# LIBERIA ANNUAL FOOD CROP PRODUCTION SURVEY 2014 AND 2015 HIES COMPONENT

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# Survey Objectives and Methodology

## A Objective

The immediate objectives of the survey are as follows:

- Assess the current levels of farming households and population;
- Provide gender-disaggregated agricultural statistics on key agricultural activities;
- Provide statistics for locally produced commodities;
- Develop a "user-friendly" agricultural database to include major indicators for PRS and food security

### *Terms and Definition*

**Enumeration Area (EA) -** a geographical area delineated by the Liberia Institute for Statistics and Geo-Information Services (LISGIS) in the 2008 National Population and Housing Census. Each EA may contain one or more towns/villages with 75 – 125 households.

**Building -** any kind of structure or house made of bricks, stone, timber /wood, cement, mat or mud with a roof made of thatch, zinc, concrete where People live or may live.

**Town/Village** - one or more building grouped together having a distinct name and a chief.

**Household -** a group of persons living together and eating from the same pot regardless of whether they live in one building and are responsible to the Same head.

**Head of Household (HoH) -** the person responsible for providing the daily needs for member households. In the decision of food security, they share with their spouse (if any) the long- term hopes and fears for the availability of household supplies.

**Agricultural Household (AH) -** a household in which any member is actively growing crop(s) or raising livestock or poultry**.**

**Agricultural Population (AP)** - all people residing permanently in the agricultural households including those temporarily absent for less than three months and excluding visitors in the household for less than three months.

**Holder -** any member of a household who operates a farm in his or her own right (means that the person is independent in making decisions concerning the operations regardless whether he/she owns the land, rent it from others or squats on it).

**Crop Mixture** - a combination of crops planted within the same plot. They do not need to be planted and harvested at the same time.

## B Methodology

The sample design for the 2014 and 2015 surveys was a multi-stage sampling. It embodied the following features: (a) Enumeration Areas (EAs) as the primary sampling units (PSUs), (b) Agricultural Holders (Ahs) within EA as the secondary sampling units (SSUs), (c) Holders' Rice Farms (HRFs) as the tertiary sampling unit, and (d) Experimental plots for crop-cut in selected farms as the ultimate stage-sampling unit. The sampling plan was adopted with each county as domain of study.

**Description of the Sampling Frame:** For the first stage of sampling, the basic frame consisted of a list of Enumeration Areas (EAs) from the Liberia Institute of Statistics and Geo-Information Services (LISGIS). These EAs were delineated as a result of the 2008 National Population and Housing Census. According to the 2008 frame, number of households for each EA was indicated and from this list, EAs were selected within county using systematic sampling. The sample was designed with a total sample size of 300 REAs for the country from the total of 4,500 rural EAs. The sample size was derived based on the amount of resources (time and money) available. However, the 2014 Crop Survey was conducted in only five (5) of the fifteen (15) counties (the southeastern region) with a total of 530 EAs.

For the second stage of sampling, the basic frame consisted of a list of holders. Enumeration areas, which were selected at the first stage of sampling, were canvassed; that is agricultural households counts were made within EA and recorded on a listing form. Based on the quick canvassing operations, a list of holders was prepared and the number of farms for each holder recorded. From the listing record of holders for each sample EA, a systematic sample of 10 holders was taken. The holders selected constituted the sample of farming households that were interviewed.

For the third stage sampling, the basic frame consisted of rice, cassava, and other vegetable gardens for holders selected at the second stage. The 10 holder farms for each crop were measured but crop cut was to be carried out only on the rice and cassava farms.

For the ultimate stage of sampling, the basic frame consisted of a list of all upland rice and **ready for harvest** cassava farms selected at the third stage for measurement and crop-cut. Without replacement, the farms selected constituted the sample of farms for yield estimates. Conventional survey method was used with a well-prepared questionnaire and forms including field manual. Different forms and questionnaires used include Enumeration Area Listing Form, Farm Measurement Form, Holders and Crop Cutting Questionnaires.

**Area and Yield Measurements:** Enumerators were provided with GPSs which were used to take measurements of the farms by taking coordinates of the parameters of the farms. Circular plots were laid using a radius of 3 meters long each for rice and for

cassava. The entire crops in the sample plots in each farm were carefully harvested in a single day. The total harvests were weighed and the weight recorded using drying method for rice. Fresh weight for cassava was taken. The formula used for estimating production per unit area (Yield) is:

$$X_i = \frac{W}{(1-\alpha) * S}$$

Where:

$X_i$ = yield of the $i^{th}$ farmer;

W = Weight of the crops harvested from the sample plot. In the case of the rice, it is the dry weight and fresh weight for cassava;

$\alpha$ = share of the area of the sample plot harvested before the crop cut;

$S$ = Size of the sample plot, which is equal to 28.274334 square meters

The production per household is obtained by multiplying the yield by the total land area cultivated for rice or cassava.

### *Estimation of Characteristics*

The objective is to estimate the value **Yc** of the characteristics for each county in which the survey was conducted. In each county there are N enumeration areas (EAs) and a systematic sample of **n** EAs was taken. The frame and selection of primary sampling units (**n)** are based on the 2008 population and housing census data. Unfortunately, some localities listed in the sample EAs were found non-existent and some of sample units are urban EAs. Thus, the formula to estimate **Yc** of the total value of the characteristics $y_{ij}$ for the first stage sample for the county **Yc** is:

$$Yc = (N/n)\,(Fc) \sum \sum y_{ij},$$

Where

N = Total number of sample enumeration areas (EAs) in the county
n = Number of sample enumeration areas (EAs) in a county (PSU)
Fc = Value of the adjustment factor within county
$y_{ij}$ = True value or variable from objective measurement in the $j^{th}$ household of the $i^{th}$ primary sample unit.

At the level of secondary and tertiary sample units, the method of ratio estimation was used. The primary objective of this method is to obtain perfect precision by taking advantage of the correlation between two variables. In addition, it solved the problem of calculating a proportion or factor of compensating the loss information caused by non-respondent households.

## C Evolution of Rice and Cassava Production 2014 and 2015

Rice is the preferred staple food for the Liberian people with cassava as the major substitute. As shifting or slashing and burn cultivation on upland soil dominates the way in which rice and cassava are produced in the Country.

**Table #8 shows the trend in the production data for paddy rice and fresh cassava in the southeast from 2014 to 2016 crop season**. According to the data, the total production for rice in 2014 and 2015 was estimated at 20,270 metric tons and 26,150 metric tons respectively.

The average yield per hectare for rice for the two farming years (2014 and 2015) in the southeast was estimated at 1,210kg/ha and 570kg/ha respectively. The average yield for cassava for 2014 was 8,280kg/ha while in 2015 it was 2,650kg/ha.

Comparing farming households in the southeast counties, 2014 had a total of 48,617 while in 2015, there were only 37,973. This shows a difference of 10,645 farming household members that did not engaged in farming activities in these counties after the Ebola epidemic in Liberia

The 2015 covered the entire country and the production for rice and cassava was estimated at 175,580 metric tons and 453,370 metric tons respectively.

## 1. Introduction

This repot is based on the crop cutting survey for 2014, which is an integral part of the Household Income & Expenditure Survey for 2014 and is intended to provide production estimates for the two key staple crops in Liberia: Rice and Cassava.

In acknowledgment of the increasing demand for reliable agricultural data, the Government of Liberia through the Liberia Institute of Statistics and Geo-Information Services (LISGIS) in collaboration with the Ministry of Agriculture (MOA) took a positive step towards continuing the production of agricultural statistics. Crop productions data are considered to be one of the most important agricultural information for the monitoring of the Poverty Reduction Strategy (PRS) and Sustainable Development Goals (SDGs).

