

SIERRA LEONE RICE VALUE CHAIN



Submitted By
James J Phillips
Agricultural Economist
Planet First Resources
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Executive Summary

This report is an analysis of Sierra Leone's rice value chain. Interviews were conducted with farmers, traders and wholesalers all over Sierra Leone including stakeholders from the Ministry of Agriculture and Forestry.

Sierra Leone is one of the top consumers of rice in Africa and imports rice to make up for production shortfalls. Production has been rebounding since the war but Sierra Leone has yet to reach self sufficiency.

There are constraints throughout the rice value chain with very little value add taking place. As a result there are a number of opportunities for upgrading and investment starting with the producers which have the greatest number of constraints.

Encouraging the formation and development of producer organizations is an excellent way to leverage interventions and capacity building to facilitate adoption of improved technologies. The most effective place for intervention at this time is at the producer level since it all emanates through the channel from here.

Suggested Policies for Improving the Rice Value Chain are:

- Establish and enforce uniform grades and standards
- Legalize cross border trade
- Privatize Seed Multiplication and Distribution
- Privatize Supply of fertilizer and Chemicals

Suggested Improvements to the Rice Value chain are:

- Establish Village Based Sources of Farm credit VSLA's
- Provide Post Harvest Training and Technology
- Train farmers on Grades and Standards (Codex Alimentarius)
- Development of Inland Valley Swamps
- Establish a Market Information System
- Train farmers on the appropriate use of Fertilizer and Chemicals

I. Introduction

Sierra Leone is a relatively small country of 71,740 square kilometers (27,699 square miles) located on the west coast of Africa and bordered by the Republic of Guinea to the north and east and Liberia to the south. It is a populous country with approximately 5.2 million people. The country was ravaged by a brutal civil war that lasted about 10 years and ended in 2002. For several years including 2008, Sierra Leone has remained at the bottom of the UN's Human Development Index.

Agriculture employs about 60% of the people. The primary staple crops are rice and cassava. Rice is grown in upland rain fed farms and in inland valley swamps under a variety of irrigated and non irrigated ecologies. Sierra Leone does not grow enough rice to feed its population and imports rice every year to meet internal demands for this staple.

Purpose of the Study

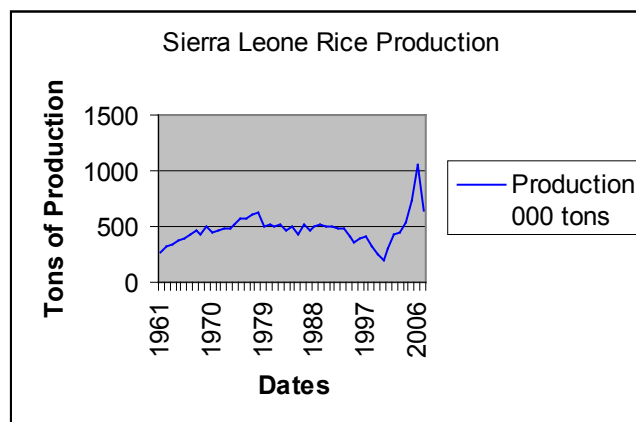
The purpose of this report is to provide an assessment of Sierra Leone's Rice value chain. Value Chains are an important framework for understanding how products move from the farm to the consumer. They are a vehicle for introducing pro poor initiatives and to help link small holders and small businesses with global markets (24).

Many definitions of value chains have been written. Perhaps the most succinct can be found the value chain wiki, (6) where they define a value chain as:

The sequence of steps and actors involved in the process from production to delivery to the final consumer.

Sierra Leone is one of the largest consumers of rice in Africa. Since the 60's and 70's Sierra Leone's level of rice self sufficiency dropped from around 90% to below 50% self sufficiency. It has since been slowly climbing back (8). Table 1.1 shows a graph of Sierra Leone's rice production from 1961 to 2007 from FAOSTAT.

Figure 1.1 Sierra Leone Rice production, 1961-2007

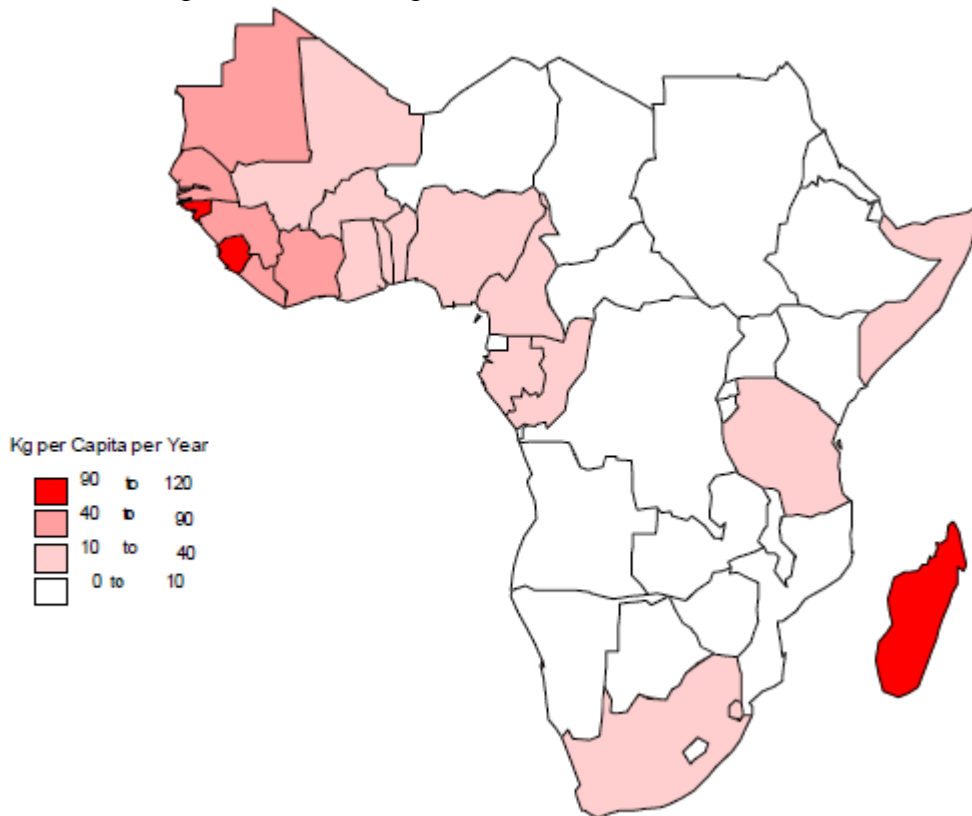


(Source FAOSTAT)

Figure 1.1 shows rice production from 1961 through 2007. Production stays close to around 500,000 tons and then drops significantly during the war. This is followed by a spike in production in 2006. Sierra Leone continues to produce at below self sufficiency levels and the Ministry of Agriculture Forestry and Food Security (MAFFS) is looking to increase rice production throughout the country.

The map below in Figure 1.2 depicting per capita rice consumption in Sub Saharan Africa shows that only Madagascar and Guinea Bissau rival Sierra Leone in per capita rice consumption.

