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SIERRA LEONE AGRICULTURAL VALUE CHAIN ANALYSIS

**ANIMAL PROTEIN, GRAINS, HORTICULTURE AND LEGUMES/PULSES
IN THE BOMBALI AND TONKOLILI DISTRICTS**

LEO

Leveraging Economic
Opportunities

REPORT #23



OCTOBER 2015

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DISCLAIMER

The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development, the United States Government, or the Government of Sierra Leone.

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ABBREVIATIONS

ABC	Agricultural Business Center
Ac	Acre
AHTS	Agricultural Household Tracking Survey
BCC	Behavioral change communication
CIF	Customs, Insurance and Freight; import price
CSA	Climate Smart Agriculture
EVD	Ebola Virus Disease
FAO	Food and Agriculture Organization of the United Nations
FBO	Farmer Based Organization
FOB	Free on Board pricing, price at point of export
FTF	Feed the Future
GoSL	Government of Sierra Leone
ICADEP	Inclusive Comprehensive Agricultural Development Program
Kg	Kilogram
Le	Leones
MAFFS	Ministry of Agriculture, Forestry and Food Security
MFI	Microfinance Institution
NSADP	National Sustainable Agriculture Development Program
PPB	Project Peanut Butter (manufacturer)
PPR	Peste de Petites Ruminant
RUTF	Ready to Use Therapeutic Food
SCP	Smallholder Commercialization Program
SME	Small and Medium Enterprises
SMP	Seed Multiplication Program
SNAP	Sustainable Agriculture and Nutrition Promotion
USAID	United States Agency for International Development
VC(A)	Value Chain (Analysis/Assessment)
WAAPP	West African Agricultural Productivity Program
WASA	West Africa Seed Alliance
WFP	World Food Program

EXECUTIVE SUMMARY

A Feed the Future (FTF) program is being planned for Sierra Leone, encompassing diversified, nutrition-sensitive agriculture. It will focus primarily on one district (Tonkolili or Bombali), to be identified per research and discussions with the Government of Sierra Leone (GoSL). In order to inform program design and focus, USAID contracted the present analysis of several agricultural commodity value chains in Tonkolili and Bombali: 1) animal protein (excluding fish and cattle), 2) grains (for food and feed), 3) horticulture (excluding tree crops), and 4) legumes/pulses (for food and feed).¹ A well-designed FTF program for Sierra Leone would aim to enhance food security, nutrition and incomes while mitigating the secondary economic impacts of the Ebola Virus Disease (EVD); fostering women’s empowerment and gender equity; building climate change resilience, and avoiding negative impacts on the environment (including climate). The potential impact of investments in each value chain will be characterized in terms of i) inclusiveness (households reached), ii) income generation, and iii) nutrition.

The research team selected target commodities for analysis and FTF program consideration according to their estimated contribution to the above objectives, per desk research and initial fieldwork: chicken eggs, goats, sheep, maize, millet, chili pepper, eggplant, leafy greens, okra, groundnut and pigeon pea. Among these, several were selected as top priorities after field work, due to higher overall estimated contributions: chicken eggs, maize, chili pepper, okra and groundnut.

Sierra Leone and the target districts are an excellent focus for FTF. Sierra Leone is a defined low-income country with a Human Development Index (HDI) rank of 183 out of 187 countries in 2014 (UN 2014). In 2014, 52.9 percent of the population lived in poverty, and gross national income per capita was \$702 (World Bank 2015), or \$1,815 in PPP terms (UN 2014). It falls below other Low-HDI countries in these measures (UN 2014). Tonkolili, in particular, has the highest rate of food insecurity and the second-highest rate of EVD (WFP, 2015); and the team perceived lower access to agricultural development resources there than Bombali. Yet it has a sufficient foundation for program success, and strong production and trade/market hubs that could anchor a program, leading the team to view it as a priority focus area. Ebola has had significant economic effects, with the World Bank (2015b) estimating a two to three percent contraction annually for 2014-2015. Agricultural producers, who are already on the edge of poverty or below, were significantly affected due to transit restrictions that left them unable to sell their commodities and purchase inputs for subsequent seasons, and work on their farms in some cases. Ebola prevention bylaws banning the sale of bush meat virtually eliminated it from household incomes and as a food source. The Government of

TARGET COMMODITIES

- Animal Protein: Chicken eggs*, Small ruminants (goats, sheep),
- Grains: Maize*, Millet
- Horticulture: Chili pepper*, Eggplant, Leafy Greens, Okra*
- Legumes/Pulses, Groundnut*, Pigeon pea

* = top priority

¹ In the initial SOW, the specific commodities listed in each group were as follows: 1) animal protein: poultry, small ruminants and non-EVD vector bush meat; 2) grains: fonio, maize, millet and sorghum; 3) horticulture: chili pepper, okra, onion, tomato, eggplant, leafy greens; and 4) legumes/pulses: cowpea, groundnut, pigeon pea and soy. The team identified this list per desk research and initial discussions with USAID, then revised it per further desk research and initial field work.

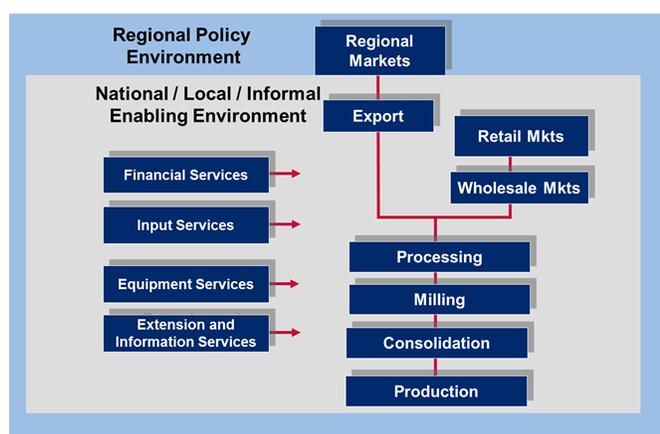
Sierra Leone is very supportive of agricultural development, but has limited resources to implement its programs.

APPROACH

This value chain assessment considered consumption and production of the target commodities in the Bombali and Tonkolili districts. The inquiry followed the value chain from production through end markets. The team traced production from the target districts to in-country end markets (including exporters), and from in-country sources (production and imports) to the target districts. Additionally the team assessed cross-cutting services, both sector-specific (e.g., inputs, equipment, extension) and cross-sector (finance, ICT, transportation), and the enabling environment (policies and norms). The figure below depicts the value chain analysis framework. The assessment combined primary and secondary research, with primary research including individual interviews and focus groups; and used both qualitative and quantitative data.

KEY FINDINGS

- A diversified, integrated production system would have broad-based benefits for producers and other value chain actors. It would allow for risk diversification, income smoothing, improved nutrition and food security, and broad market opportunities.
- Farmers in both districts are already producing such an integrated system, but are not using modern practices due to limited resources and training. As a result, yields are low and post-harvest losses are high



- Farmers in the target districts can produce the target commodities competitively, and there is strong market demand for them. Thus, there is potential for upgrading, and inclusive growth.
- Upgrading is needed across the value chain, from farm to market, to raise incomes, and reduce poverty.
- There are many common constraints across value chains, particularly access to finance (to support modern practices), technical capabilities among farmers and service providers, and market linkages.
- Storage and post-harvest loss are major issues across value chains.
- Commodities such as chili pepper, groundnut, maize and millet have the potential for on-farm value addition, which can raise incomes and further diversify market opportunities.
- Some chains provide opportunities for youth employment, such as groundnut paste production.
- The private sector is thin. In sub-sectors such as fertilizer, government intervention has constrained the development of independent, private-sector entities.
- Veterinary services are very limited in availability, resulting in high livestock mortality due to lack of preventative and curative care.

- Women’s empowerment and gender must be addressed in any program. Fieldwork indicated that women bear a significant share of the total labor burden across commodities, providing the majority of labor for vegetables and groundnuts (with men generally handling more arduous tasks across commodities). However, they reported that they generally do not have control over land, income or other assets. They also factor highly in retail, and trade in some cases, so such efforts must cover the value chain.
- Climate change impacts such as changes in average temperatures, and the timing and intensity of rainfall, have not been severe to date, but have begun, and continued effects are predicted (World Bank 2015c). Thus, efforts to support adaptation are important and will position producers well for the future. Programs should seek to avoid negative impacts on the environment and climate, such as habitat loss and emissions from converting primary forest and other native lands into agricultural land.

POTENTIAL INTERVENTIONS

The following interventions address key constraints that the field team identified as limiting outcomes in the target value chains, and are thus important to consider for FTF programing. Many are linked, and thus should be implemented in concert, to achieve positive, optimal outcomes.

- Facilitate access to pre-season finance for seeds, fertilizer, storage bags and livestock; to increase output and profits. This was the major constraint seen across commodities. Value chain financing and financial institutions seem to be the most sustainable sources of financing.
- Foster market linkages. Many farmers and traders indicated that they had few buyers, and/or wanted more direct buying relationships. Such relationships would foster mutual gains in terms of efficiency, quality and mutual profits. The cost/benefit of direct sales must be evaluated, as these require the buyer or seller to bear transport costs that an intermediary would otherwise cover.
- Provide technical and financial training to farmers and linked value chain (VC) actors, in dual-gender/joint spouse training. Producers showed a keen willingness to learn about better practices and to be able to access pre-season financing. TechnoServe has found that joint spouse training (e.g., Coffee initiative, East Africa) drives higher women’s empowerment in the household, and higher farm output. Mutual understanding across the supply chain can return mutual gains.
- Organize farmers for collective post-harvest processing and marketing, and build capacity for ownership and management of collective ventures. Basic post-harvest processing such as shelling and drying peanuts can deliver measurable added income. Appropriate facilities, such as clean drying areas, are essential. Foster the expansion of ABCs to the target commodities, with the provision of business and management training, and democratic leadership and decision-making structures. This will enable farmers to take ownership of ABCs and undertake sustained operations with equitably shared benefits.
- Facilitate on-farm value addition, and improved post-harvest handling and storage. Simple processing such as making groundnut paste and grain flour can diversify income streams and grow incomes. Post-harvest handling must be improved with respect to food safety and quality, particularly in terms of drying grains to a standard moisture content that meets end market demands.² High post-harvest losses, due to

² The MAFFS crops division cited a 14 percent standard, while a poultry producer cited 11 percent as their standard for maize, and noted that they have drying facilities since farmers do not dry to this level.

insects and rats, can be prevented through better bags, such as PICS bags or double-bagged poly bags. This would enable off-season sales, which bring higher prices and foster income smoothing.

- Facilitate the development of independent private sector input/service producers; with consideration for tactics that help private suppliers compete in distorted markets, and address this distortion. The government has intervened in the fertilizer sector in particular, limiting the number of enterprises, which increases prices and reduces availability. The continued provision of large amounts of free and subsidized inputs by NGOs and government has distorted markets and makes them unattractive/non-competitive for the private sector. In a recent report on Ebola effects on the agricultural sector, Mercy Corps (2015) note this issue, and recommended vouchers as a means of addressing this. Producers would use vouchers that offset part of the cost to purchase goods from private firms, maintaining purchasing behavior and fostering a buyer-seller relationship. At the same time, it is critical to engage the government in changing policy to reduce distortion, and promote free competition that draws more suppliers to the sector. Private sector development in inputs and service provision can also cover gaps in extension and vet services (due to limited funding at MAFFS), and supplies of animal inputs such as vaccines.
- Facilitate the development of financial products tailored to agriculture, with features such as longer pay-back times to enable end-of-season repayment. Other products such as savings and weather (index) insurance would be valuable. Mobile banking can be scaled up to reach more rural households (e. g., MPESA in East Africa), though ICT limitations (network coverage and smartphone use) affect potential reach at present. As part of this, train farmers on financial management and loans, and train lenders on agricultural production cycle needs and risks, so they can engage more confidently and successfully.
- Implement behavioral change communication to increase vegetable consumption, and thus micronutrient intake. Vegetable growers reported selling a high proportion of their output, a phenomenon that key informants also reported for major vegetable regions such as Koinadugu. This indicates that households need education to understand the health benefits and economic value of home consumption.
- Advocate for the implementation of MAFFS' gender policy, to provide for sustained gender equity. MAFFS stated that they have a defined gender policy but need resources and support to implement it.
- Foster smallholder-friendly climate adaptation such as planting hedgerows to mitigate winds, using drought tolerant varieties where available (e.g., pigeon pea), and planting crops along farm edges to reduce erosion.
- Facilitate in particular market re/inclusion of communities that were highly affected by Ebola, particularly due to stigma associated with areas of high incidence, such as Tonkolili and quarantined communities. Incorporate program elements that transition households receiving emergency Ebola support, such as free inputs and food, back to market-based systems (e.g., market systems development and facilitation).

I. INTRODUCTION

A Feed the Future (FTF) program is being planned for Sierra Leone. It will focus on one district, to be identified per research and discussions with the Government of Sierra Leone (GoSL). In order to inform program design and focus, USAID contracted the present analysis of food commodity value chains in Tonkolili and Bombali: 1) animal protein (excluding fish and cattle), 2) grains (for food and feed), 3) horticulture (excluding tree crops), and 4) legumes/pulses (food and feed). It aims to enhance food security, nutrition and incomes while mitigating the negative economic impacts of the Ebola Virus Disease (EVD), fostering women’s empowerment and gender equity, and building climate change resilience. The potential impact of investments in each value chain will be characterized in terms of i) inclusiveness (households reached), ii) income generation, and iii) nutrition.

USAID seeks to drive inclusive growth by improving nutrition outcomes and agricultural productivity, expanding markets and trade, and increasing economic resilience among vulnerable rural communities. The program will seek to build on other USAID investments such as Food for Peace, SNAP and behavioral change communication (BCC) programs. It will be well aligned with the GoSL’s Inclusive Comprehensive Agriculture Development Programme (ICADEP), as it seeks to increase productivity and incomes among rural men and women who rely on agriculture for their livelihoods. The GoSL is currently finalizing ICADEP, which will run from 2016-20.

Animal protein is of interest as a government ban on bush meat sales, coupled with BCC focused on reducing its consumption due to the risk of contracting Ebola, drastically reduced consumption. In addition, a previous USAID assessment team heard reports of certain villages believing that EVD may have come from poultry and eggs. These factors removed important protein sources from the diet, and virtually eliminated bush meat as an income source. Sierra Leone imports sizeable amounts of poultry, eggs, goat and sheep meat, maize, and numerous vegetables (ComTrade 2015). The target districts are also consuming horticultural products from other districts. As such, it is of interest to evaluate the competitiveness of the target commodities relative to external sources.

The present study comprises several areas of inquiry to achieve the desired objectives:

1. Identify and analyze end markets where animal proteins, grains, horticulture, and legumes/pulses, produced by male and female smallholders, have or could have a competitive advantage.
2. Analyze each value chain and identify those with the greatest potential for inclusive growth—to reduce poverty and improve nutrition (for all populations) among the largest number of people.
3. Evaluate each value chain’s direct and indirect contributions to food security and nutrition.
4. Evaluate the impacts of EVD, particularly on production, consumption and end markets.
5. Determine how climate change has impacted production and market systems, and may affect these systems in the future; identify critical impacts across the value chain; and determine what actions are needed to support adaptation, and, where appropriate, mitigate adverse impacts.

The team began with an initial list of commodities per desk research and discussions with USAID staff, used initial field research and further desk research to select commodities for in-depth fieldwork and FTF program consideration, then prioritized commodities further after completing the field work. The team evaluated commodities based on their estimated potential to drive inclusive growth, upgrading, poverty reduction,

nutrition/food security and gender equity/women's empowerment among the largest population in the near term; while addressing the effects of EVD and climate change.

Inclusive growth (including demand and competitive value proposition) and upgrading potential are paramount, as they underlie the potential to drive impacts. The team eliminated commodities that proved to be weak in these areas: bush meat (cane rat, Guinea fowl), cowpea, fonio, sorghum, poultry meat and soy. This left the following target commodities for analysis and program consideration: chicken eggs, goats and sheep, maize, millet, chili pepper, eggplant, leafy greens, okra, groundnut and pigeon pea. Among these commodities, the team identified several as top priorities after fieldwork, due to higher overall estimated contributions to the program objectives. Chapter 4 presents a detailed discussion of the commodity selection process.

Fieldwork and further secondary research also served to prioritize the district for intervention (with Tonkolili deemed the priority), and identify potential interventions to implement, to achieve program objectives. The team sought to understand the relative strengths, weaknesses and resources, and the relative importance the selected commodities, in each district. Research also served to characterize unmet profitable market demand, upgrading opportunities, change agents that are positioned to drive upgrading, value chain functions and actors, relationships within and across value chain levels, key constraints that value chain actors face in upgrading, linkages among them, and ways to address these constraints in a cost-effective way through a shorter-term intervention. The following report presents these findings, along with potential interventions for FTF programming that delivers against the stated objectives.

TARGET COMMODITIES

- **Animal Protein:** Chicken eggs*, Small ruminants (goats, sheep)
- **Grains:** Maize*, Millet
- **Horticulture:** Chili pepper*, Eggplant, Leafy Greens, Okra*
- **Legumes/Pulses,** Groundnut*, Pigeon pea

* = top priority

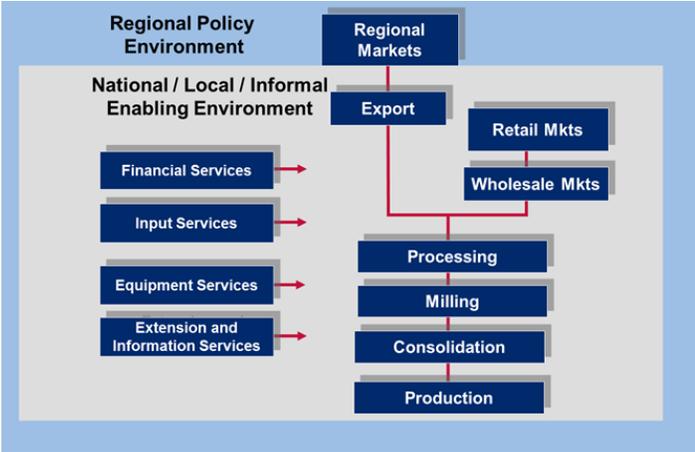
II. METHODOLOGY

APPROACH

This value chain assessment considered consumption and production of the target commodities in the Bombali and Tonkolili districts. The inquiry followed the value chain from end markets to production. The team traced production from the target districts to in-country end markets (including exporters), and consumption from in-country sources (production and imports) to the target districts. Additionally the team assessed cross-cutting services, both sector-specific (e.g., inputs, equipment, extension), cross-sector (finance, ICT, transportation), and the enabling environment (policies and norms).

Figure 1 depicts the value chain analysis framework. The assessment combined primary and secondary research, with primary research including individual interviews and focus groups, and used both qualitative and quantitative data.

Figure 1: Value Chain Assessment Scope



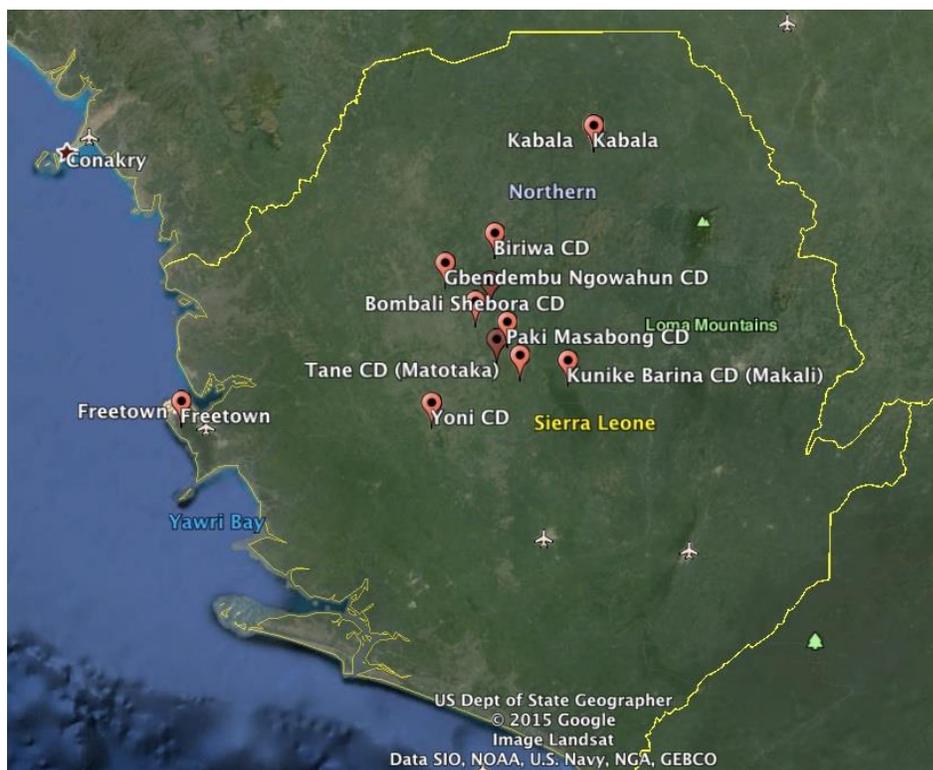
GEOGRAPHY

Primary research took place in the Western Urban (chiefly Freetown), Bombali, Tonkolili and Koinadugu districts. Figure 2 depicts the geographies covered. The team visited twelve villages in nine chiefdoms across the three latter districts; in addition to Freetown/Western Urban district.

RESEARCH PROCESS AND TEAM

Prior to fieldwork, a small team of ACIDI/VOCA staff conducted desk research and conferred with the Mission to develop an initial list of target commodities. USAID specified the commodity groups and target geographies. In late July through early August, a team of eleven researchers undertook the fieldwork (five VC-specific, inputs/services, climate, finance, gender, policy/political economy, field coordinator). The fieldwork began in Freetown (Western Urban district) with three days of end market surveys, and interviews with key informants and value chain actors. Eight days of up-country work followed (by district: three in Bombali, four in Tonkolili and one in Koinadugu), with daily writing and team debriefs. The team then returned to Freetown for three days of focused writing, additional end market surveys and interviews, and final debrief. Figure 3 indicates the research and analysis process. Table 1 summarizes the interviews and focus groups. Overall the team conducted 122 interviews, comprising 95 with individuals/organizational representatives and 27 with groups.

Figure 2: Study Area



Chiefdom	Sub-chiefdoms (Towns/Villages) Visited
Bombali District	
Biriwa	Kamabai (Kamabai, Kamanko/Mabolie, Masamarankay)
Bombali Seborah	Kagbaran Dokom B (Gbanka Potho, Makambo)
Gbendembu Ngowa	Fore Road Loko
Paki Masabong	Masabong (Makeni Lol)
Safroko Limba	(Kagbo)
Koinadugu District	
Wara Wara	(Kabala)
Tonkolili District	
Kunike Barina	(Makali)
Tane	(Matotaka)
Yoni	Gaindema (Mile 91 area)

Figure 3: Research Process

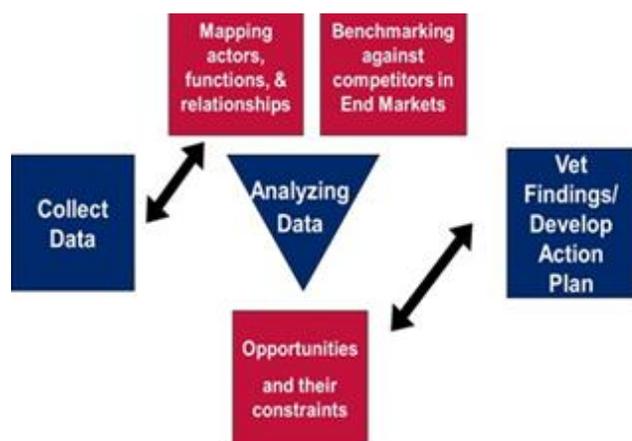


Table 1: Interviews by Type and Issue Area

	All/ Crops	Animal Protein	Grains	Horticulture	Legumes/ Pulses	Cross-cutting	TOTAL
Farmers, individual		11	1			2	14
Farmers, focus group		4	3.5	8	6.5	5	27
Farmer Organizations and Agric. Business Centers	2					1	3
Primary Aggregators		1	6	4	9	1	21
Primary Processors					2		2
Product Manufacturers					2		2
Retailers & Exporters		1	5	7	3		16
Input/Service producers					1	5	6
Financial services providers						11	11
Government	5	4				4	13
NGOs	5					2	7
TOTAL	12	20	15.5	19	23.5	31	122

Fractions of group indicate that multiple VC team members interviewed the same group. Team members focused on cross-cutting issues also partnered on interviews for each VC, which are counted only once, under the VC. Counts for cross-cutting issues represent interviews led by cross-cutting team members.

