea Bissao and even Bamako, Mali.

The border market of Diawbhè in Senegal receives Guinean birds-eye chili originating from the wholesalers collecting from the Fouta region as well as some parts of Maritime Guinea, such as Kindia and Telimele. This is the transit point towards Senegal, The Gambia, and Guinea Bissao.

From the Labé market alone, a volume of 10 to 12 tons is reported leaving for Diawbhè every week during the four month campaign period from October to February each year. Total estimated volume is more than 200 tons per year. From the Kindia market, a wholesaler reported that when the price is right in Diawbhè, a 15 ton truckload leaves Kindia Diawbhè every two weeks during the five months commercial campaign period from October to February every year. Total estimated volume is around 200 tons a year.

Unlike African countries such as Uganda, Kenya, and Malawi, no attempts have been made to grow birds-eye chili for international markets in Guinea. Some reports have mentioned Senegal importers repacking dried chili purchases from Guinea for re-export to the Netherlands, but no factual data on this exists.

Export transport. Presently, export transport is exclusively by road from the main diffusion markets to neighboring markets, and almost exclusively to border zone markets such as Diawbhe in Senegal, as described above. Due to the pungent components of birds-eye chili, which are highly volatile, no mixed loading is advisable (to avoid diffusion of the pungency to other products), resulting in transporting birds-eye chili in a single load of 10 to 15 tons per truck. Cost of transport from Labé to Diawbhe is 5,000,000 GNF for 10 metric tons (MT), thus 500 GNF per kg.

Structure of the production base. The production base of birds-eye chili is comprised of a mixture of individual producers and producer groups. Based on field observations and documentation review, birds-eye chili is a crop grown primarily by women in Guinea. Recently, men have entered into some birds-eye chili production through producer groups, which include men. In Maritime Guinea, the Benna Moussayah Producers Union (BMPU), created in August 2001, was found during a July 2006 visit to be comprised of 96 producer groups, of which only 10 were women producer groups. In Lelouma, the villages of Parawol and Korka have several producer groups and unions of producer groups with more than half of the producer groups being composed of women.

Production. In most regions of Guinea, birds-eye chili is grown primarily in *tapades*, which are the lands surrounding homesteads and which benefit from the application of household wastes and other organic matter to the soil. The *tapade* is a very small piece of land around the hut in the family compound, generally with a small surface area rarely exceeding 0.30 hectares. Surface areas planted to birds-eye chili are all very small, rarely exceeding 0.30 hectares. The *tapade* is given to a woman by her husband when she marries into his family. Women often depend on crops for their household or as cash crops that can be used to generate income.

Birds-eye seedlings are generally produced in swampy areas known as *bas fonds* in March before the start of the rainy season. After the rains begin around June, maize is sown in the *tapade*, with the chili seedlings subsequently transplanted in pockets on the same land. Other sauce ingredient crops (aubergine, okra, spinach) or root and tuber crops may also be planted together with the chili in the *tapade*. Following the harvest of the maize, the stalks are used as mulch for the chili crop. Chili harvest commences approximately two to three months after transplanting. Drying the fruit during the first couple of months of harvest (August – October) is difficult, as the rainy season is still ongoing. Producers attempt to dry most of what they harvest at this time, laying the fruit out on mats (constructed of a variety of materials) outdoors during dry periods and bringing them indoors when it rains.

The second major system of birds-eye chili production is to transplant seedlings into fields (usually from 0.100 to 0.300 hectares) sown to rice, millet, or fonio during the rainy season. Since the chili plants are out-shaded by the major crop (rice, millet, etc.), there is no fruit production during the first rainy season. When the rains begin the subsequent year, the chili crop sets and harvest begins in June. Drying the fruit harvested during this time and the subsequent months presents a major constraint as this coincides with a significant proportion of the months with high rainfall.

There are no reliable birds-eye chili production statistics in Guinea, but the country's production has been estimated to fluctuate on average between 4,000 and 5,000 metric tons (MT) per year.

No reliable data could be found on yields of chili, with some documents reporting yields as low as 300 kg/ha and others as high as more than 1 MT/ha.

In both production systems traditionally observed in Guinea, unselected seed saved from previous crops (usually the producer's own, but in some cases purchased from others) is used. In a few areas, producers simply take seedlings that sprout spontaneously from seeds that have fallen on the soil underneath established plants. Women and children weed and harvest the crop, with men reportedly assisting with plowing the land when this practice is performed. Women and children, in turn, do the weeding and harvesting of fruit in the men's fields of *gros piment* (*Capsicum chinense*). This type of chili is sold fresh, unlike birds-eye chili. Women keep the profits from the sales of their chili, and their husbands have the right to know how much their profits are. Conversely, men keep the profits from their *gros piment* sales, and do not share any information regarding the profits they make with their wives. In some cases, laborers outside the family may be hired for weeding the fields and harvesting the fruit.

Chili is inevitably highly variable in nature, and there is a complete lack of knowledge of the importance and practice of seed selection. This results in the heterogeneity of fruit produced, including lack of uniform color and size (bright red color and small size being the consumers' preference). Guinean chili peppers fetch a lower price on regional markets (e.g., Senegal) than those from Benin, which are more uniform in color and size.

Post-harvest. Fruit is dried using very rudimentary techniques, primarily consisting of placing them on used woven polyethylene bags, mats, or sheeting which is in direct contact with the soil, usually in front of the producer's house. No means are employed to protect the drying fruit from contamination, e.g., with the feces of poultry or small animals roaming the village, flies, or dust.

Dried fruit are stored in recycled or new woven polyethylene bags (used for rice, flour, etc.) with a volume of ca. 40 kg.

No post-harvest infrastructure developments exist, despite the fact that a local researcher affiliated with the Centre de Recherche Agronomique (CRA) – Bareng, Mr Minthe, has developed models of dryers that could be the basis for such developments. Solar tunnel

dryers have been introduced in Guinea, and the Groupement Féminin pour la Production des Fruits et Légumes (GFPFL) in Kindia has solar tunnel dryers that could be used, and are to a limited extent, for drying chili.

In the Foutah Djallon region, Elargi de Gestion des Ressources Naturelles (PEGRN), a USAID funded project which was operational from 1999 – 2005, developed two types of simple solar dryers for dehydrating fruits. The extension of these dryers appears to have been limited, however, and insufficient training and follow-up advisory services were provided. Nonetheless, reports state that where installed, the dryers produced high quality dried chili, and were well received by the target groups.

Processing. Some of the dried chili is ground into chili powder, mostly for the local market with very limited regional sales. Kanya Donse Fanyi in Kindia reports selling 100 kg of chili powder per month in 50 gram plastic bags from October to April each year. This would add up to 500 kg per year.

Documentation and standards. Dried birds-eye chili sold for human consumption in international markets must meet the following minimum criteria:

- Uniform size (2 – 3 cm length and 0.8 cm width) and bright red or orange color (the deeper the red pigmentation, the higher the price);
- Moisture less than 9 percent;
- Scoville units minimum 50,000 (preferred level is 80,000 and higher);
- Animal material: nil; extraneous plant material: less than 1 percent; soil: less than 0.2 percent; foreign bodies: nil;
- Total aflatoxin limit: 10 g/kg;
- No Salmonella; other bacteria, yeasts, and molds at level of 1×10^7 colony forming unit per gram (cfu/g) or lower.

