

This document is an extract from:

Data collection survey on rice related programs/projects in the CARD member countries (with Study on the local rice competitiveness in 15 selected countries) : Final Report. -- Japan International Cooperation Agency : NTC International Co., Ltd. : RECS International Inc., 2021. 8, Annex A.

# Competitiveness Analysis of Local Rice to Imported Rice

## Liberia

### 1. Objectives and outline of the analysis

The program of CARD2, launched in 2019, aims to increase rice production in Sub-Saharan Africa from 28 million tons to 56 million tons by 2030. The competitiveness of local rice against imported rice would be an important aspect to look into to achieve this aim. Given this context, a study comparing the competitiveness of local and imported rice for 15 countries<sup>1</sup>. was implemented by Japan International Cooperation Agency (JICA) from February to August 2021.

With relentless efforts in rice sector development, the competitiveness of the locally produced rice against imported rice has been recently improving in Sub-Saharan African countries. However, the pace of development in local rice is not sufficient due to the rapid expansion in demand. In addition, local rice often faces competition from imported rice. The main objective of this survey was to analyze the competitiveness of major local rice varieties against imported rice. DRC (domestic resource cost) approach was applied to quantitatively analyze the competitiveness, and sensitivity analysis to discuss the achievable approach to improve it. The competitiveness analysis should be updated as more information becomes available, since the situation on the rice sector in Sub-Saharan Africa is constantly changing and the information in the current survey was very limited.

### 2. Local rice and imported rice

#### 2.1. Comparison of local rice and imported rice

Rice is a priority crop in Liberia. Rice consumption of Liberia is one of the highest in Africa (111 kg/capita/year in 2018, FAOSTAT). Most of households eat rice as breakfast, lunch and dinner (NRDS, 2012). Although the demand is increasing, the self-sufficiency rate has been kept relatively high and it is between 40 and 60 % in recent years (Fig. 1). About 70% of local rice is produced by family farmers on the upland using slash-and-burn shifting cultivation (NRDS, 2012).

In general, consumers prefer non-parboiled, 20-25% broken, medium to bold grain type that is non-sticky and swells when cooked (NRDS, 2012). A high-end segment in urban area generally consume high quality imported rice from USA. While, starchy rice imported from China is referred to as ‘Butter Rice’ and consumed by mid-and low-range urban consumer segments. The Butter Rice is dominant in the market and approximately accounts 85% of all rice import. The locally produced rice is referred to as ‘country rice’, and largely broken, mixed, poorly milled and becomes sticky when cooked. The market supply of the ‘country rice’ is preferred by price-conscious consumers in both rural and urban areas.

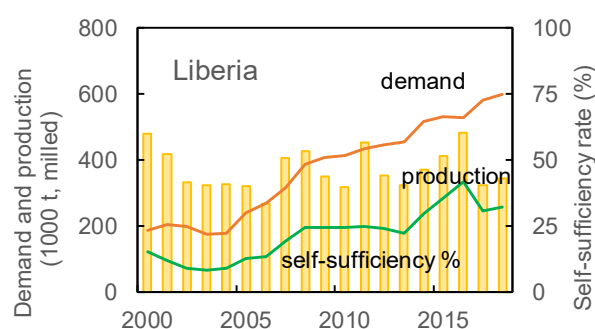


Fig. 1. Rice supply in Liberia  
Source: Made by JICA Survey Team based on data from FAOSTAT.

<sup>1</sup> Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Ghana, Guinea, Kenya, Liberia, Madagascar, Mozambique, Niger, Nigeria, Senegal, Sierra Leone, Togo.

In Liberia, most of the locally produced rice is consumed at farm or village level. Only 12% of farmers sell their rice. According to some reports, only 4-10% of locally produced rice is distributed through the markets (LISGIS, 2017; Saysay, 2016; JICA, 2021). Therefore, the domestic rice production has a huge advantage for smallholder farm families to success food directly (NRDS, 2012).

Table 1 shows some results of 2007 CWIQ survey<sup>2</sup>, and indicated that majority of consumers in urban area eats only imported rice.

## 2.2 Consumers' preference

A consumers' preference survey was carried out in June-July 2021. The number of respondents to the web-based questionnaire survey was very limited (17 respondents), but the results are summarized as follows. The important factors when choosing rice are taste, nutritional value, cleanliness and aroma. Price was not a high priority. The local rice is evaluated better than the imported rice in taste, nutritional value and aroma, but not in cleanliness. Regarding the appearance, consumers prefer yellowish color such as parboiled rice. The competitiveness of the local rice would be increased by improvement of post-harvest handling to avoid mixing with foreign matters.

## 2.3 Major brands/varieties

### (1) Local rice

According to some reports, most common varieties are NERICA L-14 and LAC-23 for upland cultivation, and Suakoko-8, NERICA L-19 and FKR-19 for lowland or irrigated cultivation (Hale *et al.*, 2011; Saysay, 2016). However, about a half of the farmers (54%) still uses local varieties with unknown names (Saysay, 2016). Among those varieties, Suakoko-8 and LAC- 23 were most sold in the wholesale market (CARD training, 2021). LAC-23 has radish color, and it is said that it has high vitamin A contents.