Figure 1.2 Per Capita Rice Consumption Sub Sahara Africa



(Source WARDA/FAO, 2005)

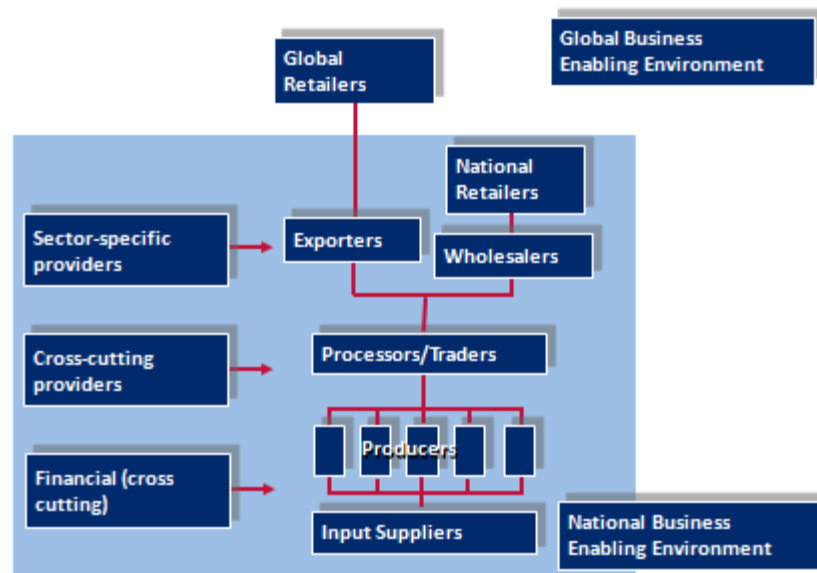
Not only is Sierra Leone a large per capita consumer of rice, the value of imported rice in Sierra Leone, consumes the largest percentage of total imports of agricultural products in Sub Sahara Africa. Guinea Bissau is the only country that comes close to Sierra Leone in Sub Sahara Africa (8). This helps to point out the importance of rice to Sierra Leone’s economy.

This report will focus primarily around the rice value chain constraints and opportunities. Based on the opportunities identified, strategies will be suggested for improving the rice value chain with interventions that will:

1. Increase smallholder production

2. Increase employment
3. Improve rural family productivity
4. Increase rural family incomes
5. Improve the role of women in Sierra Leone's Rice value chain

Figure 1.3 Value Chain Mapping
Value Chain Model



(Source: ACDI/VOCA)

The above example is a value chain map showing input suppliers farmers at the bottom and up the chain through the farmers or producers and then a network of traders and wholesalers and ultimately to the consumer. This generic illustration applies more to a product with more value add that is exported.

Although Sierra Leone's rice moves through a very similar value chain as the illustration above, the primary issue with respect to Sierra Leone's rice value chain, is that there is very little "value add" taking place along the chain. There are constraints at every level ranging from lack of inputs and capacity for their utilization by farmers, to poor post harvest technology resulting in low grades of rice and high post harvest losses, to transportation and logistics issues in getting rice to the terminal markets. Market information systems such as Short Messaging Services and Tradenet are not utilized and there is a lack of horizontal uniformity throughout the value chain.

II. Value Chain Analysis

IIa. Key Participants in Sierra Leone's Rice Value Chain

Sierra Leone's rice value chain consists of the following:

- **Farmers** who produce and harvest the rice
- **Brokers** and Traders who buy and sell the rice, (many are also wholesalers)
- **Wholesalers** of Local rice who store the rice
- **Wholesalers of Imported** rice
- **Importers** who import rice from the global market
- **Retailers** who sell rice in the terminal markets (usually both imported and local rice)

Sierra Leone farmers produce rice in a variety of ecologies which are:

- **Upland Farms** – primarily subsistence level slash and burn cultivation, found all over Sierra Leone
- **Inland Valley Swamps** – lowland areas many with permanent water, where streams feed into one another and into the primary rivers, these are found all over Sierra Leone
- **Bolilands (lowlands)** – Large flat lowland areas found mostly in the northern provinces of Bombali and Port Loko that flood with water during the rains and are dry during the dry season
- **Boliland (Riveraine Grasslands)** – similar to the other bolilands except they are located along rivers and large streams. They are also flooded during the rainy season
- **Mangrove Swamps** – Large coastal flood plains where salt water combines with the sea to create mangrove swamps. Many of these swamps have been cleared for rice cultivation where production is high. They are found mostly in Kambia district in the northwest

Each one of these ecologies is unique. There are many similar constraints but some have their own set of challenges for increasing production. Farmers grow rice primarily for their own consumption but there are pockets of surplus producers around the country mostly in Koinadugu and Kambia districts whose rice is exported through informal channels to Guinea. Sierra Leone farmers can be characterized as “price takers” primarily because of the constraints on production. They lack affordable credit and often end up having to sell their crop to repay debts at harvest time.

Brokers and traders move the rice from areas of production to the terminal markets in Sierra Leone. The largest terminal markets can be found in major towns of all of the districts of Sierra Leone:

- Freetown
- Kambia
- Port Loko

- Makeni
- Kabala
- Kono
- Moyamba
- Kenema
- Bo

The trade of rice in Sierra Leone is ad hoc and fragmented. Various individuals serve as traders and brokers and roles can vary from one year to the next. Farmers, market retailers, wholesalers and even MAFFS individuals can serve as rice traders/brokers in a given year. Brokers buy rice from villages and carry it to a terminal market such as Bamoi in Kambia, or Bo or Makeni. Some of them establish relationships with farmers so that the farmers accept payment in kind such as zinc pan for their roof. Some farmers provide rice to traders on consignment with the trader providing small cash up front with the remainder provided upon sale of the rice.

Some farmers will use their rice to get quick cash during the hungry season. They obtain a cash loan of Le15,000 then repay with a full bushel at harvest which is worth Le20,000 to Le30,000 depending on the location. Many farmers will take out loans during the hungry season only to repay with 100% interest at harvest.

Wholesalers can be found in all of the terminal markets in Sierra Leone. Many of these wholesalers also act as traders/brokers and most of the time, do not typically deal with imported rice. Some of them own their space and many rent space for the season. They also rent space to traders/brokers for a month or two at a time or in some cases they rent space to traders on a daily basis such as Le500/bag/day in Bamoi where products exchange hands swiftly.

There are four primary importers of rice in Sierra Leone and a few other very small importers. They are:

- Commodity Trading Corporation CTC
- Tajco
- Bazzy (Ibrahain Bazzy and Sons)
- Sierra Commodity Company Limited (formerly Harmony)
- Others

The largest is CTC which commands over 35% of the imported rice market in Sierra Leone. The remainder is split between the others. Bazzy and Tajco are also quite large importers and operate in a very similar way to CTC. CTC operates with one of the largest grain companies in the world; Louis Dreyfus Limited using a Collateral Management Agreement CMA. Their warehouse is fairly full but they are expecting 3 more shipments of rice in the next month. They operate through distributors and other buyers and transport and sell rice to all of the terminal markets in Sierra Leone. Imported rice is currently less expensive than local rice and will remain so until harvest time when prices fall.

Many wholesalers who sell imported rice buy from a variety of importers. Some do so on consignment and some purchase directly. There are a few who sell rice for one importer only. Many wholesalers rent space in the terminal markets and purchase transport, loading and unloading services. The wholesalers who rent space have low profit margins. A few of these wholesalers also deal with Sierra Leonean rice but this is not very common.