This publication is organized into three parts. Part A & B discusses the objectives and methodology of the survey. Part C presents analytical overview (national estimates) of the survey results for major food crops. It discusses the evolution of rice and cassava.

It also discusses gender differentiated agricultural households heads, educational levels of heads of households, members of agricultural households and activities status. Part three provides estimates at the county level. These estimates included rice and cassava

production; gender differentiated rice and cassava and vegetables producing households.

The 2014 crop cutting survey was conducted between July and September 2014 and covers a sample of 530 farming households in the southern counties. This Survey could not cover the entire country due to the Ebola epidemic in Liberia.

The 2015 was a rerun of the 2014. It covered the entire country and had a sample of 1680 farming households and was conducted in two phases as shown in table 1 below.

The current report aims at presenting farming households performance in the two-agriculture value chains covered by the surveys.

**Table 1 Linkages between the HIES and crop cut surveys**

| Agricultural Survey | Field Dates | Linkage with Household Survey |
|---|---|---|
| 2014 Crop Cut Survey | July – Sept 2014 | 2014 HIES |
| 2015 Crop Cut Survey | July – Sept 2015 (southern counties) | 2014 HIES |
| | Oct 2015 – Jan 2016 (rest of country) | |

## 2. Characteristics of agricultural households 2014

Agricultural households are households reported to be involved in agriculture activities through cultivating of land or ownership of livestock. Table 2 reports basic summary statistics for some key characteristics of agricultural households. These households consist on average of 5 members.

The table shows differences across regions in terms of households' human capital endowment. Agricultural households in Greater Monrovia, South Eastern B, South Eastern A, North Central and North Western regions have higher dependency ratio than households in the South Central region.

The great majority of agricultural household in Liberia are male-headed (Table 2). One fourth of household heads are female. Households in the South East B are larger than in the other regions. The average age of household heads is 43 years reflecting a relatively high level of experience in farming.

**Table 2. Basic household characteristics 2014**

| North Central | North Western | South Central | South Eastern A | South Eastern B | National |
|---|---|---|---|---|---|
| 4.5 | 4.4 | 4.6 | 4.6 | 5.2 | 4.6 |
| 3.4 | 3.3 | 3.6 | 3.4 | 4.0 | 3.5 |
| 1.1 | 1.2 | 1.0 | 1.1 | 1.2 | 1.1 |
| 41.3 | 44.8 | 42.6 | 43.2 | 44.4 | 43.0 |
| 0.3 | 0.3 | 0.2 | 0.2 | 0.3 | 0.3 |
| 0.4 | 0.2 | 0.3 | 0.2 | 0.2 | 0.3 |
| 0.2 | 0.2 | 0.1 | 0.2 | 0.1 | 0.2 |
| 0.2 | 0.4 | 0.3 | 0.3 | 0.4 | 0.3 |

Source: HIES. 2014

## 3. Farm Characteristics 2014

**There is a prevalence of smallholder farmers in Liberia**. Farming households in Liberia own on average 2 (two) farms. The average size of land cultivated per household is 0.7 hectares.

The distribution of land cultivated as presented in table 3 and figure 1 shows the prevalence of smallholder farmers in the country.

According to table 5 which shows the land area cultivated by quintile, less than two percent of agricultural households cultivate more than five hectares of land for farming. The top land quintile shows that land cultivations are smaller than 3 hectares.

**Table 3. Land area cultivated in hectare and allocation of land in 2014**

| | Grand gedeh | Grand kru | Maryland | Sinoe | River gee | Total |
|---|---|---|---|---|---|---|
| ***Number of farms cultivated (All farming households)*** | | | | | | |
| Total number of farms | 1.6 | 2.3 | 2.0 | 1.2 | 1.9 | 1.7 |
| Number of rice farms | 0.7 | 0.5 | 0.2 | 0.5 | 0.8 | 0.5 |
| Number of cassava farms | 0.8 | 1.4 | 0.9 | 1.1 | 1.1 | 1.0 |
| Number of rice farms cultivated- Rice HH only | 1.0 | 1.0 | 1.1 | 1.0 | 1.1 | 1.1 |
| Number of cassava farms cultivated- Cassava HH only | 1.2 | 1.5 | 1.7 | 1.2 | 1.3 | 1.4 |
| ***Land area cultivated in ha (GPS measurement)*** | | | | | | |
| Total land area cultivated (ha) | 0.7 | 0.9 | 0.6 | 0.8 | 1.0 | 0.7 |
| Land area cultivated per capiata (ha/capita) | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.2 |
| **Share of land area cultivated devote to** | | | | | | |
| Rice | 0.4 | 0.3 | 0.1 | 0.4 | 0.5 | 0.3 |
| Cassava | 0.3 | 0.5 | 0.3 | 0.5 | 0.4 | 0.4 |
| Other crops | 0.3 | 0.2 | 0.6 | 0.1 | 0.2 | 0.3 |
| **Land area (hectare) cultivated for (Households cultivating each crop only)** | | | | | | |
| Rice | 0.5 | 0.6 | 0.7 | 0.8 | 0.7 | 0.7 |
| Cassava | 0.3 | 0.4 | 0.5 | 0.3 | 0.4 | 0.4 |
| Other crops | 0.2 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 |

Source: HIES. 2014

### 3.1. Share of Rice farms cultivated by type 2014

**There is also a prevalence of intercropped amongst smallholder farmers.** Table 4 illustrates the share of rice farms cultivated by type by farming households in Liberia.

A total of 21 percent of agricultural households were not engage in the method of intercropping their rice farms for the year 2014. Of this total, six percent cultivated upland and fifteen percent cultivated lowlands for rice. Farmers engaged in the irrigation of land for rice production in the southeast of Liberia are less than four percent of all rice producing households.

**Table 4 Share of rice farms cultivated by Type in 2014**

| | Grand gedeh | Grand kru | Maryland | Sinoe | River gee | Total |
|---|---|---|---|---|---|---|
| Upland pure | 7% | 18% | 0% | 1% | 6% | **6%** |
| Upland mixed | 72% | 72% | 90% | 99% | 62% | **79%** |
| Rainfed swamp | 15% | 10% | 7% | 0% | 29% | **12%** |
| Irrigated swamp | 6% | 0% | 4% | 0% | 3% | **3%** |
| Total | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |

Source: HIES. 2014

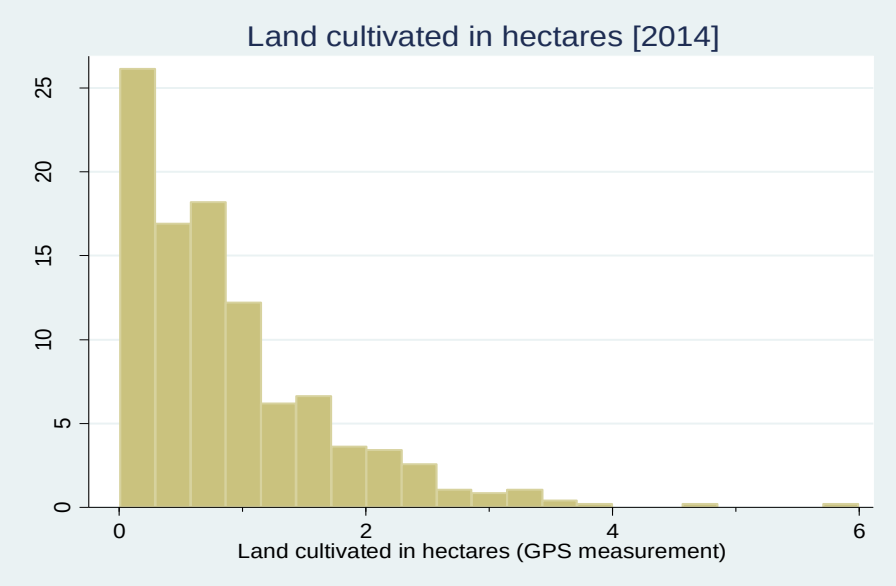


Figure1 Histogram of area of land cultivated by household in South Eastern region 2014

## 3.2. Land cultivated (hectare) by quintile of land area cultivated in 2014

Table 5 shows the area of land cultivated by quintiles. On average the smallest farms size are 0.05 hectare and as we move from smallest to largest farms, the farm size increased. Those with the largest farms cultivate on average less than 3 hectares of land for farming activities in Liberia.