Table 2 shows some information of major varieties obtained by the literature review. MOA annual report (2014) reported that one of achievement of AIDP<sup>3</sup> was providing seeds of NERICA L-19, NERICA L-14 and Suakoko-8 to farmers in Lofa County, and an achievement of ASRP<sup>4</sup> was improvement of the yield of NERICA L-19 (2.0 to 2.5 t/ha), Suakoko-8 (2.9 to 3.3 t/ha) and WITTA-4 (2.8 to 3.4 t/ha).

Table 1. Rice consumption tendency for different household, based on 2007 CWIQ survey.

	% Household	
	Local rice	Imported rice
<b>Residence area</b>		
Rural	80	79
Urban	17	97
<b>Region<sup>a</sup></b>		
Greater Monrovia	7	98
North Central	88	72
North Western	70	91
South Central	46	91
South Eastern A	84	83
South Eastern B	76	92

Source: Modified by JICA Survey Team based on Tsimpo and Wodon, 2008 and CWIQ survey, 2007.

a) North Central-Bong, Lofa, Nimba County, North Western-Bomi, Grand Cape, Mount, Gbarpolu County, South Central-Grand Bassa, Margribi, Montserrado County, South Eastern A-Grand Gedeh, Rivercess, Sinoe County, South Eastern B-Grand Kru, Maryland, River Gee County.

<sup>2</sup> Core Welfare Indicators Questionnaire Survey

<sup>3</sup> Agriculture Infrastructure Development Program (funded by WB/IDA)

<sup>4</sup> Agriculture Sector Rehabilitation Project (funded by AfDB)

Table 2. Some information of major rice varieties cultivated in Liberia.

Major variety	Main production environment	Yield (t/ha)	Growth length (days)
NERICA L-14	Upland	2.0 <sup>a</sup>	100-110 <sup>c</sup>
LAC-23	Upland	1.6 <sup>a</sup>	140-145
NERICA L-19	Rain-fed/irrigated	2.0 <sup>a, b</sup>	90-100
Suakoko-8	Lowland	2.4 <sup>a</sup> -2.9 <sup>b</sup>	140-145
Local varieties without known name	Upland	1.0 <sup>a</sup>	
Average yield (2019) <sup>d</sup>		0.7	

Source: a) Saysay, 2016. Average from JICA Survey of 201 farms in Garr Bain District, Nimba County and Panta-Kpa District, Bong County.  
 b) Annual report, MOA, 2014.  
 c) JICA, 2021.  
 d) FAOSTAT, browsed on April 12, 2021.

In Liberia majority of rice is cultivated under upland condition which occupies about 62% of rice growing area (Fig. 2) (total area = 233,108 ha in 2013, Diagne *et al.*, 2013). In upland agricultural area, traditional slash-and-burn shifting cultivation has been common practice among smallholder family farmers. According to the NRDS (2012), the average yield under upland rain-fed, lowland rain-fed, and irrigated lowland were 0.9, 1.2 and 2.0 t/ha, respectively, in 2008/2009 season.

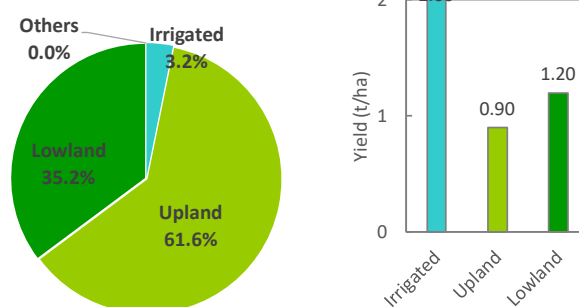


Fig. 2. Percentage of rice ecologies and their average yield. Source: Made by JICA Survey Team based on the study of Diagne, *et al.* (2013) (left) and NRDS (2012) (right).

Rice is produced in all parts of Liberia but higher production is in Nimba, Bongo and Lofa countries.

These three counties account for 56% of the area under rice production in the country (Table 3). According to the regional statistic data, the average yield of the country is 1.16 t/ha. Nimba has relatively high yield (1.28 t/ha), while, Lofa has the lowest yield (0.71 t/ha). The formation of these rice-growing areas is not only due to natural condition, such as soil fertility, but also due to convenience to major markets. Figure 3 shows the distribution of rice producing area.

Table 3. Rice production by County in Liberia.

	Area (ha)	Production (t)	Yield (t/ha)	Prod %
Nimba	55,178	70,628	1.28	25.5
Bong	46,003	51,247	1.11	18.5
Lofa	46,126	32,888	0.71	11.9
Gbarpolu	12,247	14,672	1.20	5.3
Grand Bassa	12,503	13,827	1.20	5.0
Grand Gedeh	9,527	11,728	1.23	4.2
Other counties	56,384	81,403	1.44	
<b>Total</b>	<b>237,968</b>	<b>276,393</b>	<b>1.16</b>	

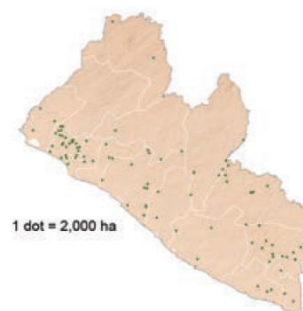


Fig. 3. Distribution of rice producing area. Source: CGIAR, 2013.

Source: Modified by JICA Survey Team Report on basic survey for improving rice production for smallholder project in Liberia, 2021.