RESEARCH AND ANALYSIS METHODS

The assessment involved the following research activities:

1. Desk research: Beginning prior to field work and continuing through final report completion, the team undertook secondary research using pertinent studies and reports on the target value chains, Sierra Leone, focus regions, and cross cutting issues; production and trade statistics databases, climate and meteorological databases; and government policy documents.

2. Key informant and value chain actor interviews: As noted above, the team interviewed value chain actors (producers, aggregators/traders, processors, manufacturers, retailers, input and service providers, relevant private sector, government, NGO, research, and other stakeholders). These interviews utilized both quantitative and qualitative survey instruments, which are in the appendix.
3. Data analysis and interview synthesis: Team members synthesized interviews to identify and prioritize key constraints and issues (e.g., fertilizer and seed availability and affordability, access to finance; women's participation), and characterize value chain dynamics; and evaluated economic, production and demand data such as pricing at each level of the value chain, yields, consumption and imports.
4. Mission briefings and report reviews: The country team lead and senior researcher conducted a pre-field-work brief with USAID to align on initial commodities and the field work plan. USAID identified some key contacts and issues to note in the field. The team lead conducted a brief with USAID after the field-work to present initial findings and gather additional questions to address in the report. USAID provided comments on draft reports thereafter.

The **competitive analysis** for each commodity used the Porter's Five Forces framework (Porter 2008). Figure 4 depicts the framework, which contains the following elements:

- Threat of substitutes: Other products that buyers would select in lieu of the target commodity, and other current sellers that buyers may find more attractive. E.g., imported eggs are cheap and lure buyers away from domestic eggs.
- Bargaining power of buyers: The relative power that buyers have in negotiating prices and other terms. E.g., if farmers have only one trader in their area (monopsony), that trader will have a high degree of market power, and may set prices with negligible room for negotiation.
- Threat of new entrants: The relative ease at which competitors can enter the market and compete profitably against existing entities, resulting in lower prices and profits. E.g., poultry are easy to acquire and reproduce, making the threat of new producers high. So long as producers continue to make a positive profit, one producer can undercut the others in an attempt to gain market share.
- Bargaining power of suppliers: The relative power that sellers have in negotiating (setting) prices and other terms. E.g., if there is only one fertilizer supplier in town, they will be able to set prices, increasing costs for producers and making fertilizer unaffordable for some.
- Rivalry among competitors: Whether entities at a given VC level compete or collude, and regulations that contribute to these dynamics. E.g., if there are only a few traders and their activities are not regulated, they may collude to fix the prices they offer to pay for commodities, and at which they sell them to retailers.

Figure 4: Porter's Five Forces



III. BACKGROUND: SIERRA LEONE, AND TARGET DISTRICTS

Sierra Leone is located in West Africa, to the south of the Republic of Guinea, and west of the Republic of Liberia. The target districts lie in the country's Northern region, with Bombali lying to the south of Guinea, and Tonkolili located to the south of Bombali. It is defined as a low-income country (World Bank 2015a) and has a Human Development Index (HDI) rank of 183 out of 187 countries in 2014 (UN 2014). Agriculture is a major contributor to the economy, with agriculture, forestry and fisheries representing 41 percent of the GDP in 2001 prices and 47 percent of the GDP in current prices in 2013 (MAFFS 2015).³ Crops alone accounted for about 29 percent of the GDP, while livestock accounted for about three percent, that year.

Total population was estimated at 6.2 million in 2014 (World Bank 2015a), with about 63 percent living in rural areas 2013 (ICF International 2014). The percentage of rural dwellers is highest in the Northern region, where the target districts are located. Literacy is 37.7 percent among women and 58.7 percent among men, indicating that women are disproportionately disadvantaged, relative to men, in arenas where literacy is required (CIA 2015). In 2014, 52.9 percent of the population lived in poverty, and gross national income per capita was \$702 (World Bank 2015), or \$1,815 in PPP terms (UN 2014). The nation falls below other HDI countries in these measures (UN 2014). Nationwide, Ebola has been associated with a 2.8 percent contraction of the economy in 2014, with a projected contraction of two percent in 2015 (World Bank 2015b). Prior to mid-2014, the economy was growing at 11 percent, indicating that Ebola has had a significant negative economic impact. Tonkolili has the second highest rate of Ebola cases, following the Western Region (Freetown and surrounding rural area) (WFP 2015).

National agriculture programs are administered by the Ministry of Agriculture, Forestry and Food Security (MAFFS). MAFFS' major agricultural development program, the Smallholder Commercialization Program (SCP), will be succeeded by ICADEP in 2016. The country's priority agricultural commodities, as identified by MAFFS (2015), are rice, cassava, sweet potato, groundnut, cowpea, chili pepper, garden egg, okra, coffee, cacao and oil palm.

Fieldwork and secondary research pointed to Tonkolili as the district where intervention seems most needed, with the Yoni chiefdom/Mile 91 area identified as a zone of special interest as trade/market hub with widespread production. The World Food Program (2015) reports that Tonkolili has the highest rates of poverty and food insecurity of any district, with food insecurity prevalence in 2013 estimated at 30 percent in Tonkolili and about ten percent in Bombali. Bombali has greater access to food imports from Guinea and other districts, easing its access to sufficient, nutritionally balanced food supplies. Given the objective to impact nutrition, FTF might target Tonkolili, as the district with more severe food security issues.

The team found that production of the target commodities was strong in both districts, and that both have good main road networks to allow for market access. However, the team found that Tonkolili appeared to be disadvantaged compared to Bombali with regard to overall economic investments. There are visible differences in the level of economic development and activity across Makeni and Magburaka, the districts'

³ Total GDP at market prices is the denominator. Crops and livestock alone (excluding forestry and fisheries) accounted for 32 percent of GDP at 2001 prices and 33 percent of the GDP at current prices, in 2013.

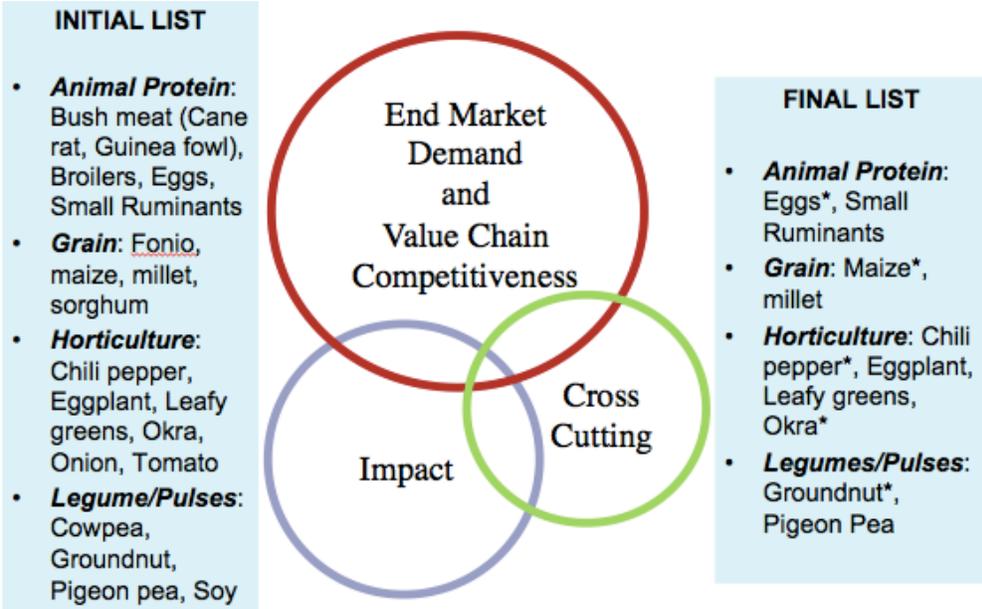
respective headquarters. Cross-cutting services such as agricultural inputs and financial services are more plentiful and diverse in Bombali. Among the FAO Food Security Working Group members, thirteen NGOs are operating in Bombali while only eight are working in Tonkolili (FAO 2015). Additionally, the team's gender analyst perceived greater gender disparity in Tonkolili, making it an important focus area to meet USAID's gender equity goals.

It is important to note, that, despite its disadvantages, Tonkolili appears to have the foundation that is needed for a successful program with meaningful impacts at scale. The district agricultural office showed strong interest and support in the field research and a Feed the Future project. Staff members at all levels shared a wealth of knowledge and a desire to improve producer services and outcomes. This indicates the presence of strong on-the-ground partners who would welcome and apply knowledge and capacity building efforts; and therefore play a role in scaling up activities, outcomes and impacts beyond the project's reach. In both districts, producers and other VC actors welcomed the team and generously shared their time and knowledge. In the Mile 91/Yoni area in particular, the team noted a strong turnout among vegetable and grain producers, indicating a robust desire to engage actively in a development program. The area is an important trade hub for the district, and the team met with numerous traders who expressed an interest in increasing their sourcing from the district, and working more collaboratively. These traders connect the grain and legume sectors to poultry and other key markets, affording an opportunity to develop multiple value chains together efficiently. The team saw evidence of strong sector drivers in Tonkolili (as well as Bombali), who are succeeding on their own volition despite economic challenges. Fostering the growth of such entities, and promoting them as models for wider adoption, would be of critical benefit. The team also encountered a women's microfinance institution (MFI) with a lending program that appeared to be more beneficial to producers than more widespread models, as it had a higher loan limit (4 mil Le) and longer payback time (six months). It is important to help scale up such models.

IV. COMMODITY SELECTION

As noted in the introduction, the team began with a larger list of commodities, and then omitted some and added others per secondary research and fieldwork. Figure 5 illustrates the initial and final target commodities, on the left and right, respectively:

Figure 5: Commodity Selection Schematic



The assessment team selected the final list of target commodities according to their estimated contribution to these objectives, per desk research and initial fieldwork: chicken eggs, goats and sheep, maize, millet, chili pepper, eggplant, leafy greens, okra, groundnut and pigeon pea. Among these commodities, the following were selected as top priorities, due to higher overall estimated contributions to the program objectives: chicken eggs, maize, chili pepper, okra, and groundnut.

Selection parameters were chosen to ensure that the target commodities could meet typical FTF objectives to achieve poverty reduction, improved nutrition and gender equity among the largest potential number of individuals within the project timespan, while addressing the negative impacts of EVD and climate change. The potential for each commodity to drive inclusive economic growth in a timely way is thus paramount. Commodity selection for potential interventions was determined by each commodity’s potential to achieve USAID’s goals, using the parameters below:

1. VALUE CHAIN COMPETITIVENESS

Value chain competitiveness combines the potential for inclusive economic growth and upgrading, as well as leadership to drive upgrading. Inclusive economic growth refers to achieving sustainably increased incomes for marginalized populations, particularly the very poor, women, youth and other vulnerable populations. This can include creating new products, increasing incomes from existing products, creating job opportunities, and targeting interventions to marginalized groups. Examples include fostering value addition such as groundnut processing; facilitating more direct, efficient sales relationships; and implementing

activities focused on gender and youth. The sector's capacity for upgrading, and the presence of entities that can play a leadership role in this (e.g., a poultry producer that can support maize producer aggregation and credit access), are critical.

2. IMPACT

2a. POTENTIAL FOR POVERTY REDUCTION

Rural agricultural households are among the poorest of the poor. Individuals operating very small-scale retail and trading operations likewise earn small profits. Commodities were evaluated in terms of their potential to provide households with sufficient income to lift themselves out of poverty over the long term. Measures such as market prices, reported profits, and yield and output, served to gauge this attribute.

2b. IMPROVED FOOD SECURITY, PARTICULARLY NUTRITION

We used FAO's (2003) definition of food security, which combines stable access, availability and utilization of safe, nutritious and culturally appropriate foods, with a focus on improved nutrition:

“Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.”

- Access and availability means that individuals can reliably get to and afford a sufficient amount of nutritious, culturally appropriate foods, via a combination of home production, purchases, and food assistance. Food supply must be adequate, available when needed and affordable over the long term.
- Utilization refers to the uptake of sufficient nutrients. This depends not only on the basic act of consuming a food, but factors such as proper food storage and processing techniques, dietary composition (e.g., fat-soluble vitamins D, E, A and K require consumption of fat for utilization), physical health, and child-care (feeding of infants and children under the age of 18).
- Nutritious food is defined as containing sufficient calories, protein, a balance of nutrients (including fat), and high quality protein (based on an amino acid score). This is necessary for availability and utilization.

2c. NUMBER OF LIVES TOUCHED

This refers to the number of individuals an intervention would reach directly (value chain actors targeted for interventions, and their families) and indirectly (communities, consumers, other VC actors, etc.). Statistics such as proportion of households that produce a commodity, and primary and secondary findings on relative prevalence of commodities in local and urban markets, served as a gauge for this measure.

2d. TIMING OF ECONOMIC EFFECTS

We considered how long it would take for households to realize the positive economic effects of value chain investments. Crops with larger unmet demand, more easy-to-implement value addition opportunities, and shorter time to maturity would rank higher, as they would return economic benefits more quickly.

3. CROSS-CUTTING ISSUES

3a. MITIGATE NEGATIVE IMPACTS OF EBOLA

Secondary research and field work indicated that travel restrictions and market closures under Ebola negatively impacted farm revenues for one season and farmers' ability to purchase seed and inputs for subsequent planting. Additionally, animal protein sources such as bushmeat were virtually eliminated from diets, and market revenues. The relative severity of these impacts for each value chain will be considered.

3b. Gender Equity and Women's Empowerment

Fieldwork indicates that women contribute a large part of the household's agricultural labor, but men make the major financial decisions in the household and have land-holding rights. Additionally, across the value chain, women are highly represented in low-margin activities such as open-market retail and primary aggregation, while men are highly represented in higher-value activities such as manufacturing and larger enterprises. Value chain interventions should take into account how women's roles will be affected in their work and households. Factors such as the following should be considered:

- Increasing women's incomes and empowering them to increase their influence in household finances
- Enabling women to secure and control assets for their home or business use; such as land and equipment
- Providing skills training and other education opportunities for women
- Ensuring equal representation for women in leadership positions
- Empowering women socio-politically, and raising their confidence and standing, at the household, community or national levels
- Ensure women are not endangered or put at considerable risk.

3c. SUSTAIN ECOSYSTEMS AND ADDRESS CLIMATE CHANGE, PARTICULARLY ADAPTATION NEEDS

This aspect considers the following:

- The absence of negative impacts on ecosystems, or the ability to prevent such impacts, in production and other value chain activities
- The relative need for climate change adaptation, particularly in production and marketing
- The relative need for mitigation, and opportunities to tap relevant ecosystems services markets.

Table 2 indicates the commodities that were selected for in-depth analysis, and consideration for FTF.

Table 2: Value Chain Selection for Fieldwork and FTF Programming

Criteria		Animal Protein		Grain		Legumes/Pulses	
		Eggs	Small Ruminants	Maize	Millet	Groundnut	Pigeon Pea
Competitiveness	Inclusive growth	H	M	H	L	H	H
	Upgrading Potential	H	M	M/H	L	M	M
	Upgrading leadership	M	L/M	H	L	H	M
Impact	Poverty reduction	H	M	M	M	H	H
	Food Security/Nutrition	H	M	M	H	H	M
	Lives touched	H	M	H	H	H	M
	Timing of economic effects	H	M	H	H	H	H
Cross-cutting Issues	Ebola impacts	M	M	M	M	H	H
	Gender equity	H	M	M	M	H	H
	Climate/environment	M	M	M	M	H	H

Criteria		Horticulture			
		Chili Pepper	Eggplant	Okra	Leafy Greens
Competitiveness	Inclusive growth	H	M	H	M
	Upgrading Potential	H	M	H	M
	Upgrading leadership	H	M	H	L
Impact	Poverty reduction	H	M	H	M
	Food security/Nutrition	L	M	H	H
	Lives touched	H	M	H	H
	Timing of economic effects	H	H	H	H
Cross-cutting Issues	Ebola impact severity	H	H	H	H
	Gender equity	H	H	H	H
	Climate and environment	H	H	H	H

The number of lives touched was estimated using data from the Agricultural Household Tracking Survey (AHTS; MAFFS, SSL, J-PAL/IPA 2011), which reports the percentage of households producing a sub-set of the target commodities in each district; and the 2004 census (Statistics Sierra Leone 2006). Table 3 summarizes the data. Interventions focused on poultry, maize and okra in Tonkolili would reach the largest number of households; followed by chickens, groundnut and chili pepper in Bombali, then chili pepper and groundnut in Tonkolili. Overall these data indicate that an intervention focused on the highest priority commodities (chicken, maize, groundnut, okra and chili pepper), in Tonkolili, would have particularly wide reach.

These data also indicate that integrated farming systems are in place, given that the percentages of households that produce the target commodities sum to more than 100 in most cases. For example, in Tonkolili, 79 percent of households raise chickens and 74 percent grow maize, which sums to 153 percent. Likewise, the sum of the percentages of households in Bombali that grow maize (47) and groundnut (74) is 121. Given the

number of commodities and the ways they could be combined in farming systems, it is not possible to determine the percentage of households that grow a specific subset, without more extensive research. However, available data provide strong evidence for some level of integration.

Table 3: Percentage of Households Producing Select Target Commodities

Commodity	Percentage of Households Producing Commodity		Households Producing Commodity ^a		Estimated Individuals Depending on Income from Production of Commodity ^b	
	Bombali	Tonkolili	Bombali	Tonkolili	Bombali	Tonkolili
Chickens	75	79	37,238	41,760	243,508	273,700
Goats	23	23	11,420	12,158	74,676	79,685
Sheep	21	14	10,427	7,401	68,182	48,504
Maize	47	74	23,336	39,117	152,598	256,377
Groundnut	74	62	36,742	32,774	240,261	214,803
Cassava leaf	53	60	26,315	31,717	172,079	207,874
Chili Pepper	72	66	35,749	34,888	233,767	228,661
Okra	61	72	30,287	38,060	198,053	249,448

^a Per 2004 census data, Bombali had 49,651 households and Tonkolili had 52,861

^b This is an estimate of the number of individuals in households that produce the target commodity. Per 2004 census data, Bombali had a population of 408,390 and Tonkolili had 347,197 residents. The authors realize that household size varies, such that percentage of households engaged in producing a commodity would not match the percentage of the population in those households. However, this is the best means of estimating given available data.

Sources: Population (Statistics Sierra Leone 2006), HH production MAFFS, SSL, J-PAL-IPA (2011)

COMMODITY SELECTION RATIONALE

1. ANIMAL PROTEIN

Included	Excluded
<p>Eggs have high market demand, with most currently imported, and the removal of bushmeat from legal markets, stands to drive further demand growth. Domestic producers reported that they can compete with import prices. These factors indicate high potential for inclusive growth and poverty reduction. Fieldwork confirmed AHTS (MAFFS, SSL, J-PA/IPA 2011) findings that household poultry rearing is widespread, so there is a solid foundation for upgrading and interventions would reach a wide population. The sector has some strong change drivers in the form of medium and larger enterprises.</p> <p>Poultry reproduction cycles are very short, supporting ongoing income/consumption smoothing and</p>	<p>Domesticated/intensively-raised Bush Meat does not yet demonstrate potential for inclusive growth or upgrading potential due to lack of legal markets and production. Thus, investments would yield minimal impacts. Due to regulations under EVD, it is illegal to sell bush meat. MAFFS staff noted that some research indicates that cane rat (locally referred to as <i>grasscutter</i>) and Guinea fowl are not EVD vectors. However, they noted that the evidence to date is inconclusive, so they have not</p>

timely returns on program investments, and spent chickens can be sold for meat. Eggs provide high-quality protein, and fat (needed to assimilate/utilize vitamins A, D E and K), and producers reported high home consumption.

Fieldwork indicated that women are highly represented in poultry rearing. Environmental impact is low and manure provides valuable fertilizer. Production growth will also support maize value chain development, driving further benefits. The co-development of both VCs is critical to optimize outcomes across both.

Small Ruminants (sheep and goats) demonstrated market demand per market surveys and widespread production in the study area, though not to the extent of poultry. Thus there is strong potential for inclusive growth and upgrading. The presence of change drivers is less clear. Market prices are good and traditional rearing methods are low cost, making for high potential profits that foster poverty alleviation. However, such rearing methods yield small animals with less meat. Sheep and goats have relatively short reproductive cycles, increasing income opportunities and fostering timely economic returns on program investments. They provide high-quality protein, and fat, though producers generally sell them rather than consuming them.

Women and youth have the primary responsibility for raising small ruminants on homesteads, while men play a larger role when animals are pastured farther from homes, so upgrading would benefit women and youth, and foster gender equity. They have lower environmental impacts than large livestock such as cattle, and can be reared intensively to avoid extensification that can damage native ecosystems and cause emissions.

pursued intensive production. Both are raised intensively in other West African countries. However, production has not succeeded Sierra Leone.⁴

Pork lacks sufficient demand and production, limiting inclusive growth and upgrading, and impacts. Pork is raised in certain parts of the country, mainly by Christians, and is considered a good means of producing animal protein in a short time when raised intensively. The team saw few pigs in the project areas and these were not reared intensively. The team did not see much pork in local markets. Muslims, who eschew pork, are highly represented in the target districts and nationwide

Poultry meat production of commercial scale is minimal in country, and there is not sufficient processing infrastructure in place for rapid or low-cost scaling up. Demand growth indicates strong market opportunity, but low-cost imports dominate the market. Scaling up this value chain would require significant time and investment, which may not have a positive cost/benefit in the timespan of an FTF project, and would make it difficult for domestic small-scale producers to compete.

