

POST HARVEST CROP ASSESSMENT—LIBERIA

RICE AND CASSAVA

2008

FINAL REPORT

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Acronyms

MOA	Ministry of Agriculture
WFP	World Food Program
FAO	Food and Agriculture organization
IPM	Integrated Pest Management
MT	Metric Tonne
UN	United Nations
FBO	Farmer Based Organizations
GDP	Gross Domestic Product
USAID	United States Agency for International Development
CFSNS	Comprehensive Food Security and Nutrition Survey
LISGIS	Liberia Institute of Statistics and Geo-Information Services
NGO	Non-governmental organization
PRS	Poverty Reduction Strategy

EXECUTIVE SUMMARY

The study was based on 3 million while current census shows a population of 3.5 million. A joint Post-harvest Crop Assessment was conducted in February/March 2008. The Assessment, led by the Ministry of Agriculture (MOA) with financial and technical support from FAO and WFP, was expected to provide reliable data and information on rice and cassava production in the agricultural season of 2007 while estimating the Liberian population food requirements for 2008.

The assessment comprised of secondary and primary data collection and analysis. The overall objective was to develop the Food Balance Sheet for 2008 to enable Government of Liberia and its developments partners, FAO/WFP, to determine the food needs of Liberia and to supply food where deficits exist and develop appropriate strategic policy responses to maximize food production.

To accomplish the task, the Post-harvest Crop Assessment applied a rapid assessment approach. The analysis and final report was based on estimates which will not replace a national agricultural census. Despite these limitations, the assessment used sound statistical methods. The assessment to the North-West/Central took into consideration the counties of **Lofa, Bong and Nimba**; Central-Coastal counties were: **Grand Cape Mount, Bomi and Grand Bassa**, The South-Eastern counties assessed were **Maryland, Grand Kru and Grand Gedeh**; .

The assessment revealed that:

- Liberia is self-sufficient in cassava production but has a deficit in the main staple food
- The current technology being used for rice and cassava cultivation remains largely unchanged, characterized by limited use of inputs and traditional slash and burn shifting cultivation using broadcasting, with plowing, manual weeding and harvesting.
- The 2007 total production of rice (milled) available for consumption in 2008 was 155,293 MT, with a projected domestic utilization of 331,969 MT.
- Rice import requirement was estimated at 185,282 MT with 22,000 MT to be covered by planned food aid and an uncovered deficit of 163,282 MT.
- There was a total cassava production of 1 693 770 MT in 2007
- Increase in rice yield is attributed to an increase in farm size/family and distribution of improved seeds to about 19 percent of the farmers in 2007.
- It is recommended to continue the supply of improved rice seeds to farmers and this must continue since higher yields were recorded by farmers who received improved seeds from FAO in 2007. However, the distributions of locally produced improved seeds should be given preference.
- Pests, lack of tools, lack of seeds and lack of labour are the main constraints to rice production.
- Use of improved technology to raise yields is central if real incomes are to increase for both net food buyers and net producers.
- There is the need to introduce small-scale mechanization and improvement in extension delivery service to ensure increased production of rice and cassava.
- Post harvest losses in cassava are high because of poor storage and inadequate processing.
- Post harvest handling of cassava must be given priority attention to reduce post harvest losses through the provision of small-scale processing facilities such as cassava graters for processing the commodity into farina.

- Women play an important role in food crop production and marketing, which is key to ensuring food security and reduction of poverty.
- There is no recovery in cash-food crop production. It is yet to recover from the destruction caused by the war.
- There is the need to improve on irrigation facilities for irrigated swamp rice production., especially to rehabilitate existing dams.

The conclusions drawn from the assessment are:

Farm family is estimated to have increased from 352,708 farm families in 2005 to 408,295 farm families at the end of 2007.

The mean area cultivated in hectares across the rice farming systems for irrigated swamp rice (1.03 ha); rainfed swamp (0.31 ha) and upland (0.69 ha). In all the rice farming systems, there are variations in farm sizes per region. Farm sizes under all the rice systems are relatively large in Lofa County compared to the others. However, Bong County has the largest area under irrigated swamp rice in the survey report.

The mean area cultivated in hectares under cassava is 0.9 ha. There are variations in farm sizes per region. Farm sizes are relatively large in South-East.

Yields from irrigated swamp rice fields, however, were observed to be higher than that from the rainfed and upland types of rice production systems. Irrigated swamp rice yields almost *four-times* the mean estimated yields under the rainfed and upland rice. It is however observed that the highest yields in irrigated swamp rice are found in Grand Gedeh in the South-East Liberia. Yields under upland and rain fed rice are 0.772 MT/ ha and 0.821 MT/ha respectively. Cassava yields, on the other hand, average 8.8 MT per ha.

The total estimated production of rice paddy is 295,149.5 MT. Using post-harvest estimates (19.05%) and seed use (21.6%) of production data from the survey, the estimated milled production available for human consumption is 175, 171.3 MT.

Fertilizer use was observed to be limited among farmers. Only 1.9 percent of rice farmers used fertilizer in production. Fertilizer usage is very low in all regions.

The sources of seed rice for agricultural production for the 2007 season were mostly (41 percent) from farmers own seed stock relative to 19 percent from external sources such as the UN agencies.

The estimated food balance sheet for rice, 2008 records a food deficit of 185,282 MT of rice. Given planned food aid of 22,000 MT, there is an estimated uncovered deficit of 163,282 MT for the year. For cassava, the cereal equivalent estimated is 426 372.6 MT.

There was regional variation in constraints to crop production. Common constraints to rice production were lack of seeds, lack of labor and tools, groundhog and bird attack, weed infestation, lack of rice mill, insect infestation, disease infection and onset of early rain.

Households throughout the regions indicated various strategies that they adopt to overcome food shortages. Farmers produced a number of food crops to supplement rice and cassava for consumption. Intensity of cultivation of such crops varied with region. Other farmers also produced charcoal, tapped rubber, produced palm oil by harvesting wildy growing oil palm fruits or worked on other farms as labourers to generate income to buy food for the family. The most common cash crops produced included coffee, cocoa, oil palm and rubber.

In conclusion there is the need to supply improved rice seeds to farmers and this must continue since higher yields were recorded by farmers who received improved seeds from FAO. There is the need to introduce small scale mechanization and improvement in extension delivery service to ensure increased production of rice and cassava. To ensure food security and reduce poverty in Liberia postharvest handling of both rice and cassava must be given priority attention.

The report recommends the following interventions:

Rice:

There are region specific interventions that must be carried out to address agricultural constraints to ensure increased rice production to meet national demand and to alleviate poverty. Improvement in land preparation through the provision of power tillers for ploughing is important. The following major interventions, however, should be considered:

- Formation of Farmer-Based Organizations (FBOs) to source credit and facilitate education on better farming practices.
- Use of simple agronomic measures e.g. crop rotation, minimum tillage for soil fertility and water conservation.
- Use of appropriate seed treatment before planting.
- Growing of alternate crops instead of the continuous monocropping of rice season after season is necessary to reduce bird population and crop damage.
- Use of improved varieties that are high yielding, tolerant to pests and diseases, tolerant/resistant to drought and resistant to lodging.
- Promotion and farmer education of Integrated Pest Management (IPM) to reduce crop losses.
- Provision of credit to farmers to purchase farming inputs such as inorganic fertilizer and improved seed.
- Timely harvest to maintain grain quality.
- Provision of threshers and supply of mini-rice mills with de-stoning facilities to small-scale rice producers to help improve the quality of the rice produced which will enhance opportunities for marketing

Cassava:

In order to achieve the potential cassava yield and improve on its storability and utilization the following interventions must be considered:

- Sustained promotion of the use of simple agronomic soil and water conservation measures e.g. crop rotation, multiple cropping, minimum tillage must be introduced to farmers and the farmers encouraged to practice them.
- Breed for or introduce easy to peel varieties

- Breed for/introduce delayed/prolonged post-harvest deterioration varieties
- Introduce/design equipment for peeling
- Introduce/design affordable/suitable and quality processing machines, for example, cassava graters.
- Use of improved varieties, e.g. with high yields, high quality to meet stakeholders demand, longer in-ground storage.
- Use of optimum planting distances.
- Proper weed control.
- Control of pests e.g. groundhog.
- Intensifying farmer education on the use of IPM
- Introduction of improved storage methods for cassava as well as improving on the traditional storage methods.
- introduce/design appropriate storage facilities/methods
- breed/introduce varieties with long in-ground storability
- Provision of drying floors in the communities for the drying of cassava chips.
- Farmers should be supplied with cassava graters to facilitate the processing of farina.