Figure 4 shows the major cropping season in Liberia for upland rice and lowland rice. Rice has been produced over a period of about 6 months in the upland ecology. In general, it is only one season per year. This is because varieties LAC-23 and Suakoko-8 with long-growing period about 140-150 days (Table 2) have been cultivated by local farmers. The strategy plan for rice development suggests to cultivate 3 times in 2 years (1.5 crops per year) to achieve the target production (NRDS, 2012; CARD training, 2021). In recent years, early-maturing varieties such as NERICA L-19 (100-110 days) and NERICA 14 (75-90 days) have become popular with some extent (JICA, 2021).

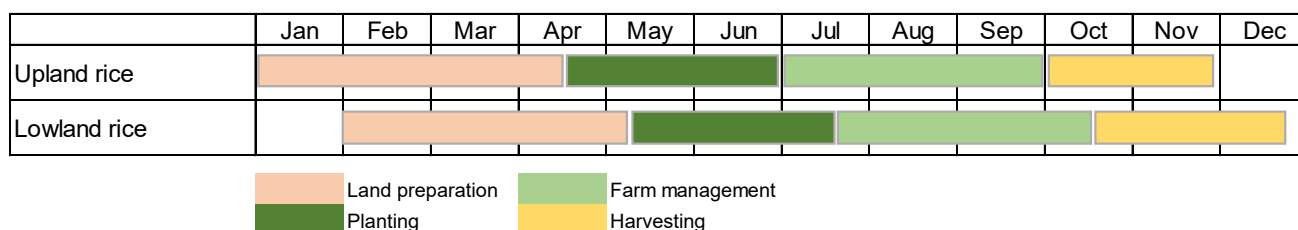


Fig. 4. Common rice seasons in Liberia.

Source: Re-made by JICA Survey Team based on the information of JICA, 2021.

## (2) Imported rice

‘Butter Rice’ from China has been very popular among nations, and the high-end segment of consumer prefers rice from US (NRDS, 2012). However, the data of ITC (International Trade Center) indicates that rice is now mostly imported from India with share of 82% (Table 4). The unit value of rice from India and that from China are 374 and 413 USD/t, respectively. Rice from US is more expensive (565 USD/t). The estimated tariff was 9.8% for all exporters, except for rice from Cote d’Ivoire. According to the market survey in 2021, IR 64 from India and ‘Butter Rice from China were most sold in the market (CARD Training, 2021).

Table 4. Information about imported rice (Total quantity, value, average tariff%, etc. of milled rice in 2019).

	Quantity imported (t)	Share in quantity (%)	Value imported (1000 USD)	Unit value (USD/t)	Growth in imported quantity between 2015-2019 (% p.a.)	Average tariff (estimated) applied by Liberia (%)
<b>Total</b>	<b>260,667</b>		<b>97,270</b>	<b>373</b>	<b>5</b>	
India	213,329	82.1	79,817	374	1	9.8
China	33,975	10.9	10,628	313	307	9.8
United States of America	8,683	5.0	4,902	565	37	9.8
Japan	2,553	1.1	1,060	415	-6	9.8
Brazil	591	0.3	270	457		9.8
Côte d’Ivoire	875	0.2	237	271	4	0.0
Pakistan	540	0.2	211	391	13	9.8
Thailand	74	0.1	89	1,203	-53	9.8
United Arab Emirates	29	0.0	30	1,034	-9	9.8
Lebanon	9	0.0	17	1,889	-2	9.8

Source: ITC (International Trade Center), [https://www.trademap.org/Country\\_SelProductCountry](https://www.trademap.org/Country_SelProductCountry), browsed on April 7, 2021

## 2.4 Marketing

### (1) Market structure

Since most of the rice produced in the country is consumed in the villages, vertical linkages in the value chain are

extremely weak. Private sector operators are very few, and often NGO-support activities or donor-funded activities are the only influential along the value chain. Figure 5 shows the rice value chain of local rice and imported rice. In general, more than 90 % of the rice produced by local farmers is for self-consumption (food and seeds for next farming) and only 4-10% is sold through the market (LISGIS, 2017; Saysay, 2016; JICA, 2021). Beside the demand from households, there is an increasing demand in restaurants due to urbanization.

Rice imported into Liberia is almost exclusively handled by 4 major companies. They own large storage facilities near the port. The poor storage situation by farmers is one of the major problems for local rice.