⁴ Key factors which have undermined commercial cane rat production in Sierra Leone are lack of locally available domesticated breeding stock; high cost of import of domesticated breeding stock from Ghana and Republic of Benin; unmet training to raise a local breeding stock from cane rats captured in the wild in Sierra Leone; unmet training in cane rat production techniques; poor dedication by trained staff, scarcity of feed sources in the wild during the dry season; and weak linkage to veterinary services; consumer perception that wild cane rats taste better than domesticated ones

2. GRAINS

Included	Excluded
<p>Maize has demonstrated unmet demand, chiefly from the poultry industry, which imports much of its supply at present. Fieldwork confirmed that it is widely produced in the study area. Larger poultry producers have played a leadership role in establishing sourcing relationships and providing financing, but much maize is imported or sourced from other districts. Thus, there is evidence of high potential for inclusive growth, upgrading and leadership; and interventions would have a wide reach.</p> <p>Most maize is sold fresh upon harvest. Poultry feed production would support income diversification, while improved storage could enable income smoothing and off-season sales at higher prices. Most farmers grew an improved variety with two harvests per year, fostering a high potential for poverty reduction relative to longer-season crops, and quick returns on program investments. Farmers can tap value-added markets by processing grain into flour (perhaps via ABCs), increasing income potential. Its nutritional value is limited, as a starchy staple, making behavioral change communication to support vegetable and protein consumption important.</p> <p>Many aggregators and retailers are women, so upgrading could benefit this population. Poultry and maize value chains must be co-developed and linked to maximize outcomes across both.</p> <p>Millet has high demand for home consumption in urban and rural markets and is produced widely in the study area to provide a key staple during the hunger season. Additionally, there are opportunities to tap local and urban end markets, and upgrade products through basic processing such as grinding and parching (which could be done via ABCs). Farmers expressed a desire to commercialize the product more, so there is a desire for upgrading. Thus, there is an opportunity for inclusive growth, a foundation for upgrading and change drivers are in place.</p>	<p>Fonio did not prove to have much market demand or production in the study area. As such it lacks the potential for inclusive growth, upgrading or wide reach. Thus, investments would yield minimal impacts.</p> <p>Sorghum did not appear to show much opportunity for upgrading or inclusive growth. Thus, investments would yield minimal impacts. Sorghum was not seen in markets in the target areas or Freetown; and production was not common. Some communities are producing commercially for sales to breweries under contract production, a low-value, low-empowerment channel. It could be used as animal feed, but industry has yet to demonstrate demand, making near-term return on investments questionable.</p>

<p>As a key household staple, millet production reduces expenditures, thus improving household income and the ability to weather shocks such as Ebola. Improved storage bags would stem current losses of up to 50 percent (one of the chief factors driving its selection), increasing its contribution to income and the amount of marketable surplus farmers can sell. The nutrition aspects raised for maize apply here.</p> <p>Women and men are both involved in production, and current post-harvest methods are labor intensive (possibly addressed via ABCs), making gender equity important. It is drought tolerant, making it resilient to longer-term climate change effects.</p>	
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3. HORTICULTURE

Included	Excluded
<p>There is a solid basis for inclusive growth and upgrading for the selected vegetables, and interventions would reach a large number of households. They are produced widely, and can be grown and marketed competitively, by producers in the target districts. They are among the most prevalent crops in local and urban markets. However, change drivers appear limited and must be cultivated. Many vegetables have short seasons, providing for quick returns on investments and continuous income opportunities. Their nutritional value is high, but growers and key informants reported that producers may sell most of their output rather than consuming it. Thus, behavioral change communication around the economic value of home consumption is critical (along with guidance on how to optimize nutrient retention and assimilation).</p> <p>Women represent about 85% of total labor, according to numerous key informants and producers, making the sub-sector critical for gender equity work. Vegetable growers reported particularly high losses of crops in transit to market, and resulting revenues under Ebola, due to its high perishability.</p> <p>Chili pepper has demonstrated high demand, including export. There is an opportunity to upgrade</p>	<p>Onion There is high market demand and a major opportunity for import substitution. However the crop is not currently produced in the target districts (Lungi is a production center). As such, implementation would require time for technical training and investment in extensive VC facilitation, making cost/benefit questionable.</p> <p>Tomato has high market demand and profitability. However, the climate in the target districts is not ideal for tomatoes and they are not widely grown there. Scaling up production would take time, and would require costly greenhouse production, which would make tomatoes non-competitive versus imports and domestic production from districts with amenable climates.</p>

<p>products, and improve prices, by drying chilies. Thus, it was among the top two priority vegetables.</p> <p>Eggplant (garden egg) is marketed widely, particularly round yellow and green varieties.</p> <p>Leafy Greens such as cassava leaf, krain krain and potato leaf are widely consumed daily, in traditional sauces that are used as the base for proteins. They provide valuable micronutrients and are a co-product with tubers in some cases, but are less hardy than other target vegetables in transit.</p> <p>Okra has high demand locally and nationally, and grows well in the study area. It is more commonly consumed than eggplant, but has received less focus from MAFFS than leafy greens such as cassava.</p>	
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4. LEGUMES/PULSES

Included	Excluded
<p>Groundnut has high market demand, some opportunities for low-cost value addition (paste production and selling shelled nuts); giving it strong potential for inclusive growth. However, it has limited change drivers, namely the small-scale processor, Project Peanut Butter. Improved varieties and increased access to finance for fertilizer can help improve yields, and reduce poverty. Value addition and upgrading among producers and cottage processors can further improve incomes. Groundnut is a good source of fat and protein, and is among the most widely produced crops, giving it strong potential to improve nutrition and have a wide reach. Women are the major producers and highly represented among traders, making it important for women's income. Paste production is also a key activity for youth, who would benefit from upgrades.</p> <p>Pigeon Pea is widely consumed and has additional uses such as animal feed, positioning it for inclusive growth. Like groundnut, change drivers seem limited at present, primarily the domestic manufacturer Bennimix. Longer term, animal producers and feed processors could be change drivers if they opt to incorporate it into feed. There are opportunities</p>	<p>Cowpea is not widely produced in the target districts, limiting the capacity for upgrading and the number of households reaches in the near term. Scaling up production would take time, making for protracted onset of impacts and limited cost/benefit. The country imports most of the cowpea it consumes, and it is not certain if new domestic production would be cost competitive.</p> <p>Soy is currently produced in community-based seed multiplication plots and research sites, making immediate upgrading potential limited. Market demand is low, limiting the potential for inclusive growth in the near term.</p>

<p>for upgrading via the production of fortified cereals, which would provide additional income and improved nutrition. Like millet, it is viewed as an important crop for food security. It is widely grown in the target areas, enabling interventions to have a wide reach. It is drought tolerant, making it good for climate adaptation.</p>	
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V. VALUE CHAIN ANALYSES

AI. CHICKEN EGGS

1. OVERVIEW

Eggs are a very common protein source in Sierra Leone, and poultry production is widespread, as indicated by the AHTS (MAFFS, SSL, J-PAL/IPA 2011). Raw and hard-boiled eggs are sold widely. Sierra Leone imports most of its eggs and shows demand growth, with imports of hen eggs in tons increasing by nearly seven percent in 2012 and 19 percent in 2011 (ComTrade 2015).⁵ Imports were valued at US\$ 6.09 million in 2014, indicating that import substitution represents a significant economic opportunity. Cost-benefit analyses are needed to determine whether this would be profitable, and the extent of benefits, if so. Major sources of imports in 2014 were the Netherlands (39.7 percent), Ukraine (38.6 percent) and India (15.9 percent). The team also encountered Brazilian eggs in Freetown markets.

KEY FIGURES

- \$6.09 mil imports, 2014
- 38 percent growth in import quantity, and 48% growth in import value, from 2010-14
- Estimated domestic production growth for chickens, 9.09 percent, from 2011-13
- Price for domestic eggs (farm gate, direct to retail) 20 percent+ higher than wholesale import

Robust demand growth is apparent. Imports have increased steadily across the past five years, with the exception of a dip in 2013; growing from \$4.18 million (2.66 million eggs) in 2010 to \$6.09 million (3.67 million eggs) in 2014. This represents 38 percent growth for egg quantity and 46 percent growth for value across that period. Domestic production has increased along with imports, with FAO Stat (2015) indicating that tonnage of egg production grew 10.6 percent in 2010 and 9.3 percent in 2011 (quantity grew by 11.1 and 9.8 percent those years).⁶ Fieldwork revealed that the majority of domestic birds are raised for egg production. Thus, the total number of birds is indicative of egg demand, and has increased steadily. Domestic production of chickens grew about ten percent annually from 2011 to 2013, moving from about 10.4 million birds in 2011 to 11.5 million in 2012 to nearly 12.6 million in 2013; and 378 percent from 2005-13 (MAFFS 2011, MAFFS 2015).⁷ However, production capacity remains far below demand. One larger producer in Freetown estimated that the 16,000 eggs he sells per day there meet only 5 percent of that market's daily demand.

Sierra Leone also imports many of its egg production input needs, such as feed, chicks, vet medicine, equipment, etc. Maize is a primary feed source, indicating that there is a sizeable import substitution opportunity for maize producers. Integrating maize and poultry into the FTF program would thus tap two strong market opportunities, while fostering more self-reliance at the farm household level.

⁵ FAOStat data indicate erratic shifts in imports from 2003-12, ranging from nearly -82 percent to 604 percent across that period; and -19 percent to 604 percent from 2007-2012. Fieldwork gave no indication as to why such variation would be valid, making it questionable that the data represent true longer-term trends.

⁶ FAOStat lists the same numbers for 2011, 2012 and 2013, rendering data for the two latter years questionable.

⁷ MAFFS statistics seem to be estimates, as their 2015 statistical report shows annual growth of about ten percent for all animals.

2. END MARKET ANALYSIS

a. Global and Regional Markets

Trade databases do not indicate any exports of eggs from Sierra Leone. The country is an end market, and not a source for other end markets. Thus, in the near term it is important to ensure local producers can compete with import prices to make import substitution profitable. One domestic producer alleged that one foreign supplier is “dumping” eggs—selling at prices below cost, which would create an uneven playing field for competition.⁸ This claim should be evaluated further. Parallel fieldwork in Guinea revealed that market prices for eggs are relatively equivalent across countries, indicating that Guinea could be a market for exports, when domestic production has scaled up sufficiently. A larger egg producer the team interviewed is exploring entering regional export markets, such as Côte d’Ivoire. A team member who visited Cote d’Ivoire noted that hard-boiled eggs are omnipresent, and consumed particularly for breakfast in sandwiches or individually.

b. National and Local Markets

Eggs are widely available in a variety of retail locations, from open markets to supermarkets, and sold by roving petty traders. Consumers can purchase them individually and in 30-egg flats. According to a large producer who sells to the Freetown market, consumers prefer the taste of domestic eggs, because they are fresher, and dislike the stale and even rotten taste of imported eggs. The team was unable to find data indicating the presence or extent of such a preference, or the associated premiums consumers would be willing to pay. One domestic producer revealed that his 360-egg cartons are priced 20 percent higher than imports, for sales in the same markets. The Freetown producer reported that they can compete successfully, as their customers prefer fresh eggs enough to pay more. As it is not clear how widespread this preference is, it is uncertain if the majority of producers will be able to compete successfully at the same differential.

Table 4 indicates prices for eggs, on a per egg basis. The team was not able to trace from a particular retailer back to the trader or the farm. Thus, margins estimated across pricing obtained for individual VC level. The prices indicate a larger differential between domestic farm gate and imported wholesale prices than the 14 percent noted above. This seems to be due to different end markets, with domestic eggs not necessarily going to mainstream channels. For example, one domestic producer reported wholesale import prices of about 556 Le per egg in his market, which is higher than the prices the team found in general markets, and makes for a lower price differential compared to domestic eggs.

⁸ This is referenced elsewhere, such as a funding proposal for Sierra Akker, dated 2010: <http://www.rvo.nl/subsidies-regelingen/projecten/building-poultry-integration-sweet-salome>

Table 4: Egg Prices per Egg in Leones, and Gross Margins, July 2015

Product	Farm gate (Sierra Leone Leones)	Wholesale Import	Retail
Single egg			1,000 (39% margin over highest domestic, 68% over lowest import)
30-egg flat import (e.g., Brazil)		440	767 (43% margin)
30-egg flat import (e.g., India)		320	600 (47% margin)
Dozen eggs Brazil			875 (50% margin over 30-egg)
Dozen eggs India			667 (50% margin over 30-egg)
360-egg carton domestic, Makeni	611	N/A	Not determined

Source: Interviews and market surveys

c. Opportunities for Growth

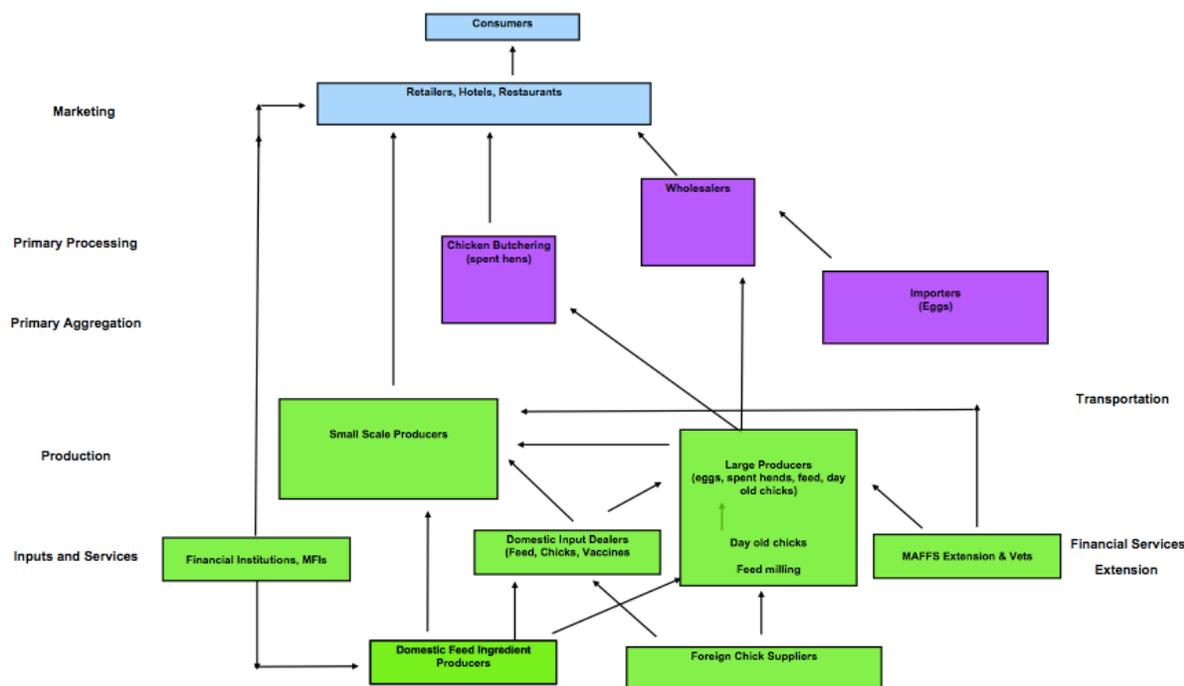
As stated above, market demand for eggs has grown over time, indicating an expanding market opportunity for domestic producers. However, some domestic producers indicates their eggs cost up to 20 percent more than imports. At present, domestic commercial producers are able to sell their output. However, in order to capture market share, particularly by smallholders, producers will need to reduce costs (and thus prices) to compete better with imports, and market the value of their domestic eggs in order to garner any differentials that make their products more costly than imports on a continued basis. Collective input purchasing and marketing can help in this area.

d. Change Drivers

A few entrepreneurs have begun operating larger-scale farms to tap growing demand for eggs domestically, with some of these eyeing export markets. Some of these producers began as self-financed risk takers while others have received grants, investments and in-kind support. These entrepreneurs have succeeded, providing a model for others to follow suit. Their larger-scale enterprises are not feasible for individual smallholders to adopt. However, smallholders can realize comparable economies of scale in some areas by aggregating to purchase inputs and market their output. If domestic eggs continue to be more costly than imports, quality differentiated pricing will be critical to ensure successful competition on a wide scale. The GoSL has quality standards in place, administered by their Standards Bureau. Fully supported implementation would benefit producers by differentiating domestic eggs from lower quality imports, and eliminating sub-standard imports from the market.

3. VALUE CHAIN MAP AND FUNCTIONS

Figure 6: Poultry Egg Value Chain, Sierra Leone



a. Marketing/Retailers: Eggs can be found at open markets, supermarkets and sold by roving petty traders. Retailers buy their eggs from importers and farmers, on contract in some cases. They sell eggs individually either raw or hard boiled, usually for Le. 1,000 each (a 20 to 56 percent markup over the wholesale prices below, amounting to a 17 to 36 percent gross margin); and in flats of 30 eggs.

b. Marketing/Wholesalers: Most domestic commercial egg farmers sell and deliver directly to retailers. Thus, wholesalers are not yet playing a significant role in distributing domestic products. Larger producers are able to wholesale their eggs to larger and more diverse markets such as supermarkets, restaurants and hotels directly. They reported selling a carton of 360 eggs for Le. 230,000-300,000. Farmers in the target district could act as wholesalers in aggregate to deliver their eggs more cost-effectively to larger markets such as Freetown and Makeni.

c. Processing: Processing is limited and basic. Retailers and wholesalers will clean eggs and pack them in crates for transportation to end markets and for sale. Larger domestic producers hand clean eggs at the farm, packed in cardboard trays and transported for sale, without refrigeration. Eggs may also be hard boiled before sale.

d. Primary Aggregation: As with wholesaling, aggregation is minimal for domestic eggs. Smallholder backyard poultry producers collect eggs from their domestic fowl and store them in a cool place until they have enough to carry to the local market for sale, a time period that can exceed a week. Local commercial egg producers collect and clean their eggs several times a day, store them on flats in cool locations and deliver several times a week, without refrigeration.

e. Production: There are three types of commercial layer farms in Sierra Leone: *small producers* have 500 hens or less; *medium size* flocks are between 500 and 3,000 hens; and *large flocks* are over 3,000 birds.

In *small producer* systems, backyard poultry are basically free range, organic birds. (See local breeds in photos to the right.) Women and youth take the primary responsibility to watch them, protect them from predators, and give them food scraps and water to keep them in or near the compound. At night the birds usually roost near the compound. Free range birds like this can lay from 30 to 50 eggs a year. Birds are rarely vaccinated against diseases and have a high mortality rate, especially during the rainy season. Newcastle's and Infectious bronchitis are major killers.

All *larger commercial farms* the team visited used intensive management techniques to some degree, with room for improvement. All have open sided poultry houses with wire mesh screens to allow air flow and keep out wild birds and predators with low hanging roofs to restrict heavy winds and rain. Most had tarps to pull down during heavy rains. Birds are raised on deep litter; no farm had any cages installed. Most had locally made feeders and drinkers. None of the birds were allowed outside in order to prevent disease. All the farms attempted to feed their birds balanced rations, depending on age: starter, grower and layer. Most farms mix their own feed using locally available ingredients, adding imported concentrate for micro-nutrients.

The team observed a direct relationship between egg production levels and the nutritional balance of the feed. Usually the smaller producers had inferior production levels, around 50 percent whereas the larger producers get up to 80 percent; about 290 eggs/hrn/year.

Chickens are either imported from Europe or are offspring from European parent stock. The most common breeds in Sierra Leone are Easy Brown and Isa Brown. Both have sex-linked coloration, meaning brown chicks are female and white ones are male. Commercial laying flocks are all hens.

Feed: Small-scale backyard poultry receive food scraps, occasionally corn, and have to forage for the rest of their food. Larger commercial farmers often start off their day old chicks by buying pre-mixed feed, complete with coccidiostat for the first 3 to 6 weeks, when the birds have their first feathers. This pre-mix feed is often imported from Europe but larger poultry farms in the Freetown area are increasingly mixing their own feed, using imported concentrate from Europe and locally available feedstuff (chiefly maize). As there are very few feed mills in country, larger producers usually grind their own corn and then mix it with the other feedstuffs on concrete floors. The two large producers in Freetown are investing or have already invested in hammer mills and mixers. After that, the birds are gradually switched to a starter mixture. This is when the managers begin experimenting with their own mixtures to save money. All continue to use imported concentrate but in varying ratios, experimenting on their birds to find a good balanced mixture. A common mixture is: 55 percent corn, 5 percent fish meal, 10 percent rice bran, 10 percent limestone and 20 percent concentrate.



Better use could be made of locally available products such as sorghum, cleaned ground oyster shells, groundnut and palm oil cake to produce a cheaper, more balanced feed. Other than concentrate, the most expensive and problematic foodstuff is maize. The domestic yellow variety is fine, but it has impurities, is often too wet, and the supply is erratic. Prices vary by region and seasons. During the study period (July), it sold for Le. 220,000/80 kg bag in Freetown, and Le. 150,000/bag in Makeni (akin to delivered and FOB⁹/free on board pricing). During the harvest season (Dec/Jan] it reportedly sells for about Le. 110,000, but usually has high moisture content.

4. VALUE CHAIN ACTOR CASE STUDIES¹⁰

Small-scale Egg Retailer

Mrs. K. sells fresh and boiled eggs for Le. 1,000 each, at the Bumbuna market and from her home. Other market vendors, all women, charge the same price (for both fresh and boiled eggs), indicating competitive dynamics. She buys from a nearby medium-sized poultry farm weekly, arranging transportation with the farm's manager who delivers one 30-egg flat to her house. She generally pays Le. 25,000 per flat, leaving her with Le. 5,000 of profit, or a 17 percent gross margin. During Ramadan demand increases, so she is likely to buy two flats per week, and may be able to sell the eggs at Le. 1,200 each. The wholesaler raises their price, too, so her gross margin is about the same. She is able to keep the money from the sales and uses it to buy household items at her discretion, due to an agreement with husband. He also gives her money for other expenses from his income, selling pigs and being paid as a pastor. Not all women have this level of equity and asset control in her area. As Mrs. K does not have refrigeration, she keeps the eggs in the shade and tries to sell them quickly. She boils any that she cannot sell quickly, as they keep longer and consumers enjoy them as a snack or part of a meal. Mrs. K raises local chickens and Muscovy ducks, but is not selling their eggs right now. She prefers to let the hens hatch them to increase the size of her flock. She also manages a small store from her front porch, and sells charcoal.

Small-scale Egg Production and Marketing

Mr. and Mrs. Baldy have about eighty improved layers on their farm (Isa Brown hybrid chicks from Europe), and raise them semi-intensively. They also have about 20 local-breed chickens and a half dozen Muscovite ducks. The improved breed birds are housed, fed and watered daily and kept on a deep litter floor. The Baldys do not let them mix with the local-breed birds. The local birds range freely, and are mainly kept to reproduce. Mrs. Baldy and the children take care of both the hybrid and local poultry flocks. They carry the food and water and occasionally greens to the hybrid flock. The improved flock has been laying for 8 months and produces about 40 eggs a day. This equates to a 50 percent production rate, which is low. The family's improved chicken production was supported by an NGO, which gave him 102 day-old chicks (22 died) and poultry feed for the first five months, and financed the construction of his poultry house. They have to supply their own feed now, but considers themselves lucky to have received all the support from the NGO, since this is not the case for small poultry farmers in general. Their poultry feed is made from imported concentrate and sometimes layer mash purchased from a retail store in Freetown. When they can obtain sufficient local feed stuff, they mix the concentrate (20 percent) with local corn, rice bran, palm kernel cake, oyster shells and

⁹ Free on Board pricing, at point of export, excludes customs fees, insurance, freight and other feed

¹⁰ Case studies are composites across actors interviewed, and all names are pseudonyms.

fish meal. Like most producers, they sell their eggs to consumers directly. They charge Le. 800 per egg in their community, and sell them in Makeni at Le. 1,000 per egg if they have a surplus.

Large-scale Egg Producer, with Spent Hen Marketing, Chick Hatchery, and Feed Mill

Mr. Ceesay began his poultry operation about five years ago, starting off by raising layers to market eggs to the Freetown area, then integrating a chick hatchery and feed mixing to meet his input needs. Mr. Ceesay received grants and training to launch and enlarge his operations, and has private investors. He has around 20,000 improved layers and a parent breeding stock of 5,000 birds. He buys his hybrid layers as day old chicks from the Isa Brown hatchery in Holland, the source of his parent flock of day-old chicks as well. He has a good bio-security system in place, vaccinates his birds on schedule, has disinfectants in his footbaths outside every poultry house and in front of the incubation room; and disinfects his incubator room after every hatch.

Egg production and marketing

Mr. Ceesay says Sierra Leone consumers prefers brown shelled eggs, which led him to raise chickens that lay them. He raises his laying hens in deep litter from wood shavings, but he plans to buy some metal cages from Europe to see if it increases production; and decreases feed consumption, disease, and the proportion of hens that eat their eggs. According to Ceesay, his production rate for his 20,000 hybrid hens is from 83 to 85%, enabling him to sell 16,000 eggs a day, mainly to the Freetown market. Ceesay estimates that his farm meets only about five percent of Freetown's demand for eggs.

His employees hand clean the eggs on the farm, pack them into 30-egg flats and then into twelve-flat cartons, imported from Europe. The eggs are not candled or graded. Like most egg producers, he markets his eggs directly, selling to market retailers, hotels, restaurants, supermarkets and bakeries. He also retails eggs at his small store in Freetown for Le. 25,000 for a 30-egg flat and Le. 10,000 per dozen. Employees transport eggs to his customers daily, in his non-refrigerated trucks. His prices are about 14 percent higher than imported eggs, priced at Le. 400,000 per carton versus imported eggs at Le. 350,000/carton, with his price determined in line with his production costs. To obtain his desired pricing, he has worked to market his eggs as fresher and better tasting than imports, which can be weeks old when they arrive in-country. Through these efforts, he has been able to get buyers to pay this differential so far, among the sliver of the market he holds. Imported eggs may be white or brown, making his more expensive eggs physically indistinguishable from cheaper brown imports. He has standing relationships with certain retailers who have been able to market their higher quality, and charge a premium over the price of imported eggs, covering the higher wholesale cost they pay.

Poultry meat sales (spent hens)

Ceesay sells his live, spent hens and cockerels for approximately Le. 25,000 each in local markets. These are not as tender as imports, which are raised as broilers. He sees an excellent opportunity in the demand for fresh poultry meat and parts to compete with the imported poultry products from Europe and Brazil. To capture some of the market, he plans to modernize his operation, and construct a commercial poultry abattoir. Initially he will slaughter his spent hens and the white cockerels. He will begin a broiler operation once he can find funding and will use imported broiler breeder stock from DeKalb in Holland. He expects to slaughter 20,000 broilers a week, raising them from 6 to 8 weeks before slaughter. He will also install a packaging operation to hygienically seal the birds after slaughter before putting them into a cool room. He also sells his deep litter manure to vegetable farmers for about Le. 40,000/50 kg bag.