Looking at the size of land cultivated for the Liberian stipples, farm size for rice are on average 0.5 hectare while for cassava it is 0.33 hectare.

**Table 5. Land cultivated (hectare) by quintile of land area cultivated in 2014**

| | Quintile of land area cultivated | | | | | Total |
|---|---|---|---|---|---|---|
| | Quintile 1 | Quintile 2 | Quintile 3 | Quintile 4 | Quintile 5 | |
| Total land area | 0.05 | 0.36 | 0.7 | 1.1 | 2.17 | 0.71 |
| Total land area cultivated per capita | 0.01 | 0.13 | 0.21 | 0.25 | 0.44 | 0.17 |
| *Share of land area cultivated devote to* | | | | | | |
| Rice | 0.03 | 0.27 | 0.4 | 0.49 | 0.48 | 0.29 |
| Cassava | 0.31 | 0.53 | 0.37 | 0.32 | 0.33 | 0.37 |
| Other crops | 0.66 | 0.21 | 0.23 | 0.19 | 0.19 | 0.34 |

Source: HIES. 2014

**Table 6** presents the incidence of crop cultivation by household and by county. As illustrated in the table, less than 50 percent on average of agricultural households in the southeast of the Country are engaged in rice production and less than 80 percent produces cassava. River Gee has the highest percentage of rice producing households followed by Grand Gedeh, Grand Kru, Sinoe, and Maryland. For households engaged in the production of cassava, Sinoe has the highest followed by Grand Kru, River Gee and Grand Gedeh.

Maryland is least with both rice and cassava producing households. The table shows that 62% of agricultural households are engaged on vegetables production. This is 15% more than rice producing households and 12% less than cassava producing households in the County.

**Table 6. Incidence of crop cultivation by household in 2014 (Share of households)**

| Crops | Grand gedeh | Grand kru | Maryland | Sinoe | River gee | Total |
|---|---|---|---|---|---|---|
| Rice | 63% | 54% | 19% | 49% | 75% | 47% |
| Cassava | 70% | 93% | 54% | 94% | 84% | 74% |
| Corn/Maize | 35% | 36% | 8% | 27% | 22% | 24% |
| Other tubers/roots | 32% | 39% | 21% | 15% | 19% | 24% |
| Legumes/oil & nuts | 4% | 6% | 4% | 5% | 2% | 4% |
| Fruits | 24% | 68% | 26% | 26% | 27% | 30% |
| Vegetables | 68% | 59% | 62% | 60% | 54% | 62% |
| Permanent cash crops | 7% | 32% | 16% | 0% | 16% | 12% |
| Other crops | 6% | 0% | 14% | 0% | 4% | 6% |

*Source: HIES. 2014*

## 4. Rice and cassava production

The year 2014 was a tough year for everyone in Liberia. The farming households were no exception. There were some who were affected by either of the farming activities: **Clearing of land**, **planting of rice seeds** or **cassava cuttings**, **farm management** or **harvesting** due to the Ebola epidemic.

The table below shows the number of farming households by gender from the five counties in the southeastern region of the country. According to the table, male households constitute 77% of the total farming households in the southeast of Liberia. From the total of 48,617 farming households, Grand Gedeh has the highest of 14,381 or 30% follow by Maryland with 28%, Sinoe with 18%, River Gee with 13% and the county with least farming households is Grandkru with 11%

**Table 7 Number of farming households by gender and county 2014**

| County | Total | Male headed Hhs | | Female headed Hhs | |
|---|---|---|---|---|---|
| | | number | Percent | number | Percent |
| Grand gedeh | 14,381 | 10,412 | 72% | 3,969 | 28% |
| Grand kru | 5,468 | 3,751 | 69% | 1,717 | 31% |
| Maryland | 13,583 | 11,192 | 82% | 2,391 | 18% |
| Sinoe | 8,665 | 7,746 | 89% | 918 | 11% |
| River gee | 6,520 | 4,551 | 70% | 1,969 | 30% |
| Total | 48,617 | 37,629 | 77% | 10,987 | 23% |

## 4.1. Trend of Rice and cassava production 2014-2016

The following table presents trend of production for 2014 to 2016 on the two main food crops in the country for the southeastern region. This comparison is based on the fact that we were only able to conduct the survey in these counties in 2014 due to the Ebola Epidemic and will like to follow the trend.

The average yield for rice reduced in 2015 by 640kg/ha (-52%) but increased by 50kg/ha (3.9%) in 2016 when compare to 2014 farming year.

The 2016 yield for rice increased by 1,259kg/ha when compared to the 2015 year. Production for rice for the year 2015 increased by 5,880 (22.5%) metric tons when compared to the 2014 year.

The production for 2016 which was based on farmers estimates shows an increase of more than 100% when compare to 2014. This production also increased by 36% when compare to the 2015 farming year.

The average yield per hectare for cassava dropped by 5,630 kg/ha in 2015 as compare to 2014 when it was 8,280kg/ha for the five counties. The production also reduced by 27,770 (26.6%) metric tons in 2015. This trend also followed the 2016 farming year where we see that both the yield and production reduced by 2,580kg/ha (31.2%) and 19,580 (18.8%) metric tons when compare to 2014. However, the 2016 average yield increased by 3,050kg/ha and production increased by 8,190 metric tons when compare to the 2015 farming year.

**Table 8 Trend of Rice and Cassava production 2014 - 2016 (SOUTHEAST REGION)**

| | Rice 2014 | | | Rice 2015 | | | Rice 2016 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ave. Yield (Kg/Ha) | Ha | Production (MT) | Ave. Yield (Kg/Ha) | Ha | Production (MT) | Ave. Yield (Kg/Ha) | Ha | Production (MT) |
| **Total** | 1,210 | 15,510 | 20,270 | **570** | **19,270** | **26,150** | **1,260** | 32,280 | 40,670 |
| Grand Gedeh | 1,500 | 4,800 | 7,200 | 430 | 3,350 | 3,700 | 1.26 | 0.85 | 9,610 |
| Grand Kru | 1,070 | 1,890 | 2,020 | 810 | 4,270 | 6,260 | 1.26 | 0.85 | 8,210 |
| MaryLand | 1,430 | 1,880 | 2,690 | 180 | 740 | 1,020 | 1.26 | 0.85 | 6,090 |
| Sinoe | 480 | 3,380 | 1,620 | 310 | 5,910 | 3,060 | 1.26 | 0.85 | 10,600 |
| RiverGee | 1,890 | 3,570 | 6,740 | 2,110 | 4,800 | 12,110 | 1.26 | 0.85 | 6,160 |
| | **Cassava 2014** | | | **Cassava 2015** | | | **Cassava 2016** | | |
| **Total** | **8,280** | **12,510** | **104,230** | **2,650** | **10,760** | **76,460** | 5,700 | 14,850 | 84,650 |
| Grand Gedeh | 9,630 | 2,560 | 24,650 | 610 | 630 | 5,460 | 5.70 | 0.40 | 20,010 |
| Grand Kru | 7,060 | 2,110 | 14,910 | 3,590 | 2,870 | 27,730 | 5.70 | 0.40 | 17,090 |
| MaryLand | 8,400 | 3,290 | 27,600 | 1,450 | 1,220 | 8,220 | 5.70 | 0.40 | 12,680 |
| Sinoe | 6,760 | 2,310 | 15,630 | 5,120 | 4,900 | 20,930 | 5.70 | 0.40 | 22,060 |
| RiverGee | 9,560 | 2,240 | 21,440 | 2,460 | 1,140 | 14,120 | 5.70 | 0.40 | 12,820 |