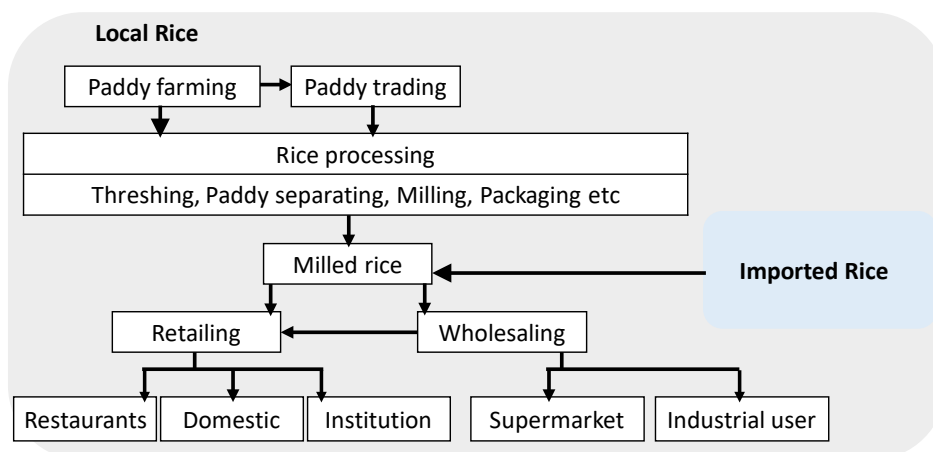
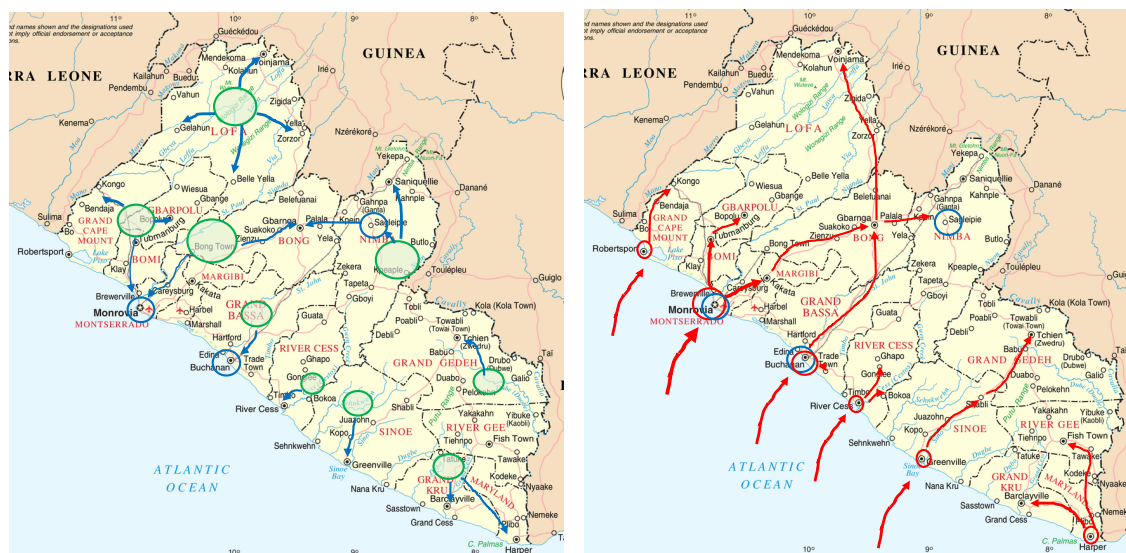


Fig. 5. Rice value chain in Liberia.  
Source: Made by JICA Survey Team based on Osuji, 2017.

## (2) Market path of local rice and imported rice

The main rice market flows of locally produced rice and imported rice are shown in Fig. 6. The port in Monrovia is the biggest among several importing ports, and the three most important markets are at Monrovia, Buncanan, and Seclepea (= Saglepie). Liberia’s rice producing areas are scattered based on the abundant water resources, and most of the rice is distributed in the local regions. Residents in big cities mainly consume imported rice (Table 1).



Local rice

Imported rice

- Main market (Monrovia, Buchanan, Seclepea=Saglepie)
- Main port (Monrovia)
- Main producing area (Nimba, Bong, Lofa, Grand Bassa, Grand Gedeh, etc.)
- ➡ Main marketing path of local rice, ➡ Main marketing path of imported rice.

Fig. 6. Marketing path of local rice and imported rice.  
Source: Made by JICA Survey Team referring CARD training, 2021.

## 2.5 Price comparison in the market

The information of rice prices was very limited. Table 5 shows the survey results for major local rice and imported rice at Suakoko wholesale market in Bong county (CARD training, 2021). Suakoko is about 170 km from the main port in Monrovia, but it can be confirmed that imported rice, especially Butter Rice from China, is sold more in the market than local rice. The prices of local rice were more expensive than imported ones.

Figure 7 shows changes in the price of imported rice in last two years in different towns/markets. It ranged between 111 and 119 LD/kg, and the price in Monrovia was lower than other towns in most of the month. Price of local rice was not available in this website of GIEWS FPMA Tool<sup>5</sup>.

Table 5. Price and quantity of major rice varieties/brands in the market.

	Variety/brand name	Price (USD/25 kg bag)	No. of bags in the market
Local rice	Suakoko-8	15.00	50
	LAC-23	15.00	100
Imported rice	Butter Rice (China)	13.00	500
	IR 64 (India)	13.00	150

Source: CARD training, 2021

<sup>5</sup> GIEWS FPMA Tool: [FPMA Tool \(fao.org\)](http://FPMA.Tool(fao.org))

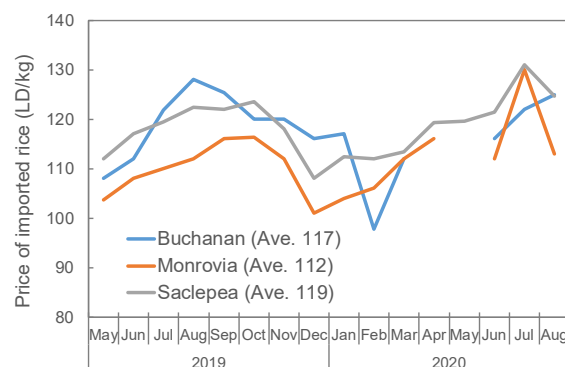


Fig. 7. Price of imported rice at retail shops in different town.  
Source: GIEWS FPMA Tool, [FPMA Tool \(fao.org\)](https://www.fao.org/fpma/).