Chili powder exported to the European Union (EU) and other international markets must not only meet the above criteria in terms of hygiene, aflatoxin, and microbial contamination, but must also undergo testing for Sudan Red. Additionally, once ground, chili powder deteriorates much more rapidly in storage than whole dried fruits.

Export formalities are centralized under Centre d'Appui aux Formalites a l'Exportation (CAFEX) in the Ministry of Commerce, which provides a single source for all documentation necessary for export, and has offices at the air and sea port, and Labé, (route to Senegal) with another planned for Kankan (route to Mali). CAFEX is not responsible for determining quality, but works with the Service National de Contrôle de Qualité, which can undertake laboratory analyses, but capabilities are limited. CAFEX maintains information on Standards and Regulations (and interacts with EU agencies, Europe-Africa-Caribbean-Pacific Liaison Committee (COLEACP), and the Center for the Development of Enterprise (CDE)) and gives advice on how to improve quality and meet internationally accepted standards.

There are no domestic sources of internationally recognized certification/accreditation bodies like Euro-Retailer Produce Working Group-Good Agricultural Practices (EurepGAP), Organic, Hazard Analysis Critical Control Points (HACCP), etc., available.

Finance and credit. Producers have yet to seek access to formal credit. Credit Rural, the financial institution lending to producers such as those in the production base, targets small producers who are unable to raise a lump sum required for specific inputs (fertilizer, planting material, etc.). However, they have to be able to pay back the loan from income earned from other sources over the following months. This is not the case presently for birds-eye chili producers in Guinea.

Projects are reported to have given producers material and capacity building support. The Programme Spécial de Sécurité Alimentaire (PSSA) funded by the Italian Government and the World Food Program constructed both a warehouse for storing rice and birds-eye chili as well as a cereal bank by the Benna Moussayah Producers Union (BMPU). Plateforme pour l'autopromotion et le développement organisationnel (PLADOR), in collaboration with La Communauté Nourricière du Fouta Djallon, has been giving support to the producer groups and the unions of producer groups in Parawol and Korbé through functional literacy training, training in accounting and marketing, and through the supply of wire nets for fencing the fields.

The Value Chain

Two basic value chains exist: the local market and the regional markets. Each market is currently profitable, and shows considerable scope for improved profitability through further and continuing refinement of the model. A third potential value chain will be proposed.

Cost data found in the available documentation targeting the present production base need to be updated. We will use reports produced by the CAR-Bareng researcher, Mr. Minthe, together with data gathered from the field to value cost elements often not quantified and therefore not accounted for in available documentation.

Usually, whether grown around homesteads or intercropped with staples such as rice and maize, seedlings are produced in swampy areas known as *bas-fonds* around the month of March, and subsequently transplanted in pockets on the fields. According to Mr. Minthe, all figures in his 2002 – 2003 reports should be multiplied by three to arrive at current values, given the devaluation of the GNF (Camara et al, 2002 and Camara et al, 2003). Thus we have taken the cost for production of 500 birds-eye chili seedlings to be three times 5,939 GNF. Birds-eye chili producers in the village of Mola (Forecariah region), especially those with no children of their own (or with children too young to work in the fields) reported hiring young people to assist with weeding and harvesting. For the first weeding, laborers are paid 35,000 GNF, 30,000 GNF for the second, and 40,000 GNF for the final weeding. With plot sizes averaging 350 – 400 square meters, this is equivalent to GNF 262 – 300 per square meter. Labor for harvesting the fruit is paid in kind, meaning that one out of three harvests is given to the laborer in return for their work. Accordingly, we have calculated the production cost of one-third of the expected crop of 50 kg to be

the cost of harvest labor. Drying as detailed above is done in a rudimentary non-hygienic way. As for storage, mostly recycled polyethylene bags are used and therefore do not cost anything.

The production costs in GNF for a plot using 500 seedlings expected to produce 50 kg of dried birds-eye chili are highlighted in the table below:

Seedling production	17,817
Transplanting	40,000
First weeding	35,000
Second weeding	30,000
Final weeding	40,000
Total production costs	162,817
Harvest labor cost	54,272
Total cost ex field	217,089
Unit cost ex field in GNF per kg	4,342

Producers of birds-eye chili pepper in Guinea use the product as a form of financial security, selling them during the hunger period according to needs for food purchases for the family. They do not appear to think of unit cost ex-field but of opportunity value.

The local market. Prices observed in the natural regions terminal markets in Guinea were reported in 2005 by the Association pour la Commercialisation Agricole (ACA) in the table below.

Table 1: Price for Birds-Eye Chili on Regional Markets in Guinea in 2005

	Jan	Feb	Mar	Apr	May	June	July	Agst	Sept	Oct	Nov	Dec	Average
CONAKRY	4,400	4,683	4,775	4,750	5,295	9,075	11,71 3	11,72 5	12,00 0	12,00 0	12,00 0	12,62 5	8,753
KANKAN		6,883	6,750	7,400	6,900	6,800	7,100	7,200	8,267		10,00 0	12,93 8	8,024
KINDIA	5,425	5,833	6,825	8,263	8,500	11,53 3	14,00 0				12,50 0	12,00 0	9,431
LABE	6,500				8,375	10,00 0				14,25 0	13,75 0	12,06 7	10,824
N'ZEREKORE	5,013	4,125	5,125	5,500	6,188	9,167	7,947	4,000		10,06 3	10,93 8	11,83 8	7,264

In July – August 2006, prices were reported to be 20,000 GNF per kg in Guinea, equivalent to more than 1,500 FCFA per kg; the same report observed prices of 750 FCFA per kg in Senegal and 850 FCFA per kg in Mali. Such prices indicate that the market is very spotty and seasonal.

The average observed price of a kg of dried chili pepper in the terminal markets in Guinea in 2005 were:

- 7,024 GNF in Kankan (Upper Guinea);
- 8,753 GNF in Conakry;
- 9,431 GNF in Kindia (Maritime Guinea);

- 10,824 GNF in Labe (The Fouta).

Field production costs have been calculated to be above about 4,500 GNF per kg. According to a report produced for ARCA Guinea by Mr. Kaba Camara, producers were paid ex-field 6,500 GNF per kilogram of dried chili pepper in the Fouta Djallon region. This results in a gross margin of around 2,000 GNF per kg of birds-eye chili for the producers.

Great potential exists for increasing returns and margins, including:

- Direct linkages between producers and wholesalers eliminating the collectors, or middlemen;
- Improving quality and quantity of dried chili produced by smallholders, both in *tapades*, rice, and other staple intercrops.

Indeed, Minthe's market surveys in 2002 – 2003 in the regions of Tougue and Lelouma, as well as the prefectures of Kindia and Sougueta identified three commercial channels, namely:

- Producers sell birds-eye chili directly to the local retail market without going through middlemen (rural collectors and urban collectors);
- Rural collectors buy from the producers and sell to the urban collectors who, in turn, sell the chili on the diffusion markets to wholesalers for the regional retail markets or for exports;
- Rural collectors buy from the producers and sell to the urban collectors who later sell the chili on the diffusion markets to wholesalers for the Conakry retail market.

Rural collectors were found, in the Kindia-Forecariah area, to usually add around 43 percent for costs and profit margin over the purchase price to sell to the urban collectors; the latter, in turn, add another 70 percent for costs and profit margin. This means that wholesalers buy 113 percent over the product cost ex-field. If direct linkages could be established between producers and wholesalers, the producers' gross margin could increase by at least 50 percent.