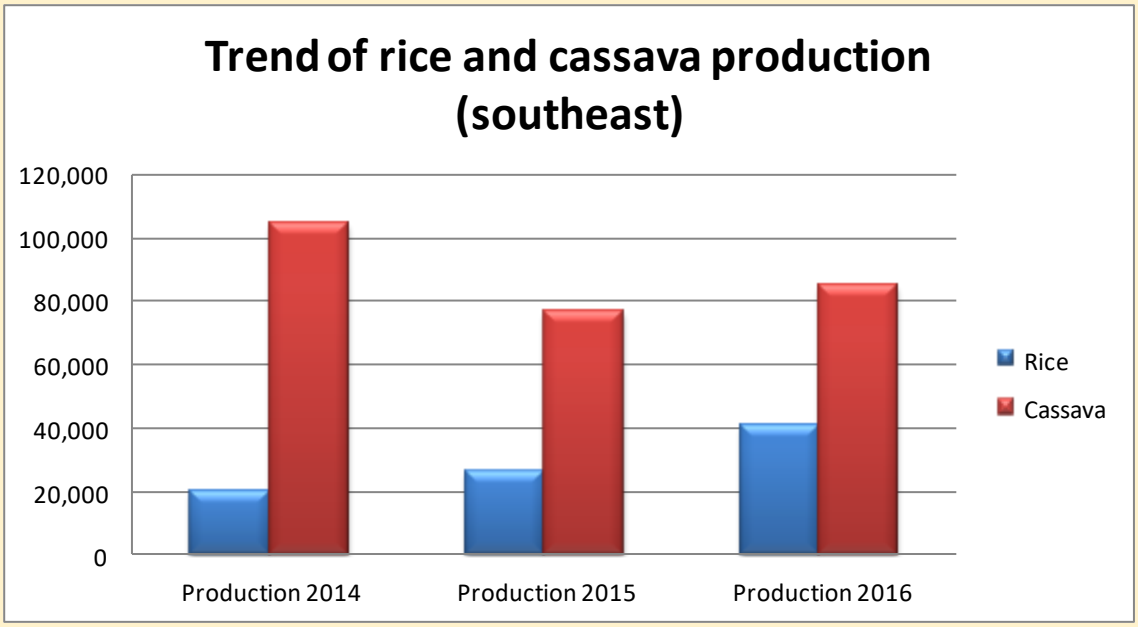


**Figure 2 Trend of Rice and cassava production (Southeast)**

## 4.2. Rice Yields and production by county 2014

The below tables illustrate the estimated production of rice and cassava (Liberian Stipples).

Table 9 shows that a total of 20,270 metric tons of rice was produced by the five Counties in the Southeast for 2014. Of this total, Grand Gedeh came highest with 7,200 metric tons followed by River Gee, Maryland, GrandKru and the least is Sinoe.

On average the yield in Metric tons per household by county is also illustrated in the table, Households in RiverGee harvested more than one metric ton, followed by households in Grand Gedeh with half a metric ton. The remaining three counties harvested less than half metric ton per household on average.

**Table 9 Estimated rice production in south Eastern regions in 2014**

| Counties | Number of farming households | Average area/household (ha) | Average yield/ha (MT) | Average yield/ household (MT) | Total Production (MT) |
|---|---|---|---|---|---|
| Grand gedeh | 14, 381 | 0.33 | 1.5 | 0.5 | 7,200 |
| Grand kru | 5, 468 | 0.35 | 1.07 | 0.37 | 2, 020 |
| Maryland | 13, 583 | 0.14 | 1.43 | 0.2 | 2,690 |
| Sinoe | 8, 665 | 0.39 | 0.48 | 0.19 | 1, 620 |
| River gee | 6, 520 | 0.55 | 1.89 | 1.03 | 6,740 |
| **Total** | **48, 617** | **0.35** | **1.27** | 0.46 | **20,270** |