### 3. Competitiveness analysis

#### 3.1 Production cost of local rice for DRC ratio analysis

For DRC analysis to evaluate the competitiveness of the local rice, three cases of production conditions were compared. All three cases are under rain-fed condition which is 97% of the cultivation area (Fig. 2). Irrigated cultivation is negligible in Liberia so far. The three cases analyzed were;

- Case I:** Upland / rain-fed cultivation with traditional method
- Case II:** Lowland / rain-fed cultivation with traditional method
- Case III:** Lowland / rain-fed cultivation with modern inputs

Table 6 shows the production costs for DRC analysis. They were from the survey report of Hale, *et al.* (2011). Generally, fertilizer and chemicals are used only by lowland farmers, such as Case III. Farmers in Case I and II were not applying any fertilizer nor agricultural chemicals, which let the cost for labor work count for about 92% of total production cost (Table 6). The average wage is 150 LRD (Liberian Dollars)/day and 50 LRD for the meal. This makes about 3 USD/day (200 LRD/day) (Hale, *et al.*, 2011). In Liberia, it is still common to pay the labors by meal, not by cash. This is a traditional custom called ‘Kuu’ in the village (JICA, 2021). The total production cost in Case III was lower than other two cases. Farmers in Case III applied fertilizer, chemicals and used power tiller (rental) for land preparation, but the labor cost was lower than Case I and II.

Table 7 shows input use, yield and estimated profit under different cultivation practice from the study of Saysay (2016). It is shown that farmers usually do not use fertilizer and agricultural chemicals in upland condition, and obtain relatively low profit. About machinery, farmers who have tractors or threshing machine are estimated to be only 0.1% of all rice farmers (JICA, 2021).



Table 6. Rice production cost of three cultivation types for DRC analysis (2011, USD/ha).

	Case I	Case II	Case III
	Upland/rain-fed	Lowland/rain-fed	Lowland/rain-fed
	Traditional	Traditional	With modern input
Yield (t/ha)	1.12	1.39	2.31
<b>Production cost</b>	<b>Cost (USD/ha)</b>		
Seeds	17.15	17.15	20.15
Fertilizer	0.00	0.00	36.38
Ag. chemicals	0.00	0.00	10.8
Fencing/trap materials	3.28	2.93	2.93
Power tiller rental	0.00	0.00	42.97
Labor <sup>a</sup>	475.00	511.00	378.00
Capital interest <sup>b</sup>	21	22	22
<b>Total (USD/ha)</b>	<b>516.47</b>	<b>553.53</b>	<b>513.38</b>
<b>Total (LRD/ha)<sup>c</sup></b>	<b>34,449</b>	<b>36,920</b>	<b>34,242</b>
<b>Total (LRD/kg, milled rice)<sup>d</sup></b>	<b>47.32</b>	<b>40.86</b>	<b>22.81</b>

Source: Modified by JICA Survey Team Hale, *et al.*, 2011.

a) Including meal (150 LRD for wage + 50 LRD for meal).

b) Capital interest was estimated for the expenses on material inputs and 40% of labor inputs by applying 10% of annual interest rate.

c) Exchange rate was 66.70 LRD/USD (Hale *et al.*, 2011)

d) Conversion rate from paddy grain to milled rice of 0.65 (Kikuchi, *et al.*, 2016) was adopted.

Table 7. Input use, yield and estimated profit of rice farmers in Liberia.

		Farm size (ha)	Seed (kg/ha)	Labor (man-day/ha)	Fertilizer (kg/ha)	Ag. chem. (L/ha)	Yield (t/ha)	Profit (LRD/ha)
Upland	Local variety	1.3	71	164			0.95	8,368
	Improved variety	1.3	75	175			1.29	22,805
Lowland	Local variety	0.9	63	145			1.10	20,599
	Improved variety	1.1	67	163			1.68	40,533
	Improved variety with fertilizer	0.8	71	153	71		2.11	54,775
	Improved variety with fert. and ag. chem.	1.0	75	145	69	2	2.51	69,326

Source: Modified by JICA Survey Team based on Saysay, 2016.

400 farmers were randomly selected from Gar Bain District in Nimba County and Panta-Kpa District in Bong County.

### 3.2 Marketing cost for DRC ratio analysis

Post-harvest cost for local rice and marketing cost for imported rice are estimated as shown in Table 8 and 9. These values for Liberia market could not be obtained by literature review nor on-line survey. The reason why the information is not available is probably due to the very limited amount of local rice in the market. The rice through market channel is less than 10% of domestically produce rice. Therefore, they were the estimation using several sources, with the assumption that the costs are comparable to those in Sierra Leone.

Table 8. Estimated post-harvest cost for local rice.

	Cost <sup>a</sup> (USD/t)
<b>Post-harvest cost</b>	
Wholesale margine	121
Milling cost	100
Transport from production site to capita	11.6
Loading	75
Storage	100
<b>Total (USD/t, milled rice)</b>	<b>408</b>
<b>Total (LRD/kg, milled rice) <sup>b</sup></b>	<b>63.99</b>

a) Values were estimated by JICA Survey Team based on the information from CARD training, and Spencer and Fornah, 2014 (Values for Sierra Leone).

b) Exchange rate of 157 LRD/USD (2018) was adopted.

Table 9. Estimated marketing cost for imported rice.