Rural collectors in the Fouta Djallon region were found to usually add around 20 percent for costs and profit margin over the purchase price to sell to the urban collectors; the latter, in turn, add another 21 percent for costs and profit margin. This means that wholesalers buy 41 percent over the product cost ex-field. If direct linkages could be established between producers and wholesalers, producers' gross margin could increase by at least 20 percent.

As for improving the quality and quantity of dried birds-eye chili produced, further recommendations are given in the proposed development models described below.

Regional market — Senegal. The most lucrative market for Guinea's chili, especially for chili produced in the Foutah Djallon region, is across the border to the north in Senegal.

Reports from wholesalers in Labé indicate that in 2005, one kilogram of dried birds-eye chili from Guinea was sold at 2,200 FCFA during the period of abundance, and at 4,000 FCFA during the period of shortage (exchange rate was around 1 FCFA to 10 GNF at the time).

Sales price in Diawbhe:	22,000 GNF per kg (or 2,200 FCFA)
Transport cost Labé/Diawbhe:	500 GNF per kg (or 50 FCFA)
Fruit cost ex-field:	4,500 GNF per kg (or 450 FCFA)
Gross margin:	17,000 GNF per kg (or 1,700 FCFA)

The problem is that most of this margin goes to intermediaries (rural collectors and urban collectors) and wholesalers for their costs (packaging and other aspects of conditioning together with sales costs) and their profit margin, with little of this added value trickling down to the producers.

Due to heterogeneity of fruit produced in Guinea, including lack of uniform color and size (bright red color and small size being the consumers' preference), the prices observed in Diawbhe are on the lower price side of the Senegalese market. Chili from Benin and Burkina Faso, which are more uniform in color and size and have better presentation, fetch higher prices.

There is great potential for increasing returns and margins not only as seen in the case of the local market, and also in moving up the high end price bracket of the market chain in Senegal.

Currently, there are no sea freight exports to Dakar, and the value chain is not presented because regional markets around Guinea exclusively use road transportation for pepper.

International markets. Due to a combination of factors, the birds-eye chili currently produced in Guinea is far from having the potential to be competitive in international (EU and North American) markets, either as whole dried fruit or ground powder destined for human consumption, or for extraction of capsaicin used in the pharmaceutical industry and for the production of personal protection devices.

Moreover, the packaging and storage conditions used are likely to further reduce the quality of the chili through insufficient protection from moisture, microbial and insect attack and, in many cases, containing contaminants which would render the chili unacceptable on the international market place.

The certified organic market is the only international market which may accept smaller quantities of high quality birds-eye chili that some producers may be able to achieve in Guinea at a remunerative price. This appears to be the only international market which Guinean producers of birds-eye chili should attempt to reach, as prices offered locally and in the regional market are higher than those found on the more common conventional international market, especially when adding cost insurance and freight charges.

Table 2. Prices Paid for Birds Eye Chili on International Markets
According to Importers and Exporters Contacted

Source of Information	Price Quoted	Comments
J.H. Wertheim, Tea Importers Inc. e-mail TEAIMPORT@aol.com	US\$1.00 – 1.20/kg, C&F New York	Minimum Scoville unit rating of 40,000; higher price paid for higher levels.
J.E. Schluter, Schluter Trading SA, e- mail jes@schluter.ch	US\$1.00 CIF	Very limited interest pungent chili for capsaicin extraction in Europe at present
Steve New, USAID- Kenya Horticulture Development Program, e-mail snew@fintrac.com	US\$2,500 – 3,500/MT FOB	Kenya currently exporting ca. one container per month; buyers have enough sources at present and are not interested in encouraging new entrants into the market. Niche demands for organic and/or fair trade certified chili.
Werner Leikert, Inproplant GmbH, Germany. e-mail: leikert@inproplant.de	Euro 5.00/kg net, C&F European Port	Will purchase only high quality certified organic chili, minimum quantity of six tons per shipment.

Oleoresin (capsaicin) extraction. In the past, there was a considerable market for oleoresin capsaicin, the birds-eye chili extract that causes the burning sensation in the mouth. This is no longer the case. According to recent reports, India has become the leading supplier of inexpensive capsaicin. By developing a different extraction process based on chili that have only moderate levels of capsaicin together with significant levels of the oleoresin used as a red dye, Indian processors are able to produce both products from chili that are available in abundance at low cost in the country. As a result, India now out-competes all other traditional sources of capsaicin, based on capsaicin extraction from birds-eye chili, which are more costly to produce (Clinton Green, personal communication; Mathew, 2005).

Current Development Projects

A number of development projects, current and planned, and donor programs impact the subsector.

Specific development projects.

- Groupe Agence Française de Développement (AFD): AFD is an organization with a long history of support to the development of the Fédération de Paysans de Foutah Djallon (FPFD) for potato commercialization. They are starting a program to support Producer Unions in the Forécariah zone through a four year support program to the Fédération des Paysans de Basse Guinée, including a component focused on formation and development of commercial activities of Unions. AFD is starting a program to examine requirements for fair trade certification. They have a long history of involvement with Credit Rural. With FPFD thinking of diversifying production for their members through birds-eye chili production, AFD could impact the subsector.

- Common Fund for Commodities (CFC): CFC has a program to restart the production and export of bananas, with many points of overlap with birds-eye chili and other products destined for export markets. Birds-eye chili could fit into CFC's existing activities due to common constraints — inputs, packaging, proper storage conditions, etc.
- International Trade Center/Ministry of Commerce and Industry: The International Trade Center (ITC) is providing support for training in commerce and export through the *Projet de Renforcement des Capacités de la Guinée en Matière de Commerce International et d'Exploitation par la Formation* (€1 million). This new program, with the remit of providing support to input supply (with other donors) is scheduled to start in 2007 (US\$12 million). The ITC supports the establishment and management of a *Centre d'Information* within the Ministry of Commerce and Industry, with access to ITC's information databases.
- The Federation des Paysans du Foutah Djallon (FPFD): FPFD has demonstrated experience in development strategy for the production and commercialization of potato, tomato, onion, and rice around Timbi Madina. Mr. Diallo Alpha Oumar, Director of Training and Capacity Building at the FPFD, indicated they would be interested in including birds-eye chili in their program due to the high value of the crop, but were unwilling to pursue this initiative until an appropriate production and marketing strategy had been developed.

Accessible donor programs.

- African Development Foundation (ADF): The ADF provides two types of support to enterprise development on a case-by-case basis: technical assistance focused on more effective market penetration; and enterprise expansion grants.
- ADF's local partner, the *Centre d'Appui au Développement* (CAD) is a potential source for funding and technical support.
- European Union (EU) Agencies: A number of EU Agencies have programs which could be applied to for assistance. The CDE has supported commercial developments in the past in Guinea, and has the potential to assist private sector developments in the processing sector, and export market investigations.

ANALYSIS

Opportunities

The scope for moderate commercial development of the birds-eye chili subsector is based on a number of core opportunities:

Access to market demand. There is reasonable scope for increased supply to both the regional and European markets. The different market requirements support a range of production operations.

Neighboring/Regional. The Senegalese market is probably the major current export market for Guinean birds-eye chili pepper, but competition from Benin and Burkina Faso suppliers needs to be addressed. Supplies to other neighboring markets have not been seriously developed. There is the potential to increase access to Liberia and Sierra Leone as well as Guinea Bissao and Banjul.