SECTION 1: SOCIO-ECONOMIC SETTING

1.1 Background

From the onset of the civil crisis, Liberia has been beset by food shortages, which has mostly been met by humanitarian agencies through the provision of food assistance and agricultural implements such as tools and planting materials. Although some achievements have been made to reduce the emergency situation by increased farming activities, there is little data to determine the size of the farming population, increase in areas under production, average farm size or the average yield, especially, for the nation's staple food crops – rice and cassava.

A joint Post-harvest Crop Assessment was conducted in February/March 2008. The Assessment was expected to provide reliable data and information on rice and cassava production in the 2007 agricultural season while estimating the Liberian population food requirements for 2008. The Ministry of Agriculture (MOA) led the assessment exercise with financial and technical support from FAO and WFP. The assessment comprised of secondary and primary data collection and analysis.

1.2 General socio-economic situation

The general socio-economic situation indicates that households in Liberia have been and continue to be impacted by war and poverty. Approximately 86 percent of households across the country have been displaced in the past due to fighting. Most have resettled in 2005-2006. Returning of refugees was completed in 2007 (Lofa and Gbarpolu). The physical infrastructure, heavily affected by the war, remains in ruins, with the majority of communities having neither a school nor a clinic. Likewise, 76 percent of households report having no toilet facilities and only 32 percent of households report having access to protected water sources. No household in Liberia has access to a steady source of electricity including households in Monrovia. Instead, 92 percent of households rely on kerosene as their source of fuel.

Roads and access to urban centres and health care, among others, remain a challenge for households in the more remote, south western counties, especially in the rainy season. The main livelihoods and income generating activities include food crop production, specifically, rice, cassava and assorted vegetables, as well as palm oil sellers, and petty trading. Overall, 15 percent of households are food crop producers while 14 and 12 percent are either palm oil producers or petty traders.

Livelihoods, however, have been severely impacted by the war leaving them heavily dependent on food purchases and food aid until the next planting system. In addition, livestock were depleted during the war. Livestock ownership, other than chickens, is rare. In fact, fewer than 10 percent of households own any other type of livestock. Cash crop production has also been suppressed with cash crop plantations still not operating at pre-war levels. Generalized poverty and attitudes about gender roles also impacts households, making it even more difficult for members to access the services that are available. Providing education remains a major challenge for the Government of Liberia. In communities with schools, lack of money and gender bias often precludes some from attaining a proper education. Available evidence indicates that a main reason for not being enrolled in school is due to lack of money. In addition, teenage girls above the age of 14 are less likely than boys to be in school. Households in Liberia remain vulnerable to an assortment of common shocks,

including harvest loss due to animal attacks, illness or disability of household member, unavailability of food, and death of household members.

1.3 Agriculture Sector of Liberia

Agriculture, excluding forestry, hunting, gathering and fishing, has been a major component of the Liberian economy and fundamental in an economy based on natural resources (LISGIS data files, 2007). The share of agriculture, excluding forestry, hunting, gathering and fishing, on the average between 2001-2006, has been about 50 percent of GDP. In 2005 and 2006, agriculture as defined accounted for 52 and 53 percents respectively. Together with forestry, hunting, gathering and fishing, contributed 69.9 and 67.8 percent to GDP.

1.3.1 Agricultural production systems

In agricultural terms, the total land area in Liberia is estimated at 9.8 million hectares, consisting mainly of tropical rain forest (USAID, 1998)¹. It is estimated that the total forested land is about 4.9 million hectares, about 50 percent of the total land surface and the estimated total arable land, at 4.6 million hectares (four million hectares upland and 0.6 million swamp land respectively). There is a potential pastureland of some 0.182 million hectares.

Agriculture in Liberia was previously divided into three distinct patterns of production: Concessions, Commercial Farms and Traditional Farms², which varied considerably in organization, efficiency and output. Concessions relate to foreign firms that have obtained concessions on large land areas (of between 2,000 and 100,000 acres each) for rubber and oil palm plantations. The concessions employed highly trained staff and, thus, secured modern management and the application of modern production techniques and rather capital-intensive with high labour productivity. Regarding Commercial Farms, the success of the rubber concessions, availability of cheap land, supply of seedlings by the concessions and their guarantee to buy the produce caused Liberian entrepreneur to start their own rubber farms around the concession areas. With the construction of roads, the number of Liberian commercial farms increased and some went into other production branches such as fruits, vegetable, coffee, oil palm, poultry, hogs, etc. An estimate indicate that about 5,000 Liberian commercial farmers cultivated an area of nearly 200,000 acres and had farms of 10-500 acres each in 1971. Though some of these commercial farms operated very well and used modern production methods, thus achieving high yields, the majority was much less efficient than the concessions.

The bulk of the rural population, however, was engaged in traditional farming which has remained more or less untouched by modern methods. They concentrated on rice and cassava and often grew some coffee, cocoa, oil palm, fruits, vegetables and cassava, and kept poultry, goats and sheep as well. Most of the cultivation was done on tribal land under the slash and burn system.

¹ USAID (1998). Agricultural Sector Assessment for Liberia and Draft Agricultural Strategy, Liberia.

² Frithjof Kuhnen (1971). Institutional Aspects of Agricultural Development in Liberia. Part of Mission, ILO Human Resources Development Mission to Liberia, October -November.

1.3.2 Poverty Reduction Strategy

The main goal of the agricultural sector in alleviating poverty is to revitalize the sector in order to contribute to shared, inclusive, and sustainable economic development and growth, and provide food security and nutrition, employment and income, and measurable poverty reduction. Specifically, the Government intends to expand agricultural production by at least 4 percent per annum during the first two years of the PRS period. This approach predicated on a strong supply response in the food crop sector, with traditional food crops such as rice and cassava recovering strongly. Production of non-traditional export crops such as vegetables is also expected to expand rapidly. The tree crop sector namely cocoa, coffee and oil palm are expected to recover by 2009. The livestock and fisheries sectors are expected to show some marginal increase during the first year of the PRS. Total agricultural production is therefore expected to expand by 6 percent by the end of 2010 and in 2011.

Food security profiles developed by CFSNS (2006) showed that most rural households are food insecure. Food security exists when all people at all times have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 2006). Nationally 80 percent of the rural population is either moderately vulnerable (41%), or highly vulnerable to food insecurity (40%), while only 9 percent of the rural population is food secure, and 11 percent are food insecure. At the same time, chronic malnutrition rates reach 39 percent for children under five, and only 32 percent of households had access to improved water sources. Different livelihood profiles provide various degrees of food security with the most food insecure and highly vulnerable groups involved in palm oil producing and selling (64%) followed by hunters and contract laborers (respectively 61% and 58%). The more food secure and moderately vulnerable groups are among the cash and food crop producers (37%), the petty traders and the employees (44% each).

To achieve the PRS objectives, there is the need to enhance food security and achieve self-reliance in the main staples, particularly increase and stable supply and availability of food products, improve access to food for the most vulnerable social groups and enhance the nutritional absorption capacity of the population, as well as, increase income of the small holders through improved production, marketing and value addition with emphasis on gender issues in agriculture. To support production, the PRS also aim to ensure that sufficient critical inputs are available and to make basic improvements in the marketing chain

1.3.3 Land Tenure

Liberia has a dual system of land tenure. The government owns and administers public land. Aboriginal communities are permitted to maintain lineage-based communal tenure. Communal tenure is a functional necessity for rotational bush fallowing systems of dry-land rice cultivation³. Liberia's land policy remains an impediment to improving agriculture. The Republic owns all land in the country, until deeded to individuals and corporate organizations. In a 2006 survey⁴, about 66 percent of the agricultural household respondents indicated they have access to land, although they indicated generally that farm sizes were smaller. Best current access to land is found in such counties

³ The World Bank (2005). Country Cohesion in Liberia. A Post-War Rapid Social Assessment. Social Development Programs. Conflict Prevention and Reconstruction. Paper No 21. January

⁴ Republic of Liberia (2006). Comprehensive Food Security and Nutrition Survey (CFSNS). October

as River Gee, Lofa and Grand Gedeh whilst fewer households in Margibi and Montserrado have access to agricultural land.

1.3.4 Farming systems

Many small-scale farmers in Liberia use the traditional bush fallow system in which cropping activities are performed primarily with simple hand tools. Land preparation is usually by slashing, burning the vegetation and tilling the land with hoe. Farmers intercrop grains, tubers and vegetables, use less fertilizer and chemical input and are dependent on rains.