	Cost <sup>a</sup> (USD/t)
<b>Market cost for imported rice</b>	
Landing cost (12%) <sup>b</sup>	44.88
Importers margin (10%)	37.40
<b>Total (USD/t, milled rice)</b>	<b>82.28</b>
<b>Total (LRD/kg, milled rice) <sup>c</sup></b>	<b>12.92</b>

a) Values were estimated by JICA Survey Team, based on the information from Spencer *et al.*, 2014 (Values for Sierra Leone).

b) 12% of CIF price of rice from India: 374 USD/t (2019, ITC).

c) Exchange rate of 157 LRD/USD (2018) was adopted.

### 3.3 Competitiveness analysis by DRC ratio

#### (1) Results of DRC ratio Analysis

In this survey, we use DRC (domestic resource cost) ratio as an indicator for the competitiveness of local rice. This measures the comparative advantage of local rice production at the capital's wholesale market, where local rice and imported rice are sold side by side (Kikuchi *et al.*, 2016). The DRC ratio is the cost-benefit ratio between the cost of domestic resources used to produce one unit of rice and the net foreign exchange that can be earned by exporting one unit of rice. We use 'tradable-good component ratio' and 'domestic-resource component ratio' of each cost needed for production and marketing of rice. Domestic rice production has a comparative advantage if DRC ratio < 1.0. Regarding the exchange rate of the currency, due to the lack of precise information on the shadow price, the market exchange rate was used to calculate the prices according to the corresponding year for conversion of foreign currency into local currency. The tradable-good component ratio refers to Kikuchi *et al.* (2016).

Table 10 shows the results of DRC analysis. The data source of production costs, marketing costs for local rice and marketing cost for imported rice are shown in Table 6, 8 and 9 above. As shown in these tables, cost information are from different sources in different years. Marketing costs used for the analysis were the estimation from several sources including information of Sierra Leone as some of them were not available for Liberia. The detailed calculation results of the DRC ratio are shown in the attached table (after the reference list).

All the Cases analyzed were with rain-fed cultivation. Case I and II were with traditional crop management method, and Case II was with modern farm inputs (Table 6). The most common varieties reported in the original survey were NERICA and LAC-23 for upland cultivation (Case I), and Suakoko-8 and FKR 19 for lowland cultivation (Case II, III) (Hale *et al.*, 2011). The imported rice is mainly from India (82% share in 2019, ITC) and from China (13%) (Table 4), and marketing cost and CIF price of rice from India in 2019 were used for the analysis. CIF price of rice from India in 2019 was adopted for the analysis because the price in 2014 was not available neither by UN Comtrade<sup>6</sup> nor by ITC<sup>7</sup>. The exchange rate used to convert the CIF price is the market exchange rate (157 LBD/USD) of 2018. The rate of 2019 has not been available.

<sup>6</sup> [Download trade data | UN Comtrade: International Trade Statistics](#), browsed on June 22, 2021.

<sup>7</sup> [Trade Map - List of importers for the selected product in 2020 \(Rice\)](#), browsed on June 22, 2021.

All three cases obtained DRC ratio higher than 1.0, however, Case III with modern inputs had the ratio relatively close to 1.0. This indicates that producing rice under traditional management, regardless if in upland area nor in lowland area, is not competitive, but the local rice with modern inputs can be at competitive level against imported rice. The modern inputs were only applied to the lowland producers in the survey of Hale *et al.*, (2011).

The difference between traditional management method and the improved management method (with modern inputs) were mainly usage of fertilizer, herbicide and pesticide. In Case I and II, none of these inputs were used, which was the cause of relatively low yield (1.12 and 1.39 t/ha). Among all Cases, only Case III rented small power tillers and needed least labor works. Case I and II needed 158 and 170 man-date, respectively, while, for Case III it was 126 man-date (Hale *et al.*, 2011). The machinery was available for rental only through cooperatives.

Comparing Case I and II, Case II had higher yield and lower DRC ratio. Considering the variety and cultivation ecology, it can be said that Suakoko-8 in lowland condition is rather competitive against imported rice than LAC-23 in upland, under traditional management method.

We have to note that, in all cases, import tariffs are not included in the calculation in this analysis since the DRC ratio analysis in principle is to evaluate the competitiveness of local rice without government intervention. Therefore, including tariffs would improve the competitiveness of local rice in all cases.

Table 10. Result of DRC analysis.

Case	Production condition	Yield (t/ha)	DRC ratio
I	Upland / rain-fed / traditional method	1.12	1.71
II	Lowland / rain-fed / traditional method	1.39	1.59
III	Lowland / rain-fed / management with inputs	2.31	1.29

## (2) Sensitivity analysis

Sensitivity analysis was conducted for three cases. Table 11 shows the possible approaches to lower its DRC ratio and increase the competitiveness.

**Case I:** In the field survey, farmers in Case I were not applying any fertilizers. If half of the amount of fertilizer that farmers in Case III applies to improve the productivity, and increase the yield to 2.0 t/ha from 1.12 t/ha, the DRC ratio is lowered to 1.36 (Table 11). The fertilizer used in Case III were NPK compound fertilizer and urea, but their application rate was not mentioned in the original survey report. The half the amount would cost 1,214 LRD/ha.

