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# RAPID ASSESSMENT OF THE HORTICULTURE SECTOR IN GUINEA

OCTOBER 29, 2015

This publication was produced for review by the United States Agency for International Development. It was prepared by the Feed the Future Innovation Lab for Collaborative Research on Horticulture (Horticulture Innovation Lab) at the University of California, Davis.

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All photos by Peter C. Shapland.

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# ACRONYMS

AFTT	<i>Association des Femmes Techniciennes et Technologues</i>
ANPROCA	<i>Agence Nationale de la Promotion Rurale et du Conseil Agricole</i>
AVRDC	The World Vegetable Center
BMI	body mass index
COPEFL	<i>Coopérative des Producteurs et Exportateurs des Fruits et Légumes de Friguiajbé</i>
COPRAKAM	<i>Coopérative des Producteurs d'Arachide de Karité et de Miel</i>
DHS	Demographic Health Survey
ECOWAS	Economic Community of West African States
ENAE	<i>École Nationales d'Agriculture et d'Élevage</i>
FAO	Food and Agriculture Organization of the United Nations
FEWS NET	Famine Early Warning Systems Network
FUMA	<i>Federazione delle Unioni di orticoltori della Haute Guinée</i>
GAPs	good agricultural practices
GDP	gross domestic product
GIS	geographic information system
GN	Guinea country code, used for FEWS NET Livelihood Zones
IFPRI	International Food Policy Research Institute
IFDC	International Fertilizer Development Center
IRAG	<i>Institut de Recherche Agronomique de Guinée</i>
ISAV	<i>Institut supérieur agronomique et vétérinaire</i>
NADP	National Agricultural Development Policy - Vision 2015
NEPAD	New Partnership for Africa's Development
NGO	non-governmental organization
PNAAFA	National Programme to Support Agricultural Value Chain Actors
PNIASA	Plan of National Agricultural Investment and Food Security
PPP	purchasing power parity
SUN	Scaling Up Nutrition
U.S.	United States
UNDP	United Nations Development Program
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WFP	United Nations World Food Programme
WHO	World Health Organization

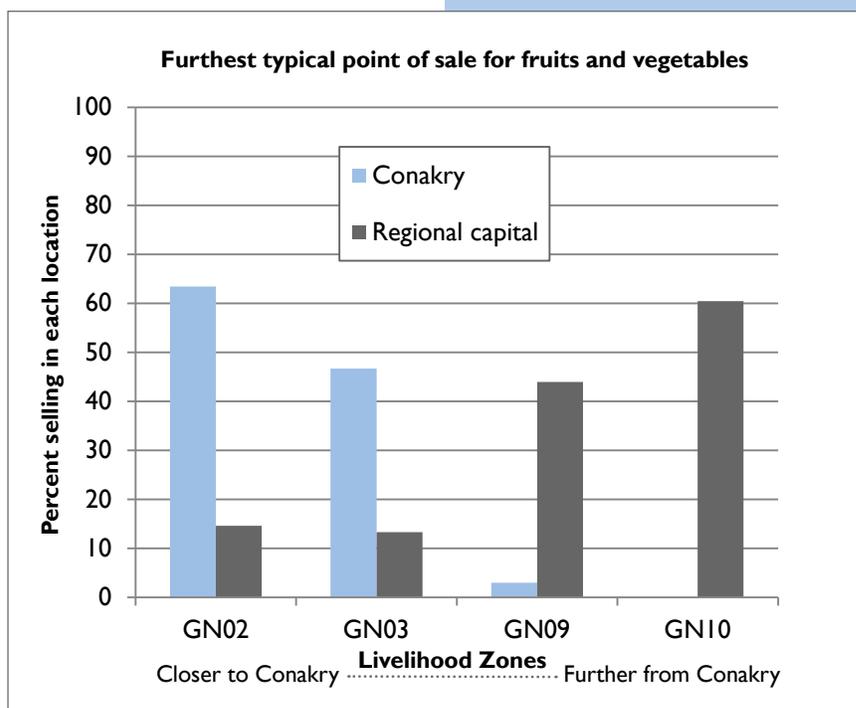
# EXECUTIVE SUMMARY

Developing the horticulture sector in Guinea is an important part of improving the capacity of smallholders to grow, eat, and market fruits and vegetables. Increasing both household and commercial production, marketing, and storage of fruits and vegetables leads to diversified cropping systems, diversified diets, and greater resiliency. With funding from the U.S. Agency for International Development, the Feed the Future Innovation Lab for Collaborative Research on Horticulture (Horticulture Innovation Lab) conducted an assessment of horticulture in Southern Guinea to identify the major constraints to improving household and commercial production of fruits and vegetables. This report outlines the assessment and recommendations of activities that donors can support to address these constraints and improve the horticulture sector in Guinea.

This rapid assessment presents a snapshot of horticulture in Guinea through three on-the-ground assessments and a desk study conducted from May to September in 2015. This assessment was designed to serve as guidance for new initiatives to address constraints in the horticulture sector. The assessment detailed in this report includes considerations of farmers, institutions and markets while looking at the entire horticultural sector from seed systems to markets, with special consideration to gender and nutrition.

Our rapid assessment uncovered several interesting things about the horticulture sector in Guinea. By looking at four different Livelihood Zones and levels of wealth, we discovered that horticultural production decreased as we moved away from Conakry. We assumed that this was because of the distance away from the major metropolitan area where there is higher demand for goods, but this was just part of the story. Farmers did sell in Conakry if they could, but they also accessed well-established weekly regional markets, even if that meant traveling to a neighboring country. Farmers were motivated to sell whenever they had extra produce. Even the poorest of farmers would rent a car or ride a long distance on a bus if they thought they could access the market. This shows the resiliency and determination of the Guinean farmer. But we also know that the poorest

The Horticulture Innovation Lab's rapid assessment team surveyed farmers and village leaders, interviewed stakeholders and surveyed market traders in four zones of Guinea.



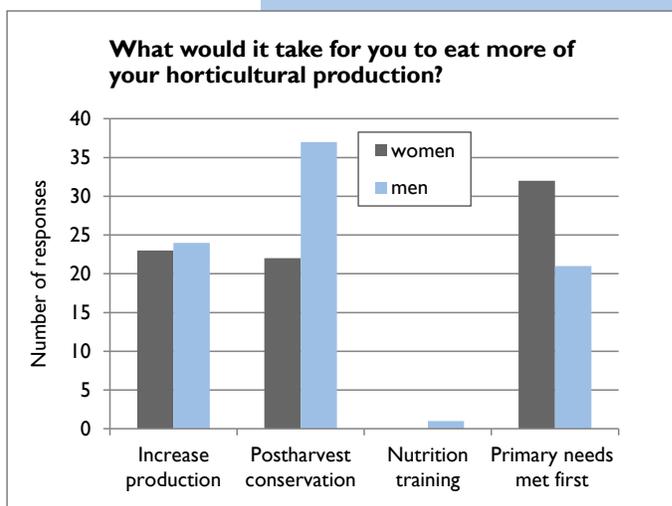
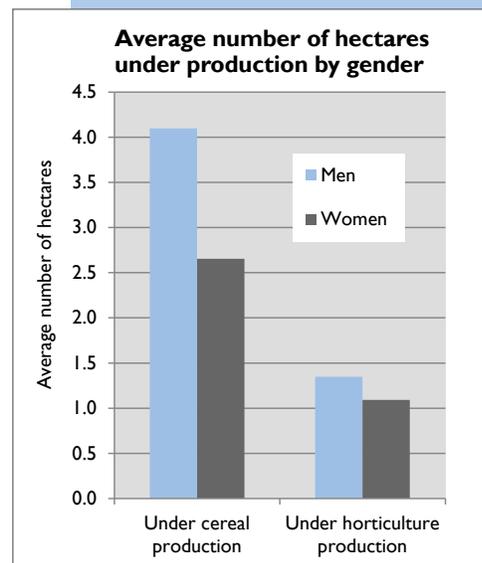
Though road conditions are often poor, farmers are growing horticultural crops ride long distances on a bus or rent a car to take their produce to established regional markets.

farmers make difficult choices, often selling their staple crops to pay for expenses now only to later purchase the staple food at higher prices. So while Guinean farmers are resilient, they are also living on the margin. Our recommendations outline steps to improve the resiliency of the Guinean farmer.

When our team looked at gender divisions in horticulture production, many things surprised us. Like women all over the world, the women in Guinea grow a lot of vegetables. And like other women, they are constrained by their ability to purchase inputs and they use their profits from horticulture to pay for food and other living expenses. However, we learned that a woman's horticultural production often becomes more sophisticated when her husband's own horticultural production improves. Men also told us that they value what the women know, including what the women learn from their time in markets. Men widely reported that they adopted varieties from the women because women learn about the new varieties first.

We also learned that Guineans measure wealth based on labor and access to equipment. This coincides with their willingness to belong to groups. Whether talking to a farmer or a marketer, our surveyors found strong participation in *groupements*. These groups offer a great opportunity for horticultural sector development through the implementation of savings groups or the creation of specialized processing and postharvest groups like the Kanya Nema.

Finally, when we looked across the horticulture sector, we discovered that great gains could be made by investing in nutrition training, postharvest processing and food preservation. Farmers who succeed at horticultural production would benefit from training in postharvest handling, packaging and storage. Consumers would benefit from having access to better stored and better processed foods. Supporting crop diversification, investing in the seed system, and scaling-up labor-saving technologies would strengthen the horticulture sector across all wealth classes, genders, and Livelihood Zones.



**Women growing horticultural crops generally adopt more sophisticated field practices when their husbands also grow fruits and vegetables.**

## SUMMARY OF RECOMMENDATIONS

A horticulture sector strategy that intentionally prioritizes rural revitalization—one that empowers individual communities to take control over their livelihoods and create their own opportunities for agricultural investment and growth—is a strategy that would find support and success in rural Guinea. In particular, we provide the following recommendations:

### HORTICULTURE SECTOR RECOMMENDATIONS

- **Inputs:** Facilitate access to loans or small grants and support seed production (research- or field-level) and seed banking techniques.
- **Production:** Promote simplified and sustainable farming techniques, conservation agriculture practices in horticulture, and basic fencing and animal husbandry practices to protect gardens.
- **Pest management:** Train agricultural extensionists in pest identification and provide training to farmers in the five components of integrated pest management.

- **Credit:** Create partnerships with local banks and with bankers who understand horticulture and support savings groups.
- **Entrepreneurship and marketing:** Promote the standardization and marketing of horticultural products, develop and reinforce technical exchange and support among horticulture actors, support training in basic agro-entrepreneurship skills and postharvest techniques, invest in simplified postharvest technologies, develop farmers' skills in record keeping, and conduct market research to support local agribusinesses.
- **Postharvest:** Provide training in basic postharvest practices; set up collection centers; and support smallholder processing of mango, avocado, banana, tomato and eggplant.
- **Policy:** Support the development of government policies in horticulture that create market opportunities for smallholders; support governments in setting minimum standards for the importation and sale of fertilizers, pesticides, seeds and other inputs; and provide opportunities for policy makers to attend regional workshops and conferences on creating a competitive, private sector-led fertilizer and input industry.
- **Nutrition:** Support interventions in household gardening along with nutrition counseling, education and behavior change communication; and take a broad, community-level approach to nutrition

### **SUPPORT FOR PARTICULAR CROPS**

- **Chili pepper:** Develop a seed marketing initiative, provide training in good agricultural practices (GAPs), build linkages between growers and international markets, and improve the processing.
- **Okra:** Increase support of production and drying.
- **Eggplant:** Improve irrigation for dry-season production, improve the quality and availability of fertilizers in local markets, and support research on better production and postharvest practices.
- **Tomato:** Support research and testing of new varieties and pest management strategies; develop Guinean institutional capacity to design and implement GAPs for tomato; and invest in postharvest interventions of shade, packaging, and processing.
- **Mango:** Support integrated pest management strategies for fruit flies, facilitate the dissemination of improved varieties, and invest in postharvest handling and storage and processing.
- **Oranges:** Support research in pests of oranges and orange trees.

### **RECOMMENDATIONS FOR WOMEN FARMERS**

- Improve upon traditional drying methods
- Encourage the production of fruits and vegetables by men and women alike to capitalize on the advantages that each provide to the other.

### **RECOMMENDATIONS BY WEALTH QUARTILE**

- **For wealthier growers:** Invest in postharvest education and production technologies; and introduce conservation of products through juicing, canning, pulping and freezing.
- **For middle-income growers:** Provide training in postharvest skills and postharvest technologies.
- **For poor growers:** Support training and research in production; assess time and labor allocations for these farmers and design approaches based on those; and provide basic training on home gardens and nutrition.
- **For poorest growers:** Conduct training programs with a goal of improving basic production, improve access to inputs, introduce home gardening where it doesn't exist, and create improved access to social safety nets.

## RECOMMENDATIONS FOR HUMAN AND INSTITUTIONAL CAPACITY DEVELOPMENT

- Develop the extension system in Guinea through strengthening the national extension system, *Direction Nationale d'Agriculture*, and investing in extensionists.

## RECOMMENDATIONS BY LIVELIHOOD ZONE

- **Zone GN02 (Piedmont Zone):** Take a value chain development approach that focuses on postharvest management, improved postharvest technologies, building market linkages and organizational development.
- **Zone GN 03 (Central Plateau zone):** Improve postharvest handling and packaging.
- **Zone GN 09 (Wooded Savannah Zone):** Focus on diversification and introduction of improved varieties and cropping diversity; support this zone in becoming a hub of seed production; and support crop diversification, technical training, organizational development, introduction of new and/or adapted crop varieties and facilitating commercialization.
- **Zone GN 10 (Pre-Forest Zone):** Initiate and support crop diversification opportunities and small scale irrigation, provide training on seed production and conservation, promote appropriate postharvest technologies and management, improve upon traditional drying methods, and scale-up labor-saving production methods.

# INTRODUCTION

Developing a horticulture sector offers the opportunity to meet food needs and improve nutrition and health, while also providing prospects for income diversification and economic advancement of the rural poor. In addition, since women are the main producers and marketers of horticultural crops in many regions, increased horticultural production often leads to an improved income stream for women and their children. Horticultural crops are both highly nutritious and economically valuable. Horticulture sector development is crucial to enabling small-scale producers to overcome agricultural market barriers and realize the benefits offered by horticultural development.

Horticultural production in the Republic of Guinea, particularly the southern region, faces the typical production and marketing constraints of other regions in West Africa. The Feed the Future Innovation Lab for Collaborative Research on Horticulture (Horticulture Innovation Lab) conducted a rapid assessment of horticulture from May to September 2015. This assessment of horticulture in Southern Guinea focuses on identifying the pivotal investments that donors can make to:

1. Improve household capacity of smallholders to efficiently grow vegetables and fruits (eaten by families) for the longest season possible, accompanied with associated understanding of the importance to properly prepare, store, and consume nutrient-rich foods; and
2. Improve commercial capacity to produce, harvest, add value to, and market high-demand horticultural (fruit and vegetable) crops.

This report is a summation of the desk study and three on-the-ground assessments. It takes into account the entire horticulture sector of Guinea, ranging from farmers to markets and individual to institutional capacity. The analysis considers all of the data compiled and identifies common needs across the horticulture sector. The conclusions presented are intended to provide donors with strategies to address these needs.

## ABOUT GUINEA

Located in West Africa, the Republic of Guinea has a young population of around 11 million people. Despite the abundance of natural resources, including mining, fertile areas with low population density and coastal access, Guinea faces major social, economic, and health related challenges. In 2013, Guinea was ranked 178th out of 187 countries in the United Nations Development Program's Human Development Index (UNDP, 2013). Democracy is relatively new to Guinea, elections were held in 2010, the first since independence. Guinea's location in West Africa has had a great influence on its economic and social mobility; conflicts in neighboring Sierra Leone and Liberia have often spilled over its borders along with hundreds of thousands of refugees throughout the 1990s. The country is also vulnerable to natural disasters such as flooding.

Guinea is a young country. In 2012, more than 16 percent of the population were under 5 years old and two-thirds were under 15, while just 3 percent were over 65 years old. The country is experiencing a drive to cities and towns with 36 percent of the population living in urban centers in 2010 (UNDP, 2013). Over the past 20 years, per capita gross domestic product (GDP) has risen modestly from \$1,128 purchasing power parity (PPP) to \$1,215 PPP (World Bank, 2014) while the under-5 mortality rate has fallen promisingly from 241 deaths per 1,000 live births to 101 deaths per 1,000 live births (UNICEF, 2012). However, these trends are modest in comparison to other countries in sub-Saharan Africa, indicating

that Guinea still struggles with serious challenges to the health and wellbeing of both their rural and urban populace.

Rapid population growth in both urban and rural areas will compound current food security issues as well as magnify changes in urban and rural population changes. Average annual urban population growth rate is currently 3.9 percent while rural is lower at 1.8 percent (UNDP, 2013). Within West Africa, Guinea has the lowest urbanization rate; however urbanization will continue at a steady pace and will lead to increasingly complex problems to be solved. By 2020 the urban population will have doubled, which will pose problems related to spatial planning, equipment and infrastructure management, environmental preservation and protection, and of course food security for urban dwellers with growing purchase power (Hatcheu, 2008). In summary, demographic trends in the medium- and long-term advocate a proactive policy both in urban and in rural areas.



**Figure 1. Map of Guinea’s four natural regions, Hatcheu Emil Tchawe, JCAD International, 2015.**

The average population density in Guinea (29 inhabitants per km<sup>2</sup>) hides significant disparities. While the population density in some rural sub-prefectures such as in Middle Guinea and the Forest region exceeds 100 inhabitants per square kilometer, it drops to less than 5 inhabitants per square kilometer in large areas of Upper Guinea. The least populated sub-prefecture, Sangardo near Kissidougou has less than 1 inhabitant per square kilometer.

In terms of administrative organization, Guinea is divided into eight regions (Conakry, Kindia, Boke, Mamou, Faranah, N’Zérékoré, Kankan and Labé). In total 33 prefectures and 305 sub-prefectures are spread throughout the country. The country is geographically divided into four natural regions (figure 1):

- The Maritime Guinea (Lower Guinea) on the edge of the Atlantic.
- The Fouta (or Middle Guinea) south of Senegal, to the highlands with many rivers designated as the "water tower" of West Africa.
- The upper Niger basin (or Upper Guinea): forming a vast savannah transition zone with Mali.
- Forest Guinea is an area of forested mountains in southeast Guinea, near Liberia.

The Southern Guinean region from Beyla to Forecariah prefectures used to be a “food reserve” for the country but has been exposed to massive displacement of people recently because of mining and railroad construction. Most people living in this area rely on small-scale family farming through field crops, gardening and plantations for their living. The varied landscape contains mountains, forests, savannah and lowlands where farming is mostly practiced during rainy season (May-October). Most gardening activities practiced in this season are done around homes as people focus more in staple crops. Few people farm vegetables and are oftentimes organized in cooperatives with support from non-governmental organizations (NGOs), research or government entities.

**Table 1. Famine Early Warning Systems Network (FEWS NET) Livelihood Zones, used for assessment by the Horticulture Innovation Lab from May to September 2015.**

Zone	Characteristic Livelihoods	Prefectures
GN02	Piedmont: Rice, Groundnut, Horticulture	Forécariah
		Kindia
GN03	Central plateau: Horticulture, Fonio, Livestock	Mamou
GN09	Wooded savannah: Rice, Cassava, Groundnut	Dabola
		Faranah
		Kissidougou
		Kérouané
GN10	Pre-forest zone: Rice, Cassava, Livestock	Beyla

According to the Food and Agriculture Organization of the United Nations (FAO, 2014), over the last 5 years the share that agriculture contributes to GDP in Guinea has steadily decreased, from 26 percent to 20 percent. For most Guineans, agriculture is both the main source of sustenance and income, even if agricultural productivity is low. The poor state of roads, water supply and electrical infrastructure hinders both the storage and transport of food to market; therefore, most of Guinea's agricultural production is intended for direct consumption or local markets.