1.3.5 Agricultural Farm Households

The MOA (2002) baseline survey in 2001 indicates that there are about 881,400 agricultural household members, which is about 79 percent of its prewar (1988) level.

The agricultural household age distribution is characterized by a large proportion of children (0-9 years), which comprise 30.4 percent of the total. Including children between 10-19 year groups, agricultural household members between 0-19 years comprise almost 56 percent of the total. The slash-burn farm practice has a gender dimension to the various farm activities. Women activities in planting, weeding and harvesting dominate whilst men activities are concentrated in the brushing, felling and clearing of virgin and secondary forests for the slash-burn farming system. The cash crops of cocoa and coffee dominate in the Bong and Nimba Counties, although these cash crops are grown in almost all the other counties. Cocoa farm households however dominate the coffee farm households.

Food crop production is the most important source of livelihoods (41% of households are engaged in this activity). Other economic practices include processing and sale of palm nuts and oil (31%) as well as petty trade and small-scale business (28%), and contract or casual work (18%). The relative importance of these income sources differs across Liberia: for instance, the contribution of food crop production is particularly high in the south-east counties of Sinoe (35%), Maryland (29%) and River Gee (26%). Cash-crop production is predominant in Nimba (15%) and Grand Bassa (10%). Processing and selling of palm nuts is a key source of income and also serves as a coping strategy across Liberia but is particularly high in Lofa (37%), River Cess (33%) and Bomi (27%). Primary agricultural activities (including farm hand, and fishing) dominate among the agricultural households. Noticeably, agro-processing as a secondary activity is low, indicating the level of value addition to agricultural produce in the economy by agricultural households. The need to increase agro-processing is therefore a priority to enhance farmer income.

1.3.6 Agro-ecological zones

Liberia is described⁵ by four agro-ecological zones: coastal plains, upper highland tropical forest, lower tropical forest, and northern savannah. Liberia generally has one rainy season with increasing amounts of rain continuing from April to August/September and decreasing towards October. The high rainforest and favorable rainfall patterns support the production of several crops including cocoa and coffee.

1.3.7 Agricultural Assistance

Agricultural assistance, reported for 22.6 percent of households, included tool and seed distribution, extension/training, agricultural loan/ credit, and other type of agricultural assistance. Overall, 20.2 percent of households received tools and 13.9 percent of households received seeds. Less than one percent of households received any other type of agricultural assistance. By county, households in River Gee reported receiving the most agricultural assistance with 55.4 percent receiving tools and 44.3 percent receiving seeds. Margibi and Grand Bassa reported receiving the least agricultural assistance (< 1%) of households receiving either seeds or tools.

1.3.8 Agricultural mechanization

The main power source for agricultural operations comes from human muscle using simple hand tools. Labour available for agricultural production is declining and technology has not improved to make the necessary substitution. Cutlass and hoes are presently the most important tools in the environmentally unfriendly subsistent system of production prevalent in Liberia. However, agricultural operations from land preparation to post harvesting or value addition can lend themselves to mechanization and reduce drudgery and increase labor productivity. Simple equipment such as power tillers, corn harvesters, mechanized cassava graters, mechanized cereal and coffee hullers, oil palm mills, among others, are known to have a significant impact on production and productivity.

1.4 Objectives of the study and methodology

The overall objective of the assessment study was to conduct a rapid assessment to estimate rice and cassava production in Liberia for 2007 planting season to facilitate the development of a National Food Balance Sheet. The specific objectives are to estimate/assess:

- The number of farm families per region.
- The average farm size under cultivation of rice and cassava during the 2007 planting season.
- The average yield per hectare of rice and cassava during 2007 planting season.
- The total production of rice and cassava at the national level for 2007.
- The potentials and constraints for rice and cassava farmers' including production constraints, post-harvest losses, processing and marketing opportunities.
- Describe agricultural and non-agricultural livelihood opportunities for rural farming families (including cash-crop production) and

⁵ USAID (1998). Agricultural Sector Assessment for Liberia and Draft Agricultural Strategy, Liberia

- Describe food security problems, farming households faced in 2007 and their coping strategies.

1.4.1 Scope and Limitations

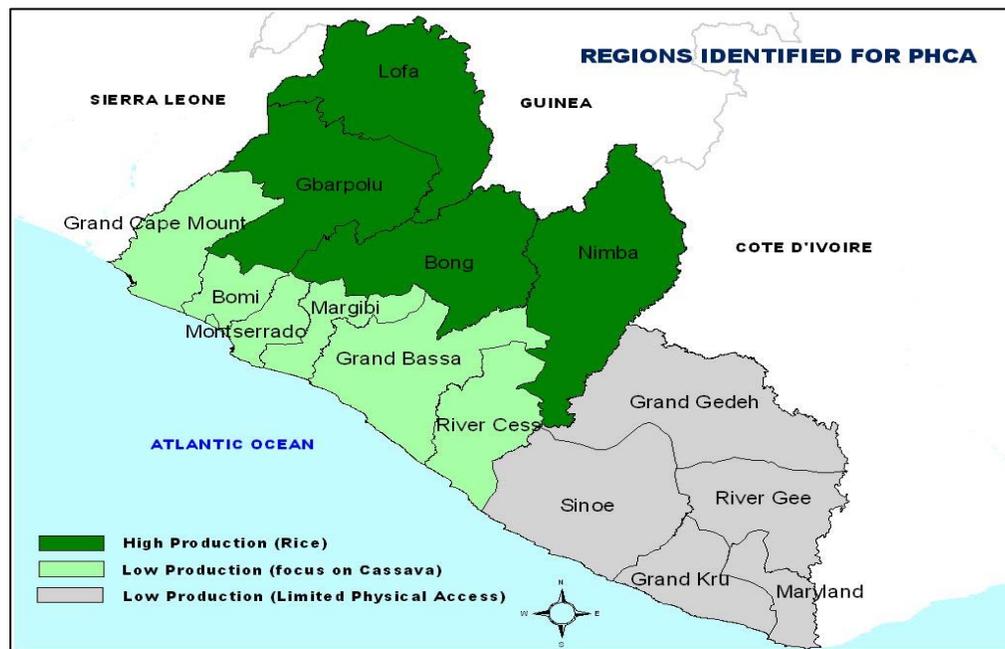
To accomplish the tasks, the Post-harvest Crop Assessment applied a rapid assessment approach. The analysis and final report is based on estimates that will not replace a national agricultural census. Despite these limitations, the assessment used sound statistical methods that are described below. The aim of the assessment was to provide a national picture of the 2007 agricultural crop season and provide estimates for the following sub-groups:

- Rice and cassava producers
- Districts with high and low production capacities

Three sub-regions were identified for the assessments (see Figure 1):

- **North-West/Central Liberia:** high agricultural productivity, focusing on rice production (Lofa, Nimba, and Bong,)

Figure 1: Sub-regions identified for the assessments



- **Central-Coastal Liberia:** low agricultural productivity, focusing on cassava production (Cape Mount, Bomi, and Grand Bassa,)
- **South-East Liberia:** low agricultural productivity due to limited physical access (Grand Gedeh, Grand Kru, and Maryland,)

Additionally, during the analysis, the data was stratified into upland and lowland rice producers and households that benefited/did not benefit from agricultural assistance in 2007.