**Case II:** The labor cost of Case II was highest among three cases. If the farmers introducing small power tillers to reduce the labor work for land preparation, apply half the fertilizer amount of Case III to improve the productivity to the level of 2.0 t/ha from the current level of 1.39 t/ha, the DRC ratio would be reduced to 1.31 from 1.59 (Table 11). The rental cost of the tiller was 2,866 Leone/ha. To rent the machine the farmers have to form or to be a member of the cooperatives. The membership fee to join a cooperative is not considered in this survey.

**Case III:** If crop management is further improved, and the yield is increased from 2.31 to 3.3 t/ha, the DRC ratio could be reduced to 1.15. Suakoko-8 which is one of the major varieties for lowland environment could perform 3.3

t/ha under ASRP<sup>8</sup> project. Therefore, it is challenging but should be possible to achieve.

Table 11. Result of sensitivity analyses for DRC ratio.

	Possible approach to increase the competitiveness	Effect (change of DRC ratio)
Case I	Apply half of the fertilizer amount of Case III (NPK and urea) to improve yield to 2.0 t/ha.	1.71 → 1.36
Case II	(1) Reduce the labor work by renting the power tiller (2) Apply half of the fertilizer amount of Case III to improve yield to 2.0 t/ha.	1.59 → 1.31
Case III	Increase the yield from 2.31 to 3.3 t/ha which is the potential productivity of Suakoko-8 with better crop management.	1.29 → 1.15

#### 4. Related policy

##### 4.1 Policy measures to stimulate consumption of local rice

In response to food crisis in 2008, the government of Liberia intervened by declaring a zero tariff for rice imports and imposing a government-determined limit on wholesale margins of 1 USD per 50 kg bag (USAID, 2015). As of 2021, the President has suspended import tariff on rice (Executive Mansion of Liberia, 2021). On the other hand, the government suspends import tariffs on the types of agricultural products and equipment, directly related to agricultural development (Liberia Agricultural and Environmental Journalists Network, 2019). This will reduce the cost of importing inputs by up to 24% through the removal of duties and goods and services tax, and importers of agriculture inputs shall pay only Custom Users Fees (1.5%) and ECOWAS trade levy (0.5%) where applicable (GROW Liberia, 2021).

The World Food Programme (WFP) in collaboration with the Ministries of Education, Agriculture, and Health launched the pilot phase of the Home-Grown School Feeding Programme in 2016, more than one thousand primary school children in Nimba County (WFP, 2016). Under the programme, The programme buys rice and vegetables from local smallholder farmers and directly support farmers to increase the production, and improve schoolchildren's nutrition education status, which resulted in developing social and productive safety nets (FrontPageAfrica, 2018). WFP also provided capacity strengthening support to smallholder farmers, stimulating local food production, promoting diet diversification, and consumption of domestically grown food produce (WFP, 2020). In particular, the programme provided training to farmers to establish linkages with markets, improve post-harvest management, and form village savings and loan associations (WFP, 2020).

##### 4.2 Quality standards and status of the application

The activities of establishing marketable grades of rice are listed in NRDS (2012-2018) Appendix 3: Major elements of Liberia's NRDS (2012). There is no information on quality standards other than that from NRDS, and it seems that development of the standards has not been completed yet.

<sup>8</sup> Agriculture Sector Rehabilitation Project (funded by AfDB).

## 5. Main issues and suggestions

In Liberia, rice is the main staple food and consumption is one of the highest in Africa (111 kg/capita/year). The self-sufficiency rate is relatively high (40-60%). Only 4-10% of locally produced rice is distributed through market, and the linkages of value chain are extremely weak. About 97% of rice producing area is under rain-fed condition with abundant water resources, and production areas are scattered in the country.

Local rice is generally known as broken, mixed, and poorly milled. Quantity of local rice which reaches big cities are limited, and consumers in urban areas eat mostly imported rice. Consumers in big cities and rural areas evaluated local rice better in taste and aroma but not in cleanliness. Therefore, if the government decides to put effort in promoting local rice marketing, it is necessary to develop market channel effectively and improve the post-harvest technology.

DRC ratio analysis indicated that all the rain-fed cases are not competitive against imported rice but the local rice in lowland rain-fed condition with modern farm inputs was close to the competitive level with DRC ratio of 1.29. Results of DRC ratio analysis and sensitivity analysis suggested that the competitiveness of local rice would be improved if farmers can introduce some machinery, such as power tillers, to reduce the labor cost. They can access the rental service through cooperatives or credit service.