Europe. Currently no Guinean birds-eye chili are exported to Europe or other international markets. Guinea could target the certified organic market, the only international market that might accept the smaller quantities of high quality birds-eye chili that some producers may be able to achieve in Guinea.

Scope for improved production. There are substantial areas for improving quality and quantity of dried chili produced by smallholders, both in *tapades*, rice, and other staple intercrops through training on improved production, harvesting, and drying techniques.

Certified organic birds-eye chili. There is reasonable potential for private commercial farmers or large scale producer organizations (farming the same land collectively) meeting specific criteria to be eligible to undertake production of organic birds-eye chili production, certified by an internationally recognized certification body such as Ecocert.

Competitive Advantage

The key competitive advantages that Guinea can mobilize to access the opportunities include an excellent growing environment for birds-eye chili — climate, soils, abundant and inexpensive labor, and access to water and unique agro-ecological conditions of the Fouta Djallon region. Producers are experienced with chili production and have a history of trading chili from the Fouta region to the more lucrative markets in Senegal, primarily in Diawbhe, which is easily accessed from Fouta Djallon. Three local varieties have been identified and characterized by the Guinean agricultural research centers: Dow-Banga, Komet, and Nendenkoro. They are appreciated in local and regional markets and priced well because of their high levels of capsaicin and red pigmentation. Agricultural research centers (especially CRA Bareng) possess a great amount of expertise in the domain of fruit (and therefore chili) production.

Constraints

Production, processing, and marketing. From a combination of visits to birds-eye chili producers in two of the major production regions (those around Kindia, and Foutah Djallon), and a review of documentation relevant to birds-eye chili production in Guinea, the following were observed to be the major constraints (in order of importance).

A lack of knowledge of importance (and therefore practice) of seed selection. All producers visited reported taking seed from fallen fruit while drying on mats. This results in heterogeneity of fruit produced, including lack of uniform color and size (bright red color and small size being the consumers' preference). These chili fetch a lower price on regional markets (e.g., in Senegal) than those from Benin, which are more uniform in color and size. Carry over of seed borne diseases is also an issue. For example, anthracnose (a seed borne fungal disease) may be the cause of the widespread plant “die back” observed in the Labe area, which in turn significantly reduces production.



Photograph 1: “Die back” in birds-eye chili plants in *tapade* near Parawol, suspected of being infected with Anthracnose.

Poor harvest/post-harvest handling practices:

- No grading of fruit at harvest or afterwards, resulting in poor quality, including infected or infested fruit mixed with good, healthy fruit which spreads infection and further reduces proportion of good quality chili;
- Problem of drying fruit during rainy season (cited in all regions). One project (Groupement Feminin pour la Promotion des Fruits et Legumes, GFPPFL, in Fouleyah) has solar tunnel dryers that could be used, and is used to a limited extent, for drying chili. The president of the GFPPFL stated, however, that most chili producers prefer to dry their own fruit as they can then sell them at a higher price than if they were to sell the fresh fruit to GFPPFL. Additionally, the president reported that cost of replacing the plastic for the tunnel dryers — which has to be done on a yearly

basis — posed a significant constraint for them as they import the material from France.



Photograph 2: Tunnel Dryer used by GFPPFL in Fouleyah.

In the Foutah Djallon region, the Projet Elargi de Gestion des Ressources Naturelles (PEGRN), a USAID funded project that was operational from 1999 – 2005, developed two types of simple solar dryers for dehydrating fruits. However, extension and training of these dryers appears to have been limited, and insufficient follow-up advisory services provided. Nonetheless, reports state that where installed, the dryers produced high quality dried chili, and were well received by the target groups. Poor drying techniques using mats, polyethylene bags, sheeting, etc., placed directly on the ground resulted in poor hygiene, slower drying (contact with humid soil; lack of aeration), and loss of color due to exposure to direct sunlight.

- Moistening of product by producers prior to selling to wholesalers (to increase weight and therefore amount paid) results in the fruit rotting and turning black in storage, which renders them unmarketable.
- Problem (in some areas) of birds eating mature fruit prior to harvest (birds lackcapsaicin receptors, unlike mammals, and are attracted by the red color of the fruit.
- Lack of awareness or ability to diagnose pest and disease problems, combined with a lack of understanding of management techniques (especially prevention):
 1. When queried as to pest and disease problems, producers cited only insect pests, and included beneficial insects (ladybugs) as “pests.” In one case of die back and defoliation (most likely caused by anthracnose, another fungal disease), the farmer attributed the problem to “insects chewing on roots.” Yet, when the plant was uprooted, no sign of root damage was seen. In all regions visited, producers had absolutely no knowledge of diseases, yet they appear to be a far bigger constraint than insects (with the exception of insect transmitted viruses).



Photographs no. 3 and 4: Mr. Minthe's artisanal solar dryer (left) and traditional method of drying Birds Eye Chilis in Guinea (right).

2. The following were found to exacerbate pest and disease problems: lack of proper rotation, failure to remove infected plants increasing the risk of spreading pest and disease problems by planting birds-eye chili together with other solanaceous crops, especially eggplant, together with lack of seed selection (as described above).
 3. Belief expressed by many producers that pesticides were all that they needed to control pest problems (no knowledge of prevention); yet, none of the producers exhibited any ability to correctly diagnose the cause of problems observed in the field. As a result, even if they had access to pesticides, they would be unlikely to use them properly (e.g., insecticides may be applied for disease control, etc.).
- Damage to crops caused by livestock: wire fencing is expensive, wooden fencing is often destroyed by termites.
 - Poor quality packaging and presentation (especially for the Senegalese market, where the Benin chili fetches a better price despite its lower capsaicin content due to being graded, packed in transparent bags, and labeled).
 - Lack of development strategy as has been done by the FPFID for potato, tomato, onion, and rice. The fact that the crop is grown only on a small scale would make the elaboration of such a strategy more complicated than was the case for the crops already forming part of the FPFID initiative.

Structure and capability of the sector. The production base includes only small producer operations, and the organized groupings of small producers are weak in resources, business skills, and organization.

Lack of medium scale private commercial farmers. Access to the certified organic international market is certainly dependent on the establishment of private commercial farmers or large scale producer organizations (farming the same land collectively) cultivating a minimum of 50 hectares of land where no chemical product has been applied over the past 3 years, and that is not at risk of contamination from chemicals or other pollutants from adjacent lands or waterways.

Lack of an industry association. At present, the sector is a collection of individual operators, each dealing separately with the constraints they face. There are many areas of common interest where a collective position would have a stronger impact. A common industry front would also help attract donor support and enable the industry to exert control over where and how support was provided.

Weak producer organizations. The production base is made of small producers mostly *tapade* growers, and in a few instances they are grouped into associations and unions of associations. Structuring producers into more associations and unions of associations, and federating such unions as in the case of the FPF, is essential to the development of small farmer production and exports through the provision of essential services, including programming of production, access to inputs, training, and marketing. A lot of capacity building is needed so the resources of these unions and federations — material and business/marketing skills — can be acceptable. The potential role they are to play is similar to the role FPF had in the development activities of the potato sector.