Day-old chick production and marketing

Mr. Ceesay has a 50,000 egg capacity incubator but was reluctant to say how many eggs he hatches monthly; his hatchability rate is 79 percent. He hinted that he could produce many more hybrid chicks, if there was a greater demand. He injects all of his day old chicks with Marek's vaccine to prevent this tumor-causing virus, and inoculates them against Newcastle's and Infectious Bronchitis (viral respiratory diseases) before selling them for 7,000 Le each. There are some local poultry farmers who want older birds, so he raises the pullets for 6 weeks and sells them for Le. 18,000 each. He sells a lot of his chicks and pullets (and feed) to NGOs that give them to farmers, free; e.g., BRAC, Child fund, BiCaps. His flocks are sex-linked colored hybrids, wherein female chicks are brown and males are white. He keeps females for egg laying and raises the males until they are about 3 to 4 months old, then sells them. Buyers slaughter most of these, though some farmers use them to breed with their hens,

Feed Production and Marketing

As his farm grew, Mr. Ceesay began mixing his own feed, using as many domestic ingredients as he could source, as imported feed is costly. He mixes feed for his flocks and for commercial sale: the cost is approximately Le. 6,000/kg, for three different rations, starter, grower and layer. He sells a 50 kg bag for Le. 200,000, or Le. 4,000/kg. Prices vary according to the mixture and seasonal feedstuff prices. He uses about 20 percent concentrate [Havens] from Europe and buys his maize, wheat and other grains at prevailing market prices. After the maize harvest, he orders the majority of his maize from traders, and dispatches some trucks to buy maize himself. He has the maize delivered to Freetown, where he undertakes drying, cleaning and storage. Domestic maize supply cannot meet his needs so he imports some from neighboring countries, e.g., Ghana. He buys limestone from Europe as a calcium supplement, as he found local oyster shells had impurities that made his layers ill.

5. CROSS CUTTING SERVICES

a. Basic Inputs and Services

To start intensive poultry operations, it is critical to obtain healthy day-old chicks. All of the operators interviewed obtained improved breeds, which were vaccinated against Marek's and Newcastle's diseases, and Infectious Bronchitis, and purchased from a national hatchery or Europe. Besides quality chicks and feed, the most important need is timely veterinary services to prevent diseases. Access to extension services is also important to assist producers to maintain good intensive management techniques, including bio-security. To complement MAFFS coverage, project support might be given to input suppliers and farmer organizations (where they exist) to provide extension services to their clients, as is done in other FTF countries.

b. Financial Services

None of the medium-sized egg producers reported receiving any credit. Two large farmers in Freetown stated that they received donor grants. A few producers sought bank credit but were turned down. All were self-financed, as a result.

c. ICT and telecom, as it affects agriculture:

Although there is SMS service in Sierra Leone, there is little evidence that market information is communicated that way; nor by the media, such as disseminating market prices for livestock products by radio or in local newspapers. It would be beneficial to coordinate with MAFFS on such a service.

d. Transportation

Moving eggs to market, and input commodities and services to commercial poultry farms, is always a challenge. Shipping the eggs to distant markets without refrigeration affects the quality of the eggs and adds significant operating/marketing costs, impacting profitability. The main roads to the major end market, Freetown are in relatively good shape, though feeder roads are dirt tracks that can become impassable during the rainy season. Transportation of eggs is facilitated by the widespread use of cardboard 30-egg flats and cartons holding 12 flats each; however, these are imported and expensive.

5. COMPETITIVE ANALYSIS OF SECTOR

a. Qualitative assessment of cooperative and competitive strategies

The GoSL encourages farmers to form Farmer Based Organizations (FBOs) to obtain economies of scale and facilitate joint training. FBOs contain 25 or more farmers. The field team did not encounter poultry-focused FBOs, though many poultry producers are in FBOs since they unite farmers across commodities. Via interviews, the team learned that FAO and MAFFS established Agricultural Business Centers, which bring together multiple FBOs for collective post-harvest processing, storage and marketing. The team found that FBOs were focused primarily on cassava and rice, though the Tonkolili District Agricultural Officer noted that a livestock ABC would be initiated in the fall of 2015. Competition is discussed below, as one of Porter's Five Forces.

b. Porter's Five Forces

Supplier Power: There are only three input sources of day old chicks: Pajah's hatchery, Europe and the hatchery in Koliagbe, Guinea; which produce chicks that are theoretically identical. This indicates a high level of supplier power for chicks, though Guinea appears to be disadvantaged relative to the others. Importing chicks from Guinea is a tedious experience due to multiple roadblocks, according to the District Livestock officer in Tonkolili, somewhat offsetting the cost advantage of Guinea's cheaper chicks. There is a larger number of poultry feedstuff input suppliers, making for good competition among providers and lower supplier power. Veterinary medicines, although sold by the public sector, are imported with GoSL oversight, reducing supplier power. Larger farms have relative power over small buyers; while smallholders have little supplier power in the face of wholesalers and more negotiating power as suppliers to retailers directly.

Buyer Power: Smallholders have little power in negotiating with buyers, as buyers have many smallholders to choose from, and smallholders are not organized for collective marketing. Larger domestic egg producers have relatively more bargaining power, and report that they are able to fetch premium prices. Consumers do not have bargaining power against retailers.

Competitive Rivalry: The sector is split, with a few large and medium producers, and many smallholders. The limited number of larger enterprises, and the lack of producer organizations, means that large entities face little competition. Smallholders face a high level of competition from other smallholders, and larger producers that have more transportation resources, and economies of scale. There is robust competition among retailers, given their larger numbers.

Threat of Substitution: Imports dominate Sierra Leone's market at present, and they are cheaper than domestic eggs. Larger domestic producers report that they can successfully compete with imports despite the price differential, but imports remain a threat so long as quality differentiation is not in place.

Threat of New Entry: Backyard poultry has low barriers to entry, making the threat of new entrants high for smallholders. The cost of entering the large-scale egg business is substantial; especially if the day old chicks are imported from Europe. Adopting the necessary bio-security needed to manage an intensive egg laying flock successfully is not easy, as it goes against traditional poultry husbandry management. Thus, for larger-scale firms, the threat of new entry is low. They do face the threat of smallholders organizing for collective input purchases and marketing, helping smallholders upgrade production and market access at lower cost. Entry into the retail trade is relatively low cost for petty traders and those in open air markets, but requires some up front capital, particularly for those desiring a market stall and storage.

A2. SMALL RUMINANTS

1. OVERVIEW

Small ruminants and goats are less prevalent than poultry in the target districts (MAFFS, SSL, J-PAL/IPA 2011) and nationally (MAFFS 2015). Goats slightly outnumber sheep nationally (MAFFS 2015). In the target districts, the number of households rearing each ruminant is about equal, though goats are much more predominant than sheep in Tonkolili, held by 32 percent and 14 percent of households respectively. Domestic sheep production has grown by about ten percent annually from 2011-2013, and 334 percent from 2005-13 (MAFFS 2011, MAFFS 2015); while goat production has grown about ten percent annually since 2010 and 336 percent since 2005.¹¹ ComTrade (2015) reports that imports of goat and sheep meat totaled \$327,790 in 2014. Reported trends show growth over the longer-term, but are erratic from year to year, with imports amounting to \$104,9548 in 2010, over \$600,000 in 2011 and 2012, then \$240,503 in 2013.



Few farmers in Sierra Leone raise small ruminants in an intensive manner. Consequently, their productivity suffers. Instead of weaning lambs and kids at an early age as is in intensive agricultural systems, the young animals are allowed to nurse for up to a year before they are separated from their mothers and are then fed forage. Thus, they gain weight and size slowly. There is no culture of sheep or goat fattening in Sierra Leone, which involves feeding the animals a mixed ration designed to add weight quickly, and maximize optimum growth. Fieldwork revealed that, in traditional small ruminant rearing, women and youth often have the primary responsibility for raising small ruminants. Thus, upgrading stands to increase employment and revenue generation to these two disadvantaged groups.

Sierra Leone is in the trypanosomiasis area of West Africa; many varieties of ruminants cannot survive. Fortunately, West African dwarf goat and sheep, which predominate in Sierra Leone, are “tryps” tolerant and are raised throughout the country. However, due to their small sizes they are mainly used for meat production rather than milk, though women occasionally milk the ewes and nannies for domestic consumption. Milk and wool varieties of small ruminants are not commonly raised. Due to a shortage of preventative veterinary care, up to 30 percent of small ruminants die annually, mostly from Peste de Petites Ruminant (PPR).

¹¹ As noted prior, the ten percent growth figures appear to be estimates, as the MAFFS report shows identical annual growth rates for all livestock reported.

2. END MARKET ANALYSIS

a. Global and Regional Markets

Trade databases (e.g., ComTrade, ITC Trade Map, FAOStat) do not report any exports of goats or sheep, or derivatives, from Sierra Leone since at least 2010. Older data from FAO (2005) indicate that a small number of live small ruminants were exported to regional markets, across land borders mainly to the north, and east. Thus, the present export market is estimated to be minimal.

b. National and Local Markets

Markets across the country sell small ruminants, both live and as butchered meat. The major end market is Freetown, which pays the highest prices for live animals to satisfy urban and suburban demand. Small ruminants from the northern, eastern and southern regions of the country are transported to markets in the Freetown area. Small ruminants are sold in market areas that are usually separate from the main village market. Animals are often slaughtered just meters away from where they are sold, and may be roasted immediately to cook the skin, which is also eaten. Butchers then butcher them, and sell meat by weight in local markets. Sheep are skinned before butchering. Skins are dried in an artisanal manner for domestic use or sale. There is no evidence of a commercial tanning industry.

Table 5 indicates small ruminant prices and gross margins for local market sales. The team was not able to determine the weight of live animals, and thus their price per kg.

Table 5: Small Ruminant Prices, Leones, and Gross Margins, July 2015

Product	Farm gate	Local Market
Ewe Makeni	120,000-150,000	150,000-170,000 (12-20% margin)
Ram Makeni	100,000-120,000	150,000-170,000 (29-33% margin)
Goat meat, kg		20,000

Source: Interviews

c. Opportunities for Growth

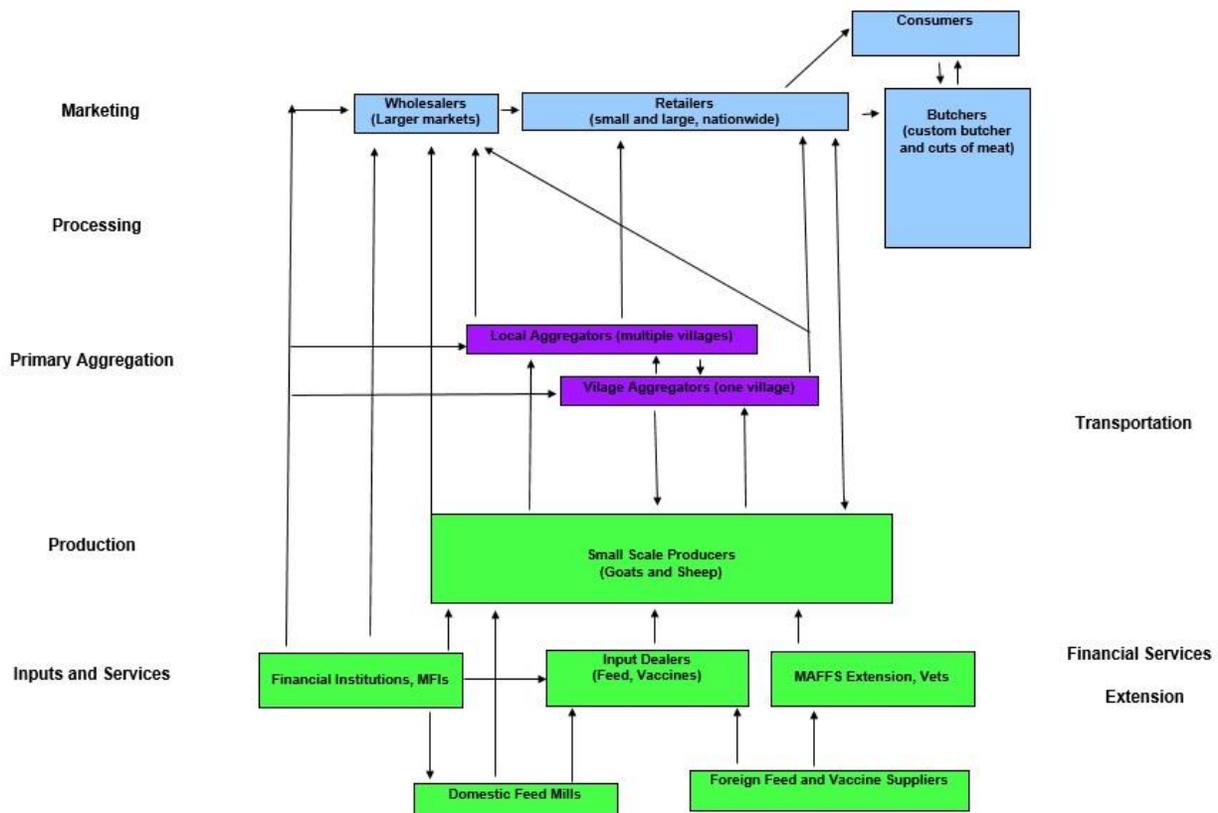
Sheep and goat husbandry has an enormous room for growth, as the current system of husbandry is very traditional and extensive. Using existing West African dwarf genetics, which are resistant to trypanosomiasis, small ruminants could be made much more efficient and profitable using simple intensive animal husbandry techniques: providing improved food and shelter, providing vaccinations and veterinary pharmaceuticals, weaning at the early age, castrating, feeding balanced feed for both breeding and fattening, selling animals by weight, etc. Once the basic meat industry begins, small ruminant herders could import improved varieties to increase production of meat, milk and wool, provide that animals receive appropriate veterinary services.

d. Change Drivers

This appears to be an area of need in the small ruminant value chain, and could be filled by facilitating the development of related entities. The major potential change drivers appear to be veterinarians and suppliers of animal inputs, especially vaccines. The team did not encounter any private veterinarians. MAFFS has a few veterinarians and vet techs, who are challenged to cover the sector's needs. Filling this gap is a longer-term process, as it would require training veterinarians. Animal input suppliers would need access to credit to purchase vaccines, and linkages with smallholders to sell their products and services. In many cases, smallholders are currently paying for veterinarian services only by covering their transportation, as organizations like FAO provide free vaccines. Thus, it is important to cultivate change drivers that can help smallholders understand why market prices are worth it. MAFFS is positioned to do this by educating producers on the need for professional veterinarians and the benefits of necessary care.

3. VALUE CHAIN MAP AND FUNCTIONS

Figure 7: Small Ruminant Value Chain



a. Marketing – Retailers primarily sell live animals at market areas adjacent to local markets. Customers have animals butchered, and typically consume the meat within a short time, since most homes do not have refrigeration. Larger markets, and those in urban areas, also have stalls with cuts of meat. Meat sells for Le. 20,000/kg, with prices rising before religious holidays. The research team was unable to confirm the dressed weight of the average sheep or goat. It is typically from 45 to 55 percent of live weight.

Local Wholesalers purchase small ruminants from retailers who do not slaughter and sell them, and may also purchase directly from smallholders. Local wholesalers feed and water the animals until they can sell them to **Regional Wholesalers**, who pay cash, and arrange for or provide transportation to sell small flocks to retailers in larger cities. Wholesalers provide small ruminants with food (usually only a maintenance diet of chopped grass), water and necessary veterinary services until selling them. The team did not hear of regulations in place regarding withdrawal times, or the time required to wait between medication and slaughter. USAID may wish to incorporate U.S. and EU-defined withdrawal times in programming as such.

b. Processing- There is no set processing value chain in Sierra Leone, nor are there modern abattoirs. Processing is linked to marketing, temporally and physically. The animals are usually slaughtered at the market and the carcass is carried to a nearby butcher's shop, or a market-based butcher, where it is cut up.

c. Primary Aggregation- These include village aggregators, who operate at the village level; and local traders, who multiple villages. These aggregators go from farm to farm to purchase animals, and sell them to local wholesalers and retailers at local markets, regional wholesalers, or urban retailers. As such some aggregators also function as wholesalers.

d. Production- Traditional production in Sierra Leone is extensive. The animals are usually tethered in grassy areas to graze; and moved periodically so they always have access to food. During the dry season they are often left to range freely. In the rainy season, producers bring animals indoors during heavy rains to protect them from cold and diseases. Animals are sheltered to prevent theft. Producers do not sell small ruminants readily, but keep them as assets to sell them when necessity demands. Farmers may sell to aggregators wholesalers, butchers or retailers. They usually lead them one by one to market by a rope and sell each head for cash. A healthy herd will multiply quickly, as small ruminants have short reproduction cycles. Under intensive management, animals reproduce annually. Under the extensive system, the young are weaned late, so females may give birth every two years. The animals are not castrated and breed freely. Due to the prevalence of trypanosomiasis, the dwarf varieties of sheep and goats seem to be the only breeds that survive. PPR is the most devastating disease reported by herders; but it is prevented by timely inoculation of PPR vaccine. There are mixed opinions about which species is most vulnerable to PPR.

Feed- Forage is the only feed currently available to small ruminants under traditional extensive management. During the dry season, small ruminants may feed on groundnut hay left in the fields before and during harvest. This is actually an excellent feed for them but it is not given to them. There is no culture to fatten them for market by providing concentrate

4. VC ACTOR CASE STUDIES

Trade and Fattening

Hussein is a trader who buys small ruminants from local farmers, at their farms and in local markets. He transports them to his land and fattens them up for sale. At a given time, he might have 20 sheep and goats, which he keeps tethered in a small pasture. At night he brings them inside a nearby shed so they are not stolen. He hires youth to watch over the animals and to move them around during the day. He does not have an intensive fattening program, as he does not castrate males or feed his animals a mixed ration of concentrate and grains, which would help them gain weight quickly. He sells animals year around and tries to sell each within two months of purchasing them. He sells primarily in Magburaka and Makeni, the district capitals; but sometimes has them shipped to larger traders who buy 5 to 10 from him directly. His highest prices come during Christian and Muslim holidays.

He prefers to sell sheep because he thinks sheep fetch a higher price, especially during religious holidays. In addition, he believes sheep are more resistant than goats to PPR, a viral disease common to small ruminants. He recently lost 20 goats to the disease. A MAFFS veterinary technician brings him various medicines to vaccinate against PPR and to treat for worms. The medicines are free, as an international agency pays for them. There currently is a shortage for PPR vaccine and he is worried.

He sells sheep for Le. 150,000 and 300,000 per head. He bought a small white ram for Le. 250,000 a week and expects to sell it for Le. 300,000. Locals prefer all white rams for special sacrifices, so he tries to buy and sell them to capture premiums. As for his goats, a full-grown billy/buck sells live for Le. 150,000 and a nanny/doe for Le. 250,000. He does not know how much money he is making but he is certain he is making a profit

Small Ruminant Farmers

The Jallohs have 50 sheep and 40 goats, all tethered on 6-to-8-foot ropes eating elephant grass and other wild forage. They purchased all of their sheep and goats in cash with their own money, often from neighbors, and have not received any credit. Mrs. Jalloh and the couple's children care for the flocks by moving them to new grazing areas, cleaning animal sheds, harvesting fodder and providing water. Forage is plentiful in the rainy season. During the dry season the Jallohs supplement forage with rice bran and cut elephant grass. The animals are herded into the solid wooden shed at night because of thieves. The shed is about a meter off the ground with a slat floor so the droppings fall below and are collected for the family vegetable gardens.

The Jallohs allow their animals to reproduce to increase the size of their flocks. Their dwarf goats and sheep normally produce one or two kids and lambs per female per year. He treats the flocks for worms and occasionally has them vaccinated. A MAFFS livestock technician comes to the farm and administers these medicines for free, if they pay transportation, since FAO has paid for medicines. However, the Jallohs know that many farmers have to pay for medicine, and have difficulty finding them. The Jallohs fatten their animals on grass to prepare them for sale to traders. Mr. Jallo negotiates with the livestock traders for the sales. He gives some proceeds to Mrs. Jalloh to buy food, clothing and equipment for the household.

Small Ruminant Veterinary Assistant

Abukar is a government Livestock Veterinary Assistant. He is qualified to vaccinate sheep, goats, cattle and poultry, and administer medications in their food and water. He can recognize some diseases but if there are symptoms he does not know, he asks his supervisor at MAFFS. He says PPR, Newcastle's, Infection Bronchitis are common diseases among small ruminants and chickens, and notes that worms are particularly bad for small ruminants. He teaches farmers how to drench their ruminants, when needed. The EVD crisis highly impacted transportation, limiting the supply of veterinary supplies, and creating shortage of PPR vaccine.

Abukar feels there is more potential for profit in raising livestock than crops in the area; so he is very enthusiastic about helping livestock farmers increase their herd and flock sizes and productivity. Unfortunately he does not get out of the office very often to visit farmers, due to transportation costs. Often farmers come to the MAFFS district office where he has a stock of veterinary supplies that he gives to the owners or administrators to their sick animals, for free. This medicine comes from the FAO-supported Diversified Food Production Project [DFFP] project. When MAFFS does not have sufficient stocks on hand he advises livestock farmers to go to Freetown to buy their veterinary supplies from private providers.

5. CROSS CUTTING SERVICES

a. Inputs

The major inputs for sheep and goats are young animals, often purchased from Guinea. Due to the prevalence of trypanosomiasis, the genetic stock is currently limited to dwarf varieties. The next most critical inputs are veterinary supplies, both preventative and curative, as the animals are susceptible to multiple diseases, most notably PPR. Simple services such as de-worming would also improve health and increase weight gain and productivity. In addition, when intensive animal husbandry techniques are used, the value chain will evolve to provide a steady supply of inputs, especially feed.

b. Extension Services

MAFFS has agents in the field throughout the country but they are few in number and lack basic means of transportation. Those based in villages do extend basic animal husbandry advice; however, there is no extension message to encourage herders to adopt intensive animal husbandry techniques.

c. Equipment Services

Very little equipment is needed in the present indigenous, traditional animal husbandry sector. However, infrastructural improvements will be necessary to go to the next level: hygienic abattoirs, cold chain, etc.

d. Financial Services

Traditional small ruminant herders usually have fewer than ten head; none that the team observed obtained any financial services, they were all self-financed. Small ruminant traders bought small ruminants directly from herders or in local markets; they too were self-financed, without access to credit.

e. ICT and telecom, as it affects agriculture

Although MAFFs publishes weekly data about market prices for cereals and legumes, this team did not find any similar data on livestock prices. Information dissemination is often communicated between local market aggregators and trader/wholesalers via SMS messages, informally.

6. COMPETITIVE ANALYSIS OF SECTOR

a. Qualitative assessment of cooperative and competitive strategies

As with poultry, there are no small ruminant-specific FBOs or ABCs, though many small ruminant farmers in FBOs. There is very little cooperation among small ruminant herders, as most keep their animals near their compounds to forage. The team did not perceive a communal herding culture, found in other West African countries. There is some cooperation among the aggregators as they are often obliged to sell their animals in segregated areas of local markets. However, aggregators certainly compete with one another to sell their animals at a good price. Some larger markets have associations of traders who share information on treating diseases, and share responsibilities such as providing fodder. However, they do not collaborate to develop or enforce marketing standards, or achieve economies of scale. One such example is a goat sellers union in Makeni, which the team met.

b. Porter's Five Forces

Supplier Power: Suppliers are small in number and inputs are limited, giving suppliers bargaining power over producers. Smallholders are not organized and have few animals, so they have little bargaining power over traders, aggregators and wholesalers. However, they can choose to fatten their animals and sell them at a specific time to increase their leverage

Buyer Power: Producers typically have access to multiple buyers, including several retailers, and often one or more aggregators and/or wholesalers. The same holds for aggregators through retailers. Thus, there is not a monopsony and buyers do not appear to control the market at any level of the value chain. At the retail level, consumers can choose among multiple sellers, and among different types of animal protein. However, they do not have the ability to dictate prices because there are many more potential buyers than sellers

Competitive Rivalry: Under the traditional, extensive husbandry system in Sierra Leone, there is competition among smallholders. Most small rural households have a few small ruminants, and choose when to sell them. Aggregators, traders, wholesalers and retailers compete as well, though they also cooperate, in the case of some trader associations. The competition mirrors the free market, with no apparent unfair advantages for a given actor, or at a specific level of the value chain.

Threat of Substitutes: All actors in this value chain face the threat of substitution from other animal proteins, both domestic and imported, such as fish, eggs, poultry meat, beef and bush meat.

Threat of New Entry: It is relatively easy and inexpensive to enter into extensive small ruminant production. Small ruminants reproduce quickly and are easy to raise under these management practices. Local aggregation and trade, and retail, involve more cost, since buyers typically pay cash up front and must tend to the animals until selling them. These entities (particularly aggregators and traders) also face the risk of having animals contract disease or illness, rendering them unsellable or leading to death. Regional trade and wholesale can entail significant cost and risk, as these entities purchase a larger number of animals at a given time, and transport them farther. Thus, the threat of new entry at the production level is high, and generally decreases across the value chain, with the exception that risk of entry at retail appears to be lower than that for aggregation, trade and wholesale.