## References

- CARD training. 2021. Inception report for the CARD training, JICA.
- CGIAR. 2013. Rice Almanac 4<sup>th</sup> edition.
- Diagne, A., E. Amovin-Assagba, K. Futakuchi, and M.C.S. Woperisis. 2013. Estimation of cultivated area, number of farming households and yield for major rice-growing environments in Africa. *In* Realizing Africa's rice promise. Africa Rice Center, p35-45.
- Executive Mansion of Liberia. 2021. President Weah Suspends Tariff On Rice in Executive Order #105, [https://www.emansion.gov.lr/2press.php?news\\_id=5373&pg=sp](https://www.emansion.gov.lr/2press.php?news_id=5373&pg=sp), browsed in June 10, 2021.
- FAOSTAT. <http://www.fao.org/faostat/en/#data/FBS>, browsed on April 4, 2012.
- FrontPage Africa. 2018. WFP, Liberian Government Feed Schoolchildren with Home-Grown Food for School Meals, <https://frontpageafricaonline.com/amp/news/wfp-liberian-government-feed-schoolchildren-with-home-grown-food-for-school-meals/>, browsed in June 10, 2021,
- GIEWS FPMA Tool, FAO. <https://fpma.apps.fao.org/giews/food-prices/tool/public/>, browsed on March 17, 2021
- GROW Liberia. 2021. Tax waiver on imported agricultural inputs marks important step in boosting farmers' productivity, <https://www.growliberia.com/insights/executive-order-no-97/tax-waiver-on-imported-agricultural-inputs-marks-important-step-in-boosting-farmers-productivity>, browsed in June 10, 2021.
- Hale, A., T. McKnight, and P. Abeygunawardena. 2011. Liberia rice production cost analysis. Center on conflict and development, Texas A & M Univ.
- ITC (International Trade Center), <https://www.trademap.org/>, browsed on March 23, 2021.
- JICA. 2021. Report on basic survey for improving rice production for smallholder project in Liberia. (JICA リベリア国「小規模農家コメ生産向上プロジェクト」基本計画策定調査報告書), In Japanese.
- Kikuchi, M., Y. Haneishi, A. Maruyama, K. Tokida, G. Asea, and T. Tsuboi. 2016. The competitiveness of domestic rice production in East Africa: A domestic resource cost approach in Uganda. *J. Agr. Rural Develop. Trop. Subtrop.* Vol.17: 57-72.

- LISGIS (Liberia Institute of Statistics & Geo-Information Services). 2017. House hold income and expenditure survey, Statistical Abstract.
- Liberia Agricultural and Environmental Journalists Network. 2019. Liberian Government Suspends Tariffs on the Importation of Agriculture Products and Machinery, Ministry of Agriculture (MOA), Republic of Liberia. 2014. Annual Report. <https://lajnet.com/liberian-government-suspends-tariffs-on-the-importation-of-agriculture-products-and-machinery/>, browsed in June 10, 2021.
- Ministry of Commerce and Industry (MoCI), Republic of Liberia. 2017. Annual Trade Bulletin.
- NRDS of Liberia, 2012. Ministry of Agriculture.
- Osuji, C. 2017. Liberia rice value chain, Value addition training manual, Smallholder agricultural productivity enhancement and commercialization (SAPEC) project.
- Saysay, J.L. 2016. Profit efficiency among smallholder rice farmers in Bein Garr and Ponta Districts. Central Liberia. PhD thesis, Sokone Univ. Agr., Mongoro, Tanzania.
- Spencer, D., S. Deen, A. Gbagbo, C. Wilson., and P. Saysay. 2014. Study of rice processing, marketing and distribution on Sierra Leone. Enterprise Development Services Ltd., Freetown, Sierra Leone.
- Spencer, D., and D. Fornah. 2014. Value chain analysis in the rice sector in Sierra Leone. Enterprise Development Services Ltd., Freetown, Sierra Leone.
- Tsimpo, C., and Q. Wodon. 2008. Rice price and poverty in Liberia. Policy research working paper 4742, The World Bank.
- USAID. 2015. Liberia Market Study for Selected Agricultural Products.
- WFP. 2016. WFP and Government of Liberia to Launch Home-Grown School Feeding Pilot, <https://www.wfp.org/news/wfp-and-government-liberia-launch-home-grown-school-feeding-pilot>, browsed in June 11, 2021. WFP. 2020. Liberia Annual Country Report 2020.

## Attached Table: Calculation and result of DRC ratio analysis

	LOCAL PRODUCTION											IMPORT			DRC CALCULATION			
	Paddy yield	Production cost		Irrigation cost				Marketing cost		Total		Border price (CIF price of 58.72 LRD/kg) <sup>a</sup>	Marketing cost		Total cost		DRC ratio	
		Total	Total	Production		Tradable		Domestic		Farm-gate to market			Border to market		Tradable			Domestic
		(/ha)	(/kg milled rice)	Tradable	Domestic	Tradable	Domestic	Tradable	Domestic	Tradable	Domestic		Tradable	Domestic	Tradable	Domestic		
Production conditions																		
	t/ha	Mt/ha	----- Mt/kg of milled rice -----															
<b>Case I: Upland/rain-fed/traditional</b>	1.12	34,449	47.32	0.23	47.09	0.00	0.00	4.14	59.85	4.37	106.95	58.72	1.61	11.30	2.75	95.64	<b>1.71</b>	
<b>Case II: Lowland/rain-fed/traditional</b>	1.39	36,920	40.86	0.16	40.70	0.00	0.00	4.14	59.85	4.30	100.55	58.72	1.61	11.30	2.69	89.25	<b>1.59</b>	
<b>Case III: Lowland/rain-fed/with inputs</b>	2.31	34,242	22.81	3.10	19.70	0.00	0.00	4.14	59.85	7.24	79.56	58.72	1.61	11.30	5.63	68.25	<b>1.29</b>	

a) CIF price of rice from India, 374 USD/t (2019), was adopted for the analysis because the price in 2014 was not available neither by UN Comtrade<sup>9</sup> nor by ITC<sup>10</sup>. The exchange rate used to convert is the market exchange rate (157 LBD/USD) in 2018. The rate of 2019 has been not available.

<sup>9</sup> [Download trade data | UN Comtrade: International Trade Statistics](#), browsed on June 22, 2021.

<sup>10</sup> [Trade Map - List of importers for the selected product in 2020 \(Rice\)](#), browsed on June 22, 2021.