Rice is by far the most important crop, accounting for about 80 percent of the area under cereals and about 50 percent of irrigated land. Other food crops include cassava and corn. In addition, Guineans grows cash crops, including cashew nuts, cocoa beans, coffee and rubber, which constitute the bulk of agricultural exports. However these only contribute to 10 percent of national GDP. Rubber exports constitute about 30 percent of total exports of cash crops, followed by cocoa beans, which represents 27 percent of exports.

Guinea's agriculture is dominated by family farms. These farms cover approximately 60 percent of agricultural land and provide some level of employment to about 95 percent of the population. This type of operation, usually small (0.30 to 0.50 hectares) contains both production for consumption as well as sales or trade. The end consumer of produce grown on these small landholdings often depends on a grower's access to water, transportation, and market linkages. Rain-fed crops are predominant and represent 95 percent of the total area. Among rain-fed crops, over 40 percent are located on hills or mountains of Middle and Upper Guinea and 30 percent on Lower Guinea trays. The lowlands and mangrove of Forest Guinea (Livelihood Zones GN10 and GN11) represent a largely untapped potential.

In 2012 the United Nations World Food Programme (WFP) and partner organizations reported that throughout Guinea 27 percent of households are food insecure, while 3 percent are severely food insecure. According to another 2014 survey, the nationwide chronic malnutrition rate among children is 34.5 percent; it exceeds 40 percent in Labé, Boké and N'Zérékoré (World Bank, 2014). The Ebola outbreak, which started in December 2013, has taken more than 3,000 victims in the country, most of whom are farmers in rural communities (CDC, 2015). This southern region has had the highest number of victims and rehabilitation is yet to be started for survivors and their families. The Ebola outbreak has impacted both production and commercialization, both exports and prices (FEWS NET, 2015).

This rapid assessment focused on the four Famine Early Warning Systems Network (FEWS NET) Livelihood Zones in Southern Guinea (table 1).

In FEWS NET Livelihood Zone GN02, the Piedmont Zone, the main economic activity for rural populations is the production of rice, groundnut and horticultural crops. Bananas, citrus, papaya and pineapple are important crops in the southern portion of the zone and mangoes, palm oil, okra, chili pepper, eggplant, cucumber and watermelon are grown throughout the zone. An abundant rainy season from May to October provides 2,000–2,500 mm of rainfall per year. While wealthier households are able to grow most of the grain they consume, poor households produce roughly five months' worth of their grain consumption, and purchase imported rice for the other seven months. This is the biggest horticultural

producing area in the country with fertile low lands, good rainfall and opportunities to export to the capital and to neighboring Sierra Leone. Kindia has the largest market of imported seeds, the seed producing research center (Kilissi) and the largest fruit tree plantations.

The Central Plateau Livelihood Zone, GN03, has relatively fertile soils and 1,500 to 2,000 mm of rainfall per year. The main economic activities in the Central Plateau Zone are horticulture, fonio and livestock. The Peuhl (an ethnic group of herders) are a dominant ethnic group in the zone and the most common animals found among smallholders are small ruminants. High topographical relief often inhibits the use of draft animal power in this relatively mountainous zone with high plains and temperate prairies. The main fruits in GN03 are mangoes, palm oil, avocados, bananas and oranges. Market gardening is also very important in the zone with potatoes, sweet potatoes, okra, chili pepper, eggplant and tomatoes taking the lead roles. This zone consists of hilly areas and gravelly fertile soils. Producers have the opportunity to export to Sierra Leone, most regional capitals across the country and to Conakry. Well-developed farming cooperatives exist in this area composed of women, youth and men.

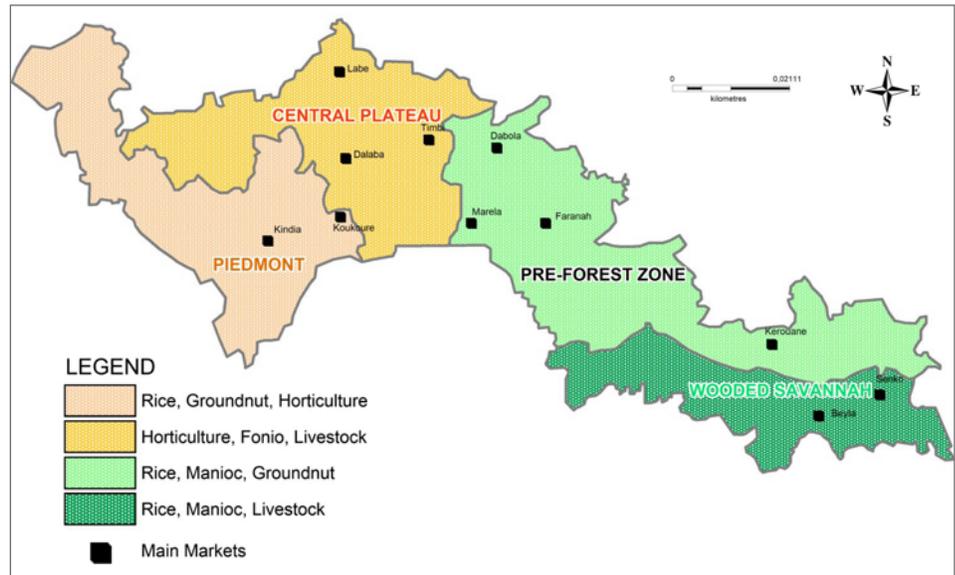
Livelihood Zone GN09 is aptly named the Wooded Savannah Zone and is a transitional zone between the forested region in Southern Guinea and the savannah plains. The main economic activity in the Wooded Savannah Zone is the production of rice, cassava, and groundnut. This zone receives 1,500 to 2,500 mm of rain per year. Young men often immigrate to mining towns to find work during the dry season. The major horticultural crops in GN09 are mangoes, oranges, avocados, okra, chili pepper, and eggplant. Vegetable farming is mainly developed in suburban areas in Kankan (Bordo), Dabola and Faranah (Tindo). This zone has some of the most fertile soils in Guinea, but horticulture is less developed in the area. Dabola contributes highly to overall national peanut production. Kerouane is a diamond mining area which attracts all social categories leaving few people involved in horticulture. Most plantains sold in Kissidougou come from the forest region (mainly Macenta and N'Zérékoré). Fruit tree planting is also less developed in this zone, mostly limited to family compounds and home gardens.

Finally, Livelihood Zone GN10, the Pre-Forest Zone, has sandy, clay soils and 1,500 to 2,000 mm of rainfall per year. The main economic activities in this zone are rice, cassava, and livestock. The major tree crops in the zone are mangoes, palm oil, oranges, bananas and avocado, with some coffee, while the major vegetable crops are okra, chili pepper, and eggplant. GN10 is rich in minerals, including diamonds, which reduces the amount of labor available for agricultural production. Poor households are unable to produce enough grain and resort to buying grains for 5 months out of the year. Beyla is the zone with the most fertile soils, but with the poorest horticultural production. Vegetables, when grown, are usually not rotated with other crops. Crops grown the most locally are: eggplants, beans, bananas, maize, mangoes and pepper. Beyla has the potential to export to Cote d'Ivoire and to the regional capitals N'Zérékoré and Kankan.

## METHODS

# RAPID ASSESSMENT METHODOLOGY

The Horticulture Innovation Lab conducted a desk study and three on-the-ground assessments in this rapid assessment. The desk study explored previous horticulture assessments, nutritional status and needs, and postharvest strategies in Guinea and the surrounding region. A three-week, on-the-ground survey in June focused on farmer characteristics and needs, this is described as the “farmer assessment.” An 11-day, on-the-ground survey in August focused on institutional and human capacity this is the “stakeholder assessment.” A two-week, on-the-ground “market assessment” was completed in August. The on-the-ground assessments took place in June and August 2015 and were



**Figure 2. Livelihood Zones focused on in this assessment by the Horticulture Innovation Lab from June to September 2015, Hacheu Emil Tchawe, JCAD International, 2015.**

conducted along the proposed Rio Tinto funded railway that will eventually be built between Conakry and Beyla. This region runs along the southern part of Guinea that borders Sierra Leone and Liberia (figure 2).

## FARMER ASSESSMENT METHODS

A survey of households and focus groups was conducted in June 2015. This survey took place in villages in each targeted Livelihood Zone. In total, 15 villages were surveyed through 14 focus groups and 190 household surveys (table 2). The research team consisted of four multi-lingual surveyors and a lead researcher who was a Horticulture Innovation Lab-trained American development professional living in West Africa.

Selection of villages and farmers had to pass through official channels because in the present environment, communities are uncomfortable with strangers arriving unannounced. The research team went to the *Prefet* and *Sous-Prefet* in every zone to request permission to work in the zone, and request that a local extension agent from the *Direction Nationale d'Agriculture* guide the team to selected villages to make the proper introductions. In the first week, the research team insisted that they select the villages

**Table 2. Survey zone for farmer assessment conducted by the Horticulture Innovation Lab in June 2015.**

Livelihood Zone	Prefecture	Sub-Prefecture	Village	Focus Groups	Individual Surveys
<b>GN 02 Piedmont Zone</b>	Forécariah	Mafieringé	Madinagbé	3	43
	Kindia	Diamakhaniy	Meyiwa		
		Friguiagbe	Massaya		
<b>GN 03 Central Plateau Zone</b>	Mamou	N'donnel	Sanama	3	32
		Timbo	Lingueya		
		Oure Kaba	Bantamaga		
<b>GN 09 Wooded Savannah Zone</b>	Faranah	Nialiaya	Layadoula	5	70
		Bendon	Dalafilany		
	Kissidougou	Massakoundo	Fermessadou		
		Aldardariya	Telikoro		
	Kerouané	Kerouané	Bafouron		
		Kosankora	Boulagnosol		
<b>GN 10 Pre-Forest Zone</b>	Beyla	Gbackedou	Djakofomdou	3	45
		Guerela	Doubadou		
		Moussadou	Famoya		

in the interest of randomization. The state officials reluctantly complied, and on one occasion, in route to the village, the extension agent advised the team to pull over and stock up on sanitary materials because they selected a village that was rumored to harbor people with Ebola. The team promptly selected a new village, and adopted a new policy of selecting villages in concert with local officials. For this reason, the household level survey does not include villages rumored to have Ebola, but does include as diverse villages as was possible at the time.

Once in the village, the research team and extension agent would explain to the local leadership the goal of the research, highlighting that this was a national survey that would in no way lead to any personal gain or project resources. The leaders were asked to select men, women and youth who engage in some type of horticultural production, from wealthier households and poorer households, from all corners of the village. In every village, the leaders were asked to explain their criteria for identifying people in the two wealth categories. They indicated that the quantity of the household's productive assets (arable land and agricultural equipment) were the main factor in determining a household's status. The survey respondents were asked the same question, and they invariably responded in the same manner, adding purchasing power (resulting from productive assets), household size (resulting from and contributing to productive assets), and remittances<sup>1</sup> (largely invested in more productive assets) as other proxies for determining a household's relative wealth.

In addition to the farmer surveys, male and female village leaders were also asked to participate in a focus group discussion on community-level horticultural constraints and opportunities with the extension agent and the lead researcher. The focus group discussions included 75 village leaders who participated.

The farmer survey had six main components (see Appendix A for complete survey):

- Household profile – size, ethnicity, education and wealth category (household was defined as the nuclear family)
- Household consumption – portion produced vs. purchased
- Production system – hectares of farmed land, and (for horticultural crops) varieties, inputs, major constraints, production and postharvest practices,
- Market engagement – value added to harvest and portions sold
- Household assets – productive and consumptive assets and criteria of wealth
- Social capital – group membership and access to credit, savings and information

The goal of the survey was to understand the farmer segmentation and priorities, categorized by gender and market engagement while highlighting key assets, constraints and development opportunities.

The survey was conducted as a rapid assessment. The sample size was not sufficiently robust to yield statistically significant results. Consequently, the results and discussion will focus on qualitative data that reached a level of saturation among the respondents. For example, except for one village, all respondents said that labor and equipment were their major constraint, while land is plentiful. In the Results and Discussion section, averages and percentages are primarily used to indicate the overwhelming majority of respondents. Any use of these numbers for more subtle distinctions should be approached carefully.<sup>2</sup>

The data in the results section are disaggregated by Livelihood Zone, gender, landholdings and wealth. The relative wealth of households was determined by the new value of their productive and consumptive household assets. While the research team was not able to conduct an exhaustive survey of all household assets, they used focus groups to identify a list of 19 key assets<sup>3</sup> that are used or desired by most rural households, thereby avoiding an indication of preference.

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1 Bigger households have more emigrant workers (going to other villages, cities or even abroad), thus contributing to the virtuous cycle between wealth and household size.

2 The Law of Small Numbers warns against drawing hasty conclusions from small sample sizes due to greater likelihood of variation from the true mean, (Kahneman, 2011).

3 Cell phone, motorcycle, bicycle, television, radio, solar panel, personal weekly tea and sugar expenditure, plow, sewing machine, hoe, shovel, axe, machete, donkey cart, donkey, cattle, goats, sheep, chickens (and other birds).

**Table 3. Villages and institutions targeted by the stakeholder assessment conducted in August 2015.**

Itinerary	Other sites included	Meetings
Conakry	Kipé, Kaloum, Kipé	IRAG, DNA, DNSA, WFP, USAID, UNICEF, WHO
Conakry - Forécariah - Kindia	Kondéyah, Foulayah	DMR, Coop., FABIK, CRAF
Kindia Ville	Foulayah, CU Kindia	RGTA, Kanya, KDF
Kindia - Mamou	Kilissi, Linsan, CU Mamou, Soubalako	Coop., Retailers, CRAK
Mamou - Dalaba - Mamou	Sébhory, Dounkimanya, Tolo	ENAE, ISAD, Coop.
Mamou - Dabola - Kankan	CU Dabola, Quartier Bordo, CU Kankan	DMR, COOPRAKAM
Kankan Ville	Quartier Bordo	DMR, Coop., CRAB, ENA
Kankan - Kérouané - Beyla	Nyonsomoridou, Bousankoro	DMR, Coop.
Beyla - Macenta - Kissidougou	Kouankan	DMR, Coop.
Kissidougou - Faranah - Mamou	CU Faranah	DMR, Coop., ISAV
Mamou Ville		DMR, Coop.

## STAKEHOLDER ASSESSMENT METHODOLOGY

A stakeholder assessment was carried out over an 11-day period in August 2015 (table 3). The assessment targeted the main horticultural stakeholders working in government agencies (research, universities and departments), NGOs, farmer cooperatives (*groupements* and/or *unions*) and high-achieving individual farmers. The assessment consisted of one-on-one surveys, group interviews or discussions, field observations, reading reports and making phone calls. Through this process more than 50 people were interviewed and 15 gardening fields and conservation or processing facilities were visited from Conakry to Beyla. The aim was to collect data from multiple and diversified sources, meet with actors from at the grassroots level, observe ongoing activities and make recommendations for improvement. In particular, this aspect of the rapid assessment sought to:

1. Analyze the horticultural seed systems and opportunities for development, including formal and non-formal systems.
2. Propose a suite of appropriate fruit and vegetable production practices and technologies, including postharvest technologies and infrastructure available to smallholders, citing recent innovations in the sector and the interventions of donors, research stations and NGOs.
3. Identify and interview key governmental, non-governmental and private sector partners in vegetable production and trade in Guinea.

## MARKET ASSESSMENT METHODOLOGY

A market survey was conducted over two weeks in August 2015. First, a Guinean geographic information systems (GIS) specialist investigated markets in the greater Conakry area before traveling to Beyla. He surveyed market traders (see Appendix B for complete survey). Due to time constraints, our team enlisted regional NGOs to gather similar data using the same survey. The market trader survey analyzes five categories of traders: wholesalers, wholesalers who also sell retail, retailers, those who transport horticultural products, and shopkeepers. The survey assessed market accessibility, the use of credit, produce losses in the markets, purchasing strategies, market cycles, horticultural suppliers, and contracts along with demographic information about the age, experience, and education of those surveyed. In total, our team surveyed 267 market actors (table 4).

All data were collected by a U.S.-based GIS and marketing specialist from West Africa and analyzed for commonalities and to identify market needs and opportunities for donor investment.

**Table 4. Market actors surveyed in the market assessment conducted in August and September 2015.**

Locality	Number of market actors surveyed
Conakry	25
Coyah	5
Dubreka	5
Forécariah	10
Faranah	140
Kérouané	23
Beyla	59
<b>Total</b>	<b>267</b>

# RESULTS AND DISCUSSION

## FARMER AND VILLAGE LEADER ASSESSMENT OF THE HORTICULTURE SECTOR IN GUINEA

Small-scale agriculture in the four Livelihood Zones is subsistence-based<sup>4</sup> and focused on rice production. Of the 190 smallholder farmers surveyed, they collectively devoted 637 hectares to cereal production (372 of which was rice production) and only 231 hectares to horticultural production.<sup>5</sup> A man farmer's primary responsibility is to grow enough grain to meet his family's caloric needs. A woman's responsibility is to contribute to subsistence grain production and independently grow cash crops, which can include horticultural production to help meet household expenditures, such as foodstuffs, healthcare-related costs, school fees and everyday purchases. The more well-off farmers will sell their surplus if they are confident they have enough grain to provide for the year. Worse-off farmers will sell their grain (even though they will have to buy grain later) when financial exigencies arise, such as emergency health costs, school fees, productive asset repair or social ceremonies.

### HORTICULTURAL PRODUCTION

In Guinea a smallholder farmer faces a number of constraints—including labor, agricultural equipment, inputs, and mechanization, and unpredictable weather—so he or she makes strategic decisions to maximize the pay-off in achieving food security first and financial security second. Compared to horticultural crops, cereals are generally hardier and, more importantly, easier to conserve for long periods of time. Cereals, mainly rice, are the foundation of subsistence agriculture in Guinea. The farmers surveyed here devoted small amounts of land and assets to horticultural production (table 5). This small amount is based on a farmer's ability to grow vegetables and tolerate risks related to the quantity of cereals produced. Horticultural crops can be more profitable if the constraints work in their favor and everything goes according to plan, but horticultural crops are also more vulnerable to those constraints as well as harder to conserve. Cereals are the stalwarts whose production is more predictable and that in the end feeds the family.

In the focus groups, farmers indicated that women grow a higher percentage of cash crops compared to men because women have less responsibility for the households cereal supply and more responsibility for the household's day-to-day expenditures. This is only mildly apparent in the survey data, and could be due to Guinean farmers' poor estimation of the size of their fields. On average, when compared to women, men are farming an extra hectare of rice. Men farm, on average, 1.4 more hectares than women and the data indicate that the extra hectare is devoted to rice production (table 5).

**Table 5. Investment of land and assets to producing horticultural crops based on a survey of 190 smallholders in June 2015.**

		Cereal hectares	Horticulture hectares	Percentage of hectares devoted to horticulture
<b>Livelihood Zone</b>	GN02	3.2	1.7	35%
	GN03	2.5	1.1	31%
	GN09	3.3	1	23%
	GN10	4.2	1.2	22%
<b>Sex</b>	Male	4.1	1.3	24%
	Female	2.7	1.1	29%
<b>Household Wealth</b>	Wealthier	4.5	1.4	24%
	Middle	3.3	1.3	28%
	Poor	2.9	1	25%
	Poorest	2.5	1.1	31%
<b>Farm Size</b>	>6 Ha	7.3	1.7	19%
	4-6 Ha	3.5	1.5	29%
	2-4 Ha	2	1.1	35%
	<2 Ha	0.8	0.3	27%

<sup>4</sup> A neat division between cash crops and subsistence crops is not possible because most households are selling a small portion of their subsistence crops (millet, rice, sorghum, peanuts, cowpea, corn, sesame). Therefore, this study uses a broad definition of subsistence crops, including all of those, as most households are consuming most of their harvest.