Source: HIES. 2014

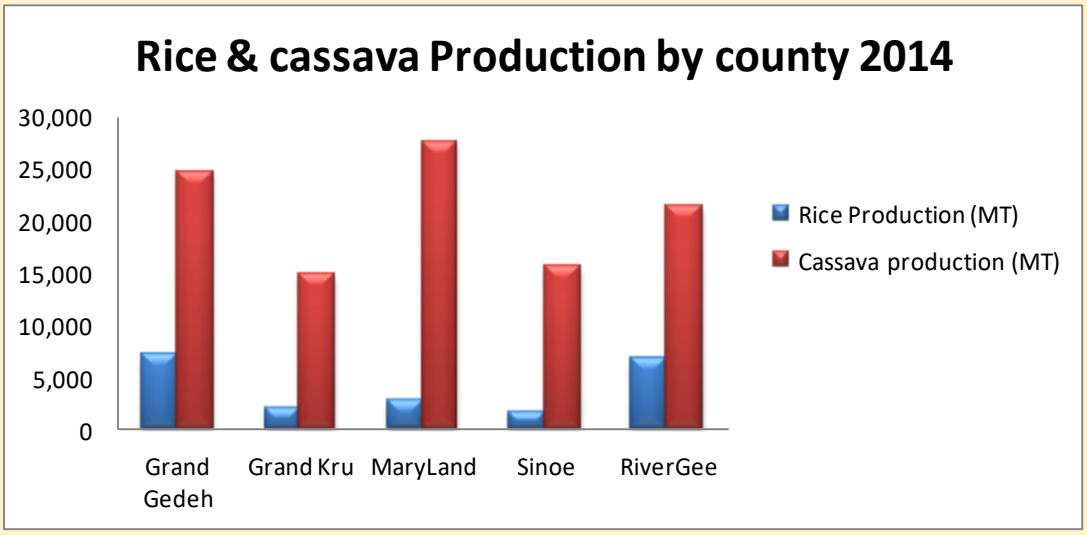


**Figure 3 Rice and cassava production in the Southeast (2014)**
Source: HIES. 2014

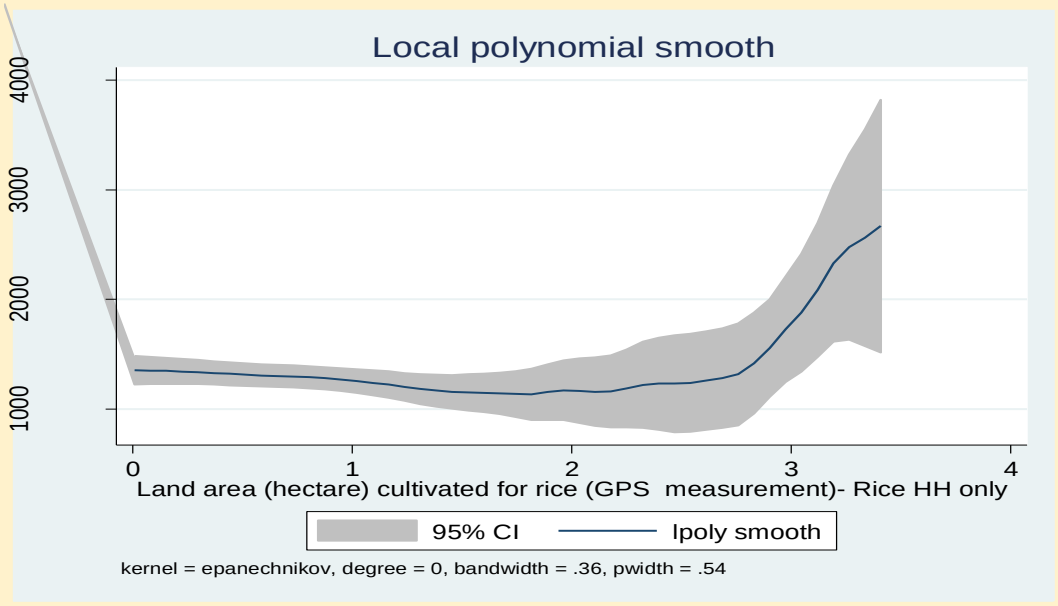


Figure 4 Local linear non-parametric regression of rice yield by land area cultivated in 2014

*Source: HIES. 2014*

As illustrated in **table 10,** there were 48,617 farming households in the five southeastern counties for the 2014 farming activities. A total of 104,230 metric tons of cassava was produced from the south east in 2014, Maryland, Grand Gedeh and RiverGee produced 27%, 24% and 21% of the total production respectively.

Sinoe and GrandKru produced the least representing 15% and 14% of the total respectively.

**Table 10 Estimated cassava production in south Eastern regions in 2014**

| Counties | Number of farming households | Average area/household (ha) | Average yield/ha (MT) | Average yield/ household (MT) | Total Production (MT) |
|---|---|---|---|---|---|
| Grand gedeh | 14, 381 | 0.178 | 9.63 | 1.71 | 24,650 |
| Grand kru | 5, 468 | 0.386 | 7.06 | 2.73 | 14,910 |
| Maryland | 13, 583 | 0.242 | 8.4 | 2.03 | 27,600 |
| Sinoe | 8, 665 | 0.267 | 6.76 | 1.8 | 15,630 |
| River gee | 6, 520 | 0.344 | 9.56 | 3.29 | 21,440 |
| Total | **48, 617** | | | | **104,230** |

*Source: HIES. 2014*

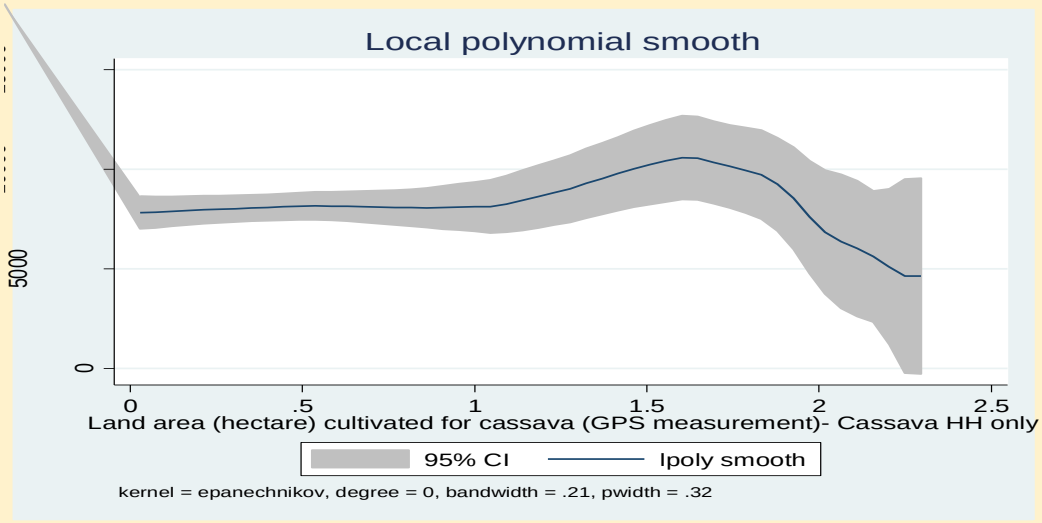


Figure 5 Local linear non-parametric regression of cassava yield by land area cultivated in 2014

*Source: HIES. 2014*

## 5. Use of modern inputs for rice production 2014

The use of modern inputs of rice seeds and technology by farmers in the county is one source to determine whether farmers are graduating from one level to the next. The method of farming or the inputs used should not be limited to a particular kind.

The table below shows that 96% of rice producing households either do not have access to improved seeds or are not educated enough on how to use improved seeds even if the seeds are available. Above 90% of producing rice in each county used traditional seeds.

**Table 11 Type of rice seeds planted by rice households in 2014**

| Counties | Type of rice seeds used for rice production | |
|---|---|---|
| | Traditional seeds | Lac rice seeds |
| Grand gedeh | 92% | 8% |
| Grand kru | 100% | 0% |
| Maryland | 95% | 6% |
| Sinoe | 100% | 0% |
| River gee | 97% | 3% |
| Total | 96% | 4% |

*Source: HIES. 2014*

## 5.1 Share of Households involved in Fruits and vegetables Production 2014

Table 12 shows the percentage of farming households that are involved in the production of fruits and vegetables for the 2014 farming season in the Southeast. As indicated in the table, Pepper is the most grown vegetable in the southeast part of Liberia. This is followed by bitter balls, and Okra. For fruits, plantain ranked the highest followed by banana and pineapple. 51 percent of the farming household in Grand Gedeh are engaged in pepper production, 27.7 and 27.1 percent are from RiverGee and Sinoe respectively. Maryland and GrandKru have 21.6 percent each of their farming households producing pepper for the 2014 farming Year.

Grand gedeh again ranked the highest with 33.8 of its households when it comes to the production of Bitter balls, while Maryland has more of its households (27.8) engaged in okra production.

**Table 12 Share of households involved in Fruits and Vegetables production 2014**

| | Grand Gedeh | Grand Kru | Maryland | Sinoe | River Gee | Total |
|---|---|---|---|---|---|---|
| Cassava | 69.5 | 93.1 | 54.8 | 94 | 83.7 | 74.3 |
| corn/maize | 31.5 | 35.9 | 7.8 | 26.6 | 16.8 | 22.2 |
| eddoes | 19.7 | 23.8 | 20.6 | 9.6 | 10.7 | 17.3 |
| rice/paddy | 62.7 | 53.8 | 19.5 | 48.8 | 75.4 | 47.3 |
| sweet potatoes | 13.5 | 10.5 | 3.2 | 5 | 2.3 | 7.1 |
| yams | 1.6 | | 3 | | | 1.4 |
| palm nuts | 28.1 | 1 | | | | 1 |
| banana | 7.1 | 12.2 | 9.3 | 9.6 | 4.6 | 8.5 |
| orange | 1.13 | 2.27 | | | | 0.6 |
| papaw | 2.19 | 2.53 | 5.85 | | 1.27 | 2.8 |
| pineapple | 5.42 | 5.7 | 3 | 2.6 | 1.2 | 5.2 |
| plantain | 10 | 58.6 | 14.8 | 16.6 | 19.4 | 19 |
| bitterballs | 33.8 | 15.3 | 18.3 | 17.8 | 19.7 | 22.3 |
| cucumber | 5.2 | 4.7 | 6.8 | 14.7 | 4.1 | 7.5 |
| egg plant | 18.3 | 5.9 | 10.7 | 3.1 | 19.1 | 11.6 |
| kitilay | 4.3 | 1.9 | | 2.1 | | 2.3 |
| okra | 10.9 | 27.3 | 27.8 | 17.1 | 17.6 | 19.8 |
| pepper | 50.8 | 21.6 | 21.6 | 27.1 | 27.7 | 31.5 |
| pumpkins | 19.3 | 8.8 | 4.2 | 7.9 | 17.1 | 11 |
| sugar cane | 2.5 | 11.1 | 4.1 | | 7 | 3.9 |
| Observations | 466 | | | | | |

# 6.0 Farm Characteristics 2015

The 2015 survey on food crop and livestock covered the entire country and served as a rerun of the 2014 which was erupted by the Ebola virus. It started in July with crop cut

activities in the Southeast and continued in October with the rest of the county due to the seasonal harvest time in Liberia.