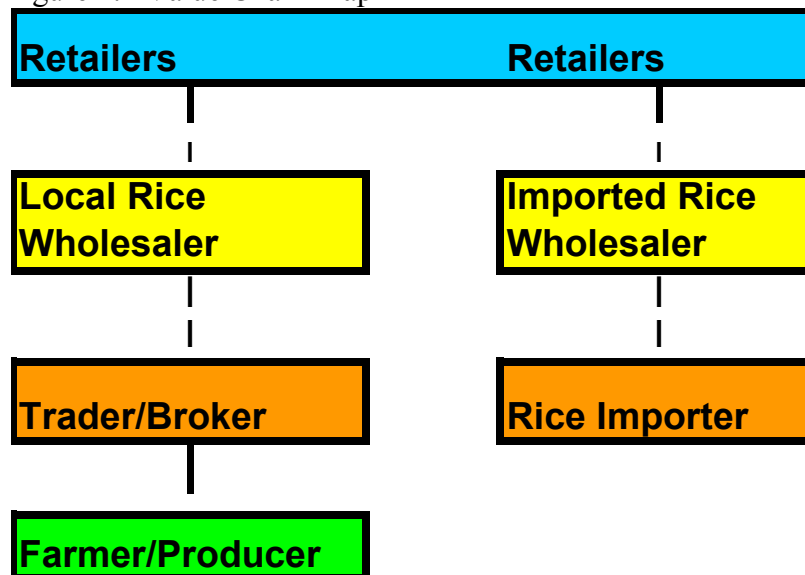
Retailers sell both local rice and imported rice by the cup in all of the terminal markets of Sierra Leone including even villages. Some of them obtain their rice from the wholesaler/distributor on consignment and pay them back when they have sold all. Some retailers will buy bags of imported rice and sell by the cup in villages where there is no rice. Many distributors lose out when retailers make off with several bags on loan and never return. You can find retailers in all of the markets of Sierra Leone many with several large bowls of different types of rice. Currently local rice is slightly higher than imported rice in all of the primary markets averaging about Le600/cup Pakistan rice and about Le700/cup local rice with local variations.

Local rice is still being sold in many of the terminal markets in Sierra Leone including Freetown.

Iib. VC Map

The channels between local rice and imported rice are mostly separate until they reach the retailer and ultimately the consumer. In smaller markets, there are wholesalers who sell both imported and local rice. However at the retailer level you find both imported and local rice being offered for sale together particularly up country. There is no Sierra Leone rice for sale in supermarkets such as Choithrams.

Figure 2.1 Value Chain Map



Iic. Value Change Along the Value Chain

There is very little “value add” along the rice value chain in Sierra Leone. The market is not well organized with a large degree of fragmentation. There is a severe lack of grades and standards with different definitions of a bushel in each district and even within the district. The product does move through a fairly traditional set of participants to get from producer to consumer. Cost data for all participants in the rice value chain can be found in appendix A. The value change is highly dependent on location and can vary accordingly.

Components of value add

Farmers pre plant

- Prepare ground for planting mostly by hand usually with a hoe
- Nurse rice (for mangrove and inland valley ecologies)
- Transplant rice mangrove and inland valley swamps only, upland and boli farms the rice is sewn directly to the ground
- Weeding by hand
- Apply fertilizer (when available)
- Treatment for cutting grass, birds, diseases and other pests
- Irrigation (inland valley swamp only) very primitive often with inappropriate water control

Farmers harvest and post harvest

- Harvesting – cutting and removal of rice stalks from field
- Threshing – removal of grain from stalk usually with sticks by hand
- Winnowing – separating grain from chaff (usually done with fans)
- Parboiling – boiling and drying rice in the husk
- Milling – removal of husk from grain done by sometimes by mill machines but mostly by hand with mortar and pestle
- Bagging the rice

Trader

- Bagging of husked rice (if not already done by the farmer)
- Milling will usually be done by machine if done at this level in the chain
- Parboiling – very popular in the north, trader will parboil if farmer has not
- Re-bagging of milled rice and parboiled rice
- Transport from village to market

Wholesaler

- Storage of rice
- Provide credit to traders and retailers

Retailers

- Sell the rice by cup (cup sizes vary)

Value Change

Below are examples of value change for the rice value chain in Sierra Leone. The first example is a current broker transaction occurring in Bamoi market in the northwest. The second is an example from a village in Samu Chiefdom where the rice goes to Guinea. There is also an example from Makeni where a broker is buying and storing rice to sell at the peak of the hungry season. All of this rice is locally grown rice.

Rice prices change from district to district and therefore a value change map will have different prices depending on the location. The value chain shortens in cases when wholesalers are engaged in trading and brokering such as the example below in figure 2.2.

Figure 2.2 Value Change (Kambia/Bamoi Market, May 2009)

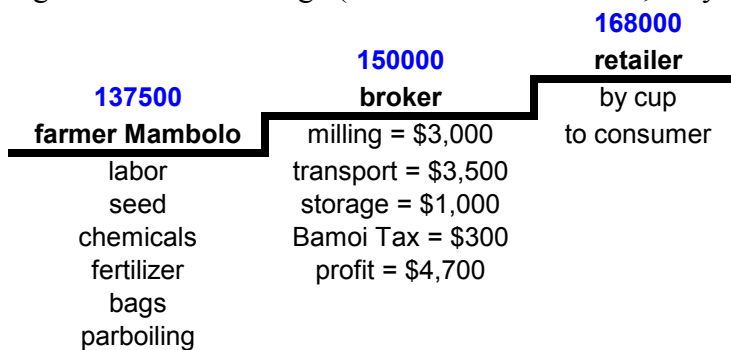
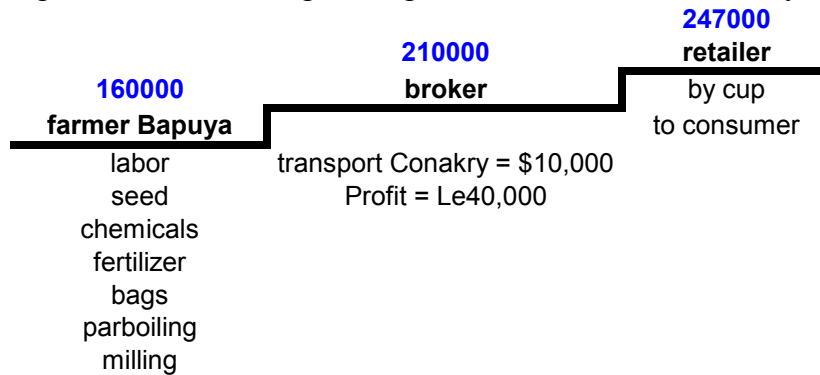


Figure 2.2 illustrates a transaction where farmers in Mambolo sold rice to a broker for Le137,500/bag. The broker transported the rice to the Bamoi market and sold it to retailers for Le150,000/bag. The retailer was selling the rice by cup for Le700.

In this example there are many risks taken by the broker, for example the storage costs at Bamoi are Le500/bay/day and this rice sat for only 2 days. The longer the rice sits the more the broker has to pay out. Also many brokers ship rice to Conakry where it can fetch Le200,000 per bag but there is risk of seizure at the border by Sierra Leone gov't officials.

From the diagram above it appears that the retailer earns the bulk of the money in the rice value chain but this is not the case due to the velocity of the transactions. Brokers can have many transactions in one day whereas retailers will take as long as 20-30 days to earn their money.