B. MAIZE AND MILLET

Maize may be sold fresh, boiled or roasted for human consumption, by the dried ear and grain for human consumption, animal feed and planting, and ground into flour or popped for eating. Millet is sold in whole-grain form for eating and planting; and coarsely ground (parched and not parched) for eating. Among crops, maize ranked fifth in its contribution to agriculture's share of GDP (maize value Le. 304,912 mil) in 2013 (MAFFS 2015).¹² That year, it represented 4.85 percent of total crop contribution to GDP and about three percent of total agriculture's contribution to the GDP.



Reported millet imports are negligible, with ComTrade (2015) showing only 140 kg total, imported from India, for 2013 and 2014 together (valued at \$27). However, maize product imports (grain, seed and flour) are sizeable, valued at \$415,604 in 2014; with an aggregate growth of 21 percent, from 2010-2014 (ComTrade 2015). Thus, it offers a sizeable and growing opportunity for import replacement; particularly for grain and flour. In 2014, seed accounted for less than one percent of import value, grain represented 40 percent, and flour represented 59 percent. That year, the major import sources for maize grain were Argentina (96 percent of imports) and South Africa (4 percent of imports), while China was listed as the sole seed source; and Germany, the U.S. and the Netherlands provided flour.



Argentina's maize grain has an average FOB price of \$627/ton while South Africa supplies at \$320/ton. A wholesale trader interviewed indicated that she pays about \$293-320/ton at farmgate, and sells to poultry processors for \$375-400/ton. These prices are extremely competitive with Argentina and should compete well with South African imports, since the latter would have customs, insurance and freight added to the stated FOB price.

Overall demand (indicated by imports and domestic production) is growing, indicating opportunity for inclusive growth in this value chain. ComTrade reports increased imports from 2010 to 2012, followed by decreases from 2012 to 2014, indicating shifting trends behind the overall growth reported above. Domestic production grew by 246 percent from 2005 to 2013, with a drop in 2012 and annual growth ranging from two to 88 percent for other years,

KEY FIGURES: MAIZE

- \$415,604 in imports, 2014
- 21 percent growth in import value, from 2010-14
- Domestic production grew 146 percent from 2005-13
- Domestic grain prices are competitive with imports

¹² MAFFS regard fruits and vegetables as a single category, which ranks second after rice. As such, among individual crops, maize may rank fourth.

indicating sustained but variable growth overall (MAFFS 2011, MAFFS 2015). Millet is largely produced for home consumption and thus serves to reduce food expenditures, leaving cash income for other foods and expenses. Producers reported having less marketable surplus for this crop than maize. However, it is widely available in markets and producers expressed an interest in selling more. There are ready opportunities to stem large post-harvest losses.

Production of both crops is widespread in both target districts, though FEWSNET (2011) maps show that maize production is most significant in the country's central southwest. Most farmers in the target districts grow improved maize, which affords multiple seasons per year, and most reported growing it as a stand-alone crop. Producers generally reported growing millet as an intercrop with rice and other crops such as sorghum, planted using broadcast. Both crops are marked by small-scale production, credit constraints, low use of fertilizer, non-mechanized post-harvest processing, and high post-harvest losses of dried grain due to rats and insects. Storage constrains limit producers' abilities to sell in the off-season, when they could fetch better prices. Across both value chains, vertical linkages appear weak, and there is little transformation of product from farm to market.

2. END MARKET ANALYSIS

a. Global and Regional Markets

Trade databases show that Sierra Leone exports are minimal, and that it is a net importer of maize. ComTrade (2015) reports exports of grain to Poland only, in 2012 (\$22,265) and 2014 (12,966), for the past five-year period. At present, the country serves as a global end market for imports. Cost-benefit analyses are needed to evaluate the relative net benefits of exportation versus import substitution.

b. National and Local Markets

Maize has demonstrated unmet demand, chiefly from the poultry industry. There is a sizeable import substitution opportunity, and it appears to be competitive given the growing investments and purchasing of domestic maize by domestic poultry farmers. At present, most maize is sold fresh upon harvest. Consumers purchase fresh ears to cook, and boiled and roasted ears as a snack. These items were widely seen in markets, with ready to eat item sold by petty traders. Maize flour, sometimes fermented; or with salt and sugar, is sold for porridge. There is also a robust market for seed, chiefly improved Western Yellow. Retailers, wholesalers, NGOs and the Seed Multiplication Unit (SMP) purchase this (SMP works through contract production agreements.) All the seed the team encountered was sold loose or in unmarked bags, with no ready signs of origin or any quality testing/certification. It does not appear that consumers are picky about maize seed quality, as damage by insects is apparent in purchased product, to a marked degree.

Millet has high demand for home consumption and is regarded as a key staple for food security during the hunger season in the study area. Millet for eating and planting is also sold at urban and local markets, including higher-value processed, parched millet.

Wholesalers operate primarily in urban areas such as Freetown and Makeni, and trade hubs such as Mile 91 in the Yoni chiefdom.

Table 6 reports prices at the farm gate, aggregation and retail levels, recorded during fieldwork; and gross margins (wholesale and retail). The team did not observe price differentials across locations. Retailers sell numerous products in scoops, which ranged from 22.3 to 28.3 tablespoons by volume, across items

purchased for fieldwork.¹³ Weight was estimated by weighing equivalent bulk products in the U.S., as the grains VCA team could not find a precise scale in country. The higher markups at wholesale likely reflect the inclusion of transport costs, since wholesalers are generally located in district trade hubs, and must travel to farms to purchase product, then travel to buyers to sell it (or pay equivalent transport costs to third parties).

Table 6: Grain Product Prices in Leones, and Gross Margins, July-August 2015, Freetown and Makeni

Product	Farm gate	Wholesale	Retail
Maize, fresh cob, single	167 small 417 large (sold by the dozen at 2,000-5,000)	N/A Farmers sell to retailers	500 small (67% margin) 1000 large (58% margin)
Maize, fresh cob, 40-45 kg bag	50,000 to 55,000	130,000 to 150,000 (62-63% margin)	Not sold
Maize, boiled cob, single	100 to 300 small 300 to 700 large	N/A Farmers sell to retailers	500 small (40-80% margin) 1,000 large (30-70% margin)
Maize, dried cob, single	500	N/A Farmers sell to retailers	1,000 (50% margin)
Maize, dried kernels, "scoop" Western Yel. 28.3 Tbl, ~375 gm Local/native 24 Tbl ~ 321 gm	500	1,000 to 1,500 (50-66% margin)	2,000 (25-50% margin)
Maize, dried kernels, 75 kg bag, for poultry feed	100,000-120,000	140,000-150,000 (25-27% margin)	Not sold
Maize flour, Western Yellow, "scoop," 28 Tbl, ~ 309 gm ^a	Not sold	Not sold (retailers grind seed)	1000
Maize flour, Local maize, fermented, "scoop"	Not sold	Not sold (retailers grind seed)	1500
Millet, dried seed, "scoop" 24.5 Tbl, ~ 310 gm	50kg bag ~ 100,000	200 with chaff 500 clean	300 with chaff (33% margin) 700-1,000 clean (30-50% margin)
Millet, coarse ground, parched (22.3 Tbl)	Not sold	2,500	3,000 (16.7% margin)
Millet, coarse ground, non-parched (22.3 Tbl)	Not sold	2300 to 2,500	2,500-3,000 (8-16.7% margin)

Source: Fieldwork interviews

^a The fact that the price per scoop for ground corn meal is cheaper than that for seed is curious, as the former requires added labor.

¹³ The team purchased only one scoop of each item, and thus did not compare scoop volume per product across retailers; only across products.

c. Opportunities for Growth

Growing demand for poultry and eggs, coupled with growing interest in domestic feed supply, indicates strong growth potential for maize. There is demonstrated unmet demand for maize from the target districts, particularly chiefly by poultry-feed-maize traders operating in Mile 91 in Tonkolili (Yoni chiefdom). They are currently sourcing the majority of their grain in districts farther away due to lack of district supply. They would much rather source in Tonkolili to reduce transit time and costs. Large poultry producers such as Sierra Akker have also expressed interest in increasing maize purchasing from the target districts, as they, too, are sending trucks much farther, and importing grain, to meet their maize needs. There is an opportunity to scale up production and supply to meet this demand, via fertilizer and better storage bags. Millet producers can likewise tap more markets if they scale up supply and improve storage, so they have marketable surplus of good quality. Both crops have some opportunities for basic value-addition, which would serve to grow prices, and thus producer incomes.

Change Drivers

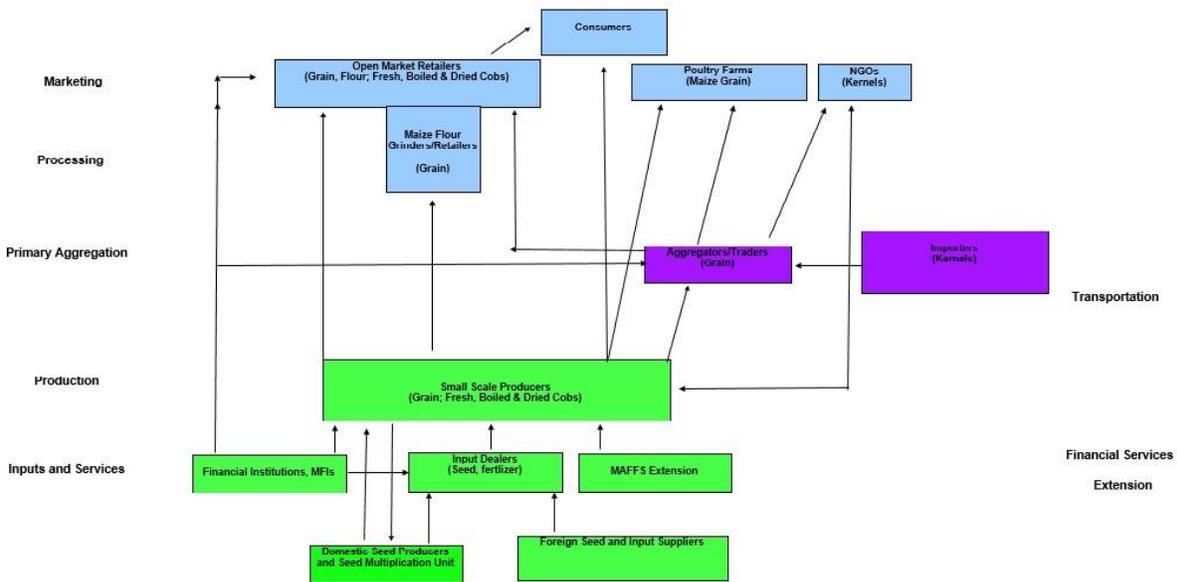
Larger poultry producers represent a key change driver in the maize value chain. Medium- and large-scale producers have integrated feed production into their operations, growing demand for maize. Some have quality standards that can serve as a model for national standards, and position producers to compete with imports better. A representative of the SNAP program indicated that they piloted a value chain financing program with a larger producer, who provided credit to smallholders up front, in exchange for a deduction on invoices purchases later. Another larger producer sources about 30 percent of their maize directly, using their own trucks, indicating a willingness to invest in domestic supply. Local traders represent another change driver, as they expressed a desire to increase their sourcing from the target districts. A focus group of traders from the Yoni chiefdom in Tonkolili stated an interest in forming a group to realize efficiencies, a first step toward creating a larger, more efficient enterprise that can compete strongly with imports, and that could be better positioned to help farmers access finance.

3. VC MAP AND FUNCTIONS

a. Marketing

Maize seed and flour, and **millet** grains, are sold primarily in open markets. Small-scale retailers typically offer multiple grains and legumes, along with some domestic and imported spices. They display product in bowls or open bags, with grains and legumes neatly organized together. They sell product by the mounded scoop, not by weight, and by the ear for dried cobs, and typically set a full mounded cup in each bowl. There are many retailers carrying the same products, making it essential to attract and retain customers. Some retailers may give discounts to reward and sustain repeat sales. Farmers may sell fresh maize at the farm, and sell it to retailers to vend at markets and along roadsides. Fresh ears are typically bundled in sets of five or six. Boiled and roasted maize are sold by petty traders at markets, by small vendors along the road (including numerous Ebola check points). Farmers may also sell boiled ears directly, or sell them to retailers. Per retailers the team interviewed, traders in Makeni (Bombali district) marketed their product by visiting retailers' market stands. In Freetown, traders sell their wares at the city's largest open market.

Figure 8: Maize and Millet Value Chain, Sierra Leone



b. Processing and Manufacturing

We encountered very little processing in this research, and what the team saw was very basic. Fresh ears of **maize** may be boiled by farmers or retailers, and roasted maize is charbroiled by vendors. Retailers who sold maize flour and popcorn said that they prepared it from the kernels themselves. Retailers who sell coarse ground **millet** (parched and non) said they purchased it that way from wholesalers.

c. Primary Aggregation

Aggregators may purchase **maize** seed, dried cobs and millet seed in bags (often reused 50kg rice bags), and buy fresh and boiled ears by the each or bundle (typically one dozen). Larger poultry processors may serve as aggregators. One of the country’s largest poultry companies indicated that they source from about 100 farmers, though they buy only about 5% of their volume directly. Aggregators purchase **millet** in 50 kg bags.

d. Production

Most **maize** farmers grow an improved variety, which in-country team members and producers identified as Western Yellow,¹⁴ though many reported saving seed, which can result in lower quality genetic material. Most farmers growing this variety undertake two plantings per year, as it matures in three months. A group of farmers that farm collectively (block farming) in Bombali said they plant cassava during the other part of the year. This provides more total output, but also takes more nutrients from soil that is already depleted as a result of two maize crops and little or no fertilizer use. Farmers remarked on low productivity due to lack of fertilizer use, but did not attribute fertility levels to their cropping intensity. The legume VCA researcher noted that is more common to intercrop the two during the first maize planting, and leave plots open during the six-month off season. Those planting local varieties sow only one crop annually, as this takes over six months to mature. Most grow it as a separate crop in spaced rows, though some broadcast with corn, and

¹⁴ This varietal name also appears in research and guidance for Nigeria, e.g., USAID and ICS-Nigeria (undated) and Adegbite (2011). IITA (1986) indicates it was developed by the Institute of Agricultural Research and Training.

generally produce it on their farms. Shifting cultivation is common, a practice where farmers leave some part of their land fallow for a year or more.

Commercial smallholders reported farm sizes up to three to five acres. Fertilizer use is low, generally one to two 50-kg bags per hectare, far short of the 3.5 bags recommended. On average, farmers reported selling about 50 percent of their corn fresh and 30 percent as dried seed, with the remaining 20 percent saved for replanting. Pest damage during production varies, with some reporting losses (not quantified separately from yield reductions due to insufficient fertilizer), and others not. All farmers reported post-harvest losses of dried corn due to rats and insects, up to 30 percent. **Millet** farmers sow one crop annually, often broadcast with rice. They generally do not use fertilizer. Mature millet is hand threshed to remove the grain from the panicle, dried on a ground level surface, and packed in bags for storage. Farmers reported dried grain losses of up to 50% due to rats and insects. Producers of both crops reported selling primarily to wholesalers/aggregators, then retailers, with a smaller volume sold direct to consumer.



4. VALUE CHAIN ACTORS: CASE STUDY PROFILES

Retailer

Aminita, who is in her mid-thirties, has a stand at Makeni's main open market. Before EVD, she operated her stand daily, but markets are closed on Sundays under EVD mitigation measures. Aminita learned her trade on the job, working with her mother. Though she has little formal education, she is savvy about setting prices with consideration of total costs, and has strong customer engagement skills. She sells a range of grains and legumes, displayed in different-colored bowls and/or sacks that are neatly folded open. Her grains include dried corn seed, separated and on the cob, and dried millet grains. She purchases most of her product from a few female and male wholesalers who rove the market, and buys product weekly. Aminita does not know where her wholesaler's operations are located, and does not have strong or cooperative relationships with them. Products are available nearly year round, though supply is limited in the dry season and some items may be unavailable for a month or two during this time. Her supplier offers product without advance payment if requested, then charges a slightly higher price when he or she returns to collect payment and deliver more grain.

Aminita sells her loose product in mounded scoops, not by weight, though she may buy it by weight or volume, and sells cobs by the each. She also packs a small amount of product in bags of one-half and one scoop, to enable quick purchases. She is generally happy with the quality and quantity of product she receives, can identify the sub-chiefdoms where her grains are grown, is quick to name her favorite products, and offers advice on how to prepare the grains. Aminita competes with numerous vendors selling the same items, so she works to build personal relationships and may provide discounts to good customers. She has a small number of customers, and may buy and sell only about one bowl (ten scoops) of many of her products each week. Her retail prices range from 120 to 200 percent of wholesale costs depending on the product. She pays about Le. 200/day for her market table, and Le. 30,000 per month to store her product at the market's storage site. Friends who sell product in Freetown also pay daily taxes. This leaves little profit at the end of the day.

Wholesale Trader

Fatima, aged 41, trades **maize** and groundnut. She operates out of her home in Makeni, and rents a storage site if needed. She purchases maize from two farmers in the Tonkolili district, and uses public transit to buy and deliver the maize. Fatima sells the maize to one poultry farmer, and is seeking other customers. She identified her sources through her groundnut trading work, as the crops are produced in the same communities. Her sales amount to about 20 50-kg bags per year. She estimates that her profits are about Le. 2,000/bag, far less than her average selling price of Le. 145,000/bag, after accounting for purchase price, storage and transport.

Dama, aged 45, trades maize from his base in the Mile 91 area of Tonkolili, in the Yoni chiefdom. He sources from the Port Loko, Bombali and Tonkolili districts because he is not able to secure the amount he needs to meet demand from Tonkolili alone. Product may not be available during the dry season. He sells about 45 50-kg bags per year, to several poultry producers in the Western Urban/Freetown, Tonkolili, Bo and Koinadugu districts with about 70 percent of sales occurring outside Tonkolili. He pays Le. 80,000 to 120,000/bag, in December and March respectively, and sells each bag for Le. 130,000 to 170,000, depending on the season and location. Dama uses public transportation to buy and sell maize; paying Le. 55,000 to get to Koinadugu, 15,000 to get to Makeni in Bombali, and 20,000 to get to Port Loko. If he needs to store product he pays 4,000 Le per bag per month. These costs whittle down his profits. He would prefer to source more maize from Bombali to improve his profits.

Producers

Ibrahim, aged 55, grows maize and millet on his three-acre farm. He rents the land, though several neighbors own land they inherited from their families, and some jointly rent 1.5 to three-acre plots together. Mr. Roberts sows two crops of Western Yellow corn (in May and December), and one planting of millet (May planting) per year. He grows his corn separately, and mixes the millet with rice and sorghum. Due to insufficient pre-season finance, he can afford only one bag of fertilizer per acre, and realizes yields that are well below yield potential. On top of this, he faces damage from insects, which he tries to control with **weeding**, because insecticide is costly, and loses about 10 percent of his crop due to these pests. He harvests maize in August and December, and estimates that he gets 9.5 to ten bags of fresh cobs per acre, with a bag weighing 40-45 kg. His millet is ready for harvest in January, providing a critical food source to take him through the hungry months. He harvests about 20 50-kg bags annually. In the rainy season, he sells about 40 percent of his maize fresh (Le. 5,000/bag), two percent boiled (Le. 500 to 1,000/ear depending on size) and 12 percent as dried seed (Le. 500/cup), saving about 46 percent of the seed for the next planting. In the dry season, he sells about 50 percent fresh (Le. 55,000/bag), 10 percent boiled (Le. 500-100/ear) and 20 percent dry (Le. 500/cup), saving about 20 percent for replanting.

He beats his millet to thresh it, and sells about 25 percent (Le. 100,000/50-kg bag), and saves the rest for home consumption. Mr. Roberts sells his product primarily to the Makeni market, transporting some but selling most to a trader who comes to his farm. High transport costs and police check points make transport costly and difficult. He does not know the phone number of the trader, and thus waits for the trader to come and buy product. The trader and Ibrahim negotiate prices based on the trader's reported selling price. He is not satisfied with the price he receives, as it does not leave sufficient profit to invest in his farm. He feels that prices of Le. 70,000 per bag of fresh ears and Le. 1,000 per cup of grain would be more amenable. Ibrahim stores his grains in reused rice bags on his home. Rats and insects infiltrate the bags, eating up to 30 percent of his maize and 50 percent of his millet.

6. COMPETITIVE ANALYSIS OF SECTOR

a. Qualitative assessment of cooperative and competitive strategies

The team observed more apparent cooperation than competition among farmers, but the fieldwork primarily involved FBOs. Thus, it is difficult to comment on the level of competition across farmers as whole, including those that are not in FBOs. Wholesalers appeared to compete more, as they acted independently, though several wholesalers in the Yoni chiefdom of Tonkolili expressed interest in forming an association. Strong competition is apparent in retail, as prices vary little within or across markets. However, this appeared to be friendly competition, as no retailers mentioned any bad relations with other sellers. There was little cooperation apparent across value chain levels. Farmers were not able to provide buyer names or contacts, and said that buyers generally took the initiative to seek out product when needed. There is some apparent cooperation among retailers and wholesalers, as the latter provide product without upfront payment in some cases, and allow retailers to pay after they sell it, typically with some markup akin to interest. However, few retailers could state their buyers' names, contacts or operating locations.

b. Porter's Five Forces

Supplier Power: Producers have access to few input suppliers, transport options or financial providers, and supply is generally below demand, giving these entities market power. Smallholders are cash poor, giving them little leverage to negotiate. Wholesalers typically reported using public transit to buy and sell product, where they have no room to negotiate prices, and commented on the high costs it involved.

Buyer Power: Producers specifically remarked on their lack of access to buyers (often involving only one trader), and indicated that they felt they received bad prices from middlemen who were not fair. Wholesalers dealing in maize for poultry likewise stated that they had few buyers and felt they were not able to bargain for prices with sufficient profit margins. A few medium and large poultry producers could be said to have a higher degree of power. However, one of the largest such entities indicated that they buy mostly from wholesalers, buffering producers from a monopsonistic relationship. Wholesalers are more likely to face this, however. Retailers also indicated that they had access to few wholesalers.

Competitive Rivalry: As above, the team observed more cooperation among farmers, mixed competition among wholesalers, and high competition among retailers. Free market dynamics were apparent, without apparent monopolies or unfair advantages within or across levels.

Threat of Substitutes: Maize value chain actors face the threat of maize imports; and other domestic and imported grains that are consumed by individuals, or used for animal feed (e.g., rice, bulgur wheat). There is less apparent threat of substitution for fresh or boiled maize. Millet value chain actors likewise must contend for market share against other grains. Since individual actors work with multiple grains, they can address this risk by adjusting their production and purchases, though for smallholders it will require at least one production season to react. Domestic producers have an advantage in that there is higher potential for aflatoxin contamination in imports than domestic maize, as it is not stored over long periods as imports are.

Threat of New Entry: There is a strong threat of entry at the production level, for potential producers who have access to land. However, under existing low-input systems, the output from a given producer is low, limiting the absolute threat they represent. As with other commodities, the threat of entry at aggregation, wholesale and retail is lower than that for production, as it involves higher costs such as transport and storage, and more up front capital to purchase product.

C. HORTICULTURE

1. OVERVIEW

The horticulture assessment focused on chili pepper, eggplant/garden egg, leafy greens (cassava and potato leaf, krain krain) and okra. Horticulture has potential to drive inclusive growth food security and nutrition, and benefit a large number of rural women and youth. However, the sector is rather uncompetitive, with production carried out on plots averaging $\frac{1}{4}$ of an acre, and very limited use of improved seeds, fertilizer, and pesticides. Limited access to finance, high cost of labor, lack of storage facilities (cold room) and poor market linkages constrain outcomes across the value chain. Producers also faced additional hardships under Ebola, as travel restrictions and quarantines limited their ability to go to their farms, as many vegetable plots are in swampy areas located away from homesteads.



At present, trade databases report farm larger imports than exports (ComTrade 2015). In 2014, total reported vegetable imports amounted to \$8.65 million (48 percent higher than imports in 2010); while reported exports that year were values at \$217,733 (about 20 percent less than reported 2010 exports). This represents nearly a 40-fold difference. Among the target crops included in trade databases, in 2014, reported chili pepper imports were \$3,882 and imports were \$23,133 (mostly dried chilies)—a six-fold difference. Reported eggplant exports amounted to \$10,273 (with only \$53 in imports) that same year.