## 6.1 Number of farms cultivated by households for farming activities

With the exception of Grand Kru, Nimba, Bong and Lofa Counties, agricultural households in the country cultivate at most one farm on average for farming activities.

The table #13 below also distributes the number of farms cultivated for rice and cassava households by county. Accordingly, all rice households cultivate only one farm per year. Except Grand Kru County with at most two cassava farms, cassava households on average cultivate one farm per year.

**Table 13 Number of farms cultivated by county in 2015**

| counties | Total # of farms | # of Rice farms cultivated | | # of cassava farms cultivated | |
|---|---|---|---|---|---|
| | | All HH | Rice HH only | All HH | Cassava HH only |
| Bomi | 1.18 | 0.38 | 1.03 | 0.91 | 1.04 |
| Bong | 1.53 | 0.72 | 1.03 | 0.55 | 1.17 |
| Grand Bassa | 1.26 | 0.26 | 1.02 | 0.78 | 1.14 |
| Grand Cape Mount | 1.19 | 0.63 | 1 | 0.91 | 1.09 |
| Grand Gedeh | 1.32 | 0.75 | 1.07 | 0.5 | 1 |
| Grand Kru | 2.3 | 0.75 | 1 | 1.41 | 1.54 |
| Lofa | 1.57 | 1.04 | 1.07 | 0.32 | 1.03 |
| Margibi | 1.25 | 0.19 | 1.04 | 0.58 | 1.18 |
| Maryland | 1.94 | 0.4 | 1.08 | 0.91 | 1.5 |
| Montserrado | 1.36 | 0.19 | 1 | 0.67 | 1.11 |
| Nimba | 1.62 | 0.69 | 1.06 | 0.75 | 1.15 |
| River Cess | 1.12 | 0.79 | 1 | 0.81 | 1.08 |
| Sinoe | 1.43 | 0.84 | 1 | 1.25 | 1.26 |
| River Gee | 1.39 | 1 | 1.1 | 0.6 | 1.08 |
| Gbarpolu | 1.06 | 0.46 | 1 | 0.53 | 1.02 |
| **National** | 1.44 | 0.61 | 1.04 | 0.72 | 1.16 |

*Source: Crop cut 2015*

## 6.2 Share of Rice farms cultivated by type 2015

Table #14 illustrates the share of rice farms cultivated by type and by farming households for 2015 in Liberia. A total of 18 percent of agricultural households in the country were not engage in the method of intercropping their rice farms for the year 2015. Of this total, six percent cultivated upland and twelve percent cultivated lowlands for rice.

Farmers engaged in the irrigation of land for rice production in Liberia were less than four percent of all rice producing households. Nationally 82% of agricultural households intercropped their rice farms.

All rice producing households in Bomi and Sinoe counties intercropped their farms. Less than five percent of all rice-producing households irrigate their farms

**Table 14 Share of rice farms cultivated by Type in 2015**

| Counties | Upland pure | Upland mixed | Rainfed swamp | Irrigated swamp | Total |
|---|---|---|---|---|---|
| Bomi | 0% | 100% | 0% | 0% | 100% |
| Bong | 16% | 66% | 11% | 7% | 100% |
| Grand Bassa | 0% | 83% | 17% | 0% | 100% |
| Grand Cape Mount | 0% | 94% | 6% | 0% | 100% |
| Grand Gedeh | 11% | 74% | 4% | 11% | 100% |
| Grand Kru | 5% | 85% | 10% | 0% | 100% |
| Lofa | 6% | 78% | 10% | 7% | 100% |
| Margibi | 0% | 94% | 6% | 0% | 100% |
| Maryland | 5% | 87% | 2% | 5% | 100% |
| Montserrado | 0% | 77% | 23% | 0% | 100% |
| Nimba | 13% | 80% | 6% | 2% | 100% |
| River Cess | 0% | 82% | 19% | 0% | 100% |
| Sinoe | 0% | 100% | 0% | 0% | 100% |
| River Gee | 6% | 74% | 19% | 0% | 100% |
| Gbarpolu | 7% | 93% | 0% | 0% | 100% |
| **National** | 6% | 82% | 9% | 3% | 100% |

Source: HIES. 2014

## 6.3 Land area cultivated in hectare and allocation of land in 2015

For the year under review, the total average size of land area cultivated nationally was (1.5) one and half hectares. Of this total, 0.4 hectare each was allocated for the production of rice and other crops. 0.3 hectare was allocated for the production of cassava.

There are households who cultivate land for the production of only one crop. On Average, 0.90 hectare of land is cultivated for rice, 0.40 hectare for cassava and 0.33 hectare for rice. The table #15 also shows the average size of land cultivated by county. Accordingly, households in Bong, Grand Kru, Lofa, Nimba, and River Gee Counties cultivated a little more than one hectare of land for farming. Households in Grand Cape Mount on average cultivated one hectare of land for farming activities. The rest of households cultivated on average less than one hectare.