Figure 2.3 Value Change Village Samu Chiefdom to Conakry May 2009



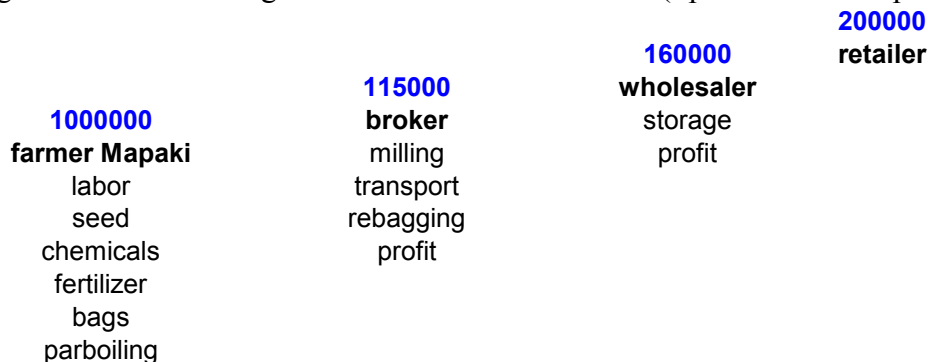
In Figure 2.3 above the farmer in Bapuya sells rice to a broker for Le160,000/bag. Since there is only one major checkpoint between Samu and Conakry the rice fetches a higher price. The rice does risk seizure on its way to Guinea but this is unlikely. This value change diagram illustrates why much of the Kambia district rice goes to Guinea.

Sierra Leone parboiled rice (wallah rice) fetches a high price in Conakry. The reason has much to do with taste preferences of the Fula, Mandingo and Susu tribes which dominate Guinea particularly around Conakry. Guinea has more than double the population of Sierra Leone and it is easier to reach Conakry from Samu chiefdom Sierra Leone than it is from many places in Guinea.

Other reasons for the trade flow between Guinea and Sierra Leone:

- Historical tribal connections between the Susu of Sierra Leone and Guinea
- Lack of natural boundaries, you have to cross a river to get to Freetown and its almost easier to send products to Guinea
- High demand and high prices for Sierra Leone palm oil and parboiled rice
- Less expensive prices on consumer goods such as cigarettes,

Figure 2.4 Value Change Bombali District June 2009 (Speculated retail price Aug 09)



As shown in figure 2.4, rice in Bombali district fetches a lower price than that of the northwest due to its distance from Guinea. In the example above, the wholesaler plans to

hold on to the rice till hungry season and sell for a profit. The price of rice can go as high as Le1,000 per cup in the hungry season. The above example shows rice at Le800/cup.

IId. Value Chain Constraints

Market power is concentrated in the hands of importers and wholesalers who own storage facilities and have the capital to buy rice low and sell rice when it is expensive during the hungry season. All other participants in the value chain are price takers. The level of trust varies but due to the overall lack of a good market information system, the inherent lack of transparency leads to an overall lack of trust.

Farmers

- Lack of fertilizer and knowledge of appropriate use
- Lack of seed, poor seed germination, inappropriate seed for ecology where planted
- Lack of credit some areas charge 100% interest, many farmers have high debts
- Lack of chemicals and knowledge of use for control of pests
- Very little mechanized cultivation, (tractors do not typically last beyond 2 or 3 seasons)
- Lack of appropriate post harvest technology resulting in high post harvest losses
- Lack of market information – farmers are price takers
- Lack of enforcement and knowledge of grades and standards
- Lack of irrigation, many farms are rain-fed
- Many inland valley swamps are no longer intensely cultivated in the intensive paddy style introduced in the 1970's and 80's.
-

Brokers/Traders

- Lack of uniform grades and standards
 - multiple definitions of a bushel
 - different cup sizes
 - different can sizes
 - different bag sizes
- Lack of market information
- Low trust
- High risks particularly when crossing the border
- Poor transportation and Logistics

Wholesalers of Local rice

- Lack of timely market information and transparency
- Low trust
- Non uniform grades and standards
- Consignment buyers disappear
- Many are sources of market power

Wholesalers of Imported rice

- Poor transportation and logistics
- No market information system

Importers

- Have the most market power
- Very few constraints

Retailers who sell rice in the terminal markets

- Lack of uniform grades and standards
- Lack of market information systems

Iie. Opportunities for Upgrading and Investment

Because of the large number of constraints throughout the value chain, and particularly on farmers, there are many opportunities for upgrading all along the value chain.

All VC Participants

- Improved market information
- Introduce uniform grades and standards
- Introduce improved storage technology
- Improve transportation infrastructure

Farmers

- Encourage the formation of producer groups and support existing groups to leverage interventions
- Introduce technologies to improve yields
- Improve Post Harvest technology and reduce loss
- Provide better sources for credit to farmers
- Capacity building for farmers such as FFS
- Agribusiness services to facilitate the acquisition of critical inputs

Marketing (Brokers/Wholesalers/Retailers)

- Improved branding and quality

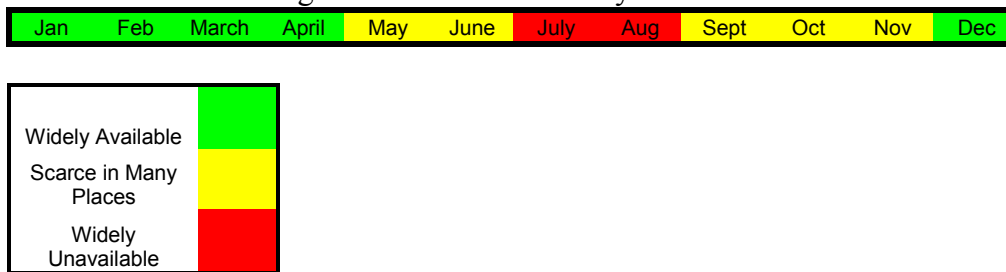
III. Supply and Demand Analysis

IIIa. Rice Availability Calendar

Harvest season begins in September when the hungry season is at a peak in the inland valley swamps and in some upland farms particularly shorter term varieties. Harvesting Begins in earnest in December and continues into January when rice availability peaks. Rice continues to be available throughout the country till June when most of it is either

used as seed or consumed. During the hungry season of July and August farmers subsist on cassava, potatoes and yams.

Figure 3.1 Rice Availability Calendar



Below are in table 3.1 are price estimates obtained from local rice traders in Freetown from August 2008 to August 2009. There will be regional variation in these prices. This is for wallah rice which is the parboiled rice sold mostly in the northern provinces of Sierra Leone.

Table 3.1 Wallah price fluctuations by month in Freetown

	August 2008	September 2008	October 2008	November 2008	December 2008	January 2009	February 2009	March 2009	April 2009	May 2009	June 2009	July 2009	August 2009
Parboil (Wallah) Rice	140,000	140,000	130,000	120,000	90,000	90,000	100,000	115,000	125,000	140,000	150,000	160,000	165,000
Spot Prices Imported Rice Pakistan	112,000									100,000	100,000		122,000
Spot prices Imported Chinese Parboil	135,000									130,000	130,000		145,000

(Leones per 50kg milled bag)

The above data shows that the price of local Sierra Leone rice is consistently higher than imported rice.

IIIb. Rice Production

The data on Sierra Leone's rice production is not well documented and needs further validation as there is conflicting information in different reports. According to FAOSTAT, Sierra Leone had a spike in rice production in 2006.