1.4.2 Methodology

Data collection instruments

The data was collected through a structured household questionnaire, which was complimented by a basic community information sheet. The household questionnaire consisted of four sections:

- Basic household information
- Rice cultivation
- Cassava cultivation
- Marketing, livelihoods (including cash crop production) and coping strategies

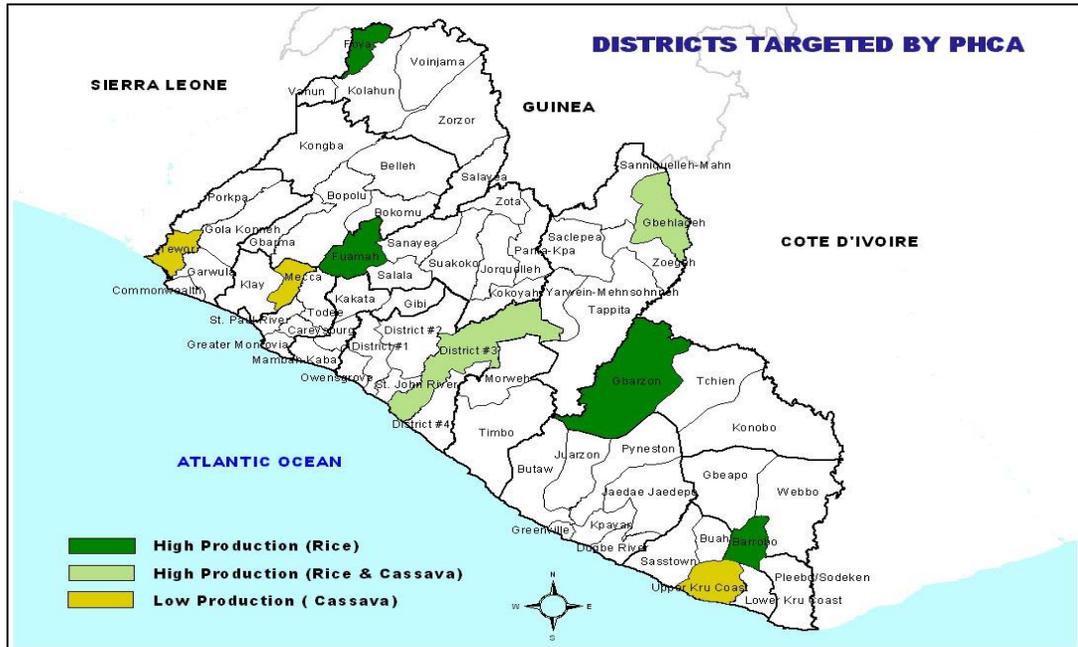
As most of the upland and lowland rice had already been harvested, proxy questions were asked to estimate the field size and yield of the 2007 agricultural season. Regarding cassava, fresh yield measurements were however taken from an area of 4.5m x 4.5 m (20.25m²) for three cassava farms in a community.

1.4.2.1 Sampling methodology

The rapid assessment included a mix of random and purposive sampling procedures to facilitate response to the research questions. Due to time and resource limitations, a rapid approach was opted for, based on secondary data and key informant inputs. In total, 945 households were interviewed across the three selected regions. Across Liberia, counties were classified according to high and low production potentials as well as potential rice or cassava producers based on 2006 CFSNS data. Based on this classification, 9 districts were selected with inputs from MOA experts and FAO field staff (see Figure 2):

- High production (rice):
 - Foya in Lofa
 - Fuamah in Bong
 - Gbarzon in Grand Gedeh
 - Barrobo in Maryland
- High production (rice & cassava):
 - District 3 in Grand Bassa
 - Gbehleh-Geh in Nimba
- Low production (cassava)
 - Suehn-Mecca in Bomi
 - Tewor in Cape Mount
 - Upper Kru Coast in Grand Kru

Figure 2: Districts selected for the assessments



In each selected district, 7 clusters (rural communities) were randomly selected proportional to population size. In each cluster, 15 rice and/or cassava-producing households were randomly selected. Households that were not producing rice or cassava were not eligible for selection. Table 1 illustrates the breakdown by team and region, number of clusters and households interviewed per team:

Table 1.1: Breakdown by team, region, number of clusters and households interviewed

Team & Region	Number rural communities (cluster)	Number of HH questionnaires per cluster	Total number of HH questionnaires
TEAM 1: Central/Coastal	21	12-15	315
TEAM 2: North-West/Central	21	12-15	315
TEAM 3: South-East	21	12-15	315
TOTAL	63		945

SECTION 2: THE AGRICULTURE SECTOR: THE CASSAVA AND RICE SURVEY 2007

2.0 General introduction

Rice and cassava are the most important food crops in Liberia. The study revealed that farmers cultivated rice and cassava as the main food crops. Eighty-three percent and 58 percent of the households cultivated rice and cassava, respectively. These crops are grown on subsistence basis and farmers use crude tools and traditional methods of cultivation. The average area cultivated per family in 2000 for rice and cassava were 1.8ha and 0.48ha, respectively (Baseline Survey, 2001). Average yields of 1.3MT/ha and 7.8MT/ha were also reported for rice and cassava, respectively. The yields/ha of rice and cassava reported for 2005 were 0.4MT (milled) and 6MT, respectively.

In the next sections, an analysis of the data collected on average farm sizes in rice and cassava, yields and the use of fertilizer, among others, are analysed.

2.1 The number of farm families per county

Liberia's current population (2008) is 3.5 million. It is estimated that at the last census (2008) the population growth rate was 2.1 percent. The age structure at the 2005 population has the 0-14 years (43 percent), 15-64 (54 percent) and 65 years and above, 3 percent. The age structure of the population indicates that a sizeable proportion of the population is in the active labour force. The MOA (2002) baseline survey in 2001 also indicates that there are about 881,400 agricultural household members, which is about 79 percent of its prewar (1988) level.

Table 2.1 The estimated number of farm families per region for 2007

REGION	Number of Farm Family	
	2005	2007
North-West / Central Liberia Lofa, Nimba, Bong,	145,828	168,810
Central-Coastal Liberia Cape Mount, Bomi, Grand Bassa,	162,302	187,882
South-East Liberia Grand Gedeh, Grand Kru, Maryland,	44,988	52,078
Total	353,118	408,770

** The number of farm family/county for 2007 was calculated based on a projected growth rate of 5%.

The report assumed that farm family structure still exist, and that the additional farm families may derived from those persons within the age 15-64 at the time of the survey with a population growth rate within the 15-64 also 4.91 percent. Based on these assumptions, the estimated number of farm families per district per county was obtained. Table 2.1 presents the compounding growth rate of the farm families per by county. Thus the farm family is estimated to have increased from 352,708 farm families in 2005 to 408,295 farm families at end 2007.

2.2 The Socio-Economic Characteristics of Sampled Farmers

This section describes the socio-economic characteristics of the sampled farmers and their households. The characteristics were the age of the respondent and the head of the household, whether respondent or head of household is literate, gender, household size and its distribution by age and gender and the contribution of the household to farming operations by age and gender.

Tables 2.2a-2.2c describe the sex, age and literacy respondents and household heads. From Table 2.2a, the mean age of the respondents across the regions is 44 years. The gender distribution of respondents, in general, was 66 percent and 34 percent for male and female respectively.

Table 2.2a Sex and Age of Respondents

	Sex of respondent		Age of respondent
	Male	Female	Mean
	Row %	Row %	
North/Coastal	63%	37%	44
North-West/Central	71%	29%	44
South-East	64%	36%	44
Total	66%	34%	44

Source: Survey data, 2008

Table 2.2b Sex, Age and Literacy of Head of Household

	Sex of HH head		Age of HH head	Literacy of HH head	
	Male	Female	Mean	No	Yes
	Row %	Row %		Row %	Row %
North/Coastal	87%	13%	48	49%	51%
North-West/Central	86%	14%	47	57%	43%
South-East	82%	18%	47	51%	49%
Total	85%	15%	47	53%	47%

Source: Survey data, 2008

From Table 2.2b, the mean age of head of household across regions is 47 years, which is not very much different from the mean age of respondents. However, the gender distribution of the household heads is very much gender biased: 85 percent male and 15 percent female. There are also gender disparities across regions with 53 percent of the male household heads being literate compared to 15 percent of female head of households (see Table 2.2c).

Table 2.2c Literacy of Sampled Household by Gender

	Literacy of HH head	
	No	Yes
	Row %	Row %
Male	47%	53%
Female	85%	15%

Source: Survey data, 2008

The average household size is 7 persons (see Table 2.3). The age and gender distribution within the household indicate a skewed age of a higher proportion of children in the 0-9 year group and the 15-59 year group. However, there are no significant difference within with regards to gender ratios

Table 2.3 Household Size and its Distribution by Gender and Age

	Household	Males (0-9)	Females (0-9)	Males (10-14)	Female (10-14)	Males (15-59)	Females (15-59)
	size	Sum	Sum	Sum	Sum	Sum	Sum
North/Coastal	7.0	442	447	118	107	348	412
North-West/Central	8.0	449	456	232	183	583	606
South-East	7.0	464	419	234	186	443	476
Total	7.0	1,355	1,322	584	476	1,374	1,494

	Males (60+)	Females (60+)
	Sum	Sum
North/Coastal	56	49
North-West/Central	78	57
South-East	62	45
Total	196	151

Source: Survey data, 2008

Table 2.4 describes the age and gender roles of the household in farming activities. It was observed that the age bracket of 15-59 provides the bulk of labor within the household for farming. However, it appears more female than male within this age group contributes the most.