Potential constraints in regard to gender issues. From all field observations together with documentation reviewed, the birds-eye chili is a crop grown primarily by women in Guinea. Although not documented, informal questioning revealed that while men provide only minimal input for the production of their wife's/wives' chili crop (plowing the land, when performed), women are expected to do the weeding and harvesting of their husband's *gros piment* (and, most likely, other crops as well). When queried as to whether her husband would have any objections should she expand her chili production, one chili producer replied that she anticipated no problems, unless she were to brag about how much money she was making. As for the additional labor that would be required, the woman said she would hire extra help, assuming the chili crop proved worthy of this additional cost. What isn't known is whether with increased levels of production (including additional time required to improve quality of the product, e.g., through grading at harvest), there might be conflicts with the husband's requirements for his wife's/wives' labor in his own crop production activities.

PRODUCT DEVELOPMENT PLAN

Target Region

The best region for producing high quality birds-eye chili in Guinea is the Foutah Djallon, also known as “Middle Guinea.” Advantages in this region over others, e.g., Maritime Guinea, include the climate, producers’ experience with chili production, and access to the history of trading chili from the region to the more lucrative markets in Senegal, primarily in Diawbhe.

The climate in Middle Guinea is well suited to high quality chili production due to the lower rainfall and relative humidity, which reduces the incidence of fungal and bacterial disease infections in the crop. Additionally, the lower relative humidity makes drying the fruit easier than in areas such as Guinea Maritime. The temperature regime is ideal for quality and quantity of the chili crop produced. The average maximum temperature for the hottest month, May, is only 31.6 C, which is too low to bring about heat stress abscission of flowers and fruit (such would be the case in Haute Guinea, where average maximum temperatures go as high as 38 C). Night temperatures are much lower throughout the year than in other regions of Guinea (ranging from 10 – 18 C at Labe, versus 19 – 21 C at Kindia), which reduces the rate of plant maintenance respiration, thereby increasing assimilate levels available for fruit production, and, consequently, conducive to higher yields than other regions where average night temperatures are higher. With lower rainfall, and higher sunlight intensity, Middle Guinea’s chili are higher in capsaicin and red pigmentation, both attributes that make the product more attractive to consumers. Numerous reports state that this area is known on both domestic and regional markets for producing superior quality chili.

Additionally, the agricultural research center for the region of Foutah Djallon (CRA Bareng) has the greatest amount of expertise in the fruit domain (and therefore chili) production, compared to the national research centers in other regions of Guinea.

The proximity of Foutah Djallon to Senegalese markets (and the large volumes of trade of chili, amongst other products from Labé to Diawbhé) is an additional reason for targeting this area for assistance in chili production.

Proposed Models for Development of the Birds Eye Chili Sector

Model for small scale producers/producer organizations targeting the domestic market.

The major thrusts for improving quality and quantity of dried chili produced by smallholders, both in *tapades*, rice, and other staple intercrops should be to provide them with training on improved production, harvesting, and drying techniques. National extension services could provide this training, provided they have adequate funding to train and provide salaries and transportation to their extension agents, nongovernmental organizations working in the agriculture sector or international research institutions, such as the Asian Vegetable Research and Development Center (should Guinea be included in their West African program). The training should focus on the areas highlighted below.

Recommendations for improvements at the production and processing levels.

- Proper seed selection techniques to improve uniformity of the crop and reduce the incidence of seed-borne diseases.
- Integrated pest and disease management, including: pest and disease identification, appropriate rotations to follow, avoiding intercropping with other crops requiring intense sunlight, removing infected plants, use of botanical pesticides, when necessary, and increasing plant resistance through improved soil fertility (focusing on composting and use of green manures, rather than chemical fertilizers), use of scarecrows to reduce losses caused by birds eating the mature fruit.
- Improved harvesting techniques: harvesting high quality fruit separately from poor (diseased, blemished, poor coloration, etc.) quality fruit.
- Improved drying techniques: for individuals and producer associations unable to afford even the small solar dryer developed by Mr. Minthe Camara of CRA-Bareng, they should be encouraged to dry fruit on structures raised off of the soil. These can consist of mats supported by poles one meter high to reduce the likelihood of animals coming into contact with the chili.

Recommendations directed towards the marketing level. An activity which should be directed toward the chili buyers, especially the wholesalers, is to raise awareness on how to avoid purchasing fruit that have been moistened to increase their weight, a practice that leads to increased deterioration in storage. One simple technique is for the purchaser to take a sample of the chili (preferably from the middle-lower end of the sack or whatever the chili are contained in) and try to bend the fruit. Chili that has been moistened will be very pliable, whereas those which are sufficiently dry should break or very nearly break when bent. Another means of deterring producers/middlemen from adding water to dried chili would be for the wholesalers to purchase according to volume, rather than weight.

Wholesalers who store chili for any length of time should be certain to use dry, well ventilated storage rooms that have screens on any windows or other openings to prevent insects from entering the storage area. Placing a small amount of charcoal, wrapped in tissue or paper, at the bottom of the storage vessel will help to absorb humidity and reduce the risk of spoilage. Storage vessels should be placed on pallets or shelves, and not in direct contact with soil. Chili that are blemished, heterogeneous in size or color or otherwise of lesser quality should be sold to small scale processors to be made into chili powder.

Model for small scale producers/producer organizations targeting the regional market.

The same recommendations outlined above apply to production, harvesting, drying, and storage techniques. Suggested changes/additions to the above model are as follows:

- More impact may result if large producer organizations, rather than small individual producers, are targeted. Additionally, one or more members could be designated seed producer to receive special training and monitoring on seed selection and storage techniques.
- Solar dryers should be encouraged, assuming the price premium for the dried fruit product exceeds investment costs. Individual producers with smaller hectares would likely find the small dryer designed by Mr. Minthe Camara to be most appropriate. Larger producers and/or producer organizations (where the individual members'

crops are in close proximity to one another) may find tunnel dryers, either of the type used by UFPPFL or the Hohenheim tunnel dryer (see below) to be more appropriate.

- Value could be added at the retail level by improved packaging, e.g., using transparent plastic bags with labels, as are reported to be employed by the Benin chili traders.

Model for private commercial farmers and large scale producer organizations targeting the certified organic international market. Private commercial farmers or large scale producer organizations (farming the same land collectively) would be eligible to undertake organic birds-eye chili production if they have sufficient funding. They are certified by an internationally recognized certification body, and meet the following criteria:

- A minimum of 50 hectares of land that hasn't had chemicals applied to it over the past three years, and which is not at risk of contamination from chemicals or other pollutants from adjacent lands or waterways;
- Construct storage facilities with a minimum volume of six metric tons (MT) of dried chili (this volume is equivalent to a 20 foot container), and can maintain the stored product in hygienic, moisture free conditions;
- Purchase sufficient solar tunnel dryers to dry three MT fresh chili per week (e.g., four Hohenheim solar tunnel dryers, currently quoted at a total of €25,000, including transport for all four);
- Procure a moisture meter;
- Access to telecommunications, and ability to converse in English, French, or Spanish;
- Hire a full time, literate farm manager experienced in certified organic crop production and processing;
- Ability to mobilize and pay for a minimum of at least 100 daily laborers during the harvest period (October – March);
- Pay an annual inspection for organic certification; and
- Procure conditioning material (including an average of at least 250 food grade sacks of 25 kg (dried chili) each).



Photograph 5: A “Hohenheim” single solar tunnel dryer in use for birds-eye chili in Rwanda.