Table 3.2 Sierra Leone Paddy Rice Production (tons)

2003	2004	2005	2006	2007
445,633	542,000	738,000	1,062,320	650,000

(Source FAOSTAT)

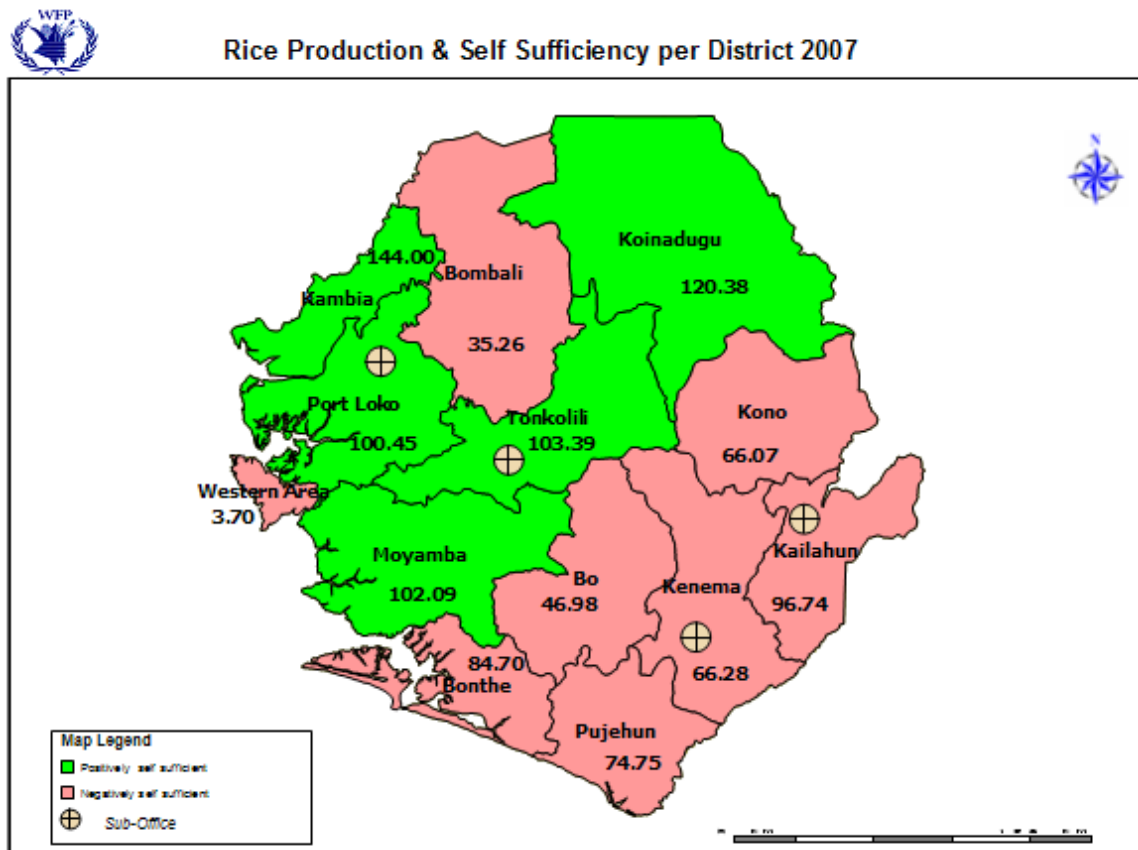
Paddy rice production shown in table 3.2, which is rice still in the husk, shrinks when milled by about 55 to 65% depending on the amount of drying, and the type of milling. Sierra Leone requires approximately 530,000mt of milled rice to meet its consumption needs (9)(8).

According to the data in table 3.2, Sierra Leone should have been self sufficient in 2006 although FAO data shows Sierra Leone importing 61,911 tons of milled rice plus 28,400 tons of broken rice. This may be a faulty figure or it is possible that much of the rice produced up country in 2006 did not make it to the largest market in Freetown due to the poor transportation infrastructure. The data on formal and informal trade flows out of Sierra Leone along with data on rice production needs to be better captured and exported.

IIIc. Rice Production Vis a Vis Consumption

Below in figure 3.2 is an estimate of self sufficiency from WFP based on calculations of per capita rice consumption, district populations and estimates of rice production.

Figure 3.2 WP Self Sufficiency Map



(Source WFP)

Most of the districts were visited to gather data with the exception of Moyamba, Bonthe and Pujehun. This was primarily due to the time constraints of the study. As the above map illustrates the largest producers of surplus rice are Kambia and Koinadugu. The lowest producers are Bo and Kenema where there are more cash crops such as coffee and cacao.

Table 3.3 provides the data utilized for the map illustrated above in figure 3.1. Note that this data is for one year 2007. Data from other years in Sierra Leone will need to be compiled and incorporated into this model to get a better picture of the production and self sufficiency in each district. Also the population data in this table is based on estimates and does not come from recent census data. Data was not available at the time of this report writing for 2008. MAFFS Statistics is in the process of finalizing this data. This map does provide a starting point for evaluating production and consumption in Sierra Leone.

Table 3.3 Sierra Leone Self Sufficiency by District

	Population Estimate 2007	Estimated Consumption Requirements (mt)	Gross Paddy Production (mt)	Milled Rice	Self Sufficiency
Kailahun	339,363	35,294	56,481	34,143	96.7%
Kenema	455,561	47,378	51,947	31,402	66.3%
Kono	323,422	33,636	36,761	22,222	66.1%
Bombali	1,113,238	115,777	67,538	40,827	35.3%
Kambia	262,826	27,334	65,111	39,360	144.0%
Koinadugu	222,130	23,102	46,005	27,810	120.4%
Port Loko	431,883	44,916	74,638	45,119	100.5%
Tonkolili	327,864	34,098	58,317	35,253	103.4%
Bo	435,437	45,285	35,196	21,276	47.0%
Bonthe	132,754	13,806	19,345	11,694	84.7%
Moyamba	243,680	25,343	42,802	25,874	102.1%
Pujehun	218,964	22,772	28,160	17,023	74.8%
Western Rural	895,163	93,097	5,702	3,447	3.7%
Total	5,402,285	561,838	588,003	355,450	68.6%

(Source WFP)

Transportation from Koinadugu is a major constraint and it is believed that most of this surplus rice ends up in Guinea. One of the reasons for this belief is the long distance of Kabala from Freetown. Kabala is also very far from large population centers in Guinea. Trade flows into Guinea from Kabala need further measurements and evaluation. In Kambia there are strong traditional trade ties with Guinea. Parboiled rice commands a high price in Conakry and because there are no rivers to cross, its close geographical proximity, close cultural ties and favorable price for other tradable goods. As a result much of this surplus rice goes to Guinea.

IIIId. Rice Importation Outlook

Currently the imported warehouses are nearly full. CTC the largest importer of rice has three shipments due in at the end of this month. Other small importers such as Sierra Commodities are bringing additional rice into the country to meet anticipated demand. Imported rice can be found in all of the primary markets up country and in some cases such as Bo and Kono this is the only rice that can be found. Based on conversations with traders and retailers, country rice should be mostly sold out by the end of this month.