<sup>5</sup> Smallholder Guinean farmers lack the means to accurately measure their scattered and misshapen fields. Furthermore, tree crops typically are not planted with standardized spacing and hence are not conceptualized in terms of space. These numbers are rough indicators.

Despite differences in topography, agro-ecological conditions and population density among the four Livelihood Zones, farmers in these zones are cultivating similar amounts of cereals and horticultural products on average. Smallholders in zone GN03 are largely of the Fulani ethnicity. They focus more on livestock than growers in the other zones. They farm less cereal (but equal amounts of fruits and vegetables) as a consequence. Another noticeable phenomenon in the Livelihood Zone section of the data is the decreased percentage of hectares used for horticulture as one travels away from Conakry. Farmers in GN02 and GN03 rent cars and transport their harvest to the bustling markets of Conakry, where prices are higher, while farmers in GN09 and GN10 are relegated to regional markets (discussed in more detail below).

**PESTICIDES USED IN GUINEA**

**“ Herbicides are used most on rice, maize, sugarcane, banana, pineapple, coffee, groundnut, and cocoa. Insecticides are used for market gardening of vegetables, citrus, tree crops, coffee, cotton, banana, stored pests, oil palm, tobacco and ectoparasites of livestock. Fungicides are used for seed treatments, market gardening, tree crops, citrus, oil palm, rice, cashew, pineapple, coffee, banana, and cocoa. Rodenticides are both sold by the major pesticide sellers, and were found for sale in small rodent-edible bags with labels in the open market in Conakry. Molluscicides, plant growth regulators, and phosgene gas pellets for stored grain pests round out the available products and uses in Guinea.” (Schroeder & Soumah, 2005)**

A second calculation made by smallholders concerns labor and input allocation amongst the given array of cereal and horticultural crops. Farmers use more fertilizers and pesticides in fields planted with better varieties and they generally plant their better varieties in fields close to the village because: (1) weeding, guarding crops and hauling organic fertilizer are easier when the fields are close; and (2) closer fields have a higher soil fertility due to a greater concentration of animals and manure from animals returning to the village each night.

### CONSTRAINTS TO INCREASED HORTICULTURAL PRODUCTION

Access to arable land is generally not a constraint for Guinean farmers. Except in one village that was tightly packed amongst other villages, none of the respondents indicated that land is an issue. Furthermore, when asked to describe

the difference between wealthy and poor people in their village, none of the respondents mentioned arable landholdings; 64 percent said that wealthy farmers can afford to hire labor, 39 percent said that the wealthy can afford more equipment, and 13 percent said that the wealthy can afford more inputs. When farmers were asked what prevents them from increasing production and separately what prevents them from devoting more land to horticultural production, again land was not mentioned. Labor, followed by lack of agricultural inputs, were the major constraints (table 6<sup>6</sup>).

According to those surveyed, the primary constraints to increasing production are labor<sup>7</sup> and access to capital to invest in agricultural inputs and equipment. The labor problem is inherently linked to the lack of capital, inputs and equipment because labor is the productive asset that farmers employ to countervail other shortages. Rather than use mechanized irrigation systems, poor farmers pull water one watering can at a time and irrigate their dry-season vegetables by hand. Rather than using herbicides or tillers, poor farmers weed by hand. Rather than using chemical fertilizer, poor farmers collect manure and haul it out to their fields, sometimes in donkey carts, sometimes in an old bucket on their heads. When Guinean farmers are asked to describe the characteristics

**Table 6. Constraints to increasing horticultural production identified by farmers in a survey of 190 smallholders in June 2015.**

Constraint	Relative Power <sup>6</sup>
Labor	113
Fertilizer	95
Money / credit	89
Seeds / saplings	87
Pesticides	79
Equipment	54
Motorized pumps	38
Postharvest losses	24

<sup>6</sup> Relative power was calculated by reversing rank with points (as 8th was the lowest ranked constraint, the No. 1 rank became 8 points, the No. 2 rank became 7 points, etc.). Total points for each constraint were summed, divided by the total points of all constraints combined, and multiplied by 100.

<sup>7</sup> Labor is the main constraint during the agricultural season, but not for the whole year. Composting is laborious (digging the pits, filling them with manure, straw and other materials, watering the pits) but this labor occurs during the dry season, making it a viable option for improving soil fertility.

of wealthy households in their village, they point to the large families, where labor is abundant and where wealth and household size feed off each other in virtuous cycles. While inputs are purchased at the individual level within a household (the wife buys fertilizer and pesticides for her fields and the husband buys for his), agricultural equipment and other productive assets are often shared within a household. Larger households have more labor (the productive asset used to overcome other shortages), allowing them greater flexibility and investment in shared equipment. Larger households also have more emigrant workers (going to other villages, cities or even abroad and sending money back), furthering the positive feedback loops in income generation. The data from the surveys bear out this connection between wealth, household size and labor (table 7).

Poorer farmers will work their own fields and sell their labor to wealthier neighbors within the village, providing those poorer farmers with an additional source of income. Poor farmers have less access to inputs, irrigation and implements (hoes, shovels, etc.). At a certain point, it appears to become in their best interest to work the fields of wealthier neighbors for earning cash or negotiating other necessities. Also, due to poorer farmers' need for money immediately, they often make decisions that lower their overall profit in exchange for immediate payment. Selling labor rather than working your own fields is a good example of this.

Another example that occurs frequently in the area of research is that merchants arrive in a village one month before the mangoes or avocados are ripe to offer cash now for rights to harvest an entire tree. They pay farmers a fraction of the value of the tree's harvest and farmers desperate for cash take the deal.

## RURAL HOUSEHOLD ECONOMIES AND HORTICULTURE'S ROLE

Men and women smallholders are able to access existing markets for both cereal and horticultural crops. Vibrant local markets for cereals exist at all levels from large cities to small villages. As mentioned above, farmers are frequently engaged in the purchase and sale of cereals, based on their financial needs. Poor families tend to sell when the price is low, immediately following the harvest, because they need cash, and they tend to buy more cereal when the price is high, during the lean season, because they run out of cereal. Meanwhile comparatively wealthy rural families are able to wait to sell more of their cereal harvest when prices are higher.

Men and women smallholders alike have access to horticultural markets. When their harvests are smaller, they take their produce to market via public transportation or motorcycle, either borrowed or rented. When they have a large enough harvest, they rent a car and transport their produce to large city markets as far as 200 kilometers away to sell directly to bulk purchasers.<sup>8</sup> Very few (12 of the 190 respondents) farmers opt to sell their produce in the village, either to middlemen or neighbors.

A farmer's gender or wealth appears to have little influence on their ability to access markets. Farmers in Livelihood Zones GN02 and GN03 are close enough to warrant the trip to the Conakry markets where prices are usually higher, so they tend to transport their produce farther distances than farmers in more distant zones (table 8). According to the data, the poor

**Table 7. Household size and wealth. Wealth was determined by the total assets, productive and non-productive, owned by the respondent and other household members in a survey of 190 smallholders in June 2015.**

	Member total	Members of working age
<b>Wealthier</b>	14.1	7.8
<b>Middle</b>	12.4	7.0
<b>Poor</b>	10.3	5.5
<b>Poorest</b>	9.3	5.5

**Table 8. Access to markets based on the furthest typical point of sale based on a survey of 190 smallholders in June 2015.**

	Furthest typical point of sale (% of respondents)				Average distance (km)
	Conakry	Regional capital	Weekly market	In the village	
<b>GN02</b>	63	15	20	2	86
<b>GN03</b>	47	13	40	0	182
<b>GN09</b>	3	44	41	12	28
<b>GN10</b>	0	60	40	0	21
<b>Men</b>	24	32	40	5	63
<b>Women</b>	23	41	31	5	67
<b>Wealthier</b>	17	42	29	12	70
<b>Middle</b>	17	38	45	0	32
<b>Poor</b>	30	36	30	5	88
<b>Poorest</b>	32	27	39	2	71

<sup>8</sup> "They sell these products both wholesale (destined for Conakry) and retail. As a result, it is common to see higher prices on the markets in the production areas (retail markets) than on the main destination market for these products in Conakry," reported one focus group participant.

and poorest farmers are more likely to travel farther to sell their produce for a higher profit. This phenomenon most likely indicates preference (wealthy people could access farther markets too, if they desired) and perceptions of optimal time use.

Horticulture is a high-value and high-investment production system that is aimed primarily at market sales. Guinean farmers invest in their horticultural production when they are confident of the return on their investment. Farmers who are closest to the higher demand and stronger markets of Conakry are also the largest investors in their production systems (table 9). A closer look at the data indicates that the Conakry markets have a greater effect on smallholder investment in horticulture than household wealth, as evidence by the clustered levels of investment among all wealth groups. Greater access to Conakry markets would presumably have the same effect on producers in Livelihood Zones that are farther from the capital. Guinean farmers invest more in their vegetable production than fruit tree production (table 9). Fruit trees are seen more as a fixed investment in land resources than financial resources.

Men and women differ in production priorities and investment capacities (table 9). Men are more engaged in fruit tree production. Men also have more capital than women for vegetable production, even though they are less engaged in the activity (see discussion of gendered production below).

In focus groups and in the surveys, farmers indicated that they generally sell 90 percent of their horticultural harvest. The remaining 10 percent is eaten and given to friends and neighbors during the harvest. Most households can only eat a small percentage of the harvest before it spoils, so they give away more than what they consume, expecting reciprocation when the neighbors harvest.

The profit from the sold horticultural goods pays for basic living expenses. In response to an open-ended question about what they buy with horticultural profits, 70 percent of the farmers mentioned food, 55 percent said school fees for their children, 46 percent mentioned clothes, 44 percent said agricultural inputs and equipment, and another 44 percent mentioned health costs.

Even if it were possible to convince rural populations to sell less and eat more of their horticultural harvest, it is not clear that they would be any better off, because they are currently using horticulture to increase their food security and invest in the future (table 10). Without knowing the nutritional value and exact quantities of food purchased and consumed, it is nearly impossible to determine.

**Table 9. Investment of land and assets to horticulture by 190 smallholders surveyed in June 2015.**

	Percent (%) engaged in tree production	Percent (%) engaged in vegetable production	Annual (\$) investment in pesticides and fertilizers for trees	Annual (\$) investment in pesticides and fertilizers for vegetables
GN02	98	100	8	250
GN03	50	81	0	141
GN09	71	76	7	10
GN10	43	93	14	46
Men	77	74	12	121
Women	38	95	4	60
Wealthier	66	87	14	92
Middle	49	81	10	98
Poor	48	91	9	88
Poorest	60	86	3	71
>6 Ha	71	86	19	146
4-6 Ha	56	88	8	84
2-4 Ha	54	89	6	71
<2 Ha	41	75	0	60

**Table 10. Rank of importance of income generating opportunities to smallholder households among those surveyed in June 2015 (relative power).**

Zone	Horticultural production	Herding	Collecting forest goods	Small commerce	Shop owner	Making charcoal	Fishing
GN02	64	10	8	4	1	3	3
GN03	60	19	12	0	6	1	0
GN09	72	7	12	2	2	3	1
GN10	72	3	4	8	3	3	0

Although very little nutrition training reaches rural farmers (87 percent of respondents have never attended a nutrition training from governmental or NGO programs), the population is aware that fruits and vegetables are good for health, but how much and why is not well understood. In focus groups, the research team asked men and women farmers which is better for their health, a handful of fruits and vegetables or a handful of rice. They typically responded that rice was more important, but the fruits and vegetables were healthier, and they had difficulty explaining why (table 11).

**Table 11. Percentage of respondents indicating what it would take to convince them to eat more fruits and vegetables.**

	Men	Women
Increased production	30	29
Postharvest conservation	46	28
Nutrition training	1	0
Primary needs met first	26	41

## **GENDERED HORTICULTURAL PRODUCTION**

The focus groups with farmers revealed that men and widows tend to own orchards, while women often farm vegetables. While the survey information revealed that it is generally true that men tend to focus on tree cultivation and women focus on vegetable production, in reality, the division is not neat. Some amount of men grow vegetables in most villages (68 percent of men surveyed grow vegetables in the off season and 54 percent during the rainy season) and 38 percent of women surveyed own at least one tree. When they were asked why the division occurred along gender lines, men and women both stated (in order of importance):

1. “It’s just the way it is.” In other words, it is cultural.
2. Women don’t have the strength to farm trees (planting saplings and clearing land for fire breaks).
3. Women can’t wait 3-5 years after planting to harvest; they have immediate financial needs.
4. Forest fires can wipe out orchards and women are more risk averse than men.

While these are very real barriers for women in rural farming communities, they are not insurmountable. First, culturally, although women do not inherit trees, they do own them—just in smaller numbers and usually around their homesteads. In rural Guinea there is no cultural proscription for women regarding tree cultivation. However, planting a tree is akin to laying claim to land, which makes it difficult for women to plant orchards in the fields surrounding the village.

Second, regarding strength, orchards require much less work than vegetables; once the orchards are established, they don’t need to be watered, while vegetable gardens need to be watered twice per day. In reality it is not a question of brute strength, but of perception. Woman in rural Guinea who are strong enough to pound millet, chop wood, farm 3 hectares without the aid of machinery, and carry large buckets of water for long distances, could certainly cultivate orchards. When needed, their husbands, brothers and sons could be available to help with tasks such as clearing land and chopping wood.

Third, when it comes to immediate financial needs, a woman’s income is critical to a household’s food security. This barrier can be overcome through slow adoption rates and development initiatives. Our research shows that even men growers often sell themselves short and take less money up-front for products (including fruit trees) that would give them a higher return if they could just wait longer for the cash. Getting through the financially lean seasons is an issue for many in rural Guinea. Finally regarding risk, women are less risk averse than men in the early adoption of new vegetable varieties, and the economic calculation of risk versus reward is no different for women as it is men, who find tree cultivation well worth the risk.

**Table 12. Labor differences among men and women respondents in a survey of 190 smallholders in June 2015.**

Questions	Women's responses (%) for their vegetable fields				Men's responses (%) for their vegetable fields			
	I do	My husband	My children	Hired labor	I do	My wives	My children	Hired labor
Who plants	68	2	18	32	73	19	21	21
Who weeds	64	2	20	34	55	49	31	16
Who waters	83	0	23	13	50	47	34	7
Who harvests	59	4	22	34	59	48	26	17
Who sells	82	2	14	1	29	70	6	4
Who controls	85	9	2	0	89	2	0	0

As in many parts of the world the labor and time constraints on women are very real. In addition to time and labor dedicated to productive activities such as those related to agriculture their responsibilities to the household and family should also be considered. In this research we saw that women help their husbands with vegetable cultivation and marketing, while men appear to be absent from the women's fields. Women also rely more on hired labor. A point for further research would be to more about the potential connection between the time women spend in their husbands' fields and their reliance on hired labor for their own fields (table 12).

## WHEN BOTH GENDERS GROW VEGETABLES

**Bountoualy** is a 30-year-old Soussou farmer in the region of Kindia, 115 kilometers from Conakry. She lives in a small village where both men and women grow vegetables and sell their harvest in the grand markets of the capital, where supply is hard-pressed to outstrip demand. She grows onions in small plots around her house, and during the rainy season, she grows 0.25 hectares of chili pepper, 0.25 hectares of tomatoes, and 0.75 hectares of eggplant. She buys roughly \$10 in fertilizer and \$20 in pesticides for each quarter hectare plot. During the dry season, she grows the same crops in roughly the same proportions; only she doubles her expenditures on fertilizer and halves her expenditures on pesticides. Rainy season crops are grown in rotating fields, where farmers look for specific wild plants that indicate the return of soil fertility, reducing the need for fertilizer. She spends more on pesticides in the rainy season because insects and disease are a greater problem. Furthermore, half of the seeds she plants are certified varieties. Bountoualy can't read and she doesn't understand pesticides, so her husband talks to her about which pesticides she should buy and he applies them with an applicator he borrows from a friend. She supplements her chemical treatments with traditional techniques, such as using ash to reduce insect invasions. He also helps her clear her land in the beginning of the growing season, using a broad-spectrum herbicide and then incorporating the residue. Even with her husband's support, she can be found in her fields every day, for 2 to 6 hours, depending on the season (dry season production is more laborious because she pulls water from the stream and waters her vegetables by hand), sometimes alone, sometimes with her children. Upon harvest, she rents a car, or space in a *camion*, to deliver her produce to the vibrant markets in Conakry, where she sells directly to wholesalers. Vegetable gardening is her most important source of revenue, therefore she finds the money needed to buy fertilizers, certified seeds and pesticides. Her husband helps her with the work that is laborious or hazardous.



**Bountoualy next to her home garden, a raised bed of onions.**

**Kadjiatou** is a 27-year-old Camankhé farmer in the region of Beyla, a remote corner of Guinea. She lives in a small village where men have plantations of fruit trees, but take little interest in growing vegetables. The farmers in her village sell their harvest in the regional capital of Beyla, 25 kilometers away, where farmers throughout the region descend at the same times of year with the exact same fruits and vegetables to sell which causes prices to fall. Kadjiatou borrows her husband's hoe to farm (when he is not using it) and she grows half hectares of chili pepper, eggplant and okra in the rainy season. She does not grow vegetables during the dry season, even though she has access to arable land near the local stream. She does not purchase fertilizer or pesticide for her vegetable production, and she does not use improved or certified seeds. She plants saved seeds from the year before. She does not even know where she could find improved seeds. More importantly, she is not certain enough of the market for her harvest to invest in seeds or inputs. She cites a lack of knowledge of pesticide selection and application as a barrier of adoption, and she does not use traditional pest management techniques, such as the application of ash to keep insects away from her horticultural crops. Unlike Bountoualy, Kadjiatou's husband does not grow vegetables; he would not know how to advise her in the use of pesticides or improved seed. During the rainy season, Kadjiatou splits her time between tending her vegetable and her agronomic fields, with cereals taking more importance because her family's food security depends on their ability to grow staple foods. Her vegetable production has widely varying profits from year to year, depending on the caprice of the markets, invading insects, and mysterious plant diseases.

**Aboubacar**, a dynamic farmer in Kindia, grows pineapples, bananas, chili pepper, okra, cucumbers, tomatoes, avocado, palm oil, and mango, while experimenting with new varieties of papaya. He advises his wife in many facets of her production, while at the same time acknowledging the advantages that female growers add to his own approach, "You see, women spend more time in the market, selling and buying vegetables. They are the first to recognize the value of new varieties, and the first to experiment with their production. I have seen enough women succeed with the new cucumber variety that I will plant it this upcoming dry season."



**Kadjiatou planting a peanut field along the northern edge of Guinea's remote forest zone.**



**Aboubacar surveying his pineapple field**

## HORTICULTURE CROP PRODUCTION

Horticultural production in Guinea most often takes place in and around the home during the rainy season. Crops can include eggplants, pepper, tomatoes, potatoes, sweet potatoes (mostly in Mamou area), squash or beans. In addition to fruits and vegetables, farmers also grow maize, cassava, and peanut. As discussed above, much of this production is managed by women. Horticultural production in the dry season takes place mostly along river banks or along streams where farmers either work individually or in groups (*groupements*, *seres*, or *unions*). Farmers also grow various fruit trees intercropped in these fields, mainly citrus, but also mangoes, avocados and bananas.

Some permanent plantations do exist in communities (usually outside villages or cities) where farmers are growing multiple fruit tree species together, including bananas, citrus, mangoes, avocados, or cashew. This horticultural practice is usually done individually and also intended for both family consumption and commercialization (export or local weekly

markets). Very little care or improved management practices are provided to these types of plantations, and species are genetically old and not renewed. Plantations are largely located around Beyla for export of fruit to Côte d'Ivoire (table 13).