FAO (2011) recognizes the development of the agricultural sector, especially vegetable production as an important element to catalyze rural development and increase incomes. FAO emphasizes that the development of market gardening, and vegetable gardening in particular, has several advantages: it helps to assure food security, supply domestic markets, create jobs, and have a positive impact on youth and women's economic empowerment. Horticulture is a potential engine of diverse employment from farm to market, such as field work, harvesting, sorting, grading, drying, cleaning, processing, transporting, storage and marketing (TAA 2013).

The role of vegetables in maintaining health is well accepted, and seen as particularly critical for poor populations. Vegetables are good sources phosphorus, iron, vitamins A and C, and, sometimes, protein and B vitamins (Nutrition Data 2015). Adequate nutrition requires consuming a range of essential vitamins, minerals, and oils, in addition to protein and carbohydrate. Insufficient consumption of key macro- and micro-nutrients can result in child mortality or stunting. Development programs should support production, market linkages and communications together, in order to increase output and sales, along with home consumption.

2. END MARKET ANALYSIS

a. Global and Regional Markets

As noted above, vegetable exports are minimal. End markets are also limited. Among the target crops, ComTrade (2015) reported chili pepper and eggplant exports to Austria only in 2014; and chili pepper exports to Canada, Bahrain and Germany in 2012. Among all exported vegetable crops, additional end markets reported from 2012 through 2014 are Albania, Australia, Belgium, France, the Gambia, Slovenia, Sudan, Switzerland, Tanzania, the U.K., and the U.S. This indicates that the country has the capacity to meet product standards for northern markets such as the EU for at least some vegetables; and thus has a foundation for export growth. Guinea is a potential end market, given its proximity border with Bombali, and the good road network from the districts. However, the assessment team did not identify any vegetable crops that were being exported from the Bombali district to Guinea. The high value of imports, and import growth, makes import substitution of interest. It is important to determine which crops can compete profitably. The target districts have a competitive advantage in producing chili pepper, which is already exported to international markets. Dried chilies are a good candidate for increased exports, given their high value and storage life.

b. National and Local Markets

The import growth noted above is a sign of increased domestic demand, signifying the potential for inclusive growth. Vegetables are easily found in markets of all sizes, with the primary vegetables being onion, leafy greens, okra, eggplant (particularly round yellow types), chili pepper, tubers and onions. Supermarkets tend to have a limited selection of vegetables, however, such as onions, cabbages and tomatoes. Hotels and hospitals are among the other major markets nationally. Pepper and okra are the major vegetable crops sold from the target districts, along with cassava and potato leaf; Crain, garden egg/eggplant, cucumber and lettuce. These crops are widely eaten in the districts as well. Leafy greens play a central role in daily diets, used as the base of sauces that are flavored with chili pepper, and served with rice and animal protein. An estimated 70 percent of pepper traded in the market is produced from Kamakwei sub-chiefdom, Sella Limba Chiefdom in Bombali district.



Freetown, and the surrounding Western districts, are the major domestic end markets; with Freetown central market, “Dove Ceote”, and Waterloo serving as central distribution centers and consumer retail sites. The Makeni daily market in Bombali serves as a collection center for vegetables that district, and the Koinadugu and Kono districts, which are major vegetable production areas. In Tonkolili, major local markets include: Magburaka, Matotoka and Mile 91 (Yoni Chiefdom, Moyamba Junction daily market), with Magburaka being the largest in the district. The team estimated that the Makeni town market consumes about 60 percent of chili pepper; with 30 percent sold in Freetown and 10 percent sold to Tonkolili.

Table 7 specifies prices reported in field work, and corresponding gross margins. Prices are stated in Leones/kg. The ranges reflect rainy and dry season pricing, and the fact that farmers may sell direct to

retailers, or to aggregators. Farmgate prices showed a wide range, particularly in Tonkolili. Retail margins vary notably within and across crops.

c. Room for growth

The consumption of vegetables is related to socio-economic factors (Shackleton, 2009), such as income, and location. Moustier and David (1996) found about two-thirds of urban households consume vegetables 4 times per week on the average, and consumed the largest quantities of vegetables. Given that Sierra Leone is experiencing economic growth (before EVD), and urbanization, there appears to be room for growth in the vegetable market. Nutrition promotion campaigns in rural areas stand to grow demand as well.

Table 7: Horticulture Commodity Prices (Le/kg) and Gross Margins, July-August 2015

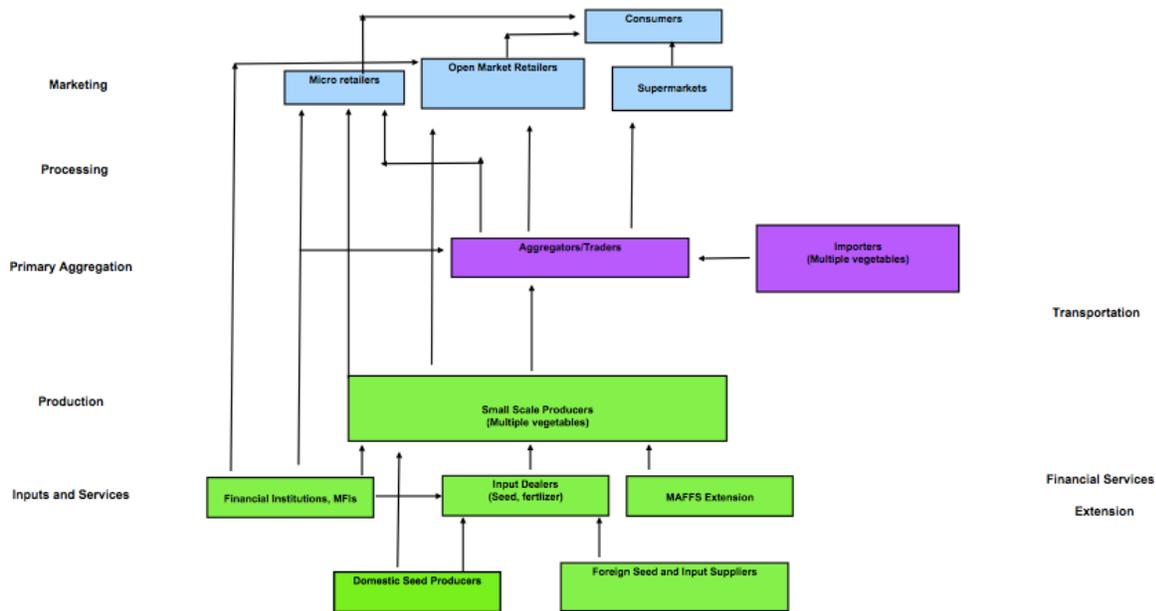
Product	Location	Farmgate	Aggregator/Wholesale	Retail
Chili pepper, fresh	Bombali farm	2,400-8,000		
Chili pepper, fresh	Tonkolili farms	2,000-10,000		
Chili pepper, fresh	Bombali aggregation	3000-7,200	3,600-8,000 (10-17% margin)	
Chili pepper, fresh	Bombali retail		3,000-8000	3,400-11,000 (11-27% margin)
Chili pepper, fresh	Tonkolili retail		4,000-8,000	4,800-8,800 (9-17% margin)
Chili pepper, dried	Tonkolili farm	11,677-22,500		
Okra	Bombali farm	2,500-5,000		
Okra	Tonkolili farms	1,250-5,000		
Okra	Bombali retail		2,500-6,000	4,250-6,750 (11-41% margin)
Okra	Tonkolili retail		2,500-6,000	3,400-6,750 (4-11% margin)
Eggplant	Tonkolili retail		667-1,667	1,000-2,000 (17-33% margin)

3. VALUE CHAIN MAP AND FUNCTIONS

a. Marketing

Vegetable marketing involves retailers and traders, who operate through weekly markets (lumas), daily markets, petty trade and supermarkets. Retailers generally sell an array items individually or in small sets, not by weight. Traders market product to distant markets, such as Freetown, generally using non-refrigerated transport. The horticultural research lead estimated that 1 bag of fresh pepper weighed approximately 25 kg. There was no weighing scale to obtain the exact weight. Retailers sell chilies in small cups of about 25g, priced around Le. 1,000 during the dry season and 2,000 in the rainy season. The team estimated that retailers make 15 percent profit on each 25 kg bag.

Figure 9: Horticulture Value Chain for Target Crops, Sierra Leone



b. Processing

Fieldwork revealed that processing is very limited, with exception of drying chill pepper. The transformation of vegetables is generally very underdeveloped in most African countries. Lack of processing facilities and refrigerated storage are key explanatory factors. Thus, most vegetables are harvested and eaten while fresh, and producers are not able to benefit from value addition.

c. Primary Aggregation

Weekly markets, or lumas, are the major aggregation centers. Farmers beyond bring their vegetables to these markets and sell them to aggregators, who sell them to other districts. Many weekly markets were closed as a result of EVD, and reopened only at the close of fieldwork. One aggregator explained that this meant aggregators needed to travel to farms, reducing sales measurably. Transport challenges and costs left many farmers unable to sell their harvest; and reduced traders' profits. The average distance from the farm to market is 8.2 km in the Tonkolili district and 8.8 km in Bombali (MAFFS, SSL, J-PAL/IPA 2011), with farms dispersed. Processors sell a 25kg bag of chilies for an average of Le. 180,000, with price ranging from 150,000 to 200,000 across the rainy and dry seasons.



d. Production

Vegetables are mostly produced in swampy areas. According to Konneh (2011), there are 573 swampy areas in the Bombali Seborah Chiefdom alone, 327 of which are found in Makeni Urban and 264 of which are in peri-urban- Makeni. Vegetable cultivation has two seasons, the dry season, from October through April, and the rainy season from May through to September. Vegetables are intercropped with other crops such as cassava, maize and groundnuts. Production is low input and labor intensive, utilizing hand tools for most tasks. Due to lack of inputs such as improved seeds, fertilizers, pesticides and technical knowledge in farming and agronomic best practices, yields are low. Interviewees stated that women accounting for about 85 percent of total labor. Men generally handle more labor-intensive tasks such as clearing bush, plowing, and harrowing. Women tend to handle nursery establishment (where applicable), planting, ongoing management, and the majority of post-harvest activities.



Climatic conditions, limited access to technical and support services, lack of access to inputs and finance, and weak market linkages are among the key challenges that vegetable producers face in Bombali and Tonkolili. Farmers sell fresh chili pepper for an average of Le. 100,000/25 kg bag. During the harvest season, the price can go as low as Le. 50,000/bag, and rise to 180,000 in the dry season.

4. VALUE CHAIN ACTORS – CASE STUDIES

Retailers

Alice, 34, is a retailer in an open market, and has been in business for eight years. She sells tomato, cucumber, okra, eggplant sweet potato, onions and chili pepper; along with pre-packaged spices. Adjacent retailers sell these item, and leafy greens such as cassava and potato leaf and krain krain. There is a friendly tone among the retailers, though they compete for customers. She is savvy marketer who is quick to notice and call attention to the quality of her items when customers look at her stand, or walk by unhurriedly. Alice buys vegetables from farmers at daily aggregation markets. The prices she pays vary depending on the season. Vegetables are most expensive during dry season, and less expensive during rainy season. She displays and sells most of her products in neatly arranged piles, but offers larger items like tubers individually, and sells small items such as chilies by the scoop. Alice tries to buy the amount of vegetables she will sell in a given day, since she does not have a lot of cash on hand, and the paid storage at the market is not refrigerated. She does not have access to credit.

Aggregators

Mr. Mansaray, 45, is an aggregator in Makeni. He purchases an array of vegetables from the target districts, as well as Koinadugu and Kono; and onions from Holland; and sells these to retailers at local markets. All the produce he buys is fresh, except for dried chilies he buys occasionally. At times, he buys at the farm gate, but high transport costs leave little profit remaining.

Producers

Amina, 29, produces okra, cassava leaf, krain krain, eggplant and chili pepper on a one-acre plot in the swamp area. Her husband's family owns the land, and her husband allows her to use it for farming. She purchases local seed to plant seedlings, and transplants these by hand into the ground. Fertilizer is expensive, and insecticide is not available, leaving her with low yields and high pest damage. Her work is time- and labor-intensive, as she does everything by hand. Her husband handles tasks like plowing, and her children help out when they are not in school. Labor costs are very high, so the family cannot afford to hire much help. When her crop is ready for harvest, she picks it and takes it to the local market. She prefers to sell to retailers rather than aggregators, since she earns more money selling to retailers.

6. COMPETITIVE ANALYSIS OF SECTOR

a. Qualitative assessment of cooperative and competitive strategies

As with grains, there appears to be little cooperation within actors at a given level. Farmers may be in FBOs but these largely function to support training and information sharing, not collective marketing and purchasing that could improve efficiency and profits. Aggregators, wholesalers, processors and retailers likewise operated independently for the most part. Across value chain levels, the team did not see evidence of strong cooperation, such as long-term agreements between buyers and sellers.

b. Porter's Five Forces

Overall, vegetables are similar to grains for most parameters.

Supplier Power: Farmers have access to a small number of input and service providers, giving suppliers bargaining power. Aggregators and traders have more market power than farmers and retailers, as there latter two are greater in number and smaller in size. Local traders and wholesalers have less relative power than larger regional counterparts.

Buyer Power: Farmers have access to several retailers and traders so buyers do not have monopsonistic power. However, farmers are small in size, many in number and not organized, giving buyers more relative power.

Competitive Rivalry: Overall, free market competition is present at each value chain level. There is no evidence of cooperation or collusion among farmers, aggregators or traders.

Threat of Substitutes: All VC actors face the threat of imports, and are challenged to address these. This is particularly the case for farmers, who face the threat of losing market share to vegetables from other districts as well as imports. However, producers from the target districts have a slight advantage in accessing Freetown and northern markets, including cross-border trade with Guinea, relative to eastern vegetable producers, given that their closer proximity

Threat of New Entry: The threat of new entrants is highest at the production level and declines across the value chain. However, an individual producer represents a relatively small threat, given the small size of farming plots, and lack of modern farming practices, resulting in low yields and output.

7. KEY ISSUES IN THE VEGETABLE VALUE CHAIN

a. Markets: The vegetable market in Sierra Leone is still small and under-developed, and major participants in the vegetable value chain market are mostly poor people. Therefore there is potential to develop the vegetable market particularly in the 5 vegetable crops that have been assessed (tomatoes, Onions, Cabbages, Okra and pepper). These products have potential to enhance the household income and improve the dietary needs of children and pregnant mothers.

b. Nutrition: No respondents mentioned vegetables as a source of nutrients for children and pregnant mothers. This indicates a big knowledge gap regarding the importance of vegetables to most households. Behavioral change communication can help address this.

c. Major constraints facing farmers

- Limited access to inputs: Limited availability and inaccessibility to improved seeds, fertilizers, and pesticides has been mentioned as a major constraint across the two districts.
- High Cost of labor: Although labor is available but the cost of Le. 15,000 to hire one worker is far beyond what a poor vegetable farmers can manage.
- Lack of access to finance: Vegetable farmers reported inability to access finance as a key constraints for expanding vegetable cultivation.
- High transport costs: Most weekly markets are located far distances from the farmers; and with the suspension of weekly markets because of Ebola outbreak, farmers have to travel very long distances to Makeni or Tonkolili main markets to sell their products
- Lack of storage facilities: Vegetable farmers and traders are lacking storage facilities for vegetable storages; the consequence of this is selling their products at low prices to avoid total loss
- Low competitiveness of the vegetable production system: this subsector is dominated by poor small peasant farmers

D. GROUNDNUT AND PIGEON PEA

1. OVERVIEW

Legumes (e.g., cowpea, pigeon pea, groundnut, soybean, broad beans) are generally regarded as “minor crops” by MAFFS (2015), though they play an important role in livelihoods and diets. The analysis focused on groundnut and pigeon pea.

Groundnut is consumed daily in the form of raw and roasted peanuts, and paste. Groundnut production does not meet national consumption demand. Imports of peanuts and derivatives were valued at \$236,562 in 2014 (ComTrade). Reported import trends in the past five years appear to be erratic, valued at \$61,458 in 2010, \$1.14 million in 2011, \$270,037 in 2012 and \$447,916 in 2013.¹⁵ Regardless, import values indicate there is an opportunity for import substitution. Imports consist primarily of shelled and unshelled nuts, with some derivatives (oil and fractions). This indicates that a good deal of import substitution can be done without increased/upgraded processing capacity, though the latter would help capture added value. Domestic production increased 82 percent from 2005-13, with annual increases ranging from two to 18 percent, indicating that producers face growing market demand.

Pigeon pea is mostly cultivated in the Northern Province, where it is consumed more than in other parts of the country. Unlike groundnut, demand for pigeon pea is met by in-country production levels. Trade databases do not show any imports over the past five years (e.g., ComTrade 2015).

A vital step toward increasing the use of legumes for human consumption, animal feed, and industrial processing is to implement measures that increase on-farm productivity and market competitiveness. This must be done in ways that create wealth, and reduce food security and poverty risk for smallholder producers and processors, and foster self-sustaining functions and relationships across the value chain.

Legume production fits in well with traditional cropping systems. The crops are nutritious (e.g., groundnut seeds contain about 23 percent protein and 40-45 percent edible oils by weight; Nutrition Data 2015),



KEY FIGURES: GROUNDNUT

- \$236,562 in imports, 2014
- Raw commodity is the primary import
- Erratic growth in imports, from 2010-14
- Domestic production grew 82 percent from 2005-13
- Domestic prices are competitive with imports for grain

¹⁵ It is not clear if these figures are valid, or reflect incomplete data.

generate income, and help maintain soil fertility by fixing nitrogen. Groundnut and rice farmers in the Northern provincial districts practice mix cropping with pigeon pea.

Globally, in 2009, groundnut production covered about 24 million ha with an average yield of 1.5 tons (t)/ha yield (ICRISAT undated). Developing countries in Asia account for 50 percent of global area and 64 percent of global production, while Africa accounts for 46 percent of the global area and 28 percent of global production. This indicates much lower yields in Africa than Asia. Sierra Leone ranks 33 in volume of groundnut production.

The legume value chain is characterized largely by a linear flow of the seeds through successive sets of hands representing “value adding” stages of the chain: from farmers through trader-hired aggregators to wholesalers and retailers who provide the bulk of what is consumed. Two industrial processors, Project Peanut Butter which uses groundnut, and Bennimix in Bo (Bo district,) uses needs pigeon pea, are the main actors who purchase the legumes for raw materials in food processing. Youth, particularly young men, operate groundnut paste “cottage processing” at daily and period markets.

2. END MARKET ANALYSIS

a. Global and Regional Markets

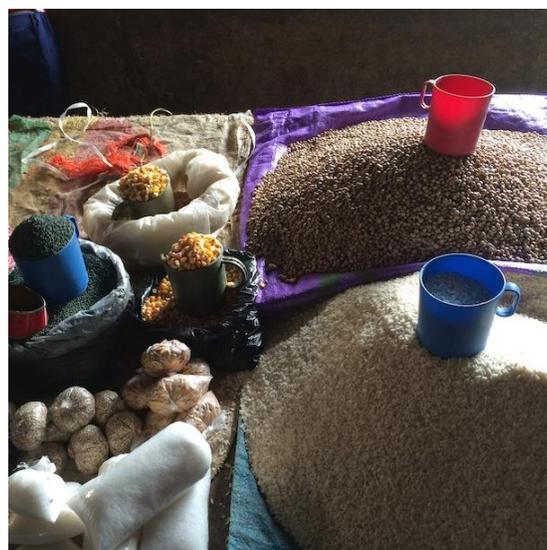
Trade databases report limited exports of groundnuts and derivatives, but none for pigeon pea. ComTrade (2015) appears to have the most comprehensive and recent data, showing groundnut exports to Estonia, the Gambia, and the United Kingdom from 2010 to 2014. Such exports amounted to \$16,789 in 2014. FAOStat (2015) reports sporadic and relatively small groundnut exports since 1961, with volumes over the last decade reported at two tons in 2008, 20 tons in 2009 and 62 tons in 2012. Thus, it appears that the bulk of groundnut production is consumed in country. A Washington, DC-based team member found Sierra Leonean groundnut butter and snacks for sale in small West African markets. This indicates that trade databases are not capturing all exports.

b. National and Local Markets

On the national market, groundnut tops pigeon pea as the most important legume, followed by white seeded black eye cowpea. Almost all groundnut sold is consumed to meet culinary needs.

The legume end markets are wholesalers and retailers (shelled and unshelled groundnut, and pigeon pea); industrial processors, local cottage industry processors (groundnut seeds); NGOs (groundnut), and In-Patient Facility/Therapeutic Feeding Centres (IPF/TFC) for Ready to Use Therapeutic Foods (RUTF; pigeon pea, groundnut).

Project Peanut Butter, a manufacturer of RUTF, purchases of four tons of groundnut every two weeks from two suppliers, to add to imported groundnut paste, soybean oil, emulsifier, milk and vitamin premix. It processes these into its product, “Dutasi” (a Limba language meaning “bring back to life”). It sells sachets



to aid agencies such as UNICEF, Medicin Sans Frontiers and Action Contre le Faim for distribution to national hospitals and clinics that treat severely malnourished children (IPFs/TFCs).¹⁶

The Bennimix Food Company buys pigeon pea to produce baby food. Its factory has the capacity to absorb 100,000 tons pigeon pea a year but currently uses only 20 percent of that capacity. While Bennimix baby food is a household brand name, the product was not found at any of the markets and shops visited in Bombali and Tonkolili. Only the focus group in Tonkolili, Yoni chiefdom, Mile 91 indicated that Bennimix is in their market. A robust marketing plan and its implementation can greatly help to increase Bennimix consumption, and pigeon pea sales.

On the daily and periodic markets, wholesalers (individuals or acting as groups) are the main suppliers of groundnut and pigeon pea. At peak business period when the farm gate price is cheaper (July/August for groundnut and February/March for pigeon pea) single wholesalers buy between 1.5 to 2.5 tons of groundnut or pigeon pea per week.

Table 8 indicates prices reported in field work, and corresponding gross margins. Prices are stated in Leones/kg. These data are from a small number of traders and wholesalers, and are thus merely illustrative. Prices differ markedly across the rainy and dry seasons. Sellers who are able to store product longer term can take advantage of these differences to maximize margins. Farm gate prices showed a wide range. For example, farmers reported unshelled groundnut prices of Le. 933 to Le. 3,333/kg in the dry season and Le. 667 to 2,333/kg in the rainy season. Pigeon Pea prices differ by variety, with the Kabala variety fetching the highest prices. Wholesalers reported paying about 25 percent more for the Kabala variety than the Kamakwe and Kono varieties.

c. Room for Growth

There is clear excess demand for groundnut, as production does not meet consumption demands. Traders import groundnut into Sierra Leone from Guinea and Senegal. For example, a wholesaler reported that she buys 3 tons of imported groundnut every two weeks to cover 25 percent of her market demand. Though current domestic production meets demand, producers can tap more market share through varietal selection. Kabala pigeon pea has an edge over other types of pigeon pea because of its higher yielding capacity, seed size and ease of cooking (requires less time for same amount of energy).

There is opportunity to grow producer incomes by improving the price-setting relationship between farmers and wholesalers. This could be realized if Bombali and Tonkolili farmers did business as a group unlike current individual arrangements. There is a model for this in Kabala (Koinadugu) women's vegetable farmers cooperatives, whose group farming and marketing model has increased their bargaining power and capacity to leverage technical and material resources in ways that have liberated them from bad wholesale deals.

d. Change Drivers

The sector has a few change drivers in the form of the domestic processors, Bennimix and Project Peanut Butter, as well as the MAFFS Crops Division. These entities have established product standards, which can

¹⁶ At the Makeni Regional hospital, for example, treatment starts with fortified milk formula "Nutraset F-75" for three days followed by F-100 for 3 days, both of which are designed for the initial phase of treatment of severe acute malnutrition. This is then followed with Plumpy-Nut for children over six months old with 15 sachets per week for three months, followed by out-patient or home care with complementary foods such as Bennimix (made with pigeon pea), Cerelac, Nutrilac, etc.

help improve overall quality. Additional change drivers are needed to facilitate on-farm value addition (paste production, better drying), and storage; which would help producers garner more income. ABCs are potential change drivers, as legume drying, storage and primary processing can be incorporated into their systems.