IIIe. Trade Policy Issues

Much of the rice in Kambia and it is speculated that much of the rice from Koinadugu district goes to Guinea through informal channels across the border. Traders speculate that as much as 85 percent of the rice from Samu chiefdom (one of the highest producers of rice in Sierra Leone) goes to Guinea. This informal trade results in high transaction costs being captured through bribes at numerous checkpoints along the border. Many traders face high risks through load seizures by police of goods traveling across the border since it is currently illegal to export rice from Sierra Leone.

III f. Sierra Leone Competitive Advantage for Rice

Below are rough farm enterprise budgets from Kambia and Bombali districts. These are not idealized budgets utilizing best practices for cultivation with maximum yields, but rather are based on farmers estimates of their own costs and yields. These budgets were developed in order to examine Sierra Leone's comparative advantage for rice. There is likely to be fluctuations from one farmer to the next within districts and larger fluctuations between different districts.

Preliminary calculations show Sierra Leone with a comparative advantage for rice production but more work needs to be done to finalize budgets for the different farm ecologies in Sierra Leone.

Sample Enterprise Budget for Kambia District

Costs 3 bushel farm

Seed	75000
Digging	50000
Pulling Grass	20000
harvesting	30000
threshing	60000
fertilizer	120000
Total	355000

Revenue

27 bushels	540000
post harvest loss	108000
transport	50000
milling and bags	20000
June in Darghabe	
Guinea	800000
profit	375000

Enterprise Budget for Inland Valley Swamp Bombali/Tonkolilli

Costs/acre

Seed	25000
land rental	50000
Brushing	20000
digging	20000
puddling	10000
transplanting	8000
weeding	8000
fertilizer	120000
harvesting	30000
threshing	30000
winnowing	30000
birds/fencing	40000
production costs	391000

30 bushels	600000
Post harvest loss 20%	120000
	480000
if sold in Bamoi in June	900000
transport	60000
milling and bags	30000
Profit	810000

Calculation of DRC

The domestic Resource Cost Coefficient (DRC) compares the cost of producing a product and bringing it to market with the price a product brings in world markets. If a products DRC is less than the exchange rates valuation of a dollar then the product has a comparative advantage (at prevailing exchange rates). In other words a dollar can be earned utilizing production of a product more cheaply than it could be purchased on the foreign exchange market. (5).

It is calculated as follows:

$$DRC-P = \frac{E_j \cdot d_{ij} \cdot pd_j}{(pb_i - E_j \cdot m_{ij} \cdot pm_j) / e}$$

DRC-P = the DRC at prevailing exchange rate

d_{ij} = domestic inputs

pd_j = domestic input prices

pb_i = border output price

m_{ij} = imported inputs

pm_j = price of imported inputs

e = exchange rate

Table 3.4 DRC Calculation

DRC Calculation $DRC = \frac{E_j d_{ij} * p_{dj}}{(p_{bi} - E_j m_{ij} * p_{mj}) / e}$	(Leone's per acre production, 2009 data)				
	Total value of domestic inputs	Border output revenue	Total value of imported inputs	exchange rate	DRC
Rice IVS Bombali	271000	419000	120000	3200	2900
Mangrove Kambia Dist	235000	375000	120000	3200	2949

All prices are assumed to be expressed in domestic currency. The output price is adjusted to reflect the marketing costs required to place it at the border. Values below the exchange rate mean a comparative advantage. The lower the number the better because this means that it costs less to earn a unit of foreign exchange (5).

Table 3.4 uses rough production cost estimates from MAFFS in Bombali for 2009, the production cost in a mangrove swamp in Samu chiefdom and the exchange rate for Leone's in 2009. Based on these budgets rice has a comparative advantage. This data is for only one year and utilizes a very small sample and needs further development and validation.

The values obtained can be distorted by a number of factors listed below:

- The value of the DRC can be affected by policies that create distortions in the currency markets.
- The DRC is location specific so the costs of growing and bringing a crop to market from one region may be very different that bringing it to market from another region in the same country.
- This approach does not take into consideration the long amount of time it takes to bring certain ecologies such as inland valley swamps into maximum production.

Having pointed out weaknesses, it is important to start a value chain analysis with a crop that will provide a country with a comparative advantage. The DRC is a good starting point for selecting value chains for development initiatives.

VI. Conclusions and Recommendations

Via. Value Chain Development Challenges and Opportunities

There are many challenges inherent in the development of the rice value chain or any of the value chains in Sierra Leone. Some of the primary overarching challenges in Sierra Leone are:

1. The lack of good roads and challenging logistics particularly in the rural villages of Sierra Leone
2. Reliable sources of power are mostly absent throughout Sierra Leone

3. The lack of a market information system in Sierra Leone such as tradenet. (<http://www.tradenet.biz/>). These would improve transparency and thus the level of trust would improve in the system
4. Lack of capacity. Sierra Leone lost much expertise during the years of the civil war. Many current civil servants and employees are in needs of skill building.

There are opportunities throughout the value chain. Sierra Leone is still feeling the effects from the prolonged civil war which has resulted in the loss of much expertise. Therefore **capacity building** all along the value chain is needed starting with farmers, producer organizations, brokers, wholesalers and retailers. The Ministry of Agriculture and Forestry represents a key opportunity for capacity building in Sierra Leone.

Encouraging the use of **private sector** throughout the value chain represents an excellent opportunity for Sierra Leone. By allowing market forces to operate more fully in this value chain could result in:

- Fertilizer would become available to increase production
- Chemicals would be available for the control of pests
- Seed rice (this plan is underway)
- Mechanization has potential if private sector funded and initiated. State owned machinery typically lasts only a couple of seasons

Vlb. Opportunities for Upgrading and PPPs

Seed Multiplication

- This PPP is in process and will help improve access to viable seed appropriate to the ecology where planted

Privatization of Input Supply such as Fertilizer and Chemicals (Agribusiness Services)

- To insure that these inputs are available to farmers. Market forces would likely drive the price down if done in conjunction with open borders
- IF MAFFS intends to subsidize fertilizer than a voucher system would be a way to allow market forces to get the fertilizer into the shops while farmers utilize vouchers to purchase.

Enforcing P4P standards and ultimately codex

- There are essentially no grades and standards for rice so this one is vitally important

Develop a Sierra Leone Brand and Market for Organic Rice (Partner with International Rice Commission, an Importer and a Local Exporter)

- This would have to be done with a cluster of existing growers who are ready. It can be developed simultaneously while the rest of the chain is undergoing investment. Local international export expertise will be a key constraint.

High Intensity Cultivation

- Building rice paddies in inland valley swamp with adequate year round water will increase production.
- Privatized mechanization of Boli lands in the north has merit and if carefully implemented with privatization, can contribute to increased production

VII. Role of Women

Women are actively involved in the rice value chain at all levels. Men tend to be more involved in brushing and hoeing and women more involved in planting and weeding. Both genders are involved in harvesting and threshing but women are the primary participants in much of the post harvest handling of rice. As you move along the value chain from the farm to the consumer many women are serving roles as wholesalers and brokers and women make up virtually all of the retailers. Several women's cooperatives in Sierra Leone are farming rice and are working at every level of the rice value chain.

VIIIa. Policy Recommendations

Many of these policy recommendations have already been recognized by MAFFS and some are currently underway.