Since most buyers of certified organic birds-eye chili purchase a minimum of six MT (one 20 foot container), and basing production on yields of 0.8 MT dried chili per hectare, of which 60 percent will be of export quality, the following program is proposed for production of certified organic birds-eye chili:

- Submission of application for organic certification: once the application has been processed, a fee of approximately 75 percent of the anticipated certification cost must be paid to the certification body.
- Establish 12.5 hectares (or more, according to the number of hectares available) of birds-eye chili at the beginning of the rainy season, according to organic regulations. Seed will be either of Dow-Banga, Komet, and Nendenkoro and will most likely have to come from a local source, grown according to organic regulations and carefully selected for uniform and disease free plants. The remaining hectares can be planted to other, non-solanaceous crops such as rice, groundnuts, maize, etc., or to green manure crops such as red sunhemp (*Crotalaria juncea*). It is essential that untreated seed is used, and no chemical inputs are applied to these other crops, i.e., they must be grown according to organic regulations. All inputs used and activities performed on the farm must be documented on a regular basis; where inputs are purchased, receipts must be provided.
- When the chili begin to yield fruit, trained laborers must harvest the fruit two to three times a week, according to the rate of fruit maturation. Laborers must use hygienic practices, harvest export-quality fruit first (with peduncle attached), separate second quality fruit, and transport fresh fruit to the dryers within two hours of harvesting.
- Once fruit have dried down to eight or nine percent moisture, peduncles should be removed, fruit graded according to color and size, and packed into storage facilities. Each bag must be clearly labeled “certified organic” and given a lot number, which is recorded. Care must be taken to keep the storage facilities free of moisture, rodents, insects, and potential chemical pollutants. If other, non-certified organic products are stored in the same facilities, they must be clearly separated from the chili. Absolutely no chemicals may be stored in the facility.
- At the end of the season, the dried chili must be packed into 25 kg bags, with a food-grade liner (other specifications may vary according to the importer), sealed and transported in such a manner as to prevent any contamination from chemicals or other pollutants to the port. Only organic products should be packed in the same container with birds-eye chili.
- The fields used to produce the chili must be used for other non-solanaceous crops for three years before planting the next crop of chili — a minimum of 50 hectares is needed as the land is divided into four parts, with one part planted with chili each year. Since the land itself is certified organic, any crop grown on the non-chili fields can also be certified, provided organic production regulations are followed. There is interest in international markets for certified organic rice, groundnuts, and soyabean, and the farm could potentially generate significant revenues from crops other than birds-eye chili.

Given that an operation of this nature would require hiring of a large number of workers, especially for harvesting, grading, and drying chili, beneficiaries of such an enterprise would include people living in the area around the farm. Women in particular are likely to be hired, as they are generally more meticulous in performing tasks such as harvesting and grading than the men are.

An additional benefit of certified organic birds-eye chili production is that fruit that are not of export quality (expected to be around 40 percent of the harvest) could be sold on regional markets. There may even be the possibility of value addition in selling the chili as certified organic in certain markets such as Dakar, where there is more likely to be a demand for organic products than in smaller, less cosmopolitan cities.

CONCLUSIONS AND RECOMMENDATIONS

As mentioned above, the major, over-riding constraint to improving quantity and quality of birds-eye chili in Guinea is lack of information at the producer level. It is imperative that extension agents, regardless of whether they are employed by the government, a donor organization, or an NGO, be trained in improved production and processing techniques for birds-eye chili. Extension agents must be provided the means to get information to producers and monitor their mastery and application of improved techniques on a regular basis.

Most of the information chili producers need already exists. Much has been developed by neighboring national research institutes like the Centre pour le Developpement de l'Horticulture in Senegal and the "world vegetable center," AVRDC, which has a regional program in West Africa, based in Bamako, Mali. IRAG should build upon what has already been developed by these and other institutions, rather than using its very limited financial resources on, for example, development of new birds-eye chili varieties and use of agri-chemicals for pest and disease management.

The one area that could benefit from research in Guinea is Integrated Pest Management (IPM) in chili. Some resistance to this may be encountered at IRAG research centers. According to one study, 47 percent of national researchers specialize in genetic crop improvement, versus only six percent that specialize in crop pest and disease control. Consequently, the inclination is for Guinean researchers to focus on improvement of crop varieties. While this aspect could play a role in pest and disease management (i.e., by developing tolerant or resistant chili varieties), it can only be effective as a component of an overall integrated pest management strategy, which would require research in cultural practices as well.

If Guinea succeeds in being added to AVRDC's list of assisted countries, an initiative which was launched during our October – November 2006 study, the country's fruit sector in general and chili production in particular stand to gain considerably from technical assistance and the introduction of improved varieties. It is recommended that Directors of CRAF and CAR-Bareng, together with backing from Dr. Sekou Beavogui, the director general of IRAG, make every effort to convince AVRDC to add Guinea to its West African program.

In the short term, there is the possibility for ICRAF-LAMIL to fund a consultancy which investigates innovative ways of improving market potential for chili in Foutah Djallon area. The Director of LAMIL, Mr. Frank Beernaert, recommended that the CRA-Bareng researcher in charge of fruit crops, Mr. Mamadou Minthe Camara, work together with LAMIL's staff members Alimou Diallo and Serge Ngendakoumana to develop a proposal for this consultancy. We recommend that the consultants investigate aspects such as the price premium that would have to be paid to producers as an incentive to grade their chili at harvest and use improved drying techniques so as to have a higher quality product that could be sold on regional markets, and whether value-added warrants these additional

efforts. If such a study is conducted and the findings indicate it would indeed be profitable to the producers to practice grading fruit at the harvesting stage, we recommend that a program be launched to instruct producers on how best to implement this practice, as well as to demonstrate to them the increase in profits they will realize in so doing.

Insofar as international markets, if an entrepreneur or association that meets the requirements (listed above) to go into production of certified organic birds-eye chili, it is strongly recommended that the individual or association seek financial assistance from the ADF or EU to launch their operations. The ITC may also be approached for technical or financial assistance, as they have supported the development of organic agriculture enterprises in other countries in sub-Saharan Africa. Otherwise, given the low price for conventional birds-eye chili in international markets, together with certification requirements and transport costs, it is far more prudent for Guinea to target the domestic and regional markets, with efforts made to improve the quality and quantity of chili produced, as well as post-harvest handling and packaging.

ANNEX A

Scope of Work for Guinea Agricultural Market Linkages Activity Product Development Plan — Hot Pepper

The Guinea Agricultural Market Linkages Activity (GAMLA) is a USAID-funded contract executed by Chemonics International Inc. The project began in June 2005 and will end in December 2006. The primary objective of GAMLA is to increase market-driven production, processing, and sales of selected agricultural and forest products. Secondary objectives include identifying longer term opportunities for agribusiness development in Guinea, key policy constraints and solutions to agribusiness development, and water technologies that could have a significant impact on rural income generation. GAMLA has one long-term technical assistant in addition to significant amounts of short-term national and international expertise.

GAMLA will contribute to a key strategic objective of USAID/Guinea: increased use of sustainable natural resource management practices. By creating additional economic opportunities in rural-based value chains, Guinean farmers will be motivated to manage their productive resource base in a more sustainable manner by, for example, decreasing use of unsustainable slash and burn farming techniques on the country's steep hillsides. Guinea's potential as a regional and international exporter of horticultural crops and forest products has long been recognized. The country has modern port facilities in Conakry, several weekly flights to major European markets, and near ideal growing conditions for a host of tropical products demanded by regional and European markets. Guinea's potential, however, has mostly remained untapped, due, in large measure, to the absence of effective linkages along the farm to market commodity chain.