Table 2.4 Gender-Age contribution within the Household to farming Activities

	Males (10-14) contributing to farming	Females (10-14) contributing to farming	Males (15-59) contributing to farming	Females (15-59) contributing to farming activities	Males (60+) contributing to farming	Females (60+) contributing to farming
	Sum	Sum	Sum	Sum	Sum	Sum
North/Coastal	101	67	295	339	36	24
North-West/Central	218	177	550	558	52	31
South-East	219	169	405	438	44	27
Total	538	413	1,250	1,335	132	82

Source: Survey data, 2008

2.3 Production indicators

2.3.1 *The average farm size under cultivation of rice and cassava during the 2007 planting season*

Table 2.5 presents the estimated mean area cultivated under rice under the three types of rice systems: irrigated swamp, rainfed swamp and upland. Whilst upland rice cultivation was observed in all the selected counties, irrigated swamp rice were in only a few counties of Bong, Grand Gedeh, Lofa and Nimba.

Table 2.5 Mean farm size under cultivation of Rice during the 2007 planting season

REGION	Irrigated swamp: area cultivated in ha	Rainfed swamp: area cultivated in ha	Upland: area cultivated in ha
North-West / Central Liberia (Lofa, Nimba, Bong)	4.284	0.528	0.742
Central-Coastal Liberia (Cape Mount, Bomi, Grand Bassa)		0.136	0.491
South-East Liberia (Grand Gedeh, Grand Kru, Maryland)	0.096	0.22	0.803
Total	1.095	.295	.678

Source: Sample Survey, 2008

The mean area cultivated in hectares across the rice farming systems is: irrigated swamp rice (1.1 ha); rain fed swamp (0.3 ha) and upland (0.68 ha). In all the rice farming systems, there are variations in farm sizes per region. Farm sizes under all the rice systems are relatively large in North-West/Central Liberia compared to the others.

In Table 2.6, the estimated mean area cultivated under cassava is presented. The mean area cultivated in hectares under cassava is 0.98 ha. There are variations in farm sizes per region. Farm sizes are relatively large in the South-East region.

Table 2.6 Mean farm size under cultivation of Cassava during the 2007 planting season

REGION	Area planted with cassava (ha)
North-West / Central Liberia Lofa, Nimba, Bong	0.893
Central-Coastal Liberia Cape Mount, Bomi, Grand Bassa	0.761
South-East Liberia Grand Gedeh, Grand Kru, Maryland	1.30
Total	.984

2.3.2 The average yield per hectare of rice and cassava during 2007 planting season

Table 2.7 presents the estimated mean yields under rice for the three types of rice systems: irrigated swamp, rain fed swamp and upland and for cassava for the planting crop season of 2007.

Table 2.7 Mean yield of Rice/Cassava cultivated during the 2007 planting season

REGION	Upland: Yield (KG) per ha (cleaned)	Irrigated swamp: Yield (KG) per ha (uncleaned)	Rainfed swamp: Yield (KG) per ha (cleaned)	Average per cassava field (MT/ha)
North-West / Central Liberia, Lofa, Nimba, Bong	760.64	1586.66(1031.33)	809.32	6.395
Central-Coastal Liberia Cape Mount, Bomi, Grand Bassa	686.60		822.00	10.38
South-East Liberia Grand Gedeh, Grand Kru, Maryland	762.58	8681.9 (5643.26)	814.45	9.00
Mean	736.61	2567.15 (1668.65)	815.49	8.864

Both upland and swamp rice are grown in Liberia. Irrigated swamp rice is grown on a small scale due to limitations of infrastructure. Yield from irrigated swamp rice fields, however, were observed

to be higher than that from the rain fed and upland types of rice production systems. Irrigated swamp rice yields almost *four-times* the mean estimated yields under the rain fed and upland rice. It is however observed that the highest yields in irrigated swamp rice are found in the South East (Grand Gedeh) and tended to increase the sample average yields under irrigated swamp rice. Yields under upland and rain fed rice are 0.772 MT/ ha and 0.821 MT/ha respectively. Cassava yields, on the other hand, average 8.8 MT per ha.

2.3.3 The estimated total production and utilization of rice at the national level for 2007

Table 2.8 presents the total estimated production of rice based on the survey data. From the table, the estimated average area per family is estimated as 0.568 ha (this is based on a weighted proportion of the various rice production systems obtained from the survey). From the table, total production of paddy rice is estimated at 295,149.5 MT. Using post-harvest estimates (19.05%) and seed use (21.6%, see Table 2.7) of production data from the survey, the estimated paddy production available for human consumption is 175, 171.3 MT.

Table 2.8 Total estimated production of rice (paddy) during the 2007 planting season

	Av. Area/Family	Yield/Ha ⁶	Average yield/family	Total Production	Prod for Human Cons less post harvest loss and seed
REGION	ha	MT	MT/ha	MT	MT (Paddy
Central/Coastal	0.1582	0.3556	0.056256	8369.461	4967.275
North-West/Central	1.3335	1.0008	1.334567	197921.1	117466.2
South-East	0.356	4.1174	1.465794	59542.54	35338.49
TOTAL	0.568	1.5388	0.874	295149.5	175171.3

Source: Survey data, 2008

6

Central/Coastal Average yield in MT/ ha = (Av. yield in upland *0.264)+(Av. yield in irrigated*0.053)+(Av. yield in rainfed swamp*0.212)
 $(0.6866*0.264)+(0.00*0.053)+(0.822*0.212)= 0.3556$

North-West/Central Average yield in MT/ ha = (Av. yield in upland *0.415)+(Av. yield in irrigated*0.526)+(Av. yield in rainfed swamp*0.520)
 $(0.7273*0.415)+(0.5289*0.526)+(0.8093*0.52)= 1.0008$

South-East Average yield in MT/ ha = (Av. yield in upland *0.32)+(Av. yield in irrigated*0.421)+(Av. yield in rainfed swamp*0.268)
 $(0.7626*0.32)+(8.682*0.421)+(0.8145*0.268)= 4.1174$

Average yield in MT/ha = (Av. yield in upland *0.637)+(Av. yield in irrigated*0.023)+(Av. yield in rainfed swamp*0.34)
 $(0.7719*0.637)+(3.431*0.023)+(0.821*0.34) = 1.5388$

Table 2.9 Total estimated production of rice (paddy) *assuming same average area per family across regions*

Region	Av. Area/Family	Yield/ha (MT)	Average yield/family (MT)	Total Production (MT)	Total Production less post harvest loss (19.05%) and seed (18.24MT) (MT)(Paddy)
Central/Coastal	0.9	0.3556	0.3556	47613.87	38543.43
North-West/Central	0.9	1.0008	1.0008	133580	108133
South-East	0.9	4.1174	4.1174	150528.9	121853.1
Total	0.9	1.5388	1.5388	295,149.5	238,923.6

However, estimates presented in Table 2.9 presents the total estimated production of rice based on an assumed average area per family of 0.9 ha, national seed use average of 18.24 MT. From the table, total production of paddy rice is estimated at 295,149.5 MT. The estimated paddy production available for human consumption is 238,924 MT.

Table 2.10 Percentage utilization of rice (paddy) *during the 2007-planting season*

Region	Percent of rice for household consumption	Percent of rice for sale	Percent of rice for seeds	Percent of rice as gift	Percent of rice for festivals
Central/Coastal	61	2	21	13	3
North-West/Central	64	4	21	9	2
South East	53	4	23	10	11
Total	60	4	22	10	5

The utilization of rice produced is summarized in Table 2.10. Across regions rice producers consumed 60 percent of the produce and stored 22 percent as seed rice for planting the next season.

2.3.4 The total production of cassava at the national level for 2007

Table 2.11 presents the total estimated production of cassava based on the survey data. From the table, the estimated average area per family is estimated as 0.9 ha. From the table, total production of cassava is estimated at 1,693,770 MT.

Table 2.11 Total estimated production of cassava *during the 2007planting season*

Region	Av. Area/Family	Yield/ha (MT)	Average yield/family (MT)	Total Production (MT)
Central/Coastal	0.785	21.006	8.143113	756672
North-West/Central	0.893	12.9491	5.710426	576227.6
South-East	1.297	16.5557	10.60388	209842.1
Total	0.9	17.84	7.928934	1,693,770

2.3.5 Use of fertilizer and sources of seed rice/fertilizer in rice production

Fertilizer use was observed to be limited among farmers (see Table 2.12). Only 1.9 percent of rice farmers used fertilizer in production. Fertilizer usage is very low in all regions. However, in some cases, farmers indicated that they sometimes used organic manure from poultry to improve soil fertility for the cultivation of vegetables in the immediate vicinity of the villages.