1. **Establish Uniform grades and standards** to be utilized throughout the country. In particular since there are many different definitions of a bushel, one standard should be adopted and enforced throughout Sierra Leone.
2. **Legalize Cross Border Trade** - There is a large volume of rice crossing the border in Guinea from Sierra Leone via informal markets. This is because parboiled rice is more expensive and in greater demand in Guinea than in Sierra Leone.

Existing agreements such as ECOWAS and Mano River Union could be utilized to free up this trade and allow goods to travel between borders without harassment. Sierra Leone will therefore be able to capture the amounts of this trade flow. This represents an opportunity for Sierra Leone to develop crops that have comparative advantage due to the pull from market forces in Guinea.

3. **Privatize Seed Multiplication and Distribution** – This is currently underway. Seeds are in great demand by farmers, they are not properly stored, and often the wrong seeds are used for the wrong ecology. The privatization of this process will greatly assist farmers in obtaining good seed for improving rice yields.
4. **Privatize Supply of Other Inputs** – Fertilizer and Chemicals are not available in stores and cannot be purchased. Currently the government of Sierra Leone has put out a bid for fertilizer to be offered at subsidized prices to farmers but there is currently no fertilizer available throughout the country. Privatizing this process and allowing free market to work will encourage business such as Fachima Agribusiness Services (Kono) to form in other parts of Sierra Leone. They can develop relationship with existing importers and privatize delivery of the whole process. This also insures that fertilizers and chemicals will be available when farmers need them. A voucher system for farmers would be a methodology for subsidizing fertilizer for farmers while allowing the private sector to deliver it to farmers. It would require careful implementation to prevent misuse and corruption.

VIIIb. Other Recommendations

Producer Groups are an excellent means for leveraging training and capacity building. The interventions suggested below will be best sustained if introduced to existing producer groups or clusters of farmers who are acting as a producer group.

1. Encourage VSLA's

- Provide a source of credit with low transaction costs at reasonable interest rates to allow for farm enterprise expansion. This is important as many farmers are burdened with debt repayment at harvest time which in some areas is as high as 100%. This service should also help farmers obtain reasonable credit for inputs during planting season and not have to pay high interest rates.

2. Post Harvest technology and training

- Introduce producer groups to appropriate methods of threshing, drying (cement drying floors), milling (and de-stoning) and appropriate storage devices to reduce post harvest losses and facilitate compliance with WFP/Codex grades and standards. This training will work mainly with women as they are heavily involved in this phase of the value chain. Appropriate rice mills and de-stoners should be introduced to active producer groups. (The large mill in Bo requires a large source of power, is maintenance intensive, and therefore not appropriate for Sierra Leone.) Utilize portable grain testers to check that the moisture content of the rice is at the appropriate level to prevent kernels from breaking.

3. Training on Codex Alimentarius

- MAFFS currently recommends codex for its standard for rice. Farmers and traders are unaware of this standard. Simplified training, needs to be developed including straight forward steps for complying. This training should be leveraged through producer groups throughout Sierra Leone. This is especially important as WFP plans to make purchases for the P4P program in Sierra Leone.

4. Inland Valley Swamp Development

- Inland Valley Swamps are underutilized in Sierra Leone. By plotting inland valley swamps with drains and canals to control water for maximum yield output and secondary cropping yields could be increased dramatically. Use a train the trainer model to develop experts regionally particularly within farmer groups.

5. Establish a Market Information System and Training

- Services such as tradenet allow traders and brokers to post information on the web and obtain SMS quotes on their cell phones. This type of service could be implemented for producer organizations to allow them to gain market power and knowledge of local and regional markets to sell rice in when and where the prices are higher.

6. Develop Training on Use of Chemicals and Fertilizer

- Farmers do not know how to properly use fertilizer and chemicals. Fertilizer should be packaged and sold in units best utilized by farmers. Graphic illustrations developed for applying fertilizer and when to apply for maximum yield. Proper handling of chemicals for pest treatment is essential for preventing injury. The handling of chemicals is particularly important as the gall midge problem persists in many areas of Sierra Leone and many sprays are not effective against this pest.

Gaps for Further Study

1. Develop regional enterprise budgets based on larger sample sizes
2. Evaluate trade between northern and eastern Sierra Leone and Guinea Kabala and Labe, Kambia and Conakry, Kailahun and Gueckedou
3. Visit farms and markets in Moyamba, Bonthé and Pujehun
4. Evaluate larger sample sizes of wholesalers and rice traders for local rice and imported rice
5. Incorporate population census data and smooth out production statistics to obtain a better picture of district self sufficiency

MAFFS Recommendations

The current strategy for rice with MAFFS has many of the same components mentioned in this report. The primary components of Sierra Leone's national plan for rice are:

- Adopting High Yield Varieties
- Providing Ag Chemicals such as fertilizer and Pesticides
- Supporting Existing Farmer Organizations
- Provide farmers with access to Post Harvest Technology
- Implement Ag Mechanization

Agricultural Mechanization has been implemented in Sierra Leone in the past but has not been sustainable. One of the reasons is because mechanization has never been privatized. This year MAFFS plans to implement mechanization for private enterprises. If mechanization is implemented to encourage private ownership, it is possible that it can work in Sierra Leone. Utilizing strong farmer organizations as a conduit for this mechanization to insure that equipment is properly utilized and maintained, will be important if this program is to be a success.

Web Site Links

World Bank Page

www.worldbank.org/sierraleone

FAO Page

http://www.fao.org/es/ess/yearbook/vol_1_2/pdf/Sierra-Leone.pdf

WFP Page

<http://www.wfp.org/countries/sierra-leone>

Value Chain WIKI

http://apps.develebridge.net/amap/index.php/Value_Chain_Mapping_Process

Tradenet

<http://www.tradenet.biz/>

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3. WARDA/Papa Abdouleye Seck, Sep 2007, “Rice Crises Myth or Reality”
4. World Fact Book <https://www.cia.gov/library/publications/the-world-factbook/geos/sl.html>
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<http://www.technoserve.org/documents/VCGuideNov12-2007.pdf>
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http://apps.develebridge.net/amap/index.php/Value_Chain_Mapping_Process
7. World Bank, August, 2007, “Agricultural Industries Emerging From Conflict, Analysis of Six Value Chains in Sierra Leone”
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<http://www.warda.org/publications/Rice%20Trends.pdf>
9. MAFFS, 2009, Draft – “National Rice Development Strategy”

Appendix A
Sierra Leone Rice Value Chain Analysis:
Cost Data along the chain
May/June 2009

Kambia District
(Bamoi Market)

1 bag milled rice =	Le160,000/bag Kassiri, Bapuya, Maportalone Le140,000/bag Rokupr, Mambolo Le150,000/bag Port Loko, Bamoi
Seed Rice Bushel	Le50,000 Samu, Le40,000 Mambolo, Rokupr Le60,000 Port Loko
Retail price per cup (local wallah rice)	Le700/cup Mambolo, Rokupr, Bamoi, Port Loko, Samu chiefdom
Imported Rice per cup	Le600/cup Bamoi (Pakistan/Indian 25% broken rice)
Imported Rice per bag	Le100,000/bag Bamoi (Pakistan/Indian 25% broken)
Milling per bag =	Le4,000 Bo, Kenema, Le3,000 Kassiri Le6,000 Mambolo
Transportation Costs 1 bag milled	Le10,000 Samu to Conakry Le 10,000 Rokupr, Mambolo, Samu to Freetown Le1,000 Rokupr to Bamoi
Bamoi Tax	Le300/bag
Store rental Bamoi	Le500/bag/day
1 bag	Le1,000
Fertilizer	Unavailable - roughly Le120,000/bag (NPK or Urea) from Guinea mostly