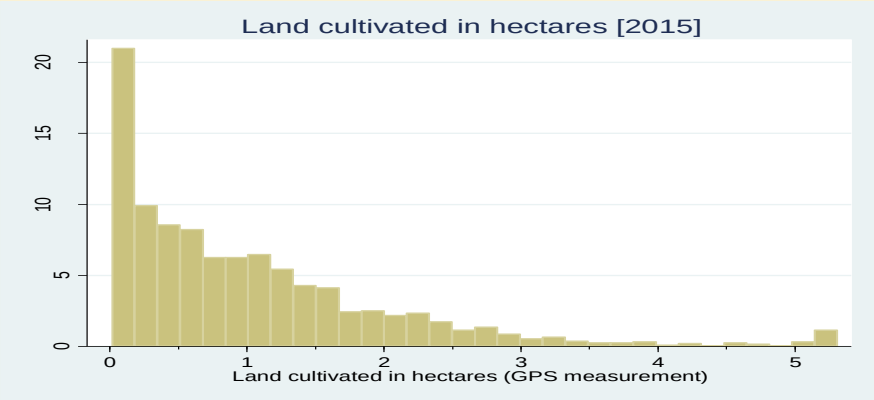


Figure 6. Land cultivated in hectares by farming households

**Table 15 Land area cultivated in hectare and allocation of land in 2015**

| | Total land area cultivated (ha) | | Share of land area cultivated devote to | | | Land area (hectare) cultivated for (HH cultivating each crop only) | | |
|---|---|---|---|---|---|---|---|---|
| Counties | Total/Household | Area per capita | Rice | Cassava | Other crops | Rice | Cassava | Other crops |
| Bomi | 0.9 | 0.27 | 0.27 | 0.49 | 0.24 | 1.14 | 0.39 | 0.14 |
| Bong | 1.28 | 0.38 | 0.52 | 0.21 | 0.27 | 1.14 | 0.36 | 0.32 |
| Grand Bassa | 0.69 | 0.22 | 0.15 | 0.42 | 0.43 | 0.83 | 0.43 | 0.18 |
| Grand Cape Mount | 1 | 0.29 | 0.47 | 0.37 | 0.16 | 0.97 | 0.34 | 0.11 |
| Grand Gedeh | 0.7 | 0.19 | 0.55 | 0.18 | 0.26 | 0.68 | 0.17 | 0.14 |
| Grand Kru | 1.29 | 0.3 | 0.41 | 0.37 | 0.22 | 0.74 | 0.45 | 0.32 |
| Lofa | 1.47 | 0.47 | 0.64 | 0.04 | 0.32 | 0.9 | 0.21 | 0.55 |
| Margibi | 0.68 | 0.25 | 0.1 | 0.28 | 0.62 | 1.03 | 0.37 | 0.32 |
| Maryland | 0.98 | 0.2 | 0.15 | 0.28 | 0.57 | 0.72 | 0.55 | 0.38 |
| Montserrado | 0.65 | 0.03 | 0.12 | 0.41 | 0.48 | 0.92 | 0.37 | 0.24 |
| Nimba | 1.52 | 0.57 | 0.33 | 0.19 | 0.49 | 0.79 | 0.35 | 0.78 |
| River Cess | 0.5 | 0.14 | 0.54 | 0.31 | 0.15 | 0.36 | 0.17 | 0.08 |
| Sinoe | 1.34 | 0.36 | 0.44 | 0.42 | 0.14 | 0.75 | 0.49 | 0.22 |
| River Gee | 1.32 | 0.32 | 0.66 | 0.15 | 0.19 | 0.91 | 0.34 | 0.31 |
| Gbarpolu | 0.98 | 0.3 | 0.36 | 0.3 | 0.34 | 1.31 | 0.23 | 0.26 |
| National | 1.06 | 0.33 | 0.38 | 0.28 | 0.35 | 0.88 | 0.36 | 0.33 |

## 6.4 Quintile of land area cultivated 2015

The land area cultivated by farming households is shown in table 16 by quintile. On average, the size of land cultivated in 2015 was 1.06 hectares. Again as shown in table #5 of section 1.3, the smallest farm size are on average 0.05 hectare.

The largest farm size for the 2015 farming activities increased by 0.71 (25%) on average compare to the 2014 year. The largest farm size was less than three (3) hectares

**Table 16. Quintile of land area cultivated in 2015**

| | Quintile of land area cultivated | | | | | |
|---|---|---|---|---|---|---|
| | **Quintile 1** | **Quintile 2** | **Quintile 3** | **Quintile 4** | **Quintile 5** | **Total** |
| Total land area | 0.05 | 0.34 | 0.75 | 1.29 | 2.88 | 1.06 |
| Total land area cultivated per capiata | 0.02 | 0.12 | 0.23 | 0.38 | 0.86 | 0.33 |
| *Share of land area cultivated devote to* | | | | | | |
| Rice | 0.03 | 0.31 | 0.51 | 0.54 | 0.5 | 0.38 |
| Cassava | 0.3 | 0.43 | 0.25 | 0.22 | 0.18 | 0.28 |
| Other crops | 0.67 | 0.27 | 0.24 | 0.24 | 0.32 | 0.35 |

# 7.0 Rice and Cassava Production 2015

## 7.1 Rice Production

As mentioned in the introduction of this report, the 2015 survey on food crop and livestock covered the entire country and served as a rerun of the 2014, which was erupted by the Ebola virus. The process started in the Southeast and moved to the rest of the country based on the clearing, planting and harvest seasons in Liberia.

Table#17 shows the distribution of farming households, yields and production by County for the 2015-farming year. From a total of 175,881 metric tons of rice produced in the country, Lofa ranked the highest with 51,048 metric tons followed by Bong and Nimba counties with 33,955 and 31,254 metric tons respectively.

Cape Mount produced 17,058 metric tons while RiverGee produced 12,049 metric tons. The production for the remaining counties ranged from 1,028 metric tons to 6,245metric tons of rice.

**Table 17 Rice production by county 2015**

| Counties | Number of farming households | Average area/household (ha) | Average yield/ha (MT) | Average yield/ household (MT) | Total Production (MT) |
|---|---|---|---|---|---|
| Bomi | 12 498 | 0.33 | 0.72 | 0.24 | 2,995 |
| Bong | 53 885 | 0.77 | 0.82 | 0.63 | 33,965 |
| Grand Bassa | 22 294 | 0.16 | 0.98 | 0.15 | 3,425 |
| Cape Mount | 23 444 | 0.54 | 1.34 | 0.73 | 17,058 |
| Grand Gedeh | 8 956 | 0.37 | 1.14 | 0.43 | 3,811 |
| Grand Kru | 7 725 | 0.55 | 1.46 | 0.81 | 6,245 |
| Lofa | 38 883 | 0.83 | 1.57 | 1.31 | 51,048 |
| Margibi | 15 668 | 0.11 | 0.93 | 0.10 | 1,590 |
| Maryland | 5 677 | 0.13 | 1.38 | 0.18 | 1,028 |
| Montserrado | 17 061 | 0.14 | 0.78 | 0.11 | 1,836 |
| Nimba | 74 658 | 0.49 | 0.86 | 0.42 | 31,254 |
| River Cess | 8 491 | 0.33 | 1.47 | 0.48 | 4,059 |
| Sinoe | 9 874 | 0.60 | 0.51 | 0.31 | 3,032 |
| River Gee | 5 741 | 0.84 | 2.52 | 2.11 | 12,049 |
| Gbarpolu | 7 459 | 0.54 | 0.54 | 0.29 | 2,186 |
| National | 312 314 | | | | **175,581** |

## 7.2 Cassava Production

Cassava is Liberian second choice of food. Most farming household grow cassava as a source of earnings and also for consumption. Cassava can be consumed by the

household in many ways: We have value addition products like farina, fufu, dippa among others.

Table #18 presents a total production of 453,377 metric tons of cassava for the 2015 farming year. Of this total, Nimba produced the highest of 68,796metric tons follow by, Cape Mount, Sinoe, Bong, Grand Bassa and Lofa with **62,756** metric tons, **50,554 metric tons**, **44,393 metric tons**, **37,609 metric tons**, and **29,112** metric tons respectively.

For the average yield per household, GrandKru came first with 3,590kg/ha follow by Grand Cape Mount with 2,680kg/ha, RiverGee with 2,460kg/ha, Sinoe with 2,120kg/ha, Bong with 1,690kg/ha and Maryland with1,450kg/ha. The remaining Counties ranged from 0.32kg/ha to 0.92kg/ha

**Table 18 Cassava production by County 2015**

| Counties | Number of farming households | Average area/household (ha) | Average yield/ha (MT) | Average yield/ household (MT) | Total Production (MT) |
|---|---|---|---|---|---|
| Bomi | 12 498 | 0.40 | 12.22 | 4.83 | 60,328 |
| Bong | 53 885 | 0.18 | 4.68 | 0.82 | 44,393 |
| Grand Bassa | 22 294 | 0.21 | 7.88 | 1.69 | 37,609 |
| Cape Mount | 23 444 | 0.28 | 9.50 | 2.68 | 62,756 |
| Grand Gedeh | 8 956 | 0.07 | 8.70 | 0.61 | 5,462 |
| Grand Kru | 7 725 | 0.37 | 9.66 | 3.59 | 27,707 |
| Lofa | 38 883 | 0.07 | 11.30 | 0.75 | 29,112 |
| Margibi | 15 668 | 0.15 | 4.46 | 0.67 | 10,538 |
| Maryland | 5 677 | 0.21 | 6.75 | 1.45 | 8,206 |
| Montserrado | 17 061 | 0.22 | 5.97 | 0.32 | 22,503 |
| Nimba | 74 658 | 0.20 | 4.50 | 0.92 | 68,796 |
| River Cess | 8 491 | 0.13 | 7.05 | 0.92 | 7,802 |
| Sinoe | 9 874 | 0.50 | 10.31 | 2.12 | 50,554 |
| River Gee | 5 741 | 0.20 | 12.43 | 2.46 | 14,070 |
| Gbarpolu | 7 459 | 0.11 | 4.24 | 0.47 | 3,540 |
| National | 312 314 | | | | **453,377** |