Table 2.12: Extent of fertilizer use in rice production, 2007

Use of fertilizer on rice farm				
Region		Use of fertilizer on rice farm		Total
		No	Yes	
North-West/Central (Lofa, Nimba, Bong)	Frequency	294	4	298
	% of Total	42.7	0.6	43.3
Central-Coastal (Cape Mount, Bomi, Grand Bassa,	Frequency	178	5	183
	% of Total	25.9	0.6	26.5
South-East (Grand Gedeh, Grand Kru, Maryland)	Frequency	203	4	207
	% of Total	29.6	0.5	30.1
Total	Frequency	675	13	688
	% of Total	98.1%	1.9%	100.0%

Tables 2.13-2.15 show the sources of seed rice and fertilizers for agricultural production for the 2007 season. From Table 2.13 many rice farmers (41%) indicated that they planted rice using their own seed stock.

Table 2.13: Source of Seed Rice by Region

	North- North/Coastal	West/Central	South-East	Total
	Column %	Column %	Column %	Column %
Source of seeds: own stock	18%	32%	73%	41%
Source of seeds: bought	50%	42%	19%	37%
Source of seeds: borrowed	10%	11%	1%	8%
Source of seeds: exchanged	1%	3%	0%	1%
Source of seeds: Gift from friends/relatives	15%	14%	3%	11%
Source of seeds: Government	1%	0%	0%	0%
Source of seeds: External assistance	29%	10%	22%	19%

Source: Survey data, 2008

Table 2.14: Extent of External Support of Rice Seeds by Region

	Source of seeds: UN Agency, specify		
	No support	seed support FAO	Other seed support
	Row %	Row %	Row %
North/Coastal	71%	27%	2%
North-West/Central	89%	2%	9%
South-East	78%	19%	3%
Total	81%	14%	5%

Source: Survey data, 2008

Table 2.15: Extent of External Support of Fertilizer by Region

	Use of fertilizer on rice farm		Source of fertilizer		
	No	Yes	Bought	Gift from friends/relatives	Provided by from NGO or other agency
	Row %	Row %	Row %	Row %	Row %
North/Coastal	97%	3%	40%	0%	60%
North-West/Central	99%	1%	33%	0%	67%
South-East	98%	2%	0%	0%	100%
Total	98%	2%	30%	0%	70%

Source: Survey data, 2008

Thirty-seven percent of rice farmers, however, bought seeds. Nineteen percent however received seeds for planting through external assistance.

The supply of improved seeds to rice farmers varied from region to region (see Table 2.14). The main supplier of seeds to farmers is the FAO of 14 percent of the total farmers (27 percent, 19 percent and 2 percent of rice farmers in North/Coastal, South-East North-West/Central respectively), whilst only 5 percent indicated that they were supported with seeds from other sources.

In the extent of fertilizer suppliers, Table 2.15 indicates that about 70 percent of farmers obtained their fertilizers from NGOs and other agencies.

2.3.6 Sources of planting materials: cassava

One of the constraints to production is the availability of improved planting materials. Many cassava farmers obtain their planting materials from diverse sources (see Table 2.16). The extent of external assistance, including NGOs, are comparable to sources of cassava from own stock and from friends and relatives.

Table 2.16: Sources of Planting materials: Cassava

County	Source of cassava stocks (Own stock)	Source of cassava stocks (Bought)	Source of cassava stocks (Borrowed)	Source of cassava stocks (Exchanged)	Source of cassava stocks (Gift from friends/relatives)	Source of cassava stocks (external assistance)	Source of cassava stocks (NGO, specify)
Bomi	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%	10.1%
Bong	16.4%	16.4%	16.4%	16.4%	16.4%	16.4%	11.8%
Grand Bassa	13.6%	13.6%	13.6%	13.6%	13.6%	13.6%	10.0%
Grand Cape Mount	13.6%	13.6%	13.6%	13.6%	13.6%	13.6%	10.0%
Grand Gedeh	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	10.5%
Grand Kru	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	11.5%
Lofa	5.9%	5.9%	5.9%	5.9%	5.9%	5.9%	12.4%
Maryland	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%	11.1%
Nimba	20.8%	20.8%	20.8%	20.8%	20.8%	20.8%	12.5%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Survey data, 2008

SECTION 3: FOOD CONSUMPTION, CONSTRAINTS TO PRODUCTION AND COPING MECHANISMS

3.1 Food consumption: supply and demand balance for 2008

The recently carried out field surveys of rice and cassava production per household in the selected areas indicates an estimated rice paddy production of 295 150 MT for 2007.

Following from the production estimates, the 2008 food balance sheet was prepared based on the following facts and assumptions.

- Population – a population of 3,489,072 for 2008 based on the current census was used.
- Production – gross rice production is estimated at 295 150 MT of paddy. Allowing for post harvest losses and seed use (Seed use and losses are estimated as 22 and 19 percent, respectively), the available production estimated for human consumption is 175 171.3 MT paddy. This is converted to milled rice using a factor of 0.65, which gives milled rice production of 113 861.2 MT. Cassava production, the consumption of which has increased rapidly in recent years, is estimated at 1 693 770 MT fresh weight.
- Stocks - a zero stock change is assumed.
- Consumption - per capital cereal and cassava consumption per year have been estimated at 92 kg/person and 100kg/person, respectively.
- Domestic utilization of rice = Per capita consumption * country population = 321969MT
- Domestic utilization of cassava = Per capita consumption * country population = 349966 MT
- The study estimates a planned food aid for rice of 22,000MT
- The cereal equivalent of fresh cassava based on FAO calorie content of selected food is estimated at 30 percent.

Table 3.1 shows the estimated food balance sheet for rice, 2008. The report estimates a food deficit of 185,282 MT of rice. Given planned food aid of 22,000 MT, there is an estimated uncovered deficit of 163,282 MT for the year (other estimated food balance based on other assumptions are presented in the appendix. These estimates are close to what is presented here). For cassava (see Table 3.2a and 3.2b), the cereal equivalent estimated is 426 372.6 MT (based on a post harvest loss of 16.09 percent from the survey data) and 381 098.4 MT (based on a 25 percent post harvest loss for cassava in neighboring countries, such as Ghana).

Table 3.1: Food Balance Sheet for Rice--2008

Rice	Total Rice 2007 MT
	(Based on 0.568 ha)
Production (milled)	155293
Domestic Utilization	321969
Losses, Seeds	44027
Deficit (Import Requirement)	185,282
Planned Food Aid	22000
Uncovered Deficit	163,282

Source: Survey data, 2008

Table 3.2a: Food Balance Sheet for Cassava--2008

Cassava	Total Cassava 2007 MT
	(Based on loss of 16.09%)
Total Production (Fresh Weight)	1693770
Losses	272527.6
Production Available for Consumption	1421242
Domestic Utilization	349966
Surplus	1071276
Cereal Equivalent (30% of production available)	426372.6

Source: Survey data, 2008

Table 3.2b: Food Balance Sheet for Cassava—2008

Cassava	Total Cassava 2007 MT
	(Based on 25% loss)
Total Production (Fresh Weight)	155289
Losses	423442.5
Production Available for Consumption	1270328
Domestic Utilization	349966
Surplus	920361.6
Cereal Equivalent (30% of production available)	381098.4

Source: Survey data, 2008

3.2 Production Constraints: Rice/Cassava

3.2.1 Major challenges to ensuring sufficiency in rice production

There was regional variation in constraints to crop production (see Table 3.3). Common constraints to rice production were lack of seeds labour and tools, groundhog and bird attack, weed infestation, lack of rice mill, insect infestation, disease infection and onset of early rain. Groundhog and bird attack were identified as the major pests in rice production across the regions. Households across regions indicated that 88 percent-95 percent and 89 percent-95 percent of pest attack is attributed to groundhog and bird attack, respectively. Households in the South-East were the most to report weed control as a constraint to rice production. Though most farmers indicated that they do not have regular visits from extension agents they did not consider it as a major constraint to production.

Table 3.3: *Major constraints to rice production by region*

Constraint	North/Coastal	North-West/Central	South-East
Poor soil	9	14	13
Lack of seeds	64	34	20
Lack of extension/training	1	3	16
Lack of tools	56	54	33
Lack of labour	32	17	20
Low demand/prices	2	0	4
Early rain	19	6	19
Late rain	1	7	4
Poor physical market access	4	0	1
Plant diseases	2	6	7
Pest	79	71	88
Human theft	0	1	0
Lack of rice mill	1	3	7
Lack of financial capital	1	1	0
Lack of food	10	9	0
Poor seeds/germination	0	2	0
No constraints	0	1	0

Table 3.4 summarizes the main causes to of post harvest losses in rice. Farmers attributed losses in production to rat/mice (87-93%), bird attack (89-95%), threshing (66-94%) and pounding (69-92%) in all regions.