Bo/Kenema/Kailahun Districts

1 bag milled rice =	Largely Unavailable,
Seed Rice Bushel	Le50,000 -60,000 but not available according to farmers

Retail price per cup	Le700-800/cup Kailahun, did not see in Bo or Kenema
Imported Rice per cup	Le700/cup Kailahun (Pakistan/Indian 25% broken rice) Le600/cup Bo Kenema
Imported Rice per bag	Le110,000/bag Kailahun Le98,000/bag Bo Kenema
Milling per bag =	Le5,000 Kailahun Le6,000 approximately in Bo
Transportation Costs 1 bag milled	
	Le4,000 Freetown to Bo/Kenema Le 5,000 Kenema to Kailahun (Did not get prices to Liberia or Guinea)
Store rental	1 million to 2 million Leone's per year depending on size in Bo or Kenema
1 empty bag fertilizer	Le1,000 Unavailable, farmers did not know the price and we did not find any in stores in Bo, Kenema or Kailahun

Kono District

1 bag milled rice =	Le100,000 country rice (not parboiled), hard to find
Seed Rice Bushel	Le50,000 -60,000 but not available according to farmers Le 120,000/bu Fachima Agribusiness Services
Retail price per cup	Le700-800/cup Kono, Kueyoldondoya
Imported Rice per cup	Le600/cup Koidu Le700/cup Tongo Field, Komadu Loma
Imported Rice per bag	Le98,000/bag Kono
Milling per bag =	Le5-6,000 Kono Le4,000 Kueyoldondoya
Transportation Costs 1 bag milled	
1 empty bag	Le4-5,000 Freetown to Kono Le1,000

fertilizer Le175,000/bag or Le3,000/ one kg bag Fachima
Agribusiness Services

Bombali/Tonkolilli/Koinadugu District

1 bag milled rice = Le100,000 country rice Mapaki
Le110,000 Mabondo, (not in Mayenbere (Batkanu area)
Le 120,000 Fadugu (Koinadugu dist)
(Most local rice was said to be in short supply)

Seed Rice Bushel Le72,000 Bange Baneh
Le60,000 Mayawenbe
(Most villages were out of seed rice except Mabando)

Retail price per cup Le850/cup Fadugu
Le750/cup Makeni
Le700/cup Mapaki
Le600/cup Mabondo, Mabonkani, Malone
Le650cup Bange Baneh,

Imported Rice per cup Le700/cup Fadugu
Le600/cup Makeni

Imported Rice per bag Le95-98,000/bag Makeni

Milling per bag = Le5000 Makeni
Le6,000 Mabando

Transportation Costs 1 bag milled

Le2,000 Freetown to Makeni
Le2,000 Malone/Mapaki to Makeni
1 empty bag Le1,000
fertilizer Did not find any fertilizer

Bushel Definitions

1 bushel = 19 pans (tropenspan)
1 bushel = 20 pans
1 bushel = 1 box (size varied)
1 bushel = two 34 cm buckets
1 bushel = 2 half kerosene tins
1 bushel = 15-18 pans
1 bushel = 24 pans
1 bushel = 4 buckets

Appendix B
Sierra Leone Rice Value Chain Analysis:
List of Interviewees
By
Jim Phillips
May/June 2009

May 18th
Kevin Gallager FAO Freetown
Dr. IMO Shamie Head MAFFS Pest Control Unit

May 19th
Miyuke Yamashita, WFP Freetown

May 20th
CTC Commodity Trading Company 3 Wallace Johnson Street, Freetown **Importer**
Yagala Enterprises, Kissy Road, Freetown **Input Supplier**
Abu Kamara, Freetown Lorry Park, **Retailer**
Abu Bakar Kargbo, MAFFS, Agricultural Instructor/Extension Agent

Kambia District

May 22nd
Kassiri **Farmers, Broker** (Samu chiefdom)
Maportalone **Farmers, Broker** (Samu chiefdom)
Bapuya **Farmers** (Samu chiefdom)

May 23rd
Bamoi Market
Interview #1 **Broker**
Interview #2 **Wholesaler**
Interview #3 **Broker**
Interview #4 **Broker/Wholesaler**
Interview #5 **Several Retailers**
Mambolo **Farmers**
Rokupr **Farmers**

May 24th
Port Loko **Farmers**
Magbanta **farmers** (Port Loko Dist)

Freetown
May 25th
Freetown Guard Street, **Several Retailers**

May 26th

Benedict Massequoi, Head MAFFS Extension
Mohamed Ajuba Sherrif, Head MAFFS Statistics

Bo District

May 27th

Chinese **Rice Miller**

Interview #1 **Import Wholesaler**

Interview #2 **Import Wholesaler**

Interview #3 **Several Retailers**

Kailahun District

May 28th

Nyanghun **Farmers**

Tortoma Womens Network **Farmers/Broker/Retailer**

Interview #3 **Import Wholesaler**

Interview #4 **Several Retailers (Country Rice and Import)**

Amuloma Luama Womens Coop, **Farmers**

Kenema District

May 29th

Interview #1 **Wholesaler/Broker**

Interview #2 **Wholesaler/Broker**

Interview #3 **Several Retailers**

Kono District

May 29th

Tongo Field **Retailer**

Komador Loma **Retailer**

#9 Youth Farmers Association, **Farmers, Millers**

Interview #5, **Wholesaler/Broker**

Interview #6, **Wholesaler/Broker**

Interview #7 **Several Retailers**

Fachima Agribusiness Services, **Farmers, Input Suppliers**

Kueldondoya Farmers Association, **Farmers**

May 30th

Fachima Agribusiness Services second interview, **Farmers, Input Suppliers**

Bombali District

James S Kamara, MAFFS Agricultural Instructor

Mayawenbere Village **Farmers**

Interview #3 **Several Retailers**
Interview #4 **Import Broker/Wholesaler**
Interview #5 **Import Broker/Wholesaler**

May 31st
Mapaki, **Farmers**
Mabando **Farmers**
Mayenbere **Farmers**
Makeni **Rice Mill**
Makeni **Broker**

Koinadugu Dist.

June 1st
Fadugu **Farmers/Broker**

Bombali District

Kamabai **Farmers**
Mabonkani Village **Farmers**
Makeni Chairlady Bombali Womens Coop, **Farmers**

June 2nd

Tonkollili Dist.

Bange Baneh Village **farmers**
Makinthe Village **Farmers**
Mapaki Taneh **Farmers**
Malone Village **farmers**
Interview #5 **Broker/Wholesaler**
Interview #6 **Broker**

June 5th
Interviews **several retailers**
Tajco and Bazy, Sierra Commodities **Importers**
Kissy Road Freetown **Input Suppliers**

June 9th
Abu Bakar Kargbo MAFFS, Lamin Kamara farmer – enterprise budget

June 10th
Gbunkuia Village **Farmers** Samu Chiefdom

June 10th
James S Kamara MAFFS, Mr Sesay farmer - enterprise budget

June 11th

Magbengba Village **farmers** (Bombali District, Batkanu area)

June 12th

Mamaka Village **farmers** (Tonkollili Dist, Mile 91 area)