Horticultural production is a complex endeavor that is both knowledge- and capital-intensive. To maximize production, farmers need to be able to:

- Identify horticultural crops and varieties that are (1) adapted to their local environment and (2) desirable in the local market, and then successfully conserve the best seeds for the following season.
- Identify (1) the specific insects and diseases that cause damage to their crops and (2) the appropriate pesticides or traditional pest management techniques, and then apply them at the correct dosage, at the correct point in the crop's life cycle, and in a safe manner.
- Discern (1) the soil fertility and (2) the nutritional needs of each horticultural crop, and then apply the correct dosage of organic and chemical fertilizers at the appropriate time.
- Harvest, sort, conserve and transport the fresh produce using techniques that minimize postharvest losses between the field and the market.
- Calculate how much they should invest in each horticultural crop given market uncertainties, and find access to finances or credit to ensure their ability to invest.

These necessities warrant a daunting set of skills for the average illiterate farmer in rural Guinea. In villages where men do not participate in vegetable production, the women are left to figure out all of these issues on their own. The women are less equipped than the men to solve these problems because they are often less educated and thus have much lower literacy rates. In the villages where men do not grow vegetables, women are less likely to apply pesticides and chemical fertilizers, as this is a task normally given to men. These fields often have lower yields, and the female growers make smaller profits from their production. Communities are more prepared to meet these challenges and find success when both men and women are bringing their unique skill sets and experiences to bear.

Vegetable growers are dependent on external markets for seed supplies. Seeds are imported from the neighboring countries of Senegal, Mali or Côte d'Ivoire (depending on the proximity to the production area/community) but also from Europe (France, Belgium or the Netherlands). The biggest importers of improved seeds are in Conakry (*Tidiane Agriculture*) and in Kindia (*Comptoir Agricole*). They work closely with farmer cooperatives and researchers to request conventional materials (seeds, herbicides and pesticides) and respond to local demands. The government doesn't exert control over the importation of seeds resulting in little if any germination or quality testing or technical assistance. The government initiated a seed

**Table 13. Major horticultural crops grown in the assessment corridor.**

Location	Areas visited	Vegetables grown		Fruit trees
		Rainy Season	Dry Season	
Forecariah	Maferinyah	Eggplants, maize, water melon, okra, cassava	Lettuce, cabbage, pepper, okra, etc.	Mango, avocado, banana, citrus
Kindia	Foulaya, Kindia Ville, Kondayah, Friguiagbe	Tomato, cassava, onion, eggplant, lettuce, cabbage, okra, maize,	Tomato, sweet potatoes, lettuce, cabbage, eggplants, pepper, carrot, okra, etc.	Mango, avocado, banana, citrus
Mamou	Mamou Ville, Soumbalako	Maize, potatoes, sweet potatoes, lettuce, okra, eggplant, pepper, beans	Tomato, sweet potatoes, lettuce, cabbage, eggplants, pepper, carrot, etc.	Mango, avocado, banana, citrus
Dabola	Dabola Ville	Maize, peanuts, okra, eggplants	Tomatoes, lettuce, cucumber,	Mango, banana
Kankan	Kankan Ville, Bordo, Scierie	Maize, onion, cassava	Lettuce, onion, eggplant, cabbage	Cashew, mango, citrus
Kerouane	Kerouane Ville	Okra, eggplants, maize, pepper, peanuts	Eggplants, onion	Mango, banana
Beyla	Beyla Ville	Okra, eggplants, maize, pepper, cassava,	Eggplants, sweet potato, cassava	Bananas, mango, avocado, citrus
Kissidougou	Kissidougou, Fermessadou	Okra, eggplants, maize, pepper, cassava	Okra, eggplants, sweet potatoes	Banana, mango
Faranah	Faranah Ville	Okra, eggplants, maize, cassava	Okra, eggplants, sweet potatoes	Mango, citrus

**Table 14. Importance of horticultural crops by Livelihood Zone, gender, and wealth class from a survey of 190 smallholders in a June 2015 survey.**

	Eggplant	Chili pepper	Okra	Tomato	Cassava	Onion	Potato	Avocado	Banana	Cucumber	Mango	Orange	Palm
<b>GN02</b>	6.8	6.7	1.6	3.2	2.1	0.5	0.2	0.0	0.2	1.2	0.0	0.0	0.0
<b>GN03</b>	3.7	2.9	1.6	3.3	0.4	0.1	2.1	0.2	0.2	0.0	0.0	0.2	0.0
<b>GN09</b>	7.3	5.4	4.7	3.0	1.3	2.7	0.0	1.7	1.5	0.2	1.4	1.2	0.8
<b>GN10</b>	6.3	5.1	6.2	1.8	1.0	0.6	0.2	0.3	0.0	0.3	0.3	0.3	0.4
<b>Men</b>	9.2	8.5	4.7	4.1	3.4	0.1	1.1	2.0	1.8	0.6	1.1	1.4	0.9
<b>Women</b>	14.9	11.5	9.4	7.1	1.4	3.8	1.4	0.2	0.1	1.1	0.5	0.2	0.2
<b>Wealthier</b>	6.7	5.1	4.9	2.6	0.7	0.9	0.6	1.2	0.4	0.8	1.2	1.0	0.2
<b>Middle</b>	6.2	5.3	3.3	2.4	1.9	1.5	0.2	0.3	0.6	0.5	0.0	0.1	0.3
<b>Poor</b>	5.6	4.8	2.7	3.0	1.5	0.8	1.0	0.5	0.4	0.3	0.3	0.1	0.4
<b>Poorest</b>	5.5	4.8	3.1	3.2	0.8	0.7	0.6	0.3	0.5	0.1	0.1	0.3	0.2

distribution system in 2012, but this provides untested seeds to uneducated farmers who lack regular technical agricultural assistance. An initiative like this, while a good start, is likely too little too late. Seed distribution schemes without technical follow up or oversight can easily become a hand-out program only benefiting politicians seeking votes. There have been a few programs supported by research centers that have initiated seed production systems locally (Dalaba, Kilissi, Bordo, Foulaya, etc.). So far, little success has come out of these programs, and most rural growers continue to rely on old seeds they can save from previous harvests (see section on institutional capacity for additional information).

Growing vegetables is more laborious and more knowledge- and capital-intensive than managing fruit tree plantations, in part because vegetables require twice-daily watering, most of which is done by hand without any motorization, while trees only require intense care in their first year. Vegetable gardens require constant care, weeding, and pest protection. Men grow vegetables only when they believe it is worth their while, i.e., in villages where it is sufficiently profitable to grow vegetables due to access to reliable markets. Some crops such as eggplant and chili pepper are important across regions, genders and wealth classes (table 14).

Men and women smallholders generally have access to markets and productive land. Women tend to have equal access to markets as men, and women are usually more aware of new varieties because they interact with the market as vendors and consumers.

## **HORTICULTURAL POSTHARVEST AND PROCESSING**

In general, the difference between the fruits and vegetables that are eaten and those that are sold is their ability to be conserved. Two main factors here are (1) the ease of preservation and the physiological nature of the specific crop, and (2) the farmer's ability and access to technology to conserve through drying, cooling or other means. For fruits and vegetables that a household can conserve (mostly by drying), such as okra and chili pepper, the family will consume up to 80 percent of their total production. For fruits and vegetables smallholders cannot conserve, such as tomatoes, it is a race to sell as

## OKRA

“Okra is second only to chili pepper in terms of profitability for poor communities, due to high and steady demand in local and urban markets. The main constraints of the sector concern: its extensive farming practices, traditional varieties characterized by low productivity and poor storage conditions, which negatively affect its commercial value.” (USAID, 2006a)

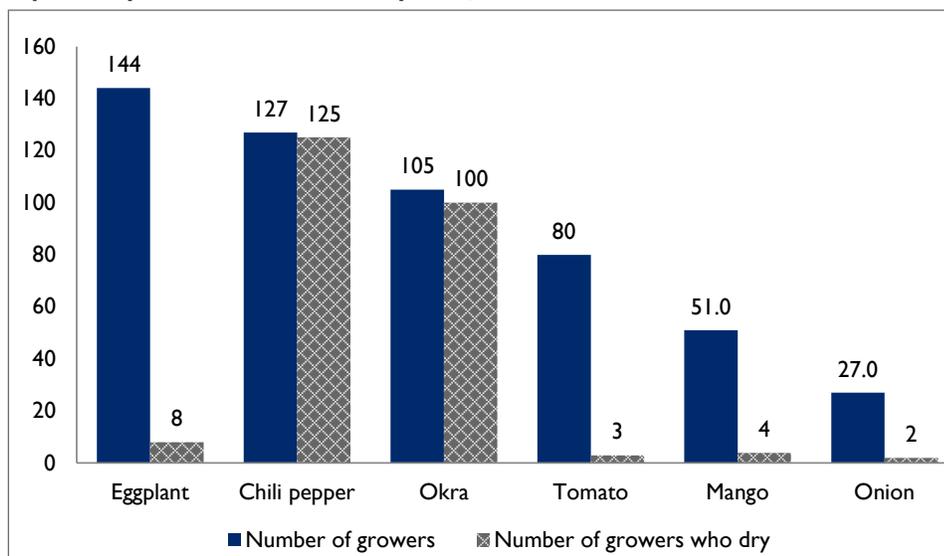
Farmers generally cultivate two varieties of okra, a disease-resistant long-season variety that is intercropped in rice fields and a short-cycle okra (45 days) that is grown in dry-season gardens. Farmers complain that the short-cycle variety is vulnerable to pests, especially insects. They use chemical insecticides and ash to protect the leaves. Okra is an important part of the rural Guinean diet; it is used in sauces to make rice and cassava-based dishes more palatable. Furthermore farmers can dry and store the vegetable and thereby consume or sell it throughout the year. Many farmers sell 90 percent of the short-cycle variety on the day of the harvest to meet immediate income needs. By the time they harvest the long-cycle variety, the price of fresh okra has fallen and so they dry and store it. They report that they eat a much higher percentage of the long-cycle because it is stored in their homes and available for the taking.

much as possible, about 90 percent as soon after harvest as possible (figure 3). To keep these vegetables any longer than one day is to watch hard work and investments rot away.

Besides greater consumption of these conservable vegetables, smallholders also exert greater economic control over their harvest when they are able to preserve it for longer periods of time. After they have covered immediate financial needs, selling either the fresh product or the first harvest, they typically hold their dried okra and chili pepper and sell later at a much higher market price (figure 3). Preservation and storage allows them to more effectively play the market to their advantage, rather than be forced to accept the market prices on the day of the harvest.

In Guinea, there are food processing and handling facilities operating at a small-scale mostly around cities, such as Kanya Nema, Kanya Donse Fanyi, or *Coopérative des Producteurs et Exportateurs des Fruits et Légumes de Friguiagbé* (COPEFL) near Kindia; *Association des Femmes Techniciennes et Technologues* (AFTT) or *Federazione delle Unioni di orticoltori della Haute Guinée* (FUMA) near Kankan; and *Coopérative des Producteurs d'Arachide de Karité et de Miel* (COPRAKAM) near Dabola (table 15). Most postharvest processing is done in the traditional way using direct sunlight

**Figure 3. Number of respondents who grow and dry common horticultural crops, reported by 190 smallholders surveyed in June 2015.**



**Table 15. Main fruit and vegetable and other major processors in Guinea.**

Structure/Organization	Location	Main Activities
COPRAKAM	Dabola	Peanuts
Kanya Nema	Kindia	Fruits and Vegetables
Kanya Donse Fanyi	Kindia	Fruits and Vegetables
COPEFL	Kindia	Fruits
FABIK	Kindia	Fruits and Vegetables
AFTT	Kankan	Fruits and Vegetables

## MANGOES

Farmers throughout the four Livelihood Zones reported that fruit flies attack their trees, and roughly 60 percent of their mangoes rot on the tree before harvest. They generally do not buy pesticides or practice integrated pest management, mostly because supply outstrips demand during the harvest. Many farmers believe mangoes aren't worth taking to market; they invest cash only in crops that generate cash. For Guinean farmers, mangoes are a low-labor, low-investment and low-income-generating crop.

Mangoes are a missed opportunity for horticulture and household nutrition. They are highly productive trees, farmers eat most of the harvest, and they yield at the beginning of the lean season when household incomes and nutrition plummet among the poor. The main problem with mango production is that the whole nation harvests them at the same time and farmers don't have viable postharvest conservation options, creating periods of gross abundance followed by total absence, thus hindering market opportunities. Postharvest options would allow farmers to continue to sell and consume mangoes throughout the lean season. Newer varieties and planting methods could also alter the harvest date to increase the likelihood that mangoes become a viable economic investment.

The secondary problem is the damage caused by insects. A Chemonics assessment of pest management in mangoes recommends smallholders use baited, insecticide-laden traps (Schroeder & Soumah, 2005).

for drying, and firewood for cooking or smoking. Oftentimes recycled (non-food-safe) containers are used to preserve, transport, or sell this dried product. Some processed vegetables or fruits are hard to sell because of cultural or food habits in certain areas. Those processing or selling processed fruits and vegetables can face serious losses (mango, onions, tomatoes, etc.).

While rice is the staple food of Guinea, each meal includes a sauce of vegetables. While some foods are widely acceptable when dried, people interviewed around Kankan (GN09) reported certain reluctance in using processed vegetables for family consumption (like dried onions, mangoes or tomatoes) and having high preference for the commonly used vegetables in their "natural" or unprocessed way. This has stopped some vegetable growers from drying fruits and vegetables even though they know that they could make more income if sold later during the rainy season when these vegetables are scarce.

## CHILI PEPPER

Chili pepper is one of the most profitable and widely grown vegetables in Guinea. The main domestic markets for the product are in Conakry, Kindia, Labé, Kankan, and N'Zérékoré, where women bring them for resale from markets throughout the country (USAID & Chemonics, 2006). Focus group participants reported that a 50 kg sack of chili pepper can sell for \$21 USD throughout the year while a 50 kg sack of okra sells for roughly \$10 USD. Chili pepper is a very popular addition to local dishes, and the varieties are judged by their pungency. Farmers can dry and store it, to sell or eat it another day. Guinean farmers grow local varieties and use saved seeds. They have a variety that yields large fruit, often called Sikouly (named after an insect of similar appearance), and a variety that produces small fruit and can produce 10 times per year for three years. Harvesting the smaller variety is more labor intensive, but it has fewer disease issues and it is more attractive to consumers because it is spicier. These chilies have export potential as well. In Senegalese markets, they are known for their high pungency, referred to as the "little Guinea pepper," but pepper producers from Benin, Nigeria and Burkina Faso who use better production and postharvest practices (homogeneity and plastic packaging) make for strong competition (USAID, 2006d).

If smallholders could add mangoes, avocado, bananas, tomatoes or eggplants to the list of products they can process and store, it is clear they would increase their bargaining power and increase profit. The increase in profit would allow them to invest in their production, household needs, technology, and foodstuffs as they see fit. Households would also eat more of these fruits and vegetables if they could save them, improving the diversity of their diets. The farmers in the focus groups said that fluctuations in production didn't change the amount they ate because the amount of fresh product they set aside for production is constrained by what they can consume (or choose to share) before it rots. Larger harvests have no effect on that constraint (table 16).

Guinea has very few horticultural canning factories, and it is our estimate that in the four Livelihood Zones there are fewer than 10 functioning ones. Even if Guinea could muster the political will, market access, management capacity and finances to modernize or expand these facilities, the smallholders supplying them would still be price-takers, and they would be investing their production capacity into finicky markets beyond their comprehension, without the flexibility to do anything but sell the day they harvest. It would be good to look to successful examples in other countries in the region to see how these processing opportunities can be both safe and successful for local consumers and profitable and empowering to local growers.

## BANANAS

An improved banana variety, Feya, costs \$0.35 USD per mature corm. Other costs for banana production include fungicide, manure, fertilizer and potassium, adding up to about \$2.20 USD per tree. A Feya plant can produce up to about 60 kilograms in its lifetime. Farmers sell bananas for \$0.50 – \$0.90 per kg. So for about \$2.55 USD invested per plant, these plants can generate upwards of \$50 USD. More importantly, farmers eat large portions of their banana harvest, and bananas do not necessarily follow a season in Guinea. This allows farmers to strategically plant bananas nine months before they believe the market price will be high, to schedule their harvest accordingly. They often plant at the start of the rainy season so that the yield occurs during the dry season (but before mango season, which lowers the price of bananas). Bananas also have export potential in West Africa; 34 percent of bananas grown in West Africa in 2010 were exported (FAO STAT, 2015).

**Table 16. Percentage of respondents answering the question “What would you do if you doubled your production?” in a survey of smallholders in June 2015.**

	Sell less, eat more	No change	No change because there's no postharvest
<b>Men</b>	22	60	17
<b>Women</b>	41	36	22

## HUMAN AND INSTITUTIONAL CAPACITY ASSESSMENT OF THE HORTICULTURE SECTOR IN GUINEA

### AGRICULTURAL RESEARCH AND DEVELOPMENT

Over the last five years, Guinean agricultural research and development spending levels have gradually increased due to increased government support. Along with increased support, the number of agricultural researchers has also increased. Still, two-thirds of Guinea's researchers hold just a Bachelors of Science degree. The largest Guinean research agency, *Institut de Recherche Agronomique de Guinée* (IRAG) is expected to lose 90 percent of its Ph.D. researchers by 2023 due to age and retirement. This highlights an urgent need for training in agriculture (ASTI, 2015). This also means that appropriate financial resources need to be dedicated to retain a young and dedicated workforce. As in much of the world, women researchers in Guinea make up a fraction of the research community, with only 4 percent of agricultural researchers being women. Programs such as African Women in Agricultural Research and Development (AWARD) are working to increase opportunities for women in science, but efforts need to be started early in girls' education. Education for girls from primary through university levels should encourage girls and women to engage in the sciences.

In 2011, Guinea invested just 0.22 percent of its agricultural GDP in research and development, much less than the levels recommended by the New Partnership for Africa's Development (NEPAD) and the UN of 1 percent GDP. In terms of the

number of researchers per 100,000 farmers, Guinea (7) does slightly better than its neighbors Liberia (5) and Sierra Leone (6).

Overall Guinea's agricultural research portfolio is balanced between crops (57%), livestock (13%) and fisheries (7%). Within crop research, most researchers focus on rice (23%) with fewer researchers focused on vegetables, cassava, maize, bananas and plantains (about 12% each) and other fruits (6%). This clearly reflects the importance of rice to the national economy and also the low prioritization of vegetable production among researchers.

In Guinea there are eight public agencies conducting agricultural research and development (table 17). IRAG accounts for more than 60 percent of the country's agricultural researchers. The institute focuses on a range of research topics, including crops, livestock, natural resources, postharvest issues, and agricultural engineering. Currently there are no private nonprofit nor for-profit organizations conducting agricultural research and development in Guinea (see Appendix C for key stakeholders in Guinean horticulture including government, non-government, and private stakeholders).

**Table 17. Research centers in Guinea.**

Name of Center	Location	Specialties
Institut de Recherche Agronomique de Guinée (IRAG)	Conakry	Supervision of different research centers and coordination of research projects
Centre Régional de Recherche Agricole de Foulayah (CRRAF)	Foulaya, Kindia	Fruits and vegetables
Centre Régional de Recherche Agricole de Bordo (CRRAB)	Bordo, Kankan	Fruits and vegetables
Centre Régional de Recherche Agricole de Sereidou (CRRAS)	Sereidou, Macenta	Fruit trees
Centre Régional de Recherche Agricole de Bareng (CRRAB)	Timbi Madina, Pita	Vegetables
Centre de Recherche Agricole de Kilissi	Kilissi, Kindia	Rice, legumes, variety selection, research and extension
Centre de Recherche Agricole de Koba	École Nationales d'Agriculture et d'Élevage (ENAE), Koba, Boffa	Swamp rice production

## DEFINITIONS OF GUINEAN FARMER GROUPS

**Groupement:** Mostly composed of women, groupements are often a group of tens of farmers working together to grow vegetables. They usually have official recognition papers, work in larger fields, and are organized from production to sales. They are provided with technical assistance by either the government or local NGOs.