GAMLA will seek to reinforce those linkages through a mixture of technical assistance and training at key points in the farm to market continuum. GAMLA, in coordination with USAID, will identify and prioritize promising product areas and market opportunities through the implementation of feasibility studies, analysis, and product development plans. Commodities may include shea butter targeted for export to the United States cosmetic market, mangoes to Europe, potatoes for sale in Senegal, and other select products, including pineapple.

The project will create linkages between the Guinean and regional/international private sector to increase the competitiveness of local products across these markets by providing technical advice and business development services to identify investment, financing, and trading opportunities for producers and businessmen alike. GAMLA will provide recommendations to USAID on long-term agribusiness opportunities and policy constraints to be addressed by the Government of Guinea, identify crosscutting technologies, such as improved irrigation, that can be readily adopted by Guinean farmers, and address gender concerns as they arise during the course of value chain reports and product development plans.

Historically considered a marginal commodity, hot pepper cultivation appears to be highly remunerative for rural communities in Guinea, especially in the poorest regions. The yearly production of chili peppers in Guinea is estimated to vary between 4,000 to

6,000 tons, of which approximately 40 percent is exported to neighboring countries, primarily Senegal, Sierra Leone, The Gambia, and Mali. Hot pepper can be grown in all regions of Guinea. However, some zones, such as Sikhourou (Forécariah), Madina Oula (Kindia), and Parawol (Lélouma), have exceptional agro-ecological conditions for chili cultivation.

The net income to rural farmers derived from the culture of hot pepper is estimated to be more than 30 billion GNF, or approximately US\$6 million. Hot pepper cultivation has been stimulated in recent years by a steadily increasing price to the farmer: the average farm gate price has increased from 2,500 GNF per kilogram during the year 2000 to approximately 15,000 GNF during the 2005 – 2006 season, which is well above the rate of inflation in Guinea. Hot pepper is also a desirable commodity due to excellent agro-ecological conditions in Guinea, and the relatively low investment required for a crop that can be harvested for up to three years.

The primary constraints to hot pepper production include rudimentary production methods, the use of improper/poor plant varieties, and limited post-harvest handling, storage equipment, and facilities. However, hot pepper produced in Guinea has a good reputation in regional markets because of its elevated concentration of capsaicin and its desirable taste by consumers.

The activities to be carried out under this scope of work are centered on formulating a product development plan (PDP) for hot pepper, an important commodity in Guinea. This will require the creating a road map for further development of this important subsector. The road map should include a comprehensive strategy and approach for developing hot pepper into viable agro-industries, including its production, transformation, and distribution to regional and international markets. Different finished products should be considered for the commodity, including fresh, dried, and ground hot pepper as food items, as well as, for example, hot pepper powder used as a component of personal security devices. Local and subregional markets in West Africa are being considered, along with international markets such as North Africa, the Middle East, the European Union, Japan, and the United States.

The PDP must consider the product development constraints that exist in Guinea and any opportunities for development of this agro-industry. The consultants should describe those activities to be carried out to address the constraints and to take advantage of the development opportunities.

The PDP will include the following:

- Target region(s);
- Target group(s);
- Market opportunities;
- Value chain(s);
- Economic potential;
- Key beneficiaries.

The plan will also identify potential Guinean agribusiness partners that provide input distribution, processing, and/or export services that would encourage and support the development of chili peppers. The PDP must include a proposed set of interventions for strengthening the respective commodity chains, organized around objectives, with recommended performance indicators. Depending on the consultant's analysis, the proposed interventions may target the following illustrative areas:

- Increased efficiency of business management skills;
- Improved production, processing, and marketing technologies;
- Efficient production with consistent product quality;
- Increased market opportunities and mechanisms;
- Increased access to financing.

The consultants' plan must take into account the work being done in this subsector by international organizations, government agencies, and NGOs.

Additionally, the PDP should identify the most significant gender issues that need to be considered during future implementation activities, or conversely, the PDP should explain why gender roles are not relevant to the activity. Specifically, the PDP should consider the following:

- How will gender relations (the varying social/cultural/economic/political roles of men and women in Guinea) affect the achievement of this activity's results?
- How will proposed activities and results affect the relative status of men and women and different age groups within each gender?
- If there are significant gender issues, what actions need to be taken to ensure 1) results are still achieved, given gender factors that may play a role and 2) the program either advances the condition of women or exacerbates or reinforces the disempowerment of women?

As GAMLA is ending, this product development plan must be targeted to an audience outside USAID. The PDP must provide a useful guide for activities that investors, exporters, local NGOs, and international organizations can follow to address these product development constraints and take advantage of product development opportunities.

After an internal review by GAMLA, the consultants must present the PDP to USAID for discussion and approval.

Specific tasks to be completed under this SOW include the following:

- Review all studies completed to date on the chili pepper subsector in Guinea to gain a sense of reality on the ground.
- Meet with knowledgeable persons, consultants, exporters, producer groups, transporters, shipping lines, international donors, and the USAID technical

representative. Visit production sites, packing sheds, collection and export centers, if any, and port facilities.

- Identify target region(s), target group(s), market opportunities, and value chain(s) economic potential and key beneficiaries in this subsector.
- Through internet research and contacts with industry sources, obtain background information on international markets, buyers, distribution channels, and product quality standards.
- Consider other USAID activities with other implementing partners as well as NGOs and other donor activities to maximize the ability to cover all levels of the commodity chains.

Deliverables. The consultants should submit a comprehensive report for this subsector of no more than 35 pages without including the executive summary and the annex, detailing very specific step by step recommended actions, organized by objectives, for further development of this subsector in Guinea. The annex of the report should include a list of people and organizations met, and their contact information.

Once the report has been completed the consultants will make a presentation of their findings to the USAID/Guinea Mission.

Consultants. This work will be carried out by an international consultant and a local consultant. The international consultant will have overall responsibility for report preparation and presentation. The local consultant will assist the international consultant in all aspects of report preparation and presentation.

Level of effort. A level of effort of 24 work days is authorized for this activity by the international consultant. This includes 21 work days and three travel days. A level of effort of 21 work days is authorized for this activity by the local consultant. This work will begin around October 15, 2006 and will end around November 30, 2006.

The consultants will report directly to the GAMLA Chief of Party, Tom Easterling.