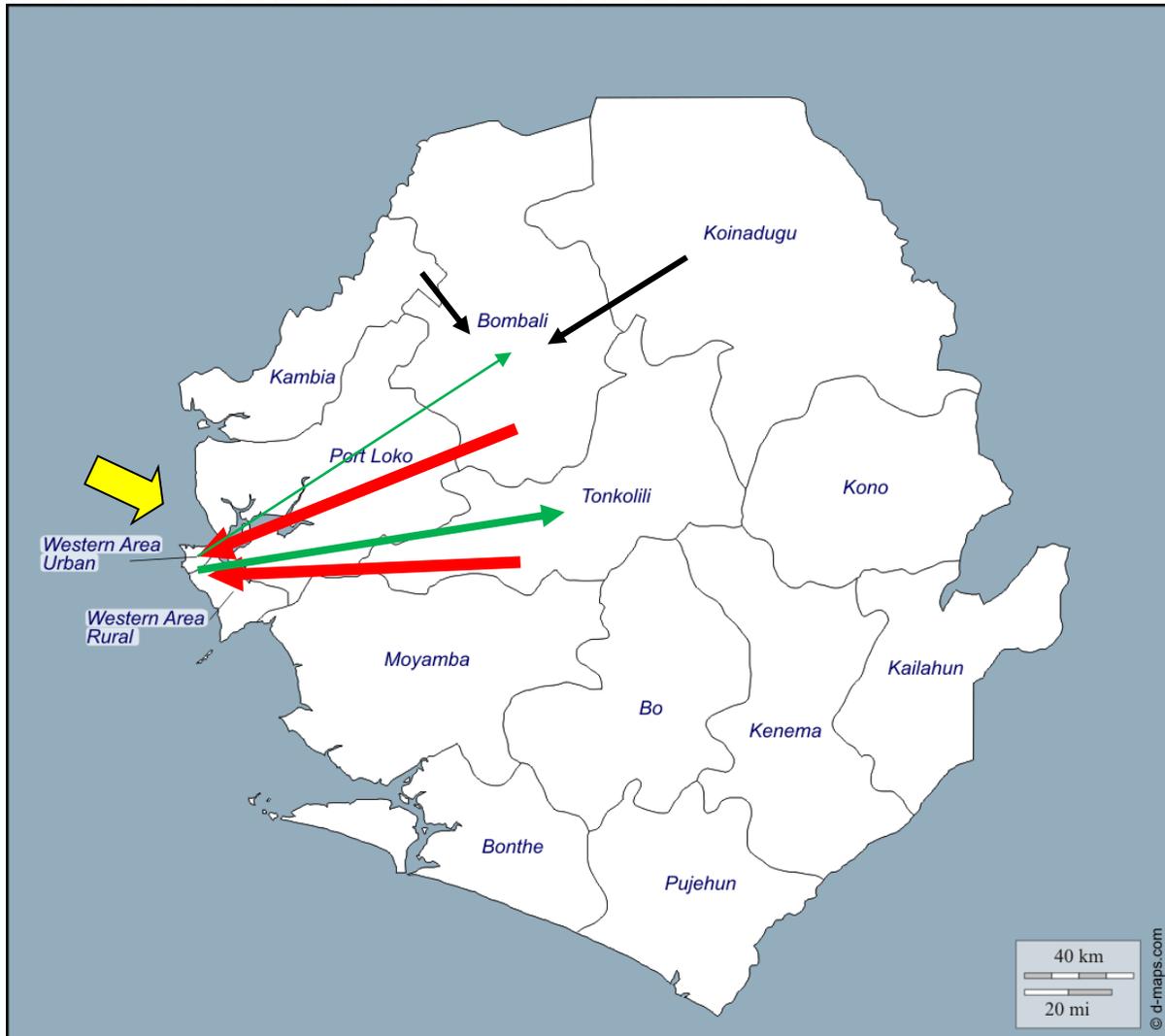
Table 8: Legume Prices in Leones/kg, and Gross Margins, July-August 2015

Product	Sale (Source) Location	Farmgate	Importer/Aggregator	Wholesale	Retail
Groundnut, shelled, dry season	Freetown (Balmoi)	Not available	7,000	9,000 (22% margin)	N/A sold
Groundnut, shelled, rainy season	Freetown (Balmoi)	Not available	6,000	9,000 (33% margin)	for processing
Groundnut, unshelled, dry season	Bombali (Bombali)	933	N/A	1,933 (52% margin)	2,400 (shelled) (19% margin)
Groundnut, shelled, dry season	Bombali (Bombali)	667	N/A	1,133 (41% margin)	2,400 (shelled) (53% margin)
Groundnut Paste (kg seed basis), rainy season	Tonkolili (Balmoi)		N/A	6,000	11,200 (46% margin) (Same retailer sells nuts at 5% margin)
Pigeon Pea, Unknown Variety,	Tonkolili (Balmoi)	Not available	N/A	417	1,000 (58% margin)
Pigeon Pea, Kabala Variety, dry season	Makeni (Bombali, Koinadugu, Kono; Tonkolili)	667	N/A	2,667 (75% margin)	Not available
Pigeon Pea, Kabala Variety, rainy season	Makeni (Bombali, Koinadugu, Kono; Tonkolili)	1,111	N/A	4,000 (72% margin)	Not available

Source: Fieldwork interviews

The growth of legume end markets in Sierra Leone can be enhanced further by growth in the processing industry to produce value added products for import substitution. Such industries will provide read, guaranteed markets to farmers. For examples, the national local content policy implementation activities can facilitate existing SME food factories to produce homegrown cooking oil for import substitution. Cottage industry groundnut paste can be developed in producer communities to enable farmers (ideally in groups) to start trading in value-added products. Cottage industry production of fresh groundnut paste at markets can be upgraded in ways that would enable youth operators to supply quality groundnut paste to shops and supermarkets. As noted, marketing can also drive growth, specifically for companies such as Bennimix and their suppliers, by helping Bennimix capture market share from imported baby foods (Cerelac and Nutrilac).

Groundnut trade routes into and from Bombali and Tonkolili districts

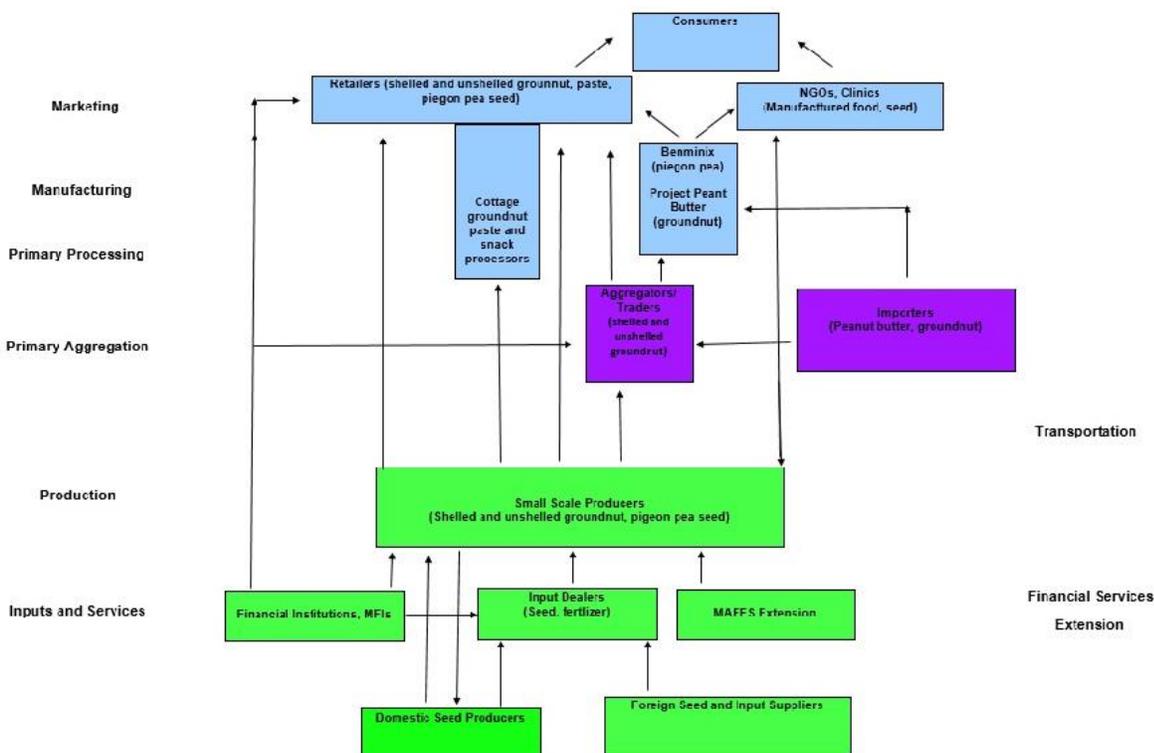


- Import of seed grains from other districts to target districts
- Import of seed grains from Senegal into Sierra Leone
- Export of seed grains to other districts (Western Urban district for industrial processing into RUTF peanut butter and for open markets in all other districts)
- Import of RUTF peanut butter to GoSL clinics to target districts (and also to all other districts) by UNICEF, MSF and ACM baby food into district

NOTE: Thickness of arrow represents relative trade volume

3. LEGUME VALUE CHAIN MAP AND FUNCTIONS

Figure 10: Groundnut and Pigeon Pea Value Chain, Sierra Leone



a. Marketing

Retailers usually buy imported dry seeds from the Balmoi market (Kambia district) at Le. 350,000 to 450,000 per 50kg bag depending on season and sell in 0.25-kg to 0.5-kg amounts in the open market at a rate that earns them Le. 504,000 to 540,000 a bag. The groundnut retailers and young men who run cottage processing sheds at the daily market outlets add nutritional and economic value to the commodity by processing the seeds into groundnut paste. The paste earns them between Le. 560,000 to 840,000 per 50kg bag of seeds processed, with the higher end gain made by those who subdivide the paste into tiny units/sachets to “meet the daily needs of poor households who can’t buy large quantities at a time.”

Wholesalers buy groundnut from different supply sources and load them in used PVC bags at the market to transport via public vehicle (only one wholesaler reported owning a vehicle to transport small quantities of produce). After sorting they load the produce in new bags for sale to customers. They buy freshly harvested husk groundnut in July/August (harvest time and hunger period when the farmgate price is cheaper) at about Le. 120,000 to 150,000 per 75kg bag. In the dry season leading to first crop planting season, the same quantity of pods, when dried, goes for Le. 200,000 to 250,000. Wholesalers also buy freshly harvested pigeon pea seeds in February (farm gate price is cheaper) at about Le. 48,000 to 50,000 per 75kg bag and sell at Le. 300,000 per bag. In the rainy season months (June to September) and the months leading to next harvest season, the farm gate price is about Le. 80,000 per bag.

Balmoi market (Kambia District) supplies about 75 percent of all the groundnut seeds traded. That source is very reliable in terms of timeliness of delivery and fairly reliable in terms of quality of seeds which are largely imported via Guinea. Traders know phenotypical characteristics of these different groundnut varieties sold at the market. They are aware of the key quality features (oiliness, seed size, moldy, seed color, blemishes, number of seeds in a pod) in selecting what to buy in line with her end market customers' need.

Generally wholesalers use local Government council stores for which they pay monthly rent of Le. 3,000 to 5,000, depending on locality. Additionally they pay daily market dues of Le. 50. Wholesalers have very good business relationship with their supply and end market sources for groundnut and pigeon pea. Occasionally they provide small gifts to suppliers in efforts to strengthen business bonds. In terms of horizontal linkages for inter-firm cooperation, groundnut sole suppliers to PPB do not compete for supplies. PPB alternates their supply times. Both traders collaborate to agree on competitive price. In line with recent cost price increase to Le. 9,000 per Kg. the suppliers are negotiating a sales price of Le. 110,000 per Kg. However they do not belong to any trade association and have not heard of one that can benefit her business. In terms of vertical linkages, PPB is the only actor that provides them with information on the quality of groundnut to supply.

All traders interviewed have never gone into any written agreement with any supplier because prices agreed upon at time of agreement can change soon after signatures. Therefore they do not quite welcome the suggestion of having written contracts with their suppliers. The verbal contracts they have with suppliers are of very short duration and sometimes driven by advance payment to guarantee agreed prices stay at the point of the agreement. On rare occasions traders have dropped their suppliers due to bad quality of produce, untimely delivery and dishonesty. Lack of supply contracts from consumer sources in addition and lack of a good starter cash loan seems to be the major constraints needing urgent attention. Micro Credit facilities are available from a number of sources in the Bombali and Tonkolili districts.

b. Processing

Processing is limited to cottage processing of groundnut, and two larger-scale manufacturer. Youth are highly represented in cottage processing of groundnut paste, operating at markets and often, using hand mills. These processors work in in shabby environments and need targeted assistance to a) improve quality of groundnut paste sold to household customers, and b) promote youth employment in localities in ways that reduce rural-urban migration. A project could engage FINNIC (at Kissy Dockyard), a local equipment fabricator that has the knowledge, machinery and skills to serve as a reliable source of SME and cottage industry machinery for processing groundnut into paste and cooking oil.

Project Peanut Butter (PPB) manufactures Plumpy'Nut, under its brand "Dutasi," using domestic groundnut, imported groundnut paste, and other imported ingredients. PPB uses state of the art machinery processes and quality checks in the production of its products. The project is equipped with machinery, knowledge and skills to quantify Aflatoxin load in raw groundnut seeds they buy and in the finished product they sell, and ensure they reject any batch with > 20ppp Aflatoxin (a health hazard especially for malnourished children, their primary consumers). Bennimix does its quality test at Sierra Leone Standards Bureau, which only recently acquired an HPLC facility that will be used to quantify Aflatoxin and other contaminants in food.

c. Aggregation

Aggregators are mostly paid scouts acting on behalf of traders who later go to villages to collect crops.

d. Production

The groundnut harvest from first planting was reportedly mainly for home consumption versus sale. The harvest from the second planting is mainly for sale and seed. The foliage from groundnut harvest is not purposefully integrated in livestock feeding or used as mulch for soil fertility enhancement. According to Mabolie farmers (Bombali district, Kamabai Chiefdom) “the goats have plenty of grass to in our locality, and besides they are pests because they also eat fresh groundnut leaves on the farm. After harvest the groundnut leaves are not old and dying and not in a good condition t feed to livestock”. Such pest problems are greater with pigeon pea where cows are raised.



Two local groundnut varieties Mares and Banginda appeared to be the only ones grown by the farmers. The other local varieties on the market e.g., Kundara, and Fleur 11, grown by a few farmers in Bombali and Tonkolili, are imports from Guinea. SAMNUT varieties, which were introduced recently and can yield 2 to 2.5t/ha, are still under community-based seed multiplication. There are three types of Pigeon pea in the country, popularly known as Kabala PP, Kamakwei PP and Kono PP based on their areas of major production, phenotypical features and cooking qualities. SLARI has made an initial collection in an on-going research to characterize the crop. All farmers practiced mixed cropping by broadcasting PP on land tilled for groundnut and follow that by sowing GN in shallow holes dug out manually.

Groundnut production is undermined by farm size and yield estimates. On-farm yield of SLINUT 1 is about 1.2 ton/ha but very low groundnut yields of approximately 200kg/ha to 400kg/ha were reported by the farmers. At only one site was the reported groundnut yield a little higher at 761kg/ha, which is about half of the 2011 national average as recorded by MAFFS. Pigeon pea yield reported were generally in the ratio of 1 bag planted to 5 bags harvested. The main constraints to higher groundnut yields are: a) Babangida variety planted on-farm is mostly mixture with local varieties and not a pure stand of SLINUT 1; b) the local varieties are inherently disease susceptible (especially Cercospora leaf spot and Groundnut Rosette). The Rosette disease attacks in the early months, causing stunting and the affected plants will produce no pods leading to total crop failure; c) the soils are low in nutrients, especially calcium and phosphorous which are crucial to Groundnut production. The farmers do not use fertilizers on either groundnut or pigeon pea and they lack knowledge and access to type of phosphorus based fertilizers (e.g. Single Super Phosphate/SSP or di-ammonium sulphate) to improve the crop yield

Farmers get no loans from external sources, except from each other and family members. They have only verbal agreement for repayment. Major constraints are ready cash to buy groundnut seeds under seeds scarcity, poor groundnut yield due to poor pod counts and seed filling, no improved facility to process seeds into paste, lack of cowpea seeds and poor groundnut yields.

Higher yields/productivity need to be pursued through use of improved and disease resistant varieties, on-farm training in improved planting techniques, appropriate use of agrochemicals, etc. Post-harvest storage systems are needed at the farm/village level to allow farmers to properly store their harvest in ways that will help them gain access to good market price during off season periods. This will require training in good store hygiene and management, such as pest management. (A wholesaler to Bennimix uses cement powder to control bruchid weevils in stored pigeon pea; the information has been passed on to Koinadugu Women Vegetable Farmers' Cooperative, which reported the pest in stored pigeon pea destined for Bennimix).

4. VALUE CHAIN ACTORS – CASE STUDIES

Retailers: Retailers are nearly always women, mostly youths to middle aged with or without formal education and sell at daily and periodic markets. A few of them own manual groundnut processing run by themselves or by hired boys. Retailers have strong business relationship with their contact wholesalers and they themselves also travel to farmers to buy the produce of their choice. They may or not have hired scouts to aggregate the produce on their behalf.

Importers, Exporters, Wholesalers: Wholesalers are a mixed group of those with formal education and those without, almost in equal proportions. Aminata, a Freetown -based wholesaler has no formal school training but her dedication to her business is quite representative of many wholesalers. She proudly says “from childhood I was trained on the job by my mother to be a trader.” She buys imported cowpea and groundnut and her main supplier is still the only credit source. Her mother is still trading from a street market stall by the Krootown Rd market in Freetown). Aminata owns a 4x4 jeep, which she uses to transport relative small quantities of commodities she buys from a periodic/weekly market at Balmoi (near Sierra Leone Guinea border) in Kambia District. She also owns a small store at her home/business, near the Krootown road market. In response to market demand, the store holds groundnut, cowpea and rice for wholesale or retail. She has never traded with either Bombali or Tonkolili Districts because in her words “these are not known districts for large supply sources for groundnut and cowpea.”

Processors: Other than industrial processors, only cottage industries exists for groundnut processing. The actors are mainly unemployed youth who may or may not have school education. A few of them learned a trade such as driving but are yet to be employed in that domain. They usually own their manual graters and charge Le. 200 per 0.25 kg to 0.5 kg cup of roasted groundnut for processing into paste. A few of them buy groundnut for processing into paste which they sell on the market. They say “customers look for paste that is oily, fully brown, smooth in texture, and good customer-processor relationships.”

Producers/Producer Organizations: The foundation of the end markets is rooted in production of the crop. Groundnut and pigeon pea production is largely by subsistence farmers. No commercial farmer was encountered or mentioned by the farmers or MAFFS contacts during the field assessment. Amongst the 59 farmers contacted at seven focus group sites in both Bombali and Tonkolili 78 percent were women and only 33 percent of the farmers cultivated group farms either GN or PP. Each group was comprised of youth (18 to 25 yrs), young adults (25 to 40 yrs) and elders (above 40 yrs). There were at least three members of each focus group with a prior formal school education, and in one village (Maboli, Kamabai Chiefdom, Bombali district) had school going members. The farmers use traditional crude implements such as hoes and cutlass as their farming tools. Family or hired labor (at Le. 6,000 to 7,000/day) provides the work force.

6. COMPETITIVE ANALYSIS OF SECTOR

a. Qualitative assessment of cooperative and competitive strategies

As with grains and horticulture, there appears to be little cooperation within actors at a given level. Farmers may be in FBOs but other than ABCs they may belong to, they are not linked to other FBOs in their vicinity. Aggregators, wholesalers, processors and retailers likewise primarily independently. However, two suppliers for a larger buyer indicated that they coordinate pricing, and that the buyer alternates purchasing across them. There is evidence of cooperation across the wholesale and processing levels, with respect to traders selling to Bennimix and Project Peanut Butter, given the long-term relationships between buyers and sellers. However, the majority of traders do not have formal agreements with buyers or sellers, indicating lack of cooperation.

b. Porter's Five Forces

Overall, legumes are similar to grains and horticulture in along most parameters.

Supplier Power: Farmers have access to a small number of input and service providers, giving suppliers bargaining power. Wholesalers have more market power than retailers, but less market power than large buyers such as Bennimix and PPB.

Buyer Power: Farmers have access to several wholesalers so buyers do not have monopsonistic power. However, farmers are small in size, many in number and not organized, giving buyers much more relative power. Wholesalers have relative power of retailers, but face buyer power from large customers such as PPB and Bennimix.

Competitive Rivalry: Overall, free market competition is present at each VC level. There are very few product manufacturers, but they are small and face significant competition from imported products, so they do not control the market as buyers or sellers. There is not evidence of cooperation or collusion among farmers, cottage processors, or wholesale traders.

Threat of Substitutes: All VC actors face the threat of imports for groundnuts, and are challenged to address these. This is particularly the case for farmers and cottage processors. For example, PPB imports groundnut paste instead of purchasing it domestically.

Threat of New Entry- As with other crops, the threat of new entrants is highest at the production level and declines across the value chain. However, an individual producer represents a relatively small threat, given the small size of farming plots, and lack of modern farming practices, resulting in low yields and output.

VI: INPUTS AND SERVICES

A. OVERVIEW

Agricultural inputs consist of the resources used in farm production. They include seeds and planting material, fertilizer, equipment, agro-chemicals, irrigation water, animal feed and vaccines. Inputs are used mainly to improve soil fertility, control pests, and support animal health and raise crop productivity to enhance food security. The main inputs providers consist of wholesalers and agro-dealers/retailers.



In most West African countries, economic liberalization such as making it easier for the private sector to invest in certain agricultural activities, including agricultural inputs, has contributed to the emergence of a significant numbers of private agricultural input wholesalers and agro-dealers/retailers. In the case of Sierra Leone, the government began working on several policy reforms aimed at privatizing the various sectors including the agricultural inputs sub-sector since the end of the 10-year civil war in 2002. This has created an environment for the emergence of limited private agricultural input wholesalers and a greater number of agro-dealers/retailers (see Table 9). The major wholesalers include Seed-Tech International and Holland Farming. However, there is currently no clear policy with regards to who takes the lead role, the public versus the private sector, in the provision of agricultural inputs in the country. This is unlike other West African countries such as Mali and Ghana where the governments have completely withdrawn from the provision of inputs.

Neither is there a clear policy on who should sell agricultural inputs in the country and of what quality. Currently, the Ministry of Agriculture Forestry and Food Security (MAFFS) is playing a dual role. That is providing policy guidelines (public sector) on one hand, and on other hand competing with the private sector in the supply of inputs/services. For instance, in 2014, the company Seed-Tech International was reported to be the number one supplier of fertilizer in the country. But in 2015, the MAFFS ordered the largest quantity of fertilizer. Perhaps this may be due partly to the Ebola epidemic. However, that fertilizer does not seem to have arrived in the country, halfway through the 2015 cropping season. The team also learned in the field that the MAFFS is involved in the selection of agro-dealers. For example, in Tonkolili, the District Agricultural Officer said there was only input supplier, who had been selected and approved by MAFFS after an involved process. This limits competition, product type and quantity available, and buyer choice, putting farmers at a severe disadvantage.



B. SEEDS, FERTILIZER, AND AGRO-CHEMICAL INPUTS

Based on field discussions by the team, it is quite evident that fertilizer and seeds comprise the main inputs used by the majority of smallholder farmers in the Bombali and Tonkolili districts. This is also reflected by the preoccupation of the agricultural inputs wholesalers and agrodealers in Table 9.

Table 9: Inputs/Services Provided by Wholesalers and Agrodealers for Target Commodities

Business Name	Business Type	Inputs/Services Provided
Seed-Tech International	Wholesaler	700 tons fertilizer; 2 ton maize; 1 ton vegetable seeds
Holland Farming		Not available
Carda Agrodealership	Agrodealer	2 tons fertilizer; 24 liters herbicide; 35 days tractor plowing; 150 acres power tilling; 28 farmers maize processing
Stadar Agrodealer Agency	Agrodealer	25 days tractor rental
4L@Mile 91	Agrodealer	24 tons maize
Gbafo Community Dev. Association	Agrodealer	210 plowed under tractor plowing service

1. SEEDS: POLICY AND OTHER CRITICAL ISSUES

Sierra Leone is implementing a National Seed Policy through a National Seed Board, a Variety Release Committee, a Seed Industry Development Unit, and a Seed Quality Control Unit; uniting MAFFS, SARLI and other entities. This mechanism oversees and manages the development, testing and release of varieties. There does not seem to any central or lead organization (including the national Seed Multiplication Program, SMP) that can provide a representative number of the amount of seed supplied in a given year, based on field visits by the team as well as from secondary source information. An assessment in nine countries commissioned by the USAID/WA's West Africa Seed Alliance in 2011 concluded that none of the countries do meet 20% of the rice and maize seed requirements in the countries. Rice and maize are the two leading grain crops in West Africa.