**Union:** A union is a group of many groupements where people work with and support each other in a prefecture or administrative region. Unions defend groupements' sovereignty and facilitate supply or sales locally and internationally.

**Federations:** Federations are larger entities gathering many unions together and are usually specialized in one value chain. Federations are commonly on a regional level and contribute highly to trainings, technical and financial assistance through loans. They also defend unions' sovereignty and facilitate networking within the country or with potential partners abroad.

## AGRICULTURAL EDUCATION AND TRAINING

Guinea has two universities and four professional schools teaching agriculture. Curricula vary from three years in professional schools to four years in universities where very recently postgraduate courses have been initiated, i.e. *Institut supérieur agronomique et vétérinaire* (ISAV). Few graduating students are taken each year to agricultural research centers or NGOs for practical and hands-on trainings. Research centers used to provide the extension service, *Agence Nationale de la Promotion Rurale et du Conseil Agricole* (ANPROCA) with up-to-date information to deliver to farmers. However, now most research centers test seeds and work directly with farmers instead of working with ANPROCA. NGOs also play an important role in extension across Guinea even though they are facing their own multiple challenges. In one of the assessment corridor zones (GN03), the National Horticulture Promotion Center in Dalaba provides training and technical assistance to many producers across the country.

The presence of cooperatives in the country cannot be underestimated. Being part of an association or cooperative is commonplace and often advantageous (as described in the marketing section). In Guinea, farmers are organized into *groupements*, *unions*, and *federations*.

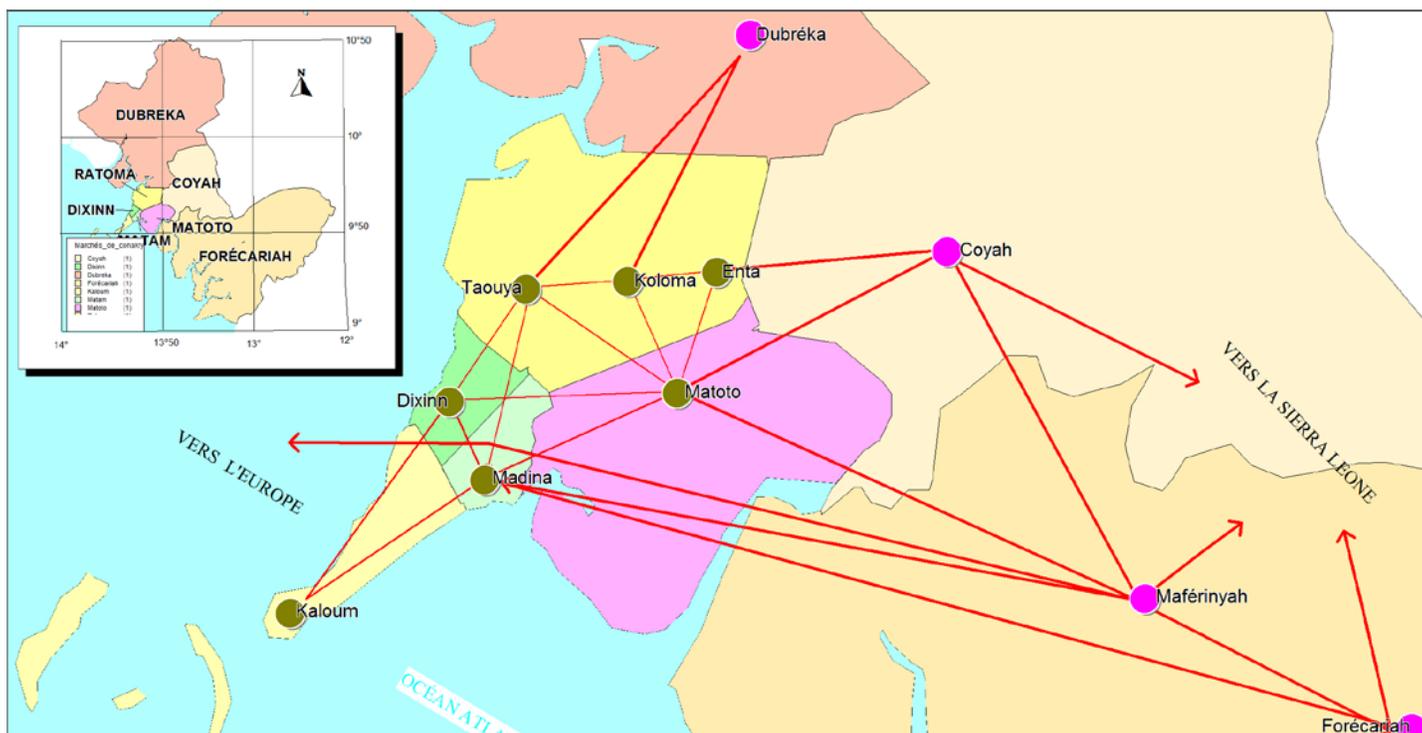


Figure 4. Market routes in the Conakry metropolitan area. Bah A. Pita, 2015.

## MARKET AND TRADE ASSESSMENT OF THE HORTICULTURE SECTOR IN GUINEA

The horticultural marketing network in Guinea is mainly a short circuit between the collection areas in countryside and distribution markets in urban centers. In large cities such as Conakry and the regional capitals (such as Labé, Kankan and Kindia), markets operate daily. In rural areas markets take place on a weekly basis. Increases in market garden production and development of road infrastructure as well as improving in transport conditions have contributed to greater business activity with the arrival of new actors at different levels of the value chain (production, transport, distribution). This market and trade assessment took place in all four Livelihood Zones (table 18).

Overall, the assessment found that women are more numerous than men in the market sector, representing up to 77 percent of the market players. This is particularly true within cities. Generally products, mainly potato and onion, are packaged 50 kilogram bags or in baskets of various sizes (as is the case with tomato, eggplant, and okra). Yam, pineapple and other fruit are priced per unit. The trade of ornamentals is an embryonic activity in Guinea, although one can find small flower shops in large cities destined for homes and public spaces.

### MARKETS IN THE CONAKRY METROPOLITAN AREA

Within the city of Conakry there are five main areas: Kaloun, Dixinn, Ratoma, Matoto, and Matam. In these areas, Matoto, Madiana, Kolama, Taouyah, and Enta are the main markets in Conakry (figure 4). The Matoto and Enta markets are in the town of Matoto along National Highway No. 1. The Madina market is the largest in the metropolitan area. The Niger Road provides the main access to the market. The Kolama and Taouyah markets are in the town of Ratoma. The Koloma market is at the edge of the Prince Road and the Taouyah market is along the North Ridge of the town. The main collection places for horticultural produce destined for Conakry markets are in

Table 18. Markets surveyed by the Horticulture Innovation Lab in August and September 2015.

Préfecture	Livelihood Zone	Market Place
Conakry	GN01	Matoto
		Enta
		Madina
		Ko
		Taouya
Dubréka	GN02	Dubréka
Coyah		Coyah
Forecariah		Central Forecariah
		Maferinyah
Faranah	GN09	Marella
		Sandenia
		Kalia
		Soulemania
		Tiro
		Bagna
Kerouane		Konsankoro
Beyla	GN10	Moribadou
		Marché de Yentèdou
		Kissiboula

Dubr ka and Coyah. In these two markets, the main products are cassava and sweet potatoes. The Forecariah-regional Maf rinyah market is a collection center of pineapple and watermelon, depending on the season. A pineapple juicing facility exists here for pineapple juice export to Europe.

## MARKETS OUTSIDE CONAKRY

In markets outside of Conakry that were surveyed in August 2015, we found fruits and vegetables in half of the market stalls. Pineapple, avocado, guava, and mango were the dominant fruits while tomato, eggplant, carrot, cabbage and lettuce were the most common vegetables. At the time, 20 percent of all market stalls had chili pepper. While markets in the greater Conakry metropolitan area and in Faranah had a diverse amount of products including tubers, fruits and vegetables, a higher percentage of vegetables were found in markets around Beyla.

## MARKET ACTORS IN GUINEA

As discussed above, the trade of horticultural products in Guinea is dominated by women. Of the market actors surveyed, the majority were Muslim and on average, 37 years old. These women had an average of six children to care for who helped them in their business. One-fifth of the traders have a second home in the metropolitan area that gives them control over both urban markets and rural production supply chains. Most (80%) marketed a variety of produce instead of specializing in one aspect of the market segment. These traders had been working in the markets for nine years, on average. Nearly one-third of traders surveyed had another job before engaging in the trade of horticultural products. To finance their business, most traders used their personal savings (44%). One-quarter of the respondents received funding for their business from a family member, while 18 percent received money for the business from their husband. Very few were able to receive a bank loan.

Association membership is quite strong among horticultural produce traders in this part of Guinea where the majority were a member of at least one organization (either an association or a savings group). Traders were members of these associations because of the services offered by them as was indicated by our survey of human and institutional capacity. Services offered by the associations were the negotiations of sales stalls and security and cleaning of those stalls (table 19).

Over half of the respondents experienced a period of supply disruption. Sometimes, this period could last up to one year. To reduce the risk of this happening, most of the traders establish a link to suppliers, giving the suppliers money in advance to guarantee their supply. This is particularly true during harvest. Trust between horticultural produce traders and their suppliers is reciprocal. To transport goods from rural to urban areas, traders used taxis or rented vehicles.

## MARKET STORAGE ISSUES

Almost half of the traders surveyed had no warehouses to store their products in their markets in Conakry as well as in the inland cities of Faranah, Kerouane, or Beyla. As is the case in many West African cities, markets take place in outdoor areas, under the sun, with little access to clean water or clean surfaces to work on. In some cases, traders in Guinea sell produce directly from their vehicles. As is expected, market conditions like this result in poor food safety and high postharvest losses. Because traders cannot store leftover produce, the produce that is unsold is given away at the market (80%). This

**Table 19. Perceptions of horticultural production traders with regard to services provided by organizations in a survey of traders in the Conakry metropolitan area.**

	Entirely satisfied	Satisfied	Little bit satisfied	Very disappointed	Little bit disappointed	No opinion
<b>Organization functioning</b>	51	9	0	0	0	40
<b>Sale space management</b>	31	42	8	11	0	9
<b>Security</b>	11	64	0	9	11	4
<b>Cleaning</b>	0	15	0	22	26	29
<b>Pricing</b>	7	67	0	7	0	13
<b>Taxes</b>	0	69	0	8	8	11
<b>Relationship with public administration</b>	0	11	0	2	0	80

food is given with promise of payment that rarely comes. An estimated 18 percent of the leftover produce is taken home and the remaining 2 percent is destroyed.

### TRANSPORTATION

In discussions with traders, we found that prices fluctuate seasonally in part because of road conditions. During the rainy season, roads significantly deteriorate. In addition to poor road conditions, transportation in Guinea is complicated by the fact that (1) the freight sector is not integrated into the agricultural marketing sector, (2) there is no specialized agricultural transportation company, and (3) transportation of food products is not highly structured. Food transportation tariffs are not regulated so the risk of price distortion is high.

Guinea has a road network of 6,825 kilometers, of which approximately 1,979 are paved. The road network is severely degraded and poorly developed. The road network is not adequate for today's population and village distribution. Markets are located very far from each other (table 20).

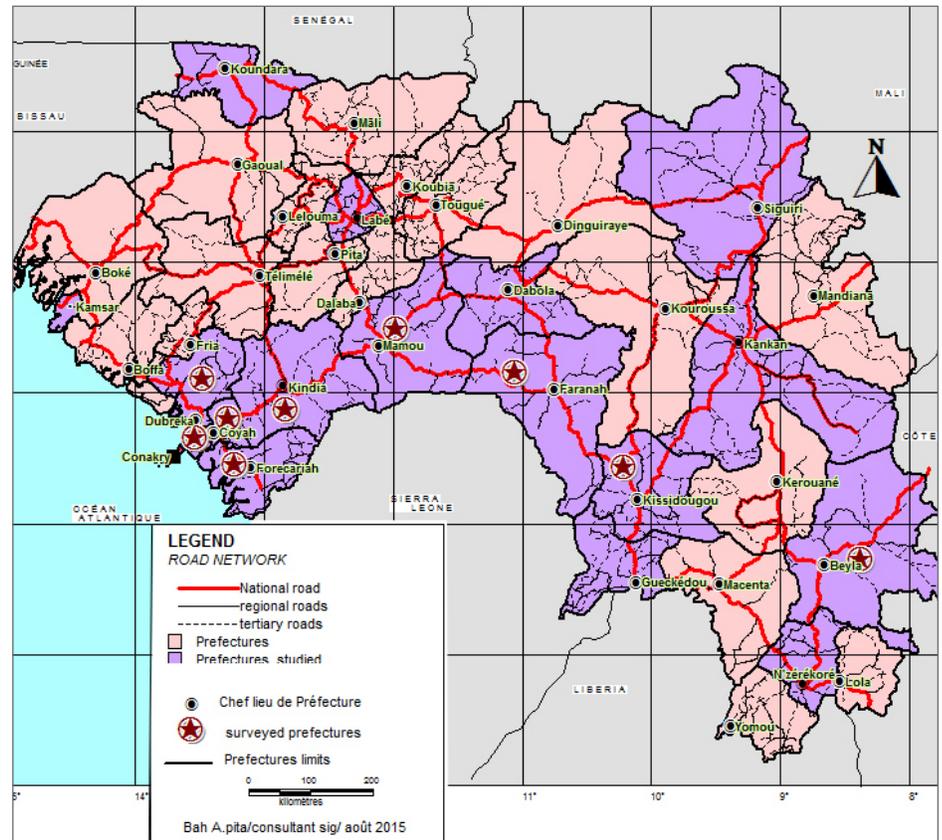
While transportation costs may not be the only determining factor of seasonal price fluctuations, they are a major constraint to the marketing of horticultural produce in Guinea. The age of the vehicle fleet, the disorganized national transportation system and the poor state of the roads are major constraints (figure 5). Transport companies don't exist which requires farmers to move their produce to the markets on their own by bus, taxi, personal car or rented/borrowed vehicle. Traders who were surveyed indicated that this is a constraint for them. Perishable fruits and vegetables don't fare well with the existing transportation constraints.

### MARKETING CHANNELS AND REGULATION OF HORTICULTURAL CROPS IN SOUTHERN GUINEA

Agricultural marketing issues in Africa are not exclusively in the realm of markets or traders, but also an important aspect of governance of the sector. Traders and farmers do have a high level of self-governance through the use of *groupements*, *unions*, and *federations*. The role of these organizations and the traders' associations is integral to the horticultural marketing sector.

**Table 20. Distance between areas of production and markets for horticultural products in Guinea.**

	Conakry	Kindia	Mamou	Faranah	Kissidougou	Kerouane	Beyla
Conakry	0	113	245	431	572	728	837
Kindia	113	0	135	320	462	617	724
Mamou	245	135	0	187	328	484	590
Faranah	431	320	187	0	143	298	405
Kissidougou	572	462	328	143	0	161	267
Kerouane	728	617	484	298	161	0	108
Beyla	837	724	590	405	267	108	0



**Figure 5. Map of the Guinea road network. Bah A. Pita, 2015.**

## **NUTRITION AND HORTICULTURE IN GUINEA**

In Guinea the overall status of nutrition, especially for children is grim. Malnutrition is one of the most important social, health and economic problems for this small, densely populated nation. Very few gains have been made over the last 10 years, and children within all sub-groups have relatively high levels of stunting (36%), and a lack of dietary diversity. The only child health indicator that has improved according to the 2012 Demographic Health Survey (DHS) was the percentage of underweight children under 5 years of age. Poor feeding practices affect the quality and quantity of foods provided to children, as well as the timing of their introduction. Lack of prenatal care for mothers and primary healthcare for children compound consumption-related deficiencies. Poor sanitation puts young children and expectant mothers at increased risk of illness, in particular diarrheal disease, which adversely affects and compounds their nutritional status. These three factors—poor healthcare infrastructure and services, inadequate food supply and intake, and poor environmental sanitation—reflect underlying social and economic conditions that result in poor nutrition for all, especially the most vulnerable.

### **ACCESS TO PRIMARY HEALTH CARE SERVICES.**

In 1987, Guinea adopted the Bamako Initiative which recognized the principles of comprehensive primary healthcare. In its implementation, Guinea began to transfer the management of health care services to community health committees, empowering them to provide a cost-effective basic package of health care in rural areas (DHS, 2012). Significant challenges remain. Slow progress to improve indicators such as under-five mortality (DHS, 2012) and under-five stunting (UNICEF, 2012; World Bank, 2014) show that Guinea continues to struggle to provide access to primary healthcare services to the most vulnerable.

### **ACCESS TO SAFE AND NUTRITIOUS FOODS**

The prevalence of women with low body mass index (BMI) has changed little between DHS surveys in 2005 and 2012, from 12.7 percent to 12.3 percent. In fact, among women in the poorest wealth group, the prevalence of low BMI has significantly increased (DHS, 2012). According to FAO between 1991 and 2014, Guinea produced enough fruits and vegetables to meet the recommended 400 grams per person per day for the prevention of chronic diseases. However, these data do not consider access to safe and nutritious fruits and vegetables, or related social determinants. These data are also highly inconsistent with other indicators related to actual consumption, stunting and wasting. This could and often does lead to the assumption that caloric deficiencies (rather than micronutrient ones) are to blame for high levels of stunting.

### **ACCESS TO CLEAN WATER AND SANITATION**

Over 60 percent of Guineans have access to some type of improved water source, while 19 percent are getting drinking water from unimproved sources or surface water (IFPRI, 2014). While access to and use of improved or shared sanitation facilities have been improving over the last 25 years, increasing from 20 percent to 40 percent, around 60 percent of the population still has no or little access to safe and clean sanitation facilities (IFPRI, 2014). While some infrastructure improvements have been made, the prevalence of diarrhea in children under five has remained constant at 16 percent between 2005 and 2012 DHS surveys.

### **CURRENT STRATEGIES**

These high rates of malnutrition throughout Guinea pose major social and economic challenges for this small West African country. The government of Guinea has responded with numerous programs and interventions to combat undernutrition and high rates of stunting among children. In 2013 Guinea joined the Scaling Up Nutrition (SUN) movement, a combined effort between participating governments, the UN, business, researchers and donors to support policy-level commitments to combat malnutrition during the critical 1,000 days window (SUN, 2014). The National Council on Food and Nutrition Security (CONSEA) is a multi-sectorial group, chaired by the prime minister's advisor on food and nutrition security and including the Ministries for Health, Agriculture, Social Affairs, Communication and the Environment (SUN, 2014). The government has also created the Food and Nutrition Division, based in the Ministry of Health and Public Hygiene, to coordinate the management of acute malnutrition activities. These activities include efforts like flour and oil fortification, vitamin A capsule distribution and salt iodization. Currently there are very few efforts being undertaken to improve or

stabilize the food supply. Nutrient-dense foods like fruits and vegetables are still relatively expensive and often hard to come by or just out of reach of the most nutritionally vulnerable households (table 21).