Table 3.4: *Major causes of post-harvest losses in rice production by region*

Causes of post harvest losses in rice	<i>Percentage Prevalence (%)</i>		
	North/Coastal	North-West Central	South-East
Rats/mice	87	93	87
Birds	14	33	34
Poor storage	20	14	32
Human theft	2	1	5
Bird attacks	95	89	91
Threshing	76	66	94
Pounding	89	69	92

3.2.2 Major challenges to ensuring food security in cassava production

During discussions with farmers, the following constraints were identified as militating against cassava production in all the regions covered by the teams:

- Inadequate supply of planting materials of improved varieties.
- poor yields of the local (unimproved) varieties
- Lack of labor/high cost of labour for land preparation.
- soil nutrient management
 - lack of fertilizer application
- Inadequate/poor weed control
- Short shelf-life of fresh roots(post-harvest deterioration period)/and poor storage
- High transportation cost to the market
- Unavailability and high cost of quality processing equipment
- Poor/non-existent extension delivery services

Table 3.5 summarizes the major cause of post harvest losses in cassava. Lack of processing and storage are identified as major post harvest constraints.

County	Post-harvest losses	Post-harvest losses (Poor storage)	Post-harvest losses (Lack of transport)	Post-harvest losses (Lack of processing)	Post-harvest losses (Human theft)
BOMI	13.7%	13.1%	21.0%	25.0%	7.1%
BONG	9.2%	5.8%	6.0%	1.9%	10.6%
GRAND BASSA	18.7%	19.9%	23.0%	17.6%	16.5%
GRAND CAPE MOUNT	20.8%	21.8%	22.0%	34.3%	28.2%
GRAND GEDEH	4.6%	2.9%	5.0%	2.8%	5.9%
GRAND KRU	12.7%	13.1%	18.0%	11.1%	10.6%
LOFA	.4%	.5%	.0%	.9%	.0%
MARYLAND	6.0%	6.8%	4.0%	3.7%	3.5%
NIMBA	14.1%	16.0%	1.0%	2.8%	17.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

3.3 Mitigation strategies

Households throughout the regions indicated various strategies that they adopt to overcome food shortages (see Table 3.6). Farmers produced a number of food crops to supplement rice and cassava for consumption and indications were that they would maintain the same levels of production of these crops in 2008. Intensity of cultivation of such crops varied with region. Other farmers also

produced charcoal, tapped rubber, produced palm oil by harvesting wildy growing oil palm fruits or worked on other farms as labourers to generate income to buy food for the family.

Table 3.6: Other food crop production *by region*

	North/Coastal		North-West/Central		South-East	
	2007	2008	2007	2008	2007	2008
Vegetables	52	47	66	67	65	68
Pepper	46	44	69	66	74	78
Peanut	3	4	9	14	3	4
Pulses/Beans	9	6	32	31	7	7
Plantain/Banana	22	19	32	29	40	41
Eddoes	18	19	25	24	30	30
Corn	19	17	53	56	52	50
Sweet Potatoes	17	12	2	2	3	2
Yams	6	4	0	0	0	1
Sesame	3	1	1	0	0	0

3.3.1 Production of Tree crops

The type of cash crops grown varied from region to region. The most common cash crops produced included coffee, cocoa, oil palm and rubber (see Tables 3.7-3.9). Twelve percent of farmers interviewed across the three regions indicated that they cultivated coffee. Ten percent, 1 percent and 1 percent of households in North-Central, Central and Coastal Liberia produced coffee, respectively.

Table 3.7: Proportion of Farmers in Coffee Cultivation

Region		Coffee		Total
		No	Yes	
North-West/Central (Bong/Lofa/Nimba)	Frequency	205	83	288
	% of Total	26.9%	9.9%	36.8%
Central/Coastal (Cape Mount/Bomi/Grand Bassa)	Frequency	244	9	168
	% of Total	29.2%	1.1%	30.3%
South-East (Grand Gedeh/Grand Kru/Maryland)	Frequency	268	9	277
	% of Total	31.0%	1.1%	32.1%
Total	Frequency	737	101	838
	% of Total	87.9%	12.1%	100.0%

Twenty-one percent of farmers interviewed across the three regions indicated that they cultivated cocoa (Table 3.8). The highest percentage (11%) of households growing cocoa was recorded in the North-West and Central regions, followed by the South-East of 7 percent and the least number of households (3%) engaged in cocoa production the South-East.

Table 3.8: Proportion of Farmers in Cocoa Cultivation

Region		Cocoa		Total
		No	Yes	
North-West/Central (Lofa, Nimba, Bong,)	Frequency	217	97	314
	% of Total	25.9	10.9	36.8
Central-Coastal (Cape Mount, Bomi, Grand Bassa,	Frequency	228	25	253
	% of Total	27.2	2.9	30.1
South-East (Grand Gedeh, Grand Kru, Maryland)	Frequency	217	60	277
	% of Total	25.9	7.1	33
Total	Frequency	662	176	838
	% of Total	79.0%	21.0%	100.0%

Twenty-one percent of farmers interviewed across the three regions indicated that they cultivated rubber (Table 3.9). Nine percent of households reportedly produced rubber in North-West/Central regions, while 5 percent and 8% produced rubber in Central Coastal and South-East, respectively.

Table 3.9: Proportion of Farmers in Rubber Cultivation

Region		Rubber		Total
		No	Yes	
North-West/Central (Lofa, Nimba, Bong,)	Frequency	235	73	308
	% of Total	28	8.7	36.7%
Central-Coastal (Cape Mount, Bomi, Grand Bassa,	Frequency	215	38	253
	% of Total	25.5	4.69	30.19
South-East (Grand Gedeh, Grand Kru, Maryland)	Frequency	213	64	277
	% of Total	25.4	7.6	33
Total	Frequency	663	175	838
	% of Total	79.1%	20.9%	100.0%

Table 3.10 Proportion of Farmers in Oil Palm Cultivation

Region		Oil palm		Total
		No	Yes	
North-West/Central (Lofa, Nimba, Bong,)	Frequency	214	94	308
	% of Total	25.6	11.3	36.9
Central-Coastal (Cape Mount, Bomi, Grand Bassa, River Cess, Montserrado, Margibi)	Frequency	223	30	253
	% of Total	26.6	3.5	30.1
South-East (Grand Gedeh, Grand Kru, Maryland)	Frequency	267	10	277
	% of Total	31.9	1.2	33.1
Total	Frequency	704	134	838
	% of Total	84.0%	16.0%	100.0%

Regarding oil palm (Table 3.10), the production is highest (11.3%) among farming households in the Northwest and least in the South-East. Six percent of farming households in the Central-Coastal reportedly produce oil palm.

3.4 Constraints to Food Production

During the study, the teams identified with households the most important constraints to food security as follows: low soil fertility as a result of continuous cultivation of land, inadequate technology for small-scale food producers, lack of improved seeds/planting materials, high fertilizer prices, inadequate extension delivery services, poor post harvest storage facilities, lack of credit facilities, difficulties for marketing produce. The teams observed that many households were interplanting rubber in food crop fields, a practice that may create food security problems in the future as a result of a reduction in area/land used for food crop production.

SECTION 4: SUMMARY, CONCLUSIONS AND RECOMMENDED INTERVENTIONS

The joint Post-harvest Crop Assessment conducted in February/March 2008 has provided reliable data and information on rice and cassava production in the agricultural season of 2007 to make projections on the food requirements for Liberia in 2008 for rice and cassava.

A Food Balance Sheet for 2008 to enable Liberia and its development partners, FAO/WFP, determine the food needs of Liberia and to supply food where deficits exist and develop appropriate strategic policy responses to maximize food production has been estimated. In this section, the summary of the report, the conclusions and the recommended interventions are presented.