Illustrative Report Format: Product Development Plan

An illustrative description of the contents of the report is the following:

Title page

Abbreviations

Table of contents

Executive summary

Introduction

Background

Analysis

Conclusions and recommendations

Annex:

- Consultant's scope of work
- List of documents reviewed
- Names and contact information of people met

ANNEX B

List of Documents Reviewed

- Andrews, Jean. *The Pepper Lady's Pocket Pepper Primer*. University of Texas Press, Austin, Texas. 1998. 184 pp.
- Boucher, T. Jude and Richard A. Ashley (Editors). *Northeast Pepper Integrated Pest Management Manual*. University of Connecticut Cooperative Extension System, College of Agriculture and Natural Resources. 136 pp.
- Camara, Kaba. *La Filière Petit Piment en Guinée: Situation Actuelle et Perspectives de Développement des Exportations*. ARCA/Chemonics International Inc./USAID, Aout 2006.
- Camara, Kaba et Mamadou Condé. *Etude d'opportunité: Développement de la Commercialisation et de l'Exportation de Produits Agricoles en Guinée (Projet GIN/05/492A)*. Centre de commerce international, Mars 2006.
- Camara, Mamadou Minthe. *Rapport sur le suivi des séchoirs solaires*. Projet Elargi de Gestion de Ressources Naturelles, Land O'Lakes International/Guinée. Novembre 2003.
- Camara, Mamadou Minthe. *Rapport sur la technique de séchage des produits alimentaires*. Projet Elargi de Gestion de Ressources Naturelles, Land O'Lakes International/Guinée. Octobre 2003.
- Camara, Kalil, Mamadou Minthe Camara, Abdjoul Bah, Abdourahamane Diallo et Cire Niang. *Rapport d'Etude sur la Filière Petit Piment Préfecture de Kindia/Sougueta*. Projet Elargi de Gestion de Ressources Naturelles, Land O'Lakes International/Guinée. Février 2003.
- Camara, Mamadou Minthe et Jacob Delamou. *Rapport d'Etude sur la Filière Petit Piment (Région de Tougué et Lélouma)*. Projet Elargi de Gestion de Ressources Naturelles, Land O'Lakes International/Guinée. Aout 2002 (version éditée janvier 2003)
- DeWitt, Dave and Paul W. Bosland. *Peppers of the World: An Identification Guide*. Ten Speed Press, Berkeley, California. 1996. 219 pp.
- Elhadj Ibrahima N'Diongue: *Identification des opportunités des marchés régionaux pour les produits agricoles et forestiers produits en Guinée, 1ere partie, étude faite en 2006 pour ARCA*
- Elhadj Ibrahima N'Diongue: *Identification des opportunités des marchés régionaux pour les produits agricoles et forestiers produits en Guinée, 1ere partie, étude faite en 2006 pour ARCA*

Lepori, Giacomo. Capsaicin Content of Pepper Berries during Ripening. *Acta Horticulturae* 52, 1975: 147-152.

Levasseur, Virginie. Annual Technical Report/January – December 2005. The World Vegetable Center (AVRDC) and the Africa Rice Center (WARDA) Joint Project: Promotion of Superior Vegetable Cultivars in West Africa. March 2006. 57 pp.

Mathew, A.G. A Personal Journey in the Indian Spice Oleoresin Industry. Paper presented at the IFEAT Conference in Cochin, India, 16-20 October 2005. Pp. 138-147 in the printed conference proceedings.

Paul, George. India's Spice Oleoresin Industry. Paper presented at the IFEAT Conference in Cochin, India, 16-20 October 2005. Pp. 2-9 in the printed conference proceedings.

Pernezy, Ken, Pamela D. Roberts, John E. Murphy and Natalie P. Goldberg (Editors). Compendium of Pepper Diseases. The American Phytopathological Society Press. 2003. 63 pp.

Programme Cadre "Genre et Developpement Agricole", Republique de Guinee/Organisation des Nations Unies pour l'Alimentation et L'Agriculture, 2001. 44 pp.

Stads, Gert-Jan and Sekou Beavogui, November 2003. Guinea: Agricultural Science and Technology Indicators. A joint IFPRI/ISNAR/IRAG publication.

Wien, H.C. Peppers, *The Physiology of Vegetable Crops* (H.C. Wien, Ed.). 1997, 259-293

Winrock International Institute for Agricultural Development: Projet Elargi de Gestion des Ressources Naturelles 6th Annual Report of the Expanded Natural Resource Management Activity, October 2004 – September 2005. 140 pp.

ANNEX C

Names and Contact Information for People Met

Centre de Recherche Agronomique de Foulaya (CRAF)

- Dr. Moustapha Donzo (Director) – e-mail mdonzo@yahoo.fr, mobile 60580684, tel. B. 30610148
- Ousmane Koleh Soumah, Coordinateur Scientifique, e-mail soumahkoleh2002@yahoo.fr, mobile 60 54 16 43
- Koumandian Camara (pineapple specialist), e-mail koumandian@yahoo.fr, mobile 60574380
- Thierno Hamidou Camara (Chef Antenne Cultures maraicheres), tel. 60 28 21 36

Association pour la promotion économique de Kindia (APEK Agriculture)

- Koita Sory, Responsable du Service Financier, Mobile 60 52 21 54
- Abou Camara, Responsable Appui au Développement Rural,
- E-mail: apekagri@sotelgui.net , Tel: 30 61 03 20

Groupement Féminin pour la promotion des Fruits et Légumes (GFPFL) à Kindia

- Madame Aminata Diop, Présidente, mobile 60 21 72 24
- Madame Barry, Trésorière, mobile 60 52 86 22

Centre de Recherche Agronomique de Bareng

- Dr. Maxime Kamano, Directeur General and FAO Consultant (potato). E-mail maximkamano@yahoo.fr, mobile 60360391
- Alhassane Balde, Directeur Scientifique, E-mail lalyabalde@yahoo.fr, lalyabalde@hotmail.com, mobile 60406857
- Mamadou Minthe Camara (Responsable des Cultures Maraicheres), e-mail mminthecamara@yahoo.fr, mobile 60288479

Federation des Paysans de Foutah Djallon (e-mail fpfd2002@yahoo.fr)

- Alpha Oumar Diallo, Responsable Formation
- Alpha Amadou Balde, Agronome

African Development Foundation

- Alpha Oumar Diallo, Country Representative, e-mail adf-gui@biasy.net, alphaoumar@yahoo.fr, mobile 60 25 02 01, office 46 75 05

ICRAF/LAMIL (Projet de Gestion des Terroirs pour l'Amélioration des Conditions de Vie des Populations), Labe

- Frank Beernaert, Chief of Party, e-mail fr.beernaert@scarlet.be, mobile 60360339
- Serge Ngendakoumana, Head of Scaling Up Program, e-mail sergendenda@yahoo.fr, mobile 60392680

Field Visits:

Kindia-Gomba

- Mrs. Camara, chili producer (in « tapade »)

Kilita

- Mayor of Kilita
- Aly Keita, Vice President, « Groupement de Piment de Kilita »
- Several of the members of the « Groupement de Piment de Kilita »

Parawol, “Groupement Hamdallaye”, Boundou Hayre

- Koumba Diouma, chili producer (in *tapade*)
- Fatouma Balde, chili producer (in *tapade*)
- Alpha Oumar Diallo, chili producer (in exterior fields) and husband of Fatouma Balde

Wholesale Market at the Tougue Bus Station

- Mamadou Kolon, chili wholesaler
- Mamadou Saidou Sow, chili wholesaler
- Housseinatou Diallo, chili wholesaler

ANNEX D

Names and Contact Details of Suppliers of Solar Dryers

1. Artisanal solar dryer already tested and in (limited) use in Guinea: Mr Mamadou Minthé CAMARA, CRA of Bareng, Daka District, Maléa sector - Labé , BP 41 Pita ,République of Guinea, mobile Telephone: + 224 60288479
2. «Hohenheim » solar tunnel dryer (successfully used to dry birds-eye chili in many countries): Innotech Ing,m GmbH, Weilemer Weg 27, D – 71155 Altdorf (Boblingen), Germany, tel. +49 7031 744741, Fax +49 7031 744742, mobile +49 170 9005959, e-mail info@innotech-ing.de, Web site www.innotech-ing.de