Two-thirds of infants are not fed an appropriate diversity of foods during the weaning stages (complementary feeding), which means that as children older than 6 months transition to solid foods, more than 60 percent of them are not getting a proper mix of nutritious micronutrient- and calorie-dense foods. Only 7.6 percent of children 6-23 months are meeting

minimum dietary diversity of four or more food groups consumed each day. There are two main reasons for this. First, nutrient-dense foods are not available or affordable to parents; and second, there is not enough knowledge about proper feeding during the critical time between 6 and 23 months of age. Meeting children's dietary needs at this critical stage in child development is key to reducing overall rates of childhood stunting.

The World Bank has recommended five key actions to address malnutrition in Guinea; among those is improving dietary diversity through home production of a diverse of foods.

**Table 21. Nutrition snapshot**  
Source: (SUN, 2014) unless otherwise noted

<b>Malnutrition, under 5 years of age</b>	
Wasting, under 5 years of age (WxH)	5.6%
Stunting, under 5 years of age (HxA)	35.8%
Underweight, under 5 years of age (WxA)*	18%
*source: (DHS, 2012) a decrease from 26.3% in 2005	
<b>Minimum diets, 6-23 months of age</b>	
6-23 months with Minimum Acceptable Diet	3.7%
6-23 months with Minimum Diet Diversity	7.6 %
<b>Specific micronutrient deficiencies, under 5 years of age</b>	
Anemia in children under 5 years of age	79%
Vitamin A deficiency in children under 5 years of age	48%

## POSTHARVEST OF HORTICULTURE IN GUINEA AND THE SURROUNDING REGION

There is a lack of information on postharvest handling and storage of horticultural produce in Guinea beyond the survey that the Horticulture Innovation Lab conducted with smallholders. Therefore, this discussion of postharvest practices relies on information from the surrounding region and other developing regions.

The horticultural sector of sub-Saharan Africa has experienced marked gains in production over the past two decades. Bolstered by a concentrated effort to raise yields and soil fertility, horticulture in sub-Saharan Africa has started to play a role in a rapidly globalized and modernized food system (Megenthaler et al., 2009). In tandem with yields in high-value horticultural crops, the global food trade has climbed as well, placing increasing importance on fresh produce, dairy, and meat products (Akram-Lodhi, 2008). Yet this combination has not come without challenges for smallholder farming communities in developing countries. Increased value on the global market for horticultural crops has led to increased investment (both domestic and foreign) in food processing and retail. This flow of resources has found itself concentrated in large food processing companies, leaving those in farming communities without a means to efficiently access global markets (McCullough et al., 2008). Thus, attention has recently been turned to community solutions for boosting supply and demand at local horticultural markets. In order to accomplish these aims, researchers, investors, development practitioners, and governments have begun to focus more on postharvest storage and processing of high-value, perishable goods (Weinberger & Lumpkin, 2007). The following examples aim to illustrate a variety of efforts from researchers and community leaders to increase the value of their horticultural goods in order to reach quality standards for larger markets or to gain a higher premium in local markets.

## RECENTLY TESTED POSTHARVEST STRATEGIES

A recent initiative at the Amity International Center for Postharvest Technology and Cold Chain Management in India with the World Food Logistics Organization assessed a wide variety of postharvest solutions for high-value crops in the developing world. In all, 10 interventions were seen as successes in garnering greater returns on investment for the smallholder farmer:

- **Liners for rough packages for transporting guava in India:** While reusable and recyclable, the plastic liners reduced damaged fruit and brought profits 5.5 times the cost of capital investment.
- **Smaller shipping packages for cabbage in Ghana:** Small sacks were shown to be profitable in the short-run and long-run, by reducing breakage. Per each ton delivered in small sacks, profits increased by \$83 USD.
- **Wrapping of cauliflower heads in India:** Producers were able to sell wrapped cauliflower heads for twice the price of unwrapped heads, greatly increasing profits.
- **Field packing under thatched roof structure with concrete floor in Rwanda:** With a cleaner, dryer, and shadier place to pack produce for market, it was estimated that each metric ton of tomatoes brought in an additional \$198 USD.
- **Shade shelters for spinach in India:** Using shade for packing and sorting leafy vegetables reduces evaporation and water loss, increasing available product weight for sale and maintaining quality. In India, these shelters were paid off after 18 uses.
- **Small zero-energy cool chamber in India:** A simple structure that is kept wet, built of clay brick and sand, was found to require only three uses to pay off the capital costs of the structure. Each load of 100 kg was able to yield an additional \$40.50 USD.
- **Large zero-energy cool chamber in India:** Similar in composition to the small chamber, eight uses paid off the capital costs, and each metric ton load increased profit by \$140 USD.
- **Small zero-energy cool chamber in Ghana:** Unlike in India, where three uses were able to pay off the initial investment, this chamber required 18 uses. However, each 200 kg load brought \$58 USD in profit.
- **CoolBot onion room in Ghana:** The unit proved immediately profitable. High-value cool onions stored in the room yielded returns of \$10,820 USD, as opposed to \$2,100 USD for onions sold immediately after harvest.
- **Low-cost tomato processing in India:** While yields of tomato puree were low, the endeavor proved profitable immediately. It should be noted that processing in a rural setting would most likely require the purchase of materials not necessarily readily available. (Saran et al., 2010)

The projects above illustrate the vast and diverse postharvest potential for high-value, highly perishable crops in sub-Saharan Africa and elsewhere. While these are indeed profitable strategies, the largest setback is the initial investment. Risk-ambiguous farmers in sub-Saharan Africa frequently lack the capital to invest in a postharvest strategy, or are unwilling to, accepting the risk of losses over the potential for greater losses in trying a new technology. While credit and savings have made inroads in East Africa, West Africa still struggles with infrastructure and available credit to fund these operations.

## POSTHARVEST CONSIDERATIONS IN GUINEA

While interventions and community projects are under way across East and Southern Africa, West Africa remains a difficult case. Whereas infrastructure exists in countries like Kenya, Tanzania, and South Africa for fortifying the supply chain and accessing potential technologies, countries like Guinea are not as fortunate. For instance, the government of Kenya recently embarked on an improved banana project aimed at rural cultivators. In addition to resources for the cultivation of bananas, a support network was elucidated between the Kenya Agricultural and Livestock Research Organization, Technoserve, the Ministry of Agriculture, the Kenya Industrial Research and Development Institute, the Banana Growers Association of Kenya, and the Horticultural Crops Development Authority. These entities aim to streamline the banana process through wholesalers (FAO, 2014). Smallholders in Guinea do not have access to such a robust supply and management chain.

## **POLICIES THAT IMPACT THE HORTICULTURE SECTOR IN GUINEA**

In 2011, the government of Guinea launched a four year plan aimed at supporting agricultural investment and food security. This plan, divided into programs and goals, has three components related to horticulture: (1) food diversification and nutrition improvement, (2) promotion of agricultural exports and agribusiness development, and (3) improvement of agricultural services and support to farming organizations. Additionally in 2014, the government of Guinea worked with FAO to develop a national horticultural development plan to be implemented in five years. Both of these plans emphasize the need to promote horticulture for both food security and livelihoods improvement across the country. The government of Guinea has been providing seeds and fertilizers to farmer organizations at affordable prices. However, these seeds and fertilizers are not tested for quality or provided along with technical assistance, as noted above. As an addendum to the government's agricultural plans, the FAO outlined support of agriculture in its Ebola response plan in October 2014. This emergency initiative of the FAO provided technical assistance around Kissidougou where farmers were given seeds, fertilizers and training to restore their agricultural production systems.

### **EBOLA IMPACTS ON AGRICULTURAL PRODUCTION**

While the West African Ebola outbreak has not been a major focus of this horticultural rapid assessment, it cannot be ignored completely. The epidemic has had direct and indirect effects on families and agricultural labor. Quantitatively the direct impact, in terms of number of infected persons in relation to the size of the population of the region, is very low. Most of the observed impact is due to border closures, restricted movement of people through the country and to neighboring countries, an exodus of people from infected areas, an increased reluctance to work in teams, and the collapse of the traditional work-sharing system.

Ebola started to spread during crop planting, before progressing rapidly during the harvest period of staple crops. Crops were impacted by a reduction of agricultural labor, which affected land preparation, weeding, chemical application, crop maintenance, and harvesting. In areas with Ebola, agricultural production declined as a result of reduced labor.

Many markets have been seriously impacted by the disruption of the flow of goods. The prices of rice, vegetables and livestock products recorded sharp drops in Ebola-affected production areas. The use of survival strategies is increasing in the most affected areas, especially in Forest Guinea. The food security of households that depend on agricultural wage labor, small trade, hunting and selling game products deteriorated sharply in most affected areas.

Overall domestic production of rice has decreased by 3.7 percent between the 2012-13 and 2013-14 agricultural seasons. That is about 77,000 tons of loss in absolute value. This relatively low impact of the disease at the national level hides greater effects on production and food security at the sub-national level. For example, the negative impact on rice production could be in the order of 8.5 percent in the N'Zérékoré region. Impact on the maize harvest is expected to be similar to that of rice, both at national and sub-national levels. However, cassava production is expected to be more resilient, with an average decline of about 1.2 percent nationally, ranging from 0 percent to 3 percent in the Labé and the N'Zérékoré regions.

The Ebola outbreak had repercussions on the production of export crops. Coffee and cocoa beans represent a significant share of exports from Guinea. The decline in production of these crops has also reduced household income resulting in a decline in purchasing power, which has restricted household access to food. Because of Ebola, many borders were closed, and severe restrictions were imposed on the international movement of goods. These factors have led to a decrease in trade flows and caused increases in transport costs. For example, Guinea exported significant quantities of palm oil, potatoes, fruit and coffee to Senegal. The closure of the border between the two countries had a significant impact on exports, prices and producers' incomes. The depreciation of the exchange rate is unlikely to lead to a rise in exports, but could instead reduce the purchasing power of households.

### **NATIONAL LEVEL AGRICULTURAL POLICIES**

In 2007, the government of Guinea adopted a National Agricultural Development Policy – Vision 2015 (NADP) focused on the development of the agricultural and livestock sectors. The goal of NADP was to improve working conditions for

farmers and increase women's income while empowering farmer organizations. In addition to NADP, the government of Guinea has a National Food Security Strategy (SNSA). This strategy is focused on improving water management and storage.

A key aspect of the NADP was improving the agricultural export sector. During this time, Guinea exported potato, mango, orange, pineapple, banana, chili pepper, locust bean seed, and cassava to the neighboring countries of Mali, Senegal, Guinea Bissau, Cote d'Ivoire, Sierra Leone, and Liberia. NADP provided guidelines for trade that reduced inefficiencies and barriers to trade. For regional markets, the NADP aimed to grow the production of products such as pineapple, mango, banana, "little Guinea pepper," onion, shea butter, groundnut, palm oil, and yam. For the international market, the NADP focused on improving quality to meet standards for international trade of mango, pineapple, green bean, cherry tomato, melon, watermelon, strawberry, litchi, and cut flowers. Special attention was given to the development of urban and peri-urban horticulture and other income-generating activities that bring substantial revenue to women (salt production, saponification, dyeing, and postharvest processing).

Unfortunately, the progress of NADP was hindered by political instability. Between 2009 and 2013, Guinea experienced low growth, increased inflation, and a doubling of the national deficit. The current government has abandoned NADP, but still aims to implement agricultural and health policy changes. The new National Agricultural Investment and Food Security Plan (PNIASA) provides a roadmap for current government strategy and gives priority to rice as a crop that reduces poverty.

National policies fall in an environment characterized by several regional and international mechanisms such as the Economic Community of West African States (ECOWAS) Common External Tariff, Economic Partnership Agreements, and the World Trade Organization, which have significantly driven strategic thinking on the development of the agricultural sector over the last three years. The adoption of the Comprehensive Program for the Development of African Agriculture (CAADP) in Maputo in 2003 under NEPAD has given additional impetus to agricultural development. The extent to which Guinea can integrate into the greater ECOWAS agricultural zone will ensure agricultural improvement. Integration is an additional market opportunity for Guinean products including fonio, fruits and vegetables, cassava, peanut, grains, potato, cola, palm oil, banana, sweet plantain, and coffee, as there are over 250 million consumers in the ECOWAS zone.

## **INTERNATIONAL AND NATIONAL POLICY SUPPORT PROGRAMS IN GUINEA**

**The World Bank's Guinea Agricultural Support Project:** The Agriculture Sector Support Project for Guinea is intended to strengthen the capacity of institutions and support the effective implementation of the PNIASA. The three components of this initiative are: (1) to build the capacity of the agricultural ministries in order to create a transparent and highly functioning institute, (2) provide analytical support to PNIASA implementation, and (3) support project management and implementation at the national level.

**National Programme to Support Agricultural Value Chain Actors (PNAAFA):** The PNAAFA is an International Fund for Agricultural Development (IFAD) program focused on building capacity of farmers organizations and developing a limited number of agricultural sectors with high economic potential for smallholders. It is part of the NADP, with farmers organizations as the main target beneficiaries. The overall objective of PNAAFA is to sustainably improve incomes and food security of the rural poor in Guinea.

**WFP 1,000 days initiative:** In 2014, the WFP and the Guinean Ministry of Health and Public Hygiene launched a chronic malnutrition prevention pilot project, funded by the Government of Japan. This project focuses on the period known as the first 1,000 days, which includes pre-pregnancy, pregnancy and care for children under 2 years old. This pilot project is extremely important as a basis to guide government actions in the fight against malnutrition. The region of Labé, where the pilot project is implemented, is one of the most affected by chronic malnutrition, with rates approaching a critical threshold of 40 percent.

This project addresses the three underlying causes of chronic malnutrition: inadequate dietary intake, inadequate feeding practices of infants and young children, and adverse health conditions. The project will last three years, target 3,000 pregnant and lactating women and 3,000 children aged 6 to 23 months in the localities of Tountouroun, Dionfo and Dalein in the Labé region.

The activities will consist of distributions of specialized nutritious food products (Plumpy'doz) to all children aged 6 to 23 months, whether or not they are affected by malnutrition. Similarly, 3,000 pregnant and lactating women will receive hygiene kits consisting of soap and chlorine for water bottles. In addition, the communication activities for the adoption of healthy and hygienic food behavior will be implemented for the targeted beneficiaries. This project, which is basically community-based, will allow better involvement of the population and promote durability and resilience of the community.

The project also aims to create a stronger connection between the population and health facilities by strengthening the capacity of health personnel. In addition, actions will be taken at the political and strategic level to strengthen government capacity to implement multi-sectoral programs that directly or indirectly prevent stunting. Project evaluations will uncover and disseminate best practices in food and nutrition nationwide.

**United States government support of horticulture in Guinea:** The USAID/Guinea mission has funded a number of projects strengthening small business and improving economic opportunities for farmers, women and youth. USAID's main projects are the Rural Microenterprise Development Guinea project, the Agriculture Education and Market Improvement Program, and the Sustainable and Thriving Environment for West African Development project.

Current projects include supporting human and institutional capacity development in agriculture and natural resources through partnerships with the ISAV and the U.S. Forest Service. Guinea is relatively new to democracy and in order to support the continued progress, USAID is supporting initiatives to strengthen governance, transparency, and mitigate conflict. Health is an area of utmost importance to USAID in Guinea, and the agency has prioritized the strengthening of the Guinean health sector by improving health management systems, supply chain management and human capacity within the health sector.

# CONCLUSIONS

The horticulture sector in Guinea, particularly in Southern Guinea in the livelihood zones studied, is thriving despite many challenges. This rapid assessment focused on the needs of farmers, traders and institutions. The recommendations that follow are an initial set of steps needed to strengthen the entire sector at this juncture.

Guinea has very favorable agro-ecological conditions for the production of horticultural crops including potato, onion, green beans, “little Guinea pepper,” okra, pineapple, mango or citrus. However, while fruits and vegetables are grown throughout Guinea, production and access to fresh fruits and vegetables decreases as one moves further from the capitol of Conakry. It appears that rapid urbanization in Conakry will continue to play a key role in the consumption of fruits and vegetables. In addition to growing demand in Conakry, there is a strong level of demand for horticultural produce from neighboring countries and the international market. Efforts to bridge these gaps are important for increasing income and improving dietary diversity of farmers and consumers in Guinea.

In addition to distance to the markets in Conakry, many constraints and issues are prevalent in Guinean horticulture. There is little regulation over imported agricultural inputs (seeds, fertilizers and pesticides) in Guinea. This puts the safety of producers and consumers at a high risk. Additionally, farmers surveyed repeatedly told us that they would find seeds or agricultural chemicals that worked well only to not be able to buy those same inputs the next year in the market. The demand for inputs is higher than what suppliers can provide, and technical assistance and regulation on inputs is lacking.

In general, cropping systems are divided along gender lines where men farmers are responsible for grain production and women contribute to this grain production while independently growing cash crops to meet household expenditures. However, fruit and vegetable production practices are strongest in villages where both men and women are engaged in both activities. For women who are the sole producer of fruits and vegetables, this produce is a very important source of revenue, but they are less likely to use the improved production practices that men do. They use income from horticultural products to purchase food, pay for healthcare, purchase inputs and equipment, and pay for school. This income is so important to the poorest families that convincing them to eat their harvest to improve their dietary diversity may not make them any better off. Instead attention should be paid to not only increasing production, but also to ensuring that produce is conserved through proper postharvest and processing practices and that the nutritional value of adopting these practices are understood. A farmer will consume large quantities of her produce when she is able to dry and store that produce. Increasing fruit tree production addresses the two major production constraints (labor and inputs) while increasing rural nutrition levels.

Labor is a constraint in horticultural production. In fact, when surveyed, farmers and village leaders identified wealthier farmers by the amount of labor they had access to. Another constraint is lack of inputs and equipment. Given the limited quantity of labor, agricultural equipment and inputs at their disposal, smallholder farmers must make strategic decisions to maximize their pay-off in achieving food security first and financial security second. The poorest farmers have very limited power in the horticulture sector. These farmers sell their reserved grain when emergencies arise, even if they will have to purchase this grain back at a later time and at higher prices to eat. The poorest farmers have the least access to inputs, irrigation and implements. They make trade-offs that decrease their production potential such as selling their labor to work in their neighbors' fields when they could be using that labor to produce their own fruits and vegetables.

When farmers do have large harvests, they face a challenge in getting their produce to market. Many are resourceful and rent vehicles for the long trip to a major market, but a substantial amount of the harvest is lost, given away or sold at a reduced price. Production standards are often not met, limiting the Guinean farmer from being able to access export markets. This is particularly important for the few crops that Guinea is known for such as the “little Guinea pepper,” mango and pineapple. Increasing farmers’ abilities to meet market standards would open up new markets in crops such as citrus.

Farmers and traders repeatedly mentioned aspects of postharvest handling as a constraint to marketing their produce or getting it to market. There is a lack of processing and drying facilities, as well as a lack of knowledge about packaging materials that allow produce to withstand long trips across bumpy roads. Transportation is also a major limitation. The roads in Guinea are highly degraded and most goods are transported in inappropriate containers on old trucks or buses. After making the long trip to a major market, Guinean farmers are forced to accept low prices because they lack marketing and pricing information.

As with many pests in developing countries, the pests of Guinean horticulture are understudied. Many of the pesticides used by Guinea farmers have been discontinued in other countries because of safety reasons (Schroeder & Soumah, 2005). Farmers have not been trained on the safe and proper use of pesticides or on the concepts embedded in integrated pest management such as rotation of chemical modes of action or the protection of beneficial organisms.

In addition to lack of training in inputs and integrated pest management, there is a lack of institutional capacity in horticulture, in general. There are few agricultural researchers focused on horticulture, and institutions are located far from the areas in Guinea that could benefit from this research. However, there is great strength and trust in farmer and marketer groups (*groupements* and *unions*). These groups could provide the backbone to build human and institutional capacity.

Finally, the Ebola outbreak has impacted export of horticultural goods either because borders were closed or because Guinean products were not trusted. Ebola killed farmers and also made people wary of visitors. While not a constant constraint in Guinean horticulture, the impact of this latest Ebola crisis on farming must be considered in short-term development projects.