4.1 Summary

The assessment revealed that:

- Rice remains the major staple in Liberia followed by cassava
- Liberia is self-sufficient in cassava production but under produce rice
- The current technology being used for rice and cassava cultivation remains largely unchanged, characterized by limited use of inputs, and traditional slash and burn shifting cultivation using broadcasting, with plowing, manual weeding and harvesting.
- The 2007 total production of rice (milled) available for consumption in 2008 was 155,293 MT, with a projected domestic utilization of 331,969 MT.
- Rice import requirement was estimated at 185,282 MT with 22,000 MT to be covered by planned food aid and an uncovered deficit of 163,282 MT.
- There was a total cassava production of 1 693 770 MT in 2007
- Increase in rice yield is attributed to an increase in farm size/family and distribution of improved seeds in 2007
- There is the need to continue the supply of improved rice seeds to farmers and this must continue since higher yields were recorded by farmers who received improved seeds from FAO in 2007.
- There is the need to improve on irrigation facilities for irrigated swamp rice production, especially to rehabilitate existing dams.
- Pests, lack of tools, lack of seeds and lack of labour are the main constraints to rice production.
- Use of improved technology to raise yields is central if real incomes are to increase for both net food buyers and net producers.
- There is the need to introduce small-scale mechanization and improvement in extension delivery service to ensure increased production of rice and cassava.
- Post harvest loss in cassava is high because of poor storage.
- To ensure food security and reduce poverty in Liberia postharvest handling of cassava must be given priority attention to reduce postharvest losses through the provision of small-scale processing facilities such as cassava graters for processing the commodity into farina.
- Women play an important role in food crop production and marketing, which is key to ensuring food security and reduction of poverty.

- There is no recovery in cash-food crop production; it is yet to recover from the destruction caused by the war.

4.2 Conclusions

Farm family is estimated to have increased from 352,708 farm families in 2005 to 408,295 farm families at the end of 2007.

The mean area cultivated in hectares across the rice farming systems for irrigated swamp rice (1.03 ha); rainfed swamp (0.31 ha) and upland (0.69 ha). In all the rice farming systems, there are variations in farm sizes per county. Farm sizes under all the rice systems are relatively large in Lofa County compared to the others. However, Bong County has the largest area under irrigated swamp rice in the survey report.

The mean area cultivated in hectares under cassava is 0.9 ha. There are variations in farm sizes per county. Farm sizes are relatively large in Grand Kru, Lofa, Maryland and Nimba Counties.

Yields from irrigated swamp rice fields, however, were observed to be higher than that from the rainfed and upland types of rice production systems. Irrigated swamp rice yields almost *four-times* the mean estimated yields under the rainfed and upland rice. It is however observed that the highest yields in irrigated swamp rice are found in Grand Gedeh in the South-East Liberia. Yields under upland and rain fed rice are 0.772 MT/ ha and 0.821 MT/ha, respectively. Cassava yields, on the other hand, average 8.8 MT per ha.

The total estimated production of rice paddy is 295,149.5 MT. Using post-harvest estimates (19.05%) and seed use (21.6%) of production data from the survey, the estimated paddy production available for human consumption is 175, 171.3 MT.

Fertilizer use was observed to be limited among farmers. Only 1.9 percent of rice farmers used fertilizer in production. Fertilizer usage is very low in all regions.

The sources of seed rice for agricultural production for the 2007 season were mostly (41 percent) from farmers own seed stock.

The estimated food balance sheet for rice, 2008 records a food deficit of 185,282 MT of rice. Given planned food aid of 22,000 MT, there is an estimated uncovered deficit of 163,282 MT for the year. For cassava, the cereal equivalent estimated is 426 372.6 MT.

There was regional variation in constraints to crop production. Common constraints to rice production were lack of seeds, labour and tools, groundhog and bird attack, weed infestation, lack of rice mill, insect infestation, disease infection and onset of early rain.

Households throughout the regions indicated various strategies that they adopt to overcome food shortages. Farmers produced a number of food crops to supplement rice and cassava for consumption. Intensity of cultivation of such crops varied with region. Other farmers also produced charcoal, tapped rubber, produced palm oil by harvesting wildily growing oil palm fruits or worked

on other farms as labourers to generate income to buy food for the family. The most common cash crops produced included coffee, cocoa, oil palm and rubber.

In conclusion there is the need to supply improved rice seeds to farmers and this must continue since higher yields were recorded by farmers who received improved seeds from FAO. There is the need to introduce small scale mechanization and improvement in extension delivery service to ensure increased production of rice and cassava. To ensure food security and reduce poverty in Liberia postharvest handling of both rice and cassava must be given priority attention.

4.3 Recommended Interventions

4.3.1 Rice

The following major interventions should be considered. However there are also region specific interventions that must be carried out to address agricultural constraints to ensure increased rice production to meet national demand and to alleviate poverty:

- Improvement in land preparation through the provision of power tillers
- Formation of Farmer-Based Organizations (FBOs) to source credit and facilitate education on better farming practices.
- Use of simple agronomic measures e.g. crop rotation, minimum tillage for soil fertility and water conservation.
- Use of appropriate seed treatment before planting.
- Growing of alternate crops instead of the continuous monocropping of rice season after season to reduce bird population.
- Use of improved varieties that are high yielding, tolerant to pests and diseases, tolerant/resistant to drought and resistant to lodging.
- Promotion and farmer education of Integrated Pest Management (IPM) to reduce crop losses.
- Provision of credit to farmers to purchase farming inputs such as inorganic fertilizer and improved seed.
- Timely harvest to maintain grain quality.
- Provision of threshers and supply mini-rice mills with de-stoning facilities to small-scale rice producing areas to help improve the quality of their rice production and hence the marketing of the final produce.

4.3.2 Cassava

In order to achieve the potential cassava yield and improve on its storability and utilization the following interventions must be considered:

- Sustained promotion of the use of simple agronomic soil and water conservation measures e.g. crop rotation, multiple cropping, minimum tillage must be introduced to farmers and the farmers encouraged to practice them.
- Breed for or introduce easy to peel varieties
- breed for/introduce delayed/prolonged post-harvest deterioration varieties
- introduce/design equipment for peeling
- introduce/design affordable/suitable and quality processing machines e.g. cassava graters.

- Use of improved varieties, e.g. with high yields, high quality to meet stakeholders demand, longer in-ground storage.
- Use of optimum planting distances.
- Proper weed control.
- Control of pests e.g. groundhog.
- Intensifying farmer education on the use of IPM
- Introduction of improved storage methods for cassava as well as improving on the traditional storage methods.
- Introduce/design appropriate storage facilities/methods
- Breed/introduce varieties with long in-ground storability
- Provision of drying floors in the communities for the drying of cassava chips.
- Farmers should be supplied with cassava graters to facilitate the processing of farina.

APPENDICES

Appendix 1: Food Balance Sheet for 2008 – Rice and Cassava

Rice (all estimates based on milled rice equivalents)	Total rice	Total rice
	2005 MT	2007 MT
Production (milled rice)	85,000	144,000
Domestic Utilization	293,000	322,000
Losses, seed and other uses	15,000	38,000
Import requirements ^{1/}	204,000	217,000
Planned Food assistance	74,000	22,000
Uncovered deficit	130,000	195,000

Cassava	Total cassava	Total cassava
	2005 MT	2007MT
Production (fresh weight)	444,000	930,000
Domestic Utilization		
Losses: moisture and other losses	190,000	232,000
Cereal equivalent of cassava	133,000	209,000

Rice	Total Rice 2007 MT
	(Based on 0.9 ha)
Production (milled)	155289
Domestic Utilization	340575.3
Losses, Seeds	48458.8
Deficit (Import Requirement)	185286.8
Planned Food Aid	22000
Uncovered Deficit	163286.8

Table 3.1: Food Balance Sheet for Rice--2008

Rice	Total Rice 2007 MT
	(Based on 0.568 ha)
Production (milled)	155293
Domestic Utilization	321969
Losses, Seeds	44027
Deficit (Import Requirement)	185,282
Planned Food Aid	22000
Uncovered Deficit	163,282

Source: Survey data, 2008

Table 3.2a: Food Balance Sheet for Cassava--2008

Cassava	Total Cassava 2007 MT
	(Based on loss of 16.09%)
Total Production (Fresh Weight)	1693770
Losses	272527.6
Production Available for Consumption	1421242
Domestic Utilization	3489072
Surplus	1051052
Cereal Equivalent (30% of production available)	426372.6

Source: Survey data, 2008

Table 3.2b: Food Balance Sheet for Cassava—2008

Cassava	Total Cassava 2007 MT
	(Based on 25% loss)
Total Production (Fresh Weight)	155289
Losses	423442.5
Production Available for Consumption	1270328
Domestic Utilization	370190.5
Surplus	900137
Cereal Equivalent (30% of production available)	381098.4

Source: Survey data, 2008