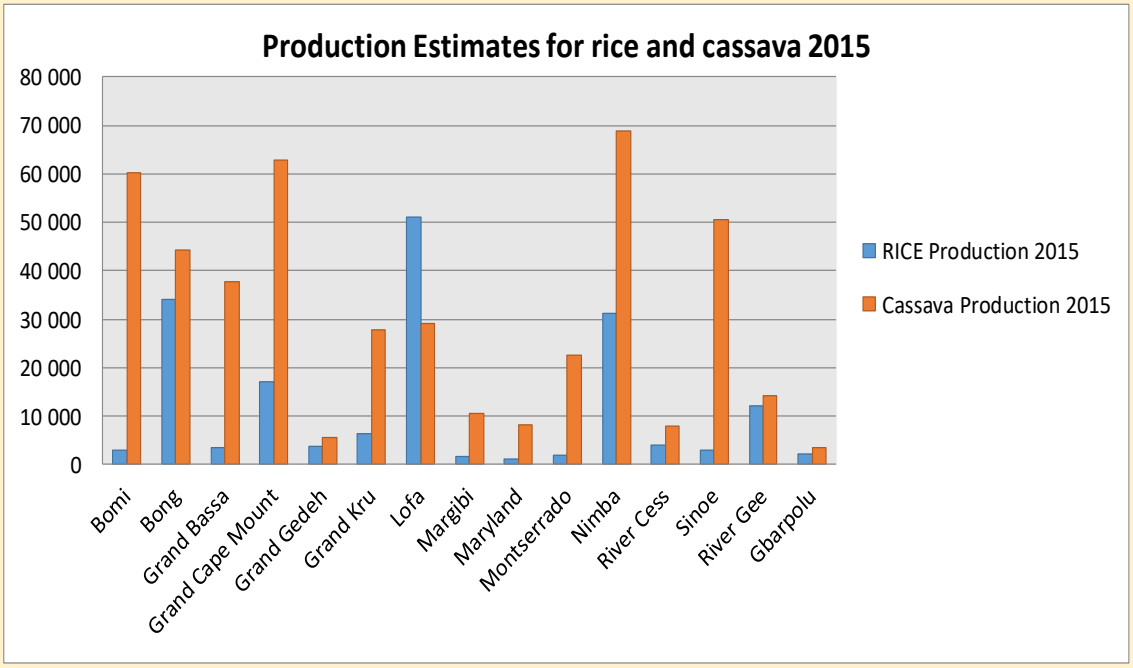


***Figure 7. Production Estimates for Rice and Cassava 2015***

## 8.0 Use of modern inputs for rice production 2015

As discussed in table 11 of section 2.3, the survey also looked at the use of modern inputs in 2015. Even though the analysis in table 11 was the results gathered from only five Counties in the southeast, table 19 also shows that nationally 92% of rice producing households used traditional seeds while only 8% decided to venture into the use of improved seeds.

**Table19. Type of rice seeds used by farming households 2015**

| | Type of rice seeds | | | |
|---|---|---|---|---|
| **County** | **Traditional seeds** | **Lac seeds** | **Rok seeds** | **Nerika seeds** |
| Bomi | 94% | 6% | 0% | 0% |
| Bong | 96% | 4% | 0% | 0% |
| Grand Bassa | 100% | 0% | 0% | 0% |
| Grand Cape Mount | 100% | 0% | 0% | 0% |
| Grand Gedeh | 97% | 3% | 0% | 0% |
| Grand Kru | 96% | 4% | 0% | 0% |
| Lofa | 62% | 23% | 12% | 2% |
| Margibi | 91% | 9% | 0% | 0% |
| Maryland | 100% | 0% | 0% | 0% |
| Montserrado | 100% | 0% | 0% | 0% |
| Nimba | 100% | 1% | 0% | 0% |
| River Cess | 100% | 0% | 0% | 0% |
| Sinoe | 100% | 0% | 0% | 0% |
| River Gee | 99% | 1% | 0% | 0% |
| Gbarpolu | 100% | 0% | 0% | 0% |
| National | 92% | 6% | 2% | 0% |

## 8.1 Comparison of farmers estimates and the actual GPS measurements for the size of land area cultivated by county

The 2014 and 2015 crop cut surveys considered asking the household head about the size if his or her farm. This was done to investigate if the farmers actually know or will be able to provide the true picture on the size of the land area they cultivate for farming. Table 20 below shows that on average most farmers may not know or might decide not to give the actual size of the land they cultivate in a given year.

On average the percent increase between the female household heads estimates in the households and the actual GPS measurement on the rice farm was 13.7% while for male household heads the Averaged GPS measurement was 16.4% above the averaged farmer's estimates.

The percent difference increased to at least 70% when it came to estimating the size of the land used for other crops. This shows that farmers in Liberia are not educated enough to give accurate information about their farming activities. It is most likely that the recall method that was used in the 2016 for agriculture production does not show a true picture especially when the results for the southeast Counties were compared to those from 2014 and 2015 in section 4.1 and show a huge increase in production.

It can be concluded that the crop cut method of estimating Agricultural productions is the best and must be continued.

### Table 20 Farmers estimates versus GPS Measurements

| Percent difference between farmer's estimate and GPS measureent on land cultivation in Hectare 2014 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Rice | | | Cassava | | | Other crops | | |
| County | Sex | Farmers est. | GPS | % difference | Farmers est. | GPS | % difference | Farmers est. | GPS | % difference |
| | **Male** | **10,780** | **12,900** | **16.4** | **7,070** | **7,990** | **11.5** | **4,580** | **15,250** | 70.0 |
| **Total** | **Female** | **2,640** | **3,060** | **13.7** | **1,710** | **1,990** | **14.1** | **750** | **3,000** | 75.0 |
| | Male | 3,400 | 2,920 | 16.4 | 590 | 750 | 21.3 | 1,350 | 3,110 | 56.6 |
| Grand Gedeh | Female | 910 | 820 | 11.0 | 240 | 300 | 20.0 | 320 | 760 | 57.9 |
| | Male | 1,820 | 2,350 | 22.6 | 3,010 | 2,690 | (11.9) | 600 | 2,590 | 76.8 |
| GrandKru | Female | 640 | 720 | 11.1 | 830 | 700 | (18.3) | 90 | 430 | 79.1 |
| | Male | 1,270 | 1,930 | 34.2 | 1,790 | 2,680 | 33.2 | 1,850 | 2,730 | 32.2 |
| MaryLnd | Female | 160 | 230 | 30.4 | 340 | 590 | 42.4 | 200 | 320 | 37.5 |
| | Male | 1,490 | 2,930 | 49.1 | 670 | 980 | 31.6 | 420 | 3,130 | 86.6 |
| Sinoe | Female | 80 | 250 | 68.0 | 130 | 250 | 48.0 | 10 | 140 | 92.9 |
| | Male | 2,800 | 2,770 | (1.1) | 1,010 | 1,220 | 17.2 | 360 | 3,080 | 88.3 |
| RiverGee | Female | 850 | 1,040 | 18.3 | 170 | 160 | (6.3) | 130 | 930 | 86.0 |