# RECOMMENDATIONS

To conclude this assessment the Horticulture Innovation Lab, in consultation with horticulture experts from Guinea and West Africa, has put together these key recommendations. These recommendations are based on our own primary research in Guinea and supported by an in-depth literature review on the subject. Some recommendations are quite broad, while others are very specific. In some cases a specific solution is known and proven and makes solving the issue relatively straightforward, while in other cases further information would need to be gathered, potentially at the community level, to understand how an intervention might be received. In prioritizing our recommendations, we sought to move beyond an “everything is broken and needs fixing” approach to identify short-term recommendations that can also provide smallholders with long-term resiliency.

First we present recommendations in the horticulture sector, followed by specific recommendations for women and for farmers from different wealth classes. We wrap up our recommendations by suggesting approaches for individual and institutional capacity development and discussing interventions that are specific to each Livelihood Zone included in the assessment. The projects and strategies listed below each recommendation are examples of successful strategies observed in other countries. Those highlighted strategies are not meant to be prescriptive, but rather indicative of what can be done under each recommendation area.

**Key recommendation:** A horticulture sector strategy that intentionally prioritizes rural revitalization, one that empowers individual communities to take control over their livelihoods and create their own opportunities for agricultural investment and growth, is a strategy that would find support and success in rural Guinea.

## OPPORTUNITIES THROUGHOUT THE HORTICULTURE SECTOR

For all wealth groups, the greatest limitations to selling more fruits and vegetables were quite similar. In order of importance, for most groups, these limitations were access to fertilizer, pesticides, dry-season irrigation, agricultural training, better postharvest handling options and transportation. Generally, access to credit was not a frequently reported limitation; however, facilitating access to credit for groups or individuals could greatly increase their ability to purchase inputs and basic technologies to improve production, yield and shelf life of perishable fruits and vegetables. The recommendations below encompass the entire horticulture sector from inputs to postharvest and from markets to nutrition.

### INPUTS

We recommend that donors initiate and support access to horticultural inputs. Many farmers indicated that access to inputs was not consistent and our report outlined other problems such as a lack of technical assistance and inadequate testing of seeds. To counter this, we recommend that projects **facilitate access to loans or small grants and support seed production (research- or field-level) and seed banking techniques.**

**An indicative initiative:** The Feed the Future Ghana Agriculture Technology Transfer project has a unique model involving actors from the seed and fertilizer sectors, among others. The seed component seeks to develop public-private partnerships to facilitate demand-driven breeding, multiplication, certification and dissemination, as well as providing technical

assistance and support to local seed companies, industry associations, agro-dealers and related networks. A consultation with USAID/Ghana could reveal if this or a version of this would be an appropriate strategy.

**An indicative initiative:** The International Fertilizer Development Center (IFDC) and the World Bank have also used a markets-first approach, establishing a private-sector inputs market that focuses on affordability and quality. These projects are working in Nigeria, Ghana, Kyrgyzstan and other countries.

## PRODUCTION

We recommend that donors promote improved horticultural productivity throughout the livelihood zones by **promoting simplified and sustainable farming techniques** (organic farming, composting, mulching, inter-cropping, crop rotation, etc.) that increase crop diversification and increase yields. Second, **promoting conservation agriculture practices in horticulture** would result in better adaptation to changing climate. Finally, many growers complained that roaming livestock damage their gardens and reduce their likelihood of planting again so the **promotion of basic fencing and animal husbandry practices** would help keep gardens for household and local consumption.

## CROPS

Our assessment identified several value chains that have great economic and nutritional potential in Guinea. These are outlined below.

- **Chili pepper** is one of the most profitable and widely grown vegetables in Guinea. The main domestic markets for the product are in Conakry, Kindia, Labé, Kankan and N’Zérékoré. The two most common varieties are the Sikouly, a large fruited variety and the smaller “little Guinea pepper.” The “little Guinea pepper” can produce as often as 10 times per year for up to three years. This smaller chili pepper has fewer pest issues and is spicier, which makes it more attractive to consumers. While they are known for this pepper, Guinean farmers are being out-marketed by farmers in neighboring countries. **Supporting this crop is recommended** and could be done successfully through a **seed marketing initiative, training in good agricultural practices (GAPs)** to meet export requirements, **building linkages between growers and international markets**, and **improving the processing of the chili** using modern low-cost technologies such as the UC Davis chimney dryer and grinders. Development of a GAPs manual through extensive research similar to the one developed by Horticulture Innovation Lab researchers in Nigeria on tomato in 2012 (discussed below) would be an ideal way to ensure that export markets can be accessible to chili pepper growers.
- **Okra**, like chili pepper, is very commonly grown and consumed both dried and fresh. In order to capitalize on current behavior, traditions and preferences, we suggest **increasing the support of production and drying of okra**. The UC Davis chimney dryer is a low-cost, highly efficient solar dryer that could be used to preserve okra at the household level. The dryer can also be modified for local materials and re-sized to accommodate small-scale commercial scale drying.
- **Eggplant** was ranked by growers as the single most important crop. For women this crop was particularly important. Profits in the dry season are around \$35 USD per grower and up to \$55 USD in the wet season. Growers suggested that **improving irrigation for dry-season production**, as well as **improving the quality and availability of fertilizers** in local markets. The World Vegetable Center (AVRDC) has been developing best practices, field guides, an integrated pest management manual and postharvest manuals specifically for eggplant. Continued support of this **research with specific recommendations** for eggplant in Guinea is important. As a globally important crop for both trade and nutrition, improving eggplant production in Guinea could result in much more economic stability for rural households. Given this crop’s importance to women, improvements could have the added benefit of empowering rural women.
- **Tomato** is one of the most important crops in these Livelihood Zones. Tomato is grown for home consumption and sale and is typically not processed before sale. The West African Agricultural Productivity Program (WAAPP) has been successfully introducing newer pest-resistant tomatoes. AVRDC has also developed several tomato varieties suitable for different consumer preferences that can be tested in Guinea. With support for **research and testing of new varieties and pest management strategies**, Guinea could see improvements across the board in tomato production. The Horticulture Innovation Lab funded research in Nigeria (Enhancing Trade in Horticultural Crops through Food Safety

and Phytosanitary Measures) to develop a science-based GAPs curriculum and training program to improve production, food safety and phytosanitary compliance. **Developing the institutional capacity to design and implement GAPs** would increase tomato production, quality and safety while laying the foundation for expanded tomato exports and trade. This will increase the incomes of smallholder farmers, including women, and contribute to enhanced food security and economic growth. Currently growers must sell upwards of 90 percent of their tomatoes immediately after harvest because there is no postharvest infrastructure and poor transportation infrastructure, leading to high losses. Recommended **postharvest interventions** are shaded field packing, use of plastic crates and low-cost tomato processing into puree. These postharvest interventions have all proved profitable in other West African countries and in India.

- **Mangoes** in Guinea are highly productive trees. Farmers surveyed eat most of the harvest that doesn't rot on the tree (60%), and the fruits mature at the beginning of the lean season, when household incomes and nutrition plummet among the poor. **Fruit flies are the main pest.** If controlled properly during pre-harvest, 100 percent control of fruit flies can be reached. A combination of male annihilation technique (MAT) using methyl eugenol as a lure and improved sanitation has worked in India to bring down infestation levels from 60 percent to 5 percent, while the additional applications of decamethrin and azadirachtin can be used to reduce infestation to near 0 ([www.infonet-biovision.org](http://www.infonet-biovision.org)). In Kenya, the breeding of two species of parasitic wasps has been showing promise in reducing fruit fly presence in mango plantations. Hot water treatments would also greatly reduce postharvest losses. **Newer varieties** that ripen at different times of the year could extend the mango season for farmers. **Improvement in postharvest handling and storage** would also extend the season slightly. **Processing** mangoes into dried leathers or juices would open up additional revenue streams and create jobs in rural areas.
- **Oranges**, while commonly grown and always sold (over 90%), suffer high pest and disease damage. Growers interviewed stated that they commonly lose 50 percent of their oranges to disease and fruit flies right on the tree. Because oranges sell so well at market, any improvement would have immediate financial benefits to growers. **Investments in orange pest research** would pay off quickly.

## PEST MANAGEMENT

In addition to crop-specific pest management recommendations outlined above, extensionists surveyed in our assessment expressed interest in **receiving manuals to help them identify pests.** Further research that we conducted also highlighted that farmers do not understand the principles of integrated pest management. Greater **training in the five components of integrated pest management** (pest identification, pest monitoring, development of specific pest management guidelines, pest prevention, and the use of a combination of biological, cultural, physical, and chemical tools) would dramatically improve the effectiveness of extensionists, provide research funding for researchers, and provide farmers with long-term pest management solutions beyond the short-term solutions suggested above.

## CREDIT

Farmers in Guinea face challenges in accessing credit to purchase inputs, technologies or to start small agri-businesses. Microfinance institutions do exist throughout Guinea. While the microfinance sector in Guinea has been growing, these efforts have largely been centered on the urban and peri-urban areas of Conakry.

**An indicative initiative:** USAID supports a loan guarantee program through Development Credit Authority to enhance economic activities. The initiative leverages U.S. dollars in an effort to improve and expand Guinean small and medium enterprises through a local commercial bank. Greater **partnerships with local banks and with bankers who understand horticulture** could greatly improve growers' ability to access credit for needed investment and growth in the sector. In Guatemala, a U.S. Department of Agriculture, Foreign Agricultural Service-funded program with Counterpart International increased smallholder access to loans by teaching loan officers and bankers about agriculture. This education greatly increased bankers' and loan officers' understanding of acceptable risk in agriculture, and they increased agricultural loans as a result of their enhanced comfort with farmers' issues.

Savings groups in rural communities can empower women and provide them with access to needed capital. Savings groups can be one of the most effective, low-cost instruments to provide basic financial services to the poor, particularly in rural

areas, at very large scale. Guineans already work well in these types of groups, and rural communities in Guinea are quite organized. **Supporting savings groups** would be an opportunity to tap into pre-existing, well-structured groups. In Mali, Freedom from Hunger and Oxfam have shown that when savings groups are well run and organized, they can have great impact by increasing savings and ultimately, improving food security. Evidence from a randomized control trial done by Innovations for Poverty Action (IPA) and the University of Arizona's Bureau of Applied Research in Anthropology (BARA) also shows very positive results can be achieved by strengthening savings groups.

## ENTREPRENEURSHIP AND MARKETING

We recommend that donors **promote the standardization and marketing of horticultural products** by supporting certification, regulation and normalization throughout the horticulture sector. Marketing should be facilitated throughout Guinea so Guinean farmers can increase exports to neighboring countries. **Technical exchange should be developed and reinforced** among all horticultural actors and practitioners including research, education, extension and producer organizations.

We recommend **training in basic agro-entrepreneurship skills and postharvest practices**. An initiative that supports basic organizational development and management would be welcome and beneficial. Basic feasibility studies should be developed that promote the involvement of producers in the horticulture sector. **Simplified postharvest technologies** (solar drying, processing, food preservation, etc.) should be promoted to strengthen the private sector as many of these technologies could serve as the foundations for small businesses.

Horticultural crops are high-value crops. Given the proper environment, even the poorest smallholders will invest in inputs and agricultural services to ensure a successful crop. As mentioned above, typical smallholder farmers inaccurately estimate the size of their fields, the number of their productive trees, the amount they spend on inputs, and their harvest size. Furthermore, productive trees in Guinea don't take up space in the same way they do in more developed agricultural systems. Some smallholders plant trees in rows with standard spacing, thus taking up a measurable space (even if they don't measure it), but just as frequently, productive trees are scattered throughout a certain section of forest that belongs to a given man farmer. **Training farmers to maintain better information** on the extent of their production, their costs and income could aid the farmers twofold: first, they would be better positioned to evaluate the benefits of investment, and second, this information could be shared with local agribusinesses, allowing them to better identify market opportunities and serve farmers' needs.

Donor programs need to systematically profile farmers throughout each intervention zone. The key to growing the agribusiness sector is meeting companies halfway by providing them the necessary market information of their potential clientele growers. **Small local agribusiness cannot afford to conduct market research**, but they will respond to opportunities when provided enough evidence of profitable services that can be sold to smallholders.

## POSTHARVEST

Postharvest technologies would allow these farmers to control their harvest and increase their bargaining position in the markets. Empowering individual farmers and rural communities is the key to increasing rural food security and nutrition. Improved postharvest handling, processing and general education would go a long way in rural Guinea. Losses of harvested crops are extremely high across the board and, as we have shown in this report, any effort to reduce losses could increase sales and income for growers, traders and marketers. This can be achieved through **training in basic postharvest practices** such as using shade, reducing handling and damage, and using plastic bags or some type of improved containers for transport. Additionally, **setting up collection centers** that include places for washing, sorting and grading of produce and whenever feasible implementing cool storage solutions (such as a CoolBot-controlled cold room with solar panels) would decrease postharvest losses. **If smallholders could add mangoes, avocados, bananas, tomatoes or eggplants to the list of products they can conserve and process**, it is clear they would gain greater control over their sales, increase their bargaining power, and they would make more profit from their production. In villages where men perform at least 30 percent of the dry-season gardening, **farmers could benefit from postharvest training** and access to postharvest equipment.

## POLICY

Integration into the greater ECOWAS zone offers Guinea potential for agricultural growth. With more than 250 million consumers in the ECOWAS zone, integration is an additional market opportunity for Guinean products including fonio, fruits and vegetables, cassava, peanut, grain, potato, cola, palm oil, banana, sweet plantain and coffee. **Any new investments in horticulture should have the support of local and national governments. By aligning new projects with current government priorities,** collaboration and success will be much easier to come by.

There is very little regulation of inputs, and this has a detrimental effect on the industry as a whole. Policy makers should consider **setting minimum standards for the importation and sale** of fertilizers, pesticides, seeds and other inputs. Currently, the application rate for fertilizer in much of Africa remains a small proportion of world average. It is vital that policies and investments support a competitive, private sector-led fertilizer and input industry in order to encourage a sustainable supply of much needed inputs. It is also important that this increase be implemented in an efficient and environmentally sound manner to avoid repeating mistakes of the Asian Green Revolution. Currently, IFDC is hosting meeting and conferences for policy makers on this topic, and we **recommend that Guinea's horticulture sector be represented at an upcoming meeting.**

## NUTRITION

Malnutrition is one of the most important social, health and economic problems for this small, densely populated nation. Very few gains have been made over the last 10 years, and children within all sub-groups have relatively high levels of stunting (36%) and a lack of dietary diversity. As a member of the SUN movement, the government of Guinea is dedicated to making improvements and meeting nutrition-related policies and infrastructure goals. In order to make nutritional gains, as measured by specific indicators, a targeted approach must be taken. This would include a combination of interventions such as **household gardening along with nutrition counseling, education and behavior change communication.** We would also recommend that a **broader community-level approach to nutrition** be taken in any community where improvements to horticulture are being sought. This means that if there is a goal to improve production over a certain geographic area, effort should also be made to increase the consumer demand and consumption of the targeted crops. Public health campaigns, school-led education and creative marketing can all be used to improve local consumption of a variety of fruits and vegetables. AVRDC has promoted vegetable consumption with creative advertising in a number of countries. For example, in the Philippines they created an ad campaign similar to “Got Milk” ads of the 1990s, where local celebrities posed with vegetables.

## RECOMMENDATIONS FOR WOMEN FARMERS

In addition to those recommendations highlighted above for women, there are several specific recommendations for women farmers that came from our research. Drying okra was much more common among women than the overall numbers of farmers who dry produce. The most commonly dried products were chili and okra. This presents an opportunity to **improve upon traditional drying methods** with the use of the UC Davis chimney dryer and some basic improved storage options.

Ultimately, our research has shown that when men are more involved in vegetable gardening, the women employ more sophisticated production practices, and when women own more trees, they control relatively stable sources of income and nutritious foods. Donor investments should **encourage the production of fruits and vegetables by men and women alike** because both genders bring unique skills and advantages to the two production systems. For example, in villages where men grow vegetables, women use more diverse pest management techniques, and men widely report that women are the ones who introduce new varieties to the village because they buy and sell vegetables in the local markets, where they are exposed to the advantages of new varieties.

## RECOMMENDATIONS BY WEALTH QUARTILE

### WEALTHIER

Overall, these growers have good production practices and are satisfied with the yields they are getting. It was this group across many regions that said that they **would prefer postharvest education or technologies over training related to production or inputs**. These growers are advanced enough in their production to begin to consider improvements to their postharvest challenges. These are growers who have the resources to move their product to nearby markets and those in Livelihood Zones GN02 and GN03 with access to the main markets in Conakry. **Conservation such as juicing, canning, pulping and even freezing**, if done at scale, could make for reliable markets for larger fruit growers.

### MIDDLE

Farmers in this wealth group find themselves able to produce a variety of crops throughout the year; they have basic production knowledge and access to local markets. They don't have access to good inputs or as much training as they need. These growers also indicated a preference toward **postharvest skills and technologies over production training**.

### POOR

For the two lowest income groups, a **more production-focused approach is recommended**. These farmers do not have a good understanding of basic horticultural practices such as plant spacing, integrated pest management or proper harvesting. These growers do not have enough of their staple grains to consume all year round (often only five months' worth is saved) and struggle to get through the lean months. These growers are extremely cash-poor and often they sell their labor rather than work their own land. Any **effort in the horticulture sector with these groups needs to consider how they are likely to allocate their time** and what possible adverse side-effects that may have on the success of an intervention. These groups could be greatly helped through **basic training on home gardens and nutrition**. Beyond the scope of this research, but still important, is the implementation of basic agronomic improvements necessary to help these growers produce enough of their staple grains to get them through the year, including the proper drying and storage of grains.

### POOREST

Similar to the above group, this group struggles with a variety of compounding factors that make sustaining income and production difficult. **Training programs with a goal of improving basic production with an additional focus of providing some inputs** could greatly improve yields. **Home gardens** would again be a good introduction to horticulture and help families meet their daily nutritional needs before focusing on vast improvements to income. More than anything, these groups need **improved access to social safety nets** that would help them smooth over health- and environment-related shocks. Once savings aren't routinely drained to get through seasonal gaps or to help family members through illness, more time and money will be spent on productive activities such as horticulture.

## HUMAN AND INSTITUTIONAL CAPACITY DEVELOPMENT

We recommend that a wholehearted effort be put into **developing the agricultural extension system** in Guinea. Regardless of how much effort is put into private sector development, without a supported and well-educated extension system, growers will have a difficult time advancing and solving problems on their own. Countries with well-funded extension systems have a much greater chance at sustainable growth in the agricultural sectors. This is not to say that a university- or state-led system is always the only way; there are creative solutions to providing training and resources to growers. Models such as the Farm Business Advisors from International Development Enterprises (iDE) have a place in a country's agricultural framework, but these private and donor efforts shouldn't replace a well-funded national extension system.

Of the 190 farmers surveyed, only 37 had contact with a state extension agent in the past year, but 78 percent of those reported that the extension agent provided useful information. The local extension agents, working for the *Direction Nationale d'Agriculture*, have a basic command of general agricultural practices, such as proper seeding and weeding techniques. However, they lack the necessary resources, technical information and accountability to effectively serve

growers. They are not provided with gas money to reach their constituent communities, they generally do not receive in depth training on improved practices or new techniques/varieties, and they are not held responsible for serving a given amount of farmers per month.

We recommend that an effort be made to **strengthen the national extension system** (*Direction Nationale d'Agriculture*). This can be done by training existing agents in improved practices and updated agronomic information. There is a great opportunity for donor investments to use these agents to support an effective, long-term extension system. By promoting access to (1) demonstration plots, (2) gas money, (3) agricultural training and (4) monitoring and evaluation of outreach and progress, donors can turn these agents into effective purveyors of agricultural research and knowledge. An inexpensive smartphone, phone credit and gas money could also help provide an agent with these necessities, without tying them to a fixed subset of villages.

As an example, extension agents in Mali are particularly enthusiastic about their on-farm demonstration plots, which allow them to show farmers the advantages of new varieties and practices; seeing is believing for risk-averse West African farmers. Several Guinean extension agents also expressed interest in acquiring a pest identification book, complete with pictures and recommendations, that could help guide their interaction with farmers.

## RECOMMENDATIONS BY LIVELIHOOD ZONE

### ZONE GN02 (PIEDMONT ZONE)

In the southern portion of the GN02 Livelihood Zone, banana, citrus, papaya and pineapple are important crops while mango, palm oil, okra, chili pepper, eggplant, cucumber and watermelon are grown throughout the zone. This is the largest horticultural producing zone in the country, and there is a lot of potential to support a wide variety of programs and see economic growth improve. We recommend that donors take a **value chain development approach that focuses on postharvest management, improved postharvest technologies, building market linkages and organizational development**.

### ZONE GN03 (CENTRAL PLATEAU ZONE)

Much like GN02, GN03 has fertile soils and the ability to move products to large markets that are relatively close, either in Conakry or locally in Labé. Growers in the region are also able to access markets across the border in Sierra Leone. Producers in this zone would benefit from **improved postharvest handling and packaging** to better move their produce to markets and reduce loss. Given the importance of home and market gardens to household nutrition and income in this zone, improvements to production, small-scale food preservation, and nutrition would benefit these farmers.

### ZONE GN09 (WOODED SAVANNAH ZONE)

Zone GN09 is a transitional zone between the forests of the south and the savannah. In Dabola and Faranah, we would recommend a **focus on diversification, introduction of improved varieties and cropping diversity**. This area has potential as a **hub of seed production**. This region could also be used as a source of sustainable economic growth and small business development. Additionally it would make a great impact to work with ISAV and with Winrock International in the region. In Kissidougou and Kerouane the main recommendations are to work on **crop diversification, technical training, support to organizational development, introduction of new and/or adapted crop varieties and facilitating commercialization**.

### ZONE GNI0 (PRE-FOREST ZONE)

In Livelihood Zone GN10, we recommend that donors initiate and **support crop diversification opportunities, small-scale irrigation** (to maintain horticulturists on fertile soils throughout the year), **provide training on seed production and conservation, and promote appropriate postharvest technologies and management**. Beyla is the area with the poorest horticultural production, thus these growers would benefit immensely from **basic training in production**. Given the presence of mining and other industries, employment opportunities off the farm are common, meaning that labor on-

farm is in short supply. **Labor-saving production methods**, such as plastic mulch to reduce weeding and drip irrigation to reduce watering, could go a long way. Those interviewed in this zone also reported higher earnings and assets, likely due to the diversification of employment opportunities. This means that there could be more potential here for investment into basic low-cost technologies to improve production, postharvest handling and storage. Drying okra was much more common in this zone than the others. This presents an opportunity to **improve upon traditional drying methods** with the use of the UC Davis chimney dryer and some basic improved storage options.

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# FARMER AND FOCUS GROUP SURVEY

Numéro de la fiche: \_\_\_\_\_ Date: \_\_\_\_\_ l'enquêteur: \_\_\_\_\_

Village: \_\_\_\_\_ Prefecture: \_\_\_\_\_

Catégorie de richesse:  1 Pauvre  2 Intermédiaire

## Household Profile (la famille nucléaire)

1. Nom du Répondant			
2. Sexe	<input type="checkbox"/> 1 Male <input type="checkbox"/> 2 Female		
3. Age			
4. Origine Ethnique	<input type="checkbox"/> 1 Soussou <input type="checkbox"/> 2 Peul <input type="checkbox"/> 3 Maninka <input type="checkbox"/> 4 Kisi <input type="checkbox"/> 5 Baga <input type="checkbox"/> 6 Kakabé <input type="checkbox"/> 7 Toma <input type="checkbox"/> 8 Kono <input type="checkbox"/> 9 Kpelle <input type="checkbox"/> 10 Lélé <input type="checkbox"/> 11 Koranko <input type="checkbox"/> 12 Other _____		
5. Nombre de membres du ménage		Homme	Femme
	Active		
	Inactive		
6. Niveau d'instruction	<input type="checkbox"/> 1. Aucun <input type="checkbox"/> 2. Primaire <input type="checkbox"/> 3. Secondaire <input type="checkbox"/> 4. Ecole Coranique <input type="checkbox"/> 5. Alphabétisation Fonctionnelle <input type="checkbox"/> 6. Autres _____		

## Household Consumption (Aucune = A, Une petite portion = PP, La moitié = M, La plupart = P, Tout = T)

7. Combien d'hectares cultivez-vous dans une année normale?	
9. Votre ménage cultive quelle partie de la céréale que vous (le ménage) mangez?	
10. Votre ménage achète quelle partie de la céréale que vous (le ménage) mangez?	
11. Votre ménage cultive quelle partie de les fruits et légumes que vous (le ménage) mangez?	
12. Votre ménage achète quelle partie de les fruits et légumes que vous (le ménage) mangez?	

Les actifs de ménage	Quant	Prop								
13. Moto										
14. Vélo										
15. Télévision										
16. Radio										
17. Téléphone										
18. Panneau solaire										
19. Charrette										
20. Charrue										
21. L'âne										
22. Machine à coudre										
23. Les dépenses personnelle de thé et sucre hebdomadaires										

**Système de Production Pendant l'hivernage**

Champ	Hectares (M ou l)	Distance du village (km)	Engrais (GF)	Pesticide (GF)	récolte (# de 50kg sacs)	Quelles sont vos principales contraintes? Quels conseils techniques pourraient vous aider? (y compris la production, la gestion des ravageurs, post-récolte et la commercialisation)
Rice						
Corn						
Peanuts						
Corn						

Comment décidez-vous la quantité de superficie consacrer au production légumière?	
Pourquoi vous ne consacrez pas d'avantage de superficie au production légumière?	
Est-ce que tu cultive le hibiscus / autres légumes autour des champs comme de barriers?	

**Systeme de Production Hors Saison**

Speculation	Metre carré (M ou GC)	Quand seme-tu	Engrais (GF)	Pesticide (GF)	récolte (# de 50kg sacs)	Quelles sont vos principales contraintes? Quels conseils techniques pourriez-vous aider? (y compris la production, la gestion des ravageurs, post-récolte et la commercialisation)

Cultures par ordre d'importance	Utilisation de la production	Qu'est-ce que vous achetez avec cet argent?

[1] 100% consommée [2] 75% consommée et 25% vendue [3] 50% consommée et 50% vendue [4] 25% consommée et 75% vendue [5] 100% vendue

24. Quelle est la profondeur de la nappe phréatique?		
25. Quels fruits, légumes, noix ou des champignons veux-tu cultiver (que tu ne cultive pas)?		
26. Pourquoi?		
27. Pourquoi tu ne les cultive pas?		
28. Qu'est-ce qui t'empêche d'augmenter la production des fruits et légumes?		
29. Qu'est-ce qui t'empêche de consacrer plus de superficie à la production des fruits et légumes?		
30. Où es-tu autorisé à planter des arbres fruitiers?		
31. Qui a le droit de récolter des arbres fruitiers?		
32. Vous récoltez des fruits et des noix de laquelle les arbres?		
33. Quels sont les coûts de démarrage pour le jardin typique de ménage?		
34. Comment accede-tu à des intrants? Achete-tu en gros via des organizations paysanne?		
35. A quelles conditions le bétail mange les cultures légumières?		

36. De ta récolte légumes commercialisable, tu vende quelle partie?		<input type="checkbox"/> 1 Aucune <input type="checkbox"/> 2 Une petite portion <input type="checkbox"/> 3 La moitié <input type="checkbox"/> 4 La plupart <input type="checkbox"/> 5 Tout
37. Où est-ce que tu le vende?		
38. le point de vente est combien de kilomètres d'ici?		
39. Le consommateur paye combien pour eux?		
40. Connais-tu le prix avant que tu les récolte?		
41. Combien d'argent pouvez-vous gagner par mètre carré de jardinage? Quel est le legume dans ce mètre carré que vous pensez?		
42. Quels sont les changements qui arrivent au marché légumes?		
43. Quels sont les changements qui arrivent au marché de fruits		
44. Qu'est-ce qui t'empêche de vendre plus de fruits et légumes?	<p>Question ouverte; il faut classer:</p> <p>___ capacité limitée pour transporter les produits vers les marchés    ___ accès limité à la terre clôturée</p> <p>___ l'accès limité à l'eau pendant la saison sèche    ___ Trop difficile de tirer de l'eau</p> <p>___ limité connaissances de bonnes pratiques    ___ accès limité aux engrais</p> <p>___ accès limité aux pesticides    ___ Produits gâcher après la récolte</p> <p>___ limitée la demande du marché    ___ bénéfices limités</p>	
45. Imaginez que le marché a une grande demande pour les tomates, et si tu cultive plus de tomates, vous étiez sûr de les vendre pour un profit. Comment tu augmenterais ta production?		
46. Es-tu une member d'un groupe de marketing, ou vende-tu tes légumes tout seul?		
47. Séche-tu tes legumes ou fruits? Comment? Quelles produits?		
48. tu tries tes legumes ou fruits? Quelles produits?		
49. À quel moment de la journée récolte-tu? (pour tous les spéculations)		
50. Comment est-ce que tu nettoyes et entretiens ta produit récolté?		

51. Comment tu transportes des fruits et légumes au marché?	
52. Comment gardez-vous les produits frais après ils sont récoltés?	
53. Quelle partie de votre récolte est trop endommagée pour le vendre?	<input type="checkbox"/> 1 Aucune <input type="checkbox"/> 2 Une petite portion <input type="checkbox"/> 3 La moitié <input type="checkbox"/> 4 La plupart <input type="checkbox"/> 5 Tout
54. Quelles sont les pratiques post-récolte que tu veux adopter?	
55. Qui plante tes légumes?	
56. Qui enlève les mauvaises herbes de ta jardin?	
57. Qui arrose tes légumes?	
58. Qui vend les fruits et légumes?	
59. Qui contrôle le revenu de ces ventes? Fruits? Légumes?	
60. Est-il l'extension nutritionnel qui est axé sur les fruits et légumes?	
61. Comment est-ce que tu classes ces opportunités génératrices de revenus?	
62. Dans quelles saisons avez-vous le temps de cultiver des légumes?	<input type="checkbox"/> 1 saison froide <input type="checkbox"/> 2 saison chaude <input type="checkbox"/> 3 saison des pluies <input type="checkbox"/> 4 saison froide <input type="checkbox"/> 5 saison chaude <input type="checkbox"/> 6 saison des pluies
63. Combien des heures par jour pouvez-vous consacrer au cultivation légumière dans chaque saison?	
64. Quelle est la différence entre ceux qui cultivent des légumes et ceux qui ne le font pas?	
65. La parcelle légumière chez toi est de quelle taille? (Mètre carré)	
66. Quelles sont les priorités financières qu'il faut satisfaire avant que tu peut manger d'avantage de légumes?	
67. Que faudrait-il pour vous de manger d'avantage de légumes?	
68. Si votre production a doublé, vendriez-vous toute votre récolte? Ou bien mangeriez-vous d'avantage des légumes?	
69. Comment accédez-vous à des	

semences non-certifiées?	
70. Comment accédez-vous à des semences certifiées?	
71. Quelle partie de vos semences légumières sont non certifiées?	<input type="checkbox"/> 1. Aucune <input type="checkbox"/> 2. Une petite portion <input type="checkbox"/> 3. La moitié <input type="checkbox"/> 4. La plupart <input type="checkbox"/> 5. Tout
72. Si vous aviez plus d'argent, vous achetez des semences certifiées, ou voulez-vous continuer à utiliser des semences locales? Est-ce que les semences certifiées sont plus rentable?	
73. Comment conservez-vous semence légumières?	
74. Ta communauté a besoin de quoi pour améliorer leurs semences légumière de base?	
75. Les semences de quelles speculations légumière fonctionnent bien?	
76. Les semences de quelles speculations légumière ne fonctionnent pas bien?	

	State Extension Agent	Private Input Dealer	NGO Project
Combien de fois avez-vous eu des contacts avec les agents de vulgarisation?			
Répondent-ils à vos besoins réels?			
Décrivez le dernier contact que vous aviez avec un agent de vulgarisation? (date, sujet, expérience)			

Etes-vous membre d'une organisation de jardinage ?	<input type="checkbox"/> 1 Oui	<input type="checkbox"/> 2 Non							
Vous réunissez-vous à quelle fréquence?	<input type="checkbox"/> 1 quotidien	<input type="checkbox"/> 2 hebdomadaire	<input type="checkbox"/> 3 Mensuels	<input type="checkbox"/> 4 6 fois par an	<input type="checkbox"/> 5 chaque année				
Quels sont les avantages d'adhésion ?	<input type="checkbox"/> 1 L'accès au crédit	<input type="checkbox"/> 2 L'accès à l'épargne	<input type="checkbox"/> 3 Achat en gros des intrants	<input type="checkbox"/> 4 Vente collective de céréales	<input type="checkbox"/> 5 L'aide avec votre production	<input type="checkbox"/> 6 L'accès à l'information			
De qui pouvez-vous emprunter de l'argent ?	<input type="checkbox"/> 7 Camaraderie and le soutien social	<input type="checkbox"/> 8 Autre	<input type="checkbox"/> 9 Personne	<input type="checkbox"/> 10 Amis et famille	<input type="checkbox"/> 11 Les prêteurs privés dans la communauté	<input type="checkbox"/> 12 Banques	<input type="checkbox"/> 13 Commerces, entreprises	<input type="checkbox"/> 14 Coopératives communautaires d'épargne	<input type="checkbox"/> 15 Autres
à quelle taux?									
Etes-vous membre d'une organisation d'épargne? De quelle genre?									
Était-il commencé par un projet? Est-il encore soutenu par un projet?									
Souhaitez-vous appartenir à un groupe d'épargne et de crédit? Si oui, quel genre?									

Comment pouvez-vous dire si quelqu'un dans ce village est plus riche ou plus pauvre que le reste?					
Entre les riches et les pauvres, quelles sont les différences entre leurs pratiques d'agricoles?					
Quels sont les aliments que les riches mangent pour lesquels les pauvres n'ont pas les moyens.					
Où se trouve votre ménage par rapport à d'autres dans votre village?	<input type="checkbox"/> 1. Riche	<input type="checkbox"/> 2. Intermédiaire	<input type="checkbox"/> 3. Pauvre	<input type="checkbox"/> 4. Extrêmement pauvre	

	Quant	Prop	Quant	Prop	Quant	Prop	Quant	Prop
bétail								
chèvres								
mouton								
Volaille								



10 Est ce qu'il vous arrive de vendre à crédit à vos clients ?	1 Très souvent 2 Quelques fois 3 Jamais	4 Autre à préciser _____
11 Si vous vendez à crédit quelles sont les échéances ?	1 Une semaine 2 Deux semaines 3 Un mois	4 Autre à préciser _____
12 Par contre est ce qu'il arrive que vos clients vous donnent des avances ?	1 Oui	2 Non
13 Est ce qu'il vous arrive de ne pas vendre tous vos produits ?	1 Très souvent 2 Quelques fois 3 Jamais	
14 Que faites vous quand vous ne vendez pas tous vos produits ?	1 Je les ramène 2 je les détruis 3 Je les donne à crédit à mes clients 4 Autre à préciser _____	
15 Quel genre de relation avez vous avec vos fournisseurs?	1 Strictement des relations d'affaire 2 De relations de famille 3 Des relations d'amitié 4 Autre à préciser _____	
16 Est ce qu'il vous arrive de faire des avances de fonds à vos fournisseurs	1 Très souvent 2 Quelque fois 3 Jamais	
17 Si oui, à quel moment le faites vous ?	1 Pendant la période des cultures 2 Pendant la période de récolte 3 Pendant la période des fêtes 4 Autre à préciser _____	
18 Est ce qu'il arrive que votre fournisseur vous accorde certaines facilités ?	1 Oui	2 Non
19 Si oui lesquelles ?	1 Echéances de paiement 2 Des compléments de marchandises en terme de cadeau 3 A nouer des relations avec d'autres fournisseurs 4 A résoudre certains problèmes de famille	
20 Est ce qu'il vous arrive de faire des commissions en ville pour votre fournisseur ?	1 Oui	2 Non
21 Si oui de quel genre de commission s'agit il ?	1 Des achats des produits en ville 2 Transport de courrier ou de message en ville 3 Intervention dans l'administration en ville 4 Autre à préciser _____	
22 Avez vous connu des périodes d'interruption dans votre activité ?	1 Oui	2 Non
23 Si oui, quelle a été la durée de cette interruption ?	_____ mois	
24 Quelle était la cause de cette interruption d'activité ?	1 Maladie 2 Problème financier 3 Problème de famille 5 Autre à préciser _____	

# KEY STAKEHOLDERS IN GUINEAN HORTICULTURE

## PRIVATE AGENCIES AND NGOS

- COPEFL (Coopérative des Producteurs et Exportateurs des Fruits et Légumes de Kindia)
- FABIK (Ferme Integree, Kondeyah, Kindia)
- COPRACAM (Coopérative des Producteurs)
- FUMA (Fédération des Unions Maraichères de Haute Guinée)
- FOPBG (Fédération des Organisations Paysannes de la Basse Guinée)
- Wakili de Tinkisso (Groupement Maraîcher a Dabola) et Conseillère Agricole Dabola
- AFTT (Association des Femmes Techniciennes et Technologues, Kankan)
- Union des Groupements Maraichers de Kindia
- RIEAG (Réseau des Institutions d'Enseignement Agronomique de Guinée, Winrock International, Faranah)
- Djouma Fleur, Sebhory, Dalaba
- APEK-Agriculture (Association pour la Promotion Economique de Kindia)
- ONG ATC (Assistance Technique et Coopération, Dabola et Kindia)
- APARFE (Association pour la Protection, l'Amélioration des Ressources Forestières et Enrichissement, Kissidougou)
- PACV (Programme d'Appui aux Communautés Villageoises, National, Aménagement et Construction d'infrastructures)
- Fasso Demeh, Groupement Maraîcher, Kankan
- Union des Groupements Maraichers de Mamou
- ONG RAFOC (Réseau d'Appui Financier aux Organisations Communautaires, Région de Kankan)

## GOVERNMENT AGENCIES

- ANPROCA (Agence Nationale pour la Promotion et le Conseil Agricole, Conakry avec démembrements a l'intérieur du pays)
- DNA (Direction Nationale de l'Agriculture, Conakry avec démembrements a l'intérieur du pays)
- DRA (Direction Régionale de l'Agriculture, chaque région administrative)
- DPA (Direction Préfectorale de l'Agriculture, chaque Préfecture du pays)
- Centre de Promotion de l'Horticulture, Dounkimagna, Sebhory, Dalaba (Moyenne Guinée)
- RADHORT (Rassemblement Africain pour le Développement de l'Horticulture), Direction Nationale de l'Agriculture, Almamyah Conakry

## UNIVERSITIES AND SCHOOLS

- ISAV-VGE de Faranah, ENAE de Bordo-Kankan, ENAE de Koba-Boffa, ENAE de Tolo-Mamou, etc
- Centres de Recherche Agricole (Kindia, Macenta, Kankan et Pita)
- Agence Nationale des Statistiques Agricoles (ANASA, Conakry)
- Direction Nationale pour la Sécurité Alimentaire (Ministère de l'Agriculture)

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## RAPID ASSESSMENT OF THE HORTICULTURE SECTOR IN GUINEA

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