The situation may be worse in Sierra Leone considering the low level of agricultural development. In 2014, Seed-Tech International, perhaps the most important input provider in Sierra Leone given its size and geographic coverage, supplied 2 tons of maize (mostly Western Yellow variety). Probably over 80 percent or more of seed of the target value chains may be from seed saved from the previous season or own seed. This is especially given the fact that what is mostly referred to in the country as “seed” is merely grain bought in the local market or during market days (“lumas”). As such, seeds of varying quality are being sold in the market to poor resource farmers. Seed buyers have no recourse in the event of pest-contaminated seed or low germination.

Except for vegetable seeds, most of the improved seeds in maize, groundnuts, and cowpeas field crops are supplied by the MAFFS's Seed Multiplication Program (SMP). In 2015, the MAFFS sourced rice, maize, and cowpea foundation and certified seeds from Nigeria, Togo, Mali, Burkina Faso, and Niger for this planting season under the post-Ebola funds support by the international community. The seed is still arriving. It takes about one month for a truck to arrive from Nigeria to the Makeni SMP warehouse (see photos).



Seed-Tech is contracted by MAFFS to off-load and distribute the certified rice and maize seed from Nigeria and Burkina Faso to farmers. SMP receives the foundation seed. Problems associated with such seed sourcing include late arrival of the seed, spoilage, loss of employment in the country, and loss in confidence by the emerging private sector input providers. These remarks were stated to the team during the field discussions.

In Sierra Leone, all of the seeds currently sold and planted for field crops (maize, ground nuts, cowpeas, sorghum/millet, and beans) are composites, not hybrids.¹⁷ The process of producing certified from such composite sources involves first producing “foundation” seed from “breeder” seed provided by scientists with the Sierra Leone Agricultural Research Institute (SLARI). This process can be done by SLARI, the SMP, or private seed agribusinesses. Foundation seed is then used to produce “certified” seed which is sold to the general public for planting. In countries in which the inputs sub-sector is private-sector led, all certified seed is produced by private seed dealers. Field inspection is a critical assurance for seed quality and verity. In Sierra Leone, qualified agents in MAFFS undertake field inspections, though the team learned that this role has recently been assigned to the newly created Sierra Leone Seed Certification Agency (SLeSCA). At present, field inspection is not done routinely, meaning the seed may not be of the expected quality such as purity. Thus, systems in place to ensure the sale of good quality seed are therefore currently compromised, and thus problematic for growers. The team was also informed that SLARI carries out regular seed inspections by randomly collecting seed samples destined for sale by formal seed dealers and taking the samples to their laboratories to check for such variables as foreign matter, percentage germination, etc.

The ability for farmers to access reliable sources of quality improved seeds is critical for Sierra Leone to be able to meet the objectives of the Comprehensive Africa Agriculture Development Program (CAADP), and is a key determinant of how well USAID through the Feed the Future (FTF) Initiative can meet its goals to improving food and nutrition security in the country. In 2006, USAID and private organizations formed an alliance (West Africa Seed Alliance – WASA) to identify constraints, share new ideas and work together at the regional and bilateral level to find solutions to the fundamental impediments to a sustainable commercial seed industry in West Africa. USAID/Sierra Leone can benefit immensely from the achievements made by WASA both policy and market-wise.

For instance in Ghana, ACDI/VOCA contracted the Prairie Volta rice company to produce certified rice seed for beneficiaries of the USAID project it is implementing in Ghana. This is partly because the company has good infrastructure including irrigation facilities as well as institutional capacity. This is something that

¹⁷ Hybrid seed, for crops such maize and soybeans in particular, are promoted and sold elsewhere, by international seed companies generally through their agents in various countries.

USAID/Sierra Leone may consider doing with the private emerging seed dealers and other major foreign agribusiness companies.

With regards to seed source and end markets, the majority of the seed/inputs providers have their own small seed multiplication farms. In addition they contract seed growers who then provide seed. At harvest time, the contractor gives back to the seed dealer the quantity of seed provided plus about 20-25 percent extra seed harvested plus the cost of inputs received. That seed is sold to various clients (FBOs, MAFFS projects, FAO, EU, ADDAX company, NGOs, etc.).

1. FERTILIZER: POLICY AND OTHER CRITICAL ISSUES

As in the case for seeds, the government does not seem to have a clear policy on who takes the lead role in the supply of fertilizer. The MAFFS continues to compete with private fertilizer wholesalers and agrodealers/retailers in the purchase and distribution of fertilizer. MAFFS sometimes puts out tenders for fertilizer purchase while in some cases it requests Seed-Tech International to supply a certain quantity and formation of fertilizer, mainly urea and NPK (15-15-15). MAFFS pays for the fertilizer at market price (between Le. 150,000 to 230,000 or higher per 50 kg bag depending on market forces). MAFFS turns around and sells the fertilizer to agrodealers at a subsidized price of about Le 130,000 per 50 kg bag. MAFFS' indicative retail price is about Le.160,000 per 50 kg bag. The retail price is, however, on in the order of Le. 200,000 or higher per bag depending on distance and other factors. In addition to orders targeted to smallholders who may need fertilizer, both Seed-Tech and Holland Farming companies also buy fertilizer for MAFFS's donor projects and private agribusiness companies. The main ones include WAAPP, IFAD, IITA, EU, FAO, and ADDAX (Table 9). At the same time private agribusiness companies such as ADDAX are also allowed to bring in fertilizer for their operations duty/tax free. MAFFS justifies this on the basis that these companies bring a lot of revenue and create employment. Holland Farming stated that he only gets duty waiver when he orders fertilizer for these projects/organizations.



The quality (purity) of imported fertilizer is another major problem as there is no effective testing organization. Fertilizer is sold in the local markets in cups and unlabeled plastic bags (see photo). A significant quantity of fertilizer comes from neighboring Guinea. It is not uncommon for fertilizer to be repacked and labelled just as is the case for imported rice. There is also the issue of NGOs providing free seeds and fertilizer to farmers in the projects which constrains the development of a sustainable private sector inputs sub-sector.



There is also the issue of fertilizer formulations/types, quantities applied to the crops by farmers, and the fertilizer recommendations in Africa but especially West African countries including Sierra Leone. Not only

are the amounts used the lowest in the world (average about 10 kg/ha¹⁸) and not necessarily based on soil tests, the existing recommendations are quite old and are 'blanket recommendations.' This amount is far less than the 86 kg/ha in Latin America, 100-135 kg/ha used in Asia, and the global average of 118 kg/ha. That is why ECOWAS recommended that member states commit achieving a minimum fertilizer rate of 50 kg/ha as part of their CAADP programming, to which the FTF is closely aligned.

All these factors are problematic and complications that are not favorable to the development and sustainability of a viable private sector-led inputs supply/distribution sub-sector in Sierra Leone. It leads to none-transparency, poor farmers not able to access fertilizer in a timely manner and at reasonable prices and good quality.

With regards to fertilizer use on the VC target crops, only maize and vegetables receive some fertilizer (perhaps in the order of five kg/ha). Animal manure (from chickens, goats, sheep and cows) is also applied to vegetable plots, and this gives them an added advantage over field crops such as maize. In Ghana, where maize (especially yellow maize) has become a commercial crop due to the poultry industry (eggs and meat), an assessment found that, even with all the good extension services provided, the average amount of fertilizer used by farmers is 68 kg/ha compared to the 130 kg/ha recommended. In Sierra Leone, the NPK elemental rates recommended by SLARI are 80, 40 and 40 kg/ha respectively. Maize is, however, only now becoming a commercial crop in Sierra Leone because of the recent development of the poultry industry, resulting in low fertilizer use. Many farmers still grow maize in their backyards houses, where there is some organic manure from household refuse. It is also grown randomly in pockets in upland rice fields with rice being the predominant crop. Otherwise, rice is the main staple crop in the country and receives most of the fertilizer under lowland production. This is more so now with the recent encouragement by MAFFS for farmers to develop the lowland areas and reduce the areas devoted to upland rice production where yields are about 500 kg/ha.¹⁹

The Ebola epidemic decreased input use, due to travel restrictions that prevented farmers from going to market. For farmers who are able and willing to travel and buy fertilizer, acquiring it can be difficult. The team found a severe shortage of fertilizer in the country. There was no fertilizer in Bombali and Tonkolili for farmers to buy during the field visits, except in small plastic bags costing Le. 1,000 and Le. 2,000.

Agro-chemicals: Policy and Other Critical Issues – Approximately 60-70 percent of the population in Sierra Leone is engaged in some form of agriculture for their livelihood. Yet the majority of the farmers are smallholders practicing mostly subsistence farming. In connection to target crop, the average area grown in maize may be barely up to 0.2 ha except in a few instances where farmers including agrodealers have started growing maize to supply the emerging poultry industries coming up in most urban towns for eggs and meat. As such the use of agro-chemical such as herbicides and insecticides is quite minimal. Insecticides are used mainly in vegetables production and in some instances for the control of grain storage pests.

The leading inputs wholesalers in the country – Seed-Tech International and Holland Farming import and sell agro-chemicals. The bulk of these chemicals are bought by NGOs for use in their projects under supervision because of safety reasons. The sales representative in Makeni for one of the two companies said their

¹⁸ Per the input/services team consultant, this figure is widely quoted and accepted in various reports, including USAID/WA's West Africa Fertilizer Program (WAFP) description that the same consultant drafted.

¹⁹ Benchmark from consultant's experience at the Africa Rice Institution

company sells diazinon insecticide for use on vegetables. They also sell fumigants such as phoxtoxin used to protect grains (rice and maize) from damage by insects and other pests. In the US, the insecticide diazinon has been outlawed because it is not as safe as current products available in the market. These are often problems connected with the use of agro-chemicals in developing countries especially without proper monitoring.

2. EXTENSION

The extension service is responsible for the training of farmers on different subject matters, helping them with technical problems, and providing them with information including access to inputs and output markets and veterinary services. The extension service is also responsible for the transfer and dissemination of new technologies such as improved varieties of crops developed and released by SLARI. In Sierra Leone, the role of the extension service is to: (a) assist with distribution of inputs, (b) formation of farmers into groups (FBOs), and (c) serving as a link with SLARI. In terms of administration, MAFFS has a Director at the national level who supervises the extension division heads at the district level. In Bombali district, the extension division comprises four units (training, agricultural information and communication, NGO desk, and gender/women in agriculture and nutrition). In connection to extension coverage/service provision, the district is partitioned into 3 units and 6 blocks with each block assigned to an extension agent. Tonkolili district has relatively the same setup except it has only 5 blocks.

Technologies are disseminated by way of demo plots that are funded by the district council as per the recent policy guidelines. The concept of “Innovation Platform Demos” introduced so that extension services are provided at the group level. A research-extension committee (MAFFS, SLARI, NGOs, livestock and community banks) has also been created recently to help in resolving issues related to farmer’s problems. In 2010, an EU funded project implemented by MAFFS and FAO introduced the Agriculture Business Centers (ABCs) for buying and selling agricultural inputs. MAFFS has been working to transform them into cooperatives to become viable private sector agribusinesses through the Smallholder Commercialization Program. However most of them are not functioning due to management issues. The team learned during the field visits that both MAFFS and NGOs provide extension service. The coverage varies from none to limited, due mainly to lack of transport.

3. AGRICULTURAL EQUIPMENT

Agricultural equipment is used mainly to ease the demands of manual labor, improve efficiency, and expand areas under cultivation. Farm sizes in Sierra Leone especially for the target VCs are presently quite small. Maize is the only crop that is now moving to the field as a monocrop. The team learned that a few agrodealers have up to 6 tractors. Some were purchased from the MAFFS (some of the tractors from India) on a three-installment payment scheme while the other tractors were purchased by family members. The MAFFS tractors had frequent breakdowns and the government reduced the cost of the tractors by up to 40% (original cost Le75M). Spare parts are reported to be sold by only one Indian store and are quite limited and expensive. Facilities for machine repair and maintenance are generally not available outside of larger towns. The demand for repair services at the District and community level will continue to grow, especially as machinery ages. Animal traction using bulls are a transition from purely manual plowing to tractors. This seems to only common in Koinadugu district unlike in the Sahelian countries where this technology is quite common. The added advantage is that the bulls are also used to transport humans and farm produce. The team learned that processing equipment especially for grain is quite useful but credit would be needed to enable producers to afford it.

4. IRRIGATION

Well-managed small-scale irrigation systems have a lot of merits, such as enabling higher crop yields, 2-3 crop seasons per year, production of multiple crops per unit area, and the integration of crops, livestock and fisheries. Crops grown under irrigation have the highest yield potential and offer the best opportunities for increasing productivity. This is why all commercial field crops are irrigated and not rely only on rainfall. At present, most government irrigation schemes are focused primarily on rice production; and, irrigation among VC crops is limited mostly to vegetable production. In the Tonkolili district, MAFFS is managing a small-scale irrigation project on a 59 ha piece of land, in order to grow more than one crop of rice per year. (A team member learned that an old dam in the near-by area is being rehabilitated and as such the irrigation water is temporarily stopped.). MAFFS is also developing plots of about 5-10 ha in both Bombali and Tonkolili for irrigated rice production under various projects and sub-contracts.

Vegetable production may use irrigation, mostly using watering cans with water from streams and/or hand-dug wells. A team member learned in prior workshops that MAFFS is encouraging farmers to use more lowland areas, especially inland valley swamps, for rice production. This is good strategy if implemented and properly. Vegetable production may also occur in these areas. Thus this approach is relevant to the target commodities.

B. CONSTRAINTS AND OPPORTUNITIES

1. The number of agro-dealers is increasing but most of them have limited technical skills, and commercial and financial capabilities.

Opportunity – Provide relevant training for wholesale distributors, agro-dealers, and members of Farmer Based Organizations (FBOs) to improve their technical, business management skills, and profitability (preparing business plans, product packaging and labeling, customer relations, advocacy, etc.). For example one of the training conducted in the USAID/WA's WASA involved loan officers in order to change their perception of agriculture as being always a risky business to finance. That changed their perception and many become more open-minded. The training will give these input dealers the various required skills and confidence to approach financing institutions and be able to acquire loans to help expand businesses as well as venture into new areas. That in turn will expand the market for inputs, thereby contributing to improved food security and nutrition.

2. The majority of smallholder farmers do not know the benefits derived from using improved seed, planting material, and fertilizers.

Opportunity – Support the establishment of well-laid out field demonstration plots combining improved seed and fertilizer using correct doses; then sponsor well-organized farmers field days to these plots by bringing together all industry representatives to exchange ideas. Ensure that the various participants bring samples of their products to take advantage of the field day; that creates market opportunities for all.

3. Agro-dealers also tend to be located mostly in urban and semi-urban towns so that farmers have to travel long distances to purchase inputs, thereby further increasing the cost.

Opportunity – Support GIS mapping of current agrodealers and the various products they sell as well as services they offer (veterinary services/products, etc.) to farmers and their communities. That way, not only will farmers and development partners know where to access inputs but may also want to sponsor more agrodealers in places where they are not present.

4. Lack of mobility to visit the villages, the team had to give rides to the extension agents responsible for the villages visited.

Opportunity – Explore as some countries have done, having good pilot farmers provide extension services in their communities; they can be paid initially in-kind (produce or labor), since staple crops market is still evolving; cash crop farmers usually generate enough revenue to hire private extension agents or simply provide incentives to the public extension workers.

5. MAFFS direct competition with the private input/providers in the supply and distribution of inputs along with the current administrative constraints in duty waiver processing is resulting in late delivery of inputs to farmers.

Opportunity – Work with other donors to liberalize the inputs supply/distribution in order to have a more transparent and efficient system that provides farmers access to timely, quality inputs, and best prices due to competing private sector provider companies.

6. The current size of fertilizer market in Sierra Leone is too small to have a dynamic environment that will dramatically increase fertilizer usage in the near-term. As in other West African countries, fertilizer imports are typically in 5,000 to 10,000MT orders/shipments, often less than a full shipload compared to the more customary 25,000 to 50,000MT shiploads in other parts of the world. This makes both the FOB shipping point price of fertilizer and the ocean freight charges significantly high. Fertilizer is only ordered on an as-needed basis unlike Guinea where fertilizer is kept in warehouses at the Port of Conakry. As noted, the team found very limited fertilizer available for sale in the country. A key informant advised the team that some fertilizer had been brought into Makeni for WAAPP, but had not yet been distributed. MAFFS has provided farmers with post-Ebola seeds purchased from neighboring countries.

Opportunity - USAID/Sierra Leone link up with the USAID/WA's FTF \$20 million West Africa Fertilizer Program (WAFP) that works on promotion of joint multi-country bulk fertilizer purchases (e.g., negotiated large consolidated orders among private companies in 2-3 countries – Mano River Union) and the promotion of new technology (e.g. local blending of NPK) where appropriate.

7. Fertilizer recommendations in Sierra Leone are 'blanket recommendations' that are outdated and no longer relevant to current soil conditions. As such, current rates/dosages used by farmers may not be in line with current knowledge, even if farmers have their soil tested, making crop yields are low. In order for the use fertilizer by farmers to be rational, the MAFFS should begin (even just on a pilot basis) collecting soil samples from selected farms, have them analyzed, and make recommendations on amount and types of fertilizer to apply by farmers. Field days can be organized to these pilot farms for farmers, NGOs, inputs suppliers, decision makers, etc. to see the benefits of proper application of fertilizer combined with improved seed. (In Ghana, most major private companies send their soil samples to overseas soils laboratories for analysis.)

Opportunity – Collaborate with SLARI and other institutions to introduce soil testing including mobile soil sampling by agrodealers and distributors in order to have reliable fertilizer recommendations for major staple crops in particular.

VII. FINANCIAL SERVICES

A. INTRODUCTION

Overall, credit is a major issue across the value chain. The World Bank (2014) ranks Sierra Leone 151 out of 189 countries in terms of obtaining credit (lower numbers indicate a better rank). The assessment found that the majority of smallholder farmers and VC actors in the scope of this inquiry were financially underserved. VC actors reported that they faced measured challenges accessing and obtaining credit, and received insufficient credit in cases where they could access it. The level of access to finance varies among operators in the value chain e.g. buyers and processors are more likely to be financed. This too may depend on the scale of their operations, where medium to large-scale processors and buyers have easier access than small scale operators. The term ‘value chain finance’ refers to the flows of funds to and among the various links within a value chain. It relates to any or all of the financial services, products and support services flowing to and from and/or through, a value chain to address the needs and constraints of those involved in that chain, be it to obtain financing or to secure sales, procure products, reduce risk and/or improve efficiency within the chain. It refers to both internal and external forms of finance (IFAD 2012).

Apart from the perceived risk nature of production agriculture, there are several reasons for the high level of financial exclusion among agricultural value chains at the macro (legal and regulatory), meso (support services) and micro levels. The most common is the failure of financial services providers to develop agribusiness-specific financing products and services. The study did find however that a number of regulated financial services providers such as Union Trust Bank, Ecobank Microfinance and the newly established Apex bank are now developing and/or have begun piloting agribusiness-specific financing products.

B. THE LEGAL AND REGULATORY ENVIRONMENT

Most of the policies on agriculture in Sierra Leone have, rightly, focused on the smallholder farmer. Unfortunately, these policies have not paid adequate attention to the rest of the value chain including critical support facilities/requirements such as access to financial services. While the on-farm operations make up the crux of the value chain, these other services are critical for success of the smallholder farmer. It is small consolation that limited access to finance is not suffered by the agricultural sector alone, it is a general private sector problem. A study undertaken for the World Bank in 2015 found that private sector financing in Sierra Leone was only 28 percent of total commercial bank lending.²⁰ Legal and regulatory issues, which indirectly legislate against increased value chain financing by regulated FIs include:

- Mismatched assets and liabilities, where all deposit taking institutions have short term liabilities but value chain financing requirements (potential assets) are mainly medium to long term.
- Asset quality requirements for regulated financial institutions
- Capital adequacy requirements

For non-regulated FIs such as non-deposit taking microfinance institutions and NGOs, the major drawback is inadequate capital.

²⁰ <http://www.bsl.gov.sl/statistics.html> (Monetary Sector Data)

The legal and regulatory policies and programs that do (or could) have effect on value chain financing include:

- The Finance Leasing guidelines which can facilitate asset purchase. However, actual leasing has not yet taken off but is hoped to start soon with IFC support.
- The Financial Sector Development Plan which specifically targets rural and agricultural finance
- The Smallholders Commercialization Program Sierra Leone's flagship agricultural development program (to be replaced by ICADEP).

At the level of the MAFFS and its district agricultural offices (DAO), there appears to be little attention given to the very limited access to finance situation among the farmers and others in the value chain which the MAFFS and DAOs support through extension services. When all is said and done, what is needed is very specific legislation that would encourage financing of agricultural value chains by financial services providers.

C. MICRO LEVEL

This is the level where the actual financial services provision by FIs. The study found that there is a wide variety of FIs providing or purporting to provide, agricultural value chain finance. They include:

- Commercial banks
- Microfinance institutions (MFIs), mostly non-deposit taking
- NGOs
- Rural Finance Institutions (RFI) made up of community banks and Financial Services Associations (FSAs). These are now under the management and supervision of the newly established Apex bank
- Agricultural Business Centers (ABCs)
- Other Co-operative-type entities such as Village Savings and Loans Associations (VSLAs).

1. COMMERCIAL BANKS

As the type among the FIs with the most financial capability and sustainability, commercial banks are expected to play a major role in value chain financing. However and for acceptable reasons, most do not participate much in targeted value chain financing. Commercial banks such as UTB and Ecobank microfinance and non-deposit taking MFIs tend not to finance producers (farmers) due to the perceived high risks involved and what relatively little lending they do to the value chain tends to be to input suppliers, buyers, and transporters and to a lesser extent, processors. Banks such as UTB and Ecobank-MF are in the process of developing/piloting agricultural value chain products which if successful will be rolled out to all branches. Their products however avoid financing at the production stage.

Union Trust Bank targets vegetable growers in Kabala using a revolving loan fund provided by the Kuwait Fund. The finance is largely for inputs of seeds and farm implements with average loan sizes of about Le5m-Le8m. Repayment is reported as having been very good. UTB hopes to increase the number of borrowers in 2016. It also undertakes contract financing, also in Kabala in collaboration with WFP where the bank finances farmers who produce commodities for WFP on contract and so repayment is guaranteed by through the farmer's contract with WFP.

Ecobank-Microfinance is in the final stages of its own agribusiness finance product that it plans to start piloting in 2016. It targets mainly poultry to start with and will finance input suppliers, buyers and transporters. It plans to include Makeni (Bombali district) as one of the pilot towns.

2. OTHER COMMERCIAL BANKS: AN OVERVIEW

Other commercial banks do lend to value chain operators, although again, not to production operators. Their agriculture lending (especially to small scale operators in the value chain) is merely a part (and a small one) of their general lending. In short, there are no agriculture-specific products. To underscore this state of affairs, this study found that as at June 2014, the average number of agribusiness borrowers with loans outstanding in the 12 commercial banks in Sierra Leone, was only 0.6 percent of total borrowers.²¹ In terms of value of the total outstanding loan portfolio of the 12 banks, agriculture loans were only an average (of the 12 banks) of six percent of gross loans outstanding.²² It is also likely that a significant number/value of the transport sector is made up of transporters doing agribusiness transporting. However, even this grouping apart from having two other subsectors (storage and communication), is not among the highest borrowers.

Table 10 gives the breakdown of loans outstanding in the agribusiness sector, of all 12 commercial banks in Sierra Leone as at June 2014.

For the on-farm producer, as the most important link in the whole value chain, their perceived high risk also affects the rest of the links in the value chain. This is because if the on-farm producer is not seen by the rest of the chain (e.g. input suppliers), to be viable, they (the input suppliers) would be reluctant to invest in agricultural inputs required by farmers. Similarly, processors will not invest much in processing equipment if the supply of the raw produce e.g. Rice, is inconsistent or unreliable.

Table 10: Outstanding Agribusiness Loans at Commercial Banks in Sierra Leone, June 2014

BANK	No. of Agribusiness Clients with O/S loans	Total no. of borrowing customers with loans O/S	% of Agribusiness borrowers to total borrowers	Total Amt. O/S from Agribusiness, Forestry & Fishing (Le '000)	Gross total advances O/S to June 2014 (Le '000)	% of Gross Advances (Le '000)
Keystone Bank	1	274	0.4%	1,617,127	24,416,744	7%
Access Bank	0	94	0.0%	0	14,318,443	0%
Ecobank	1	18,258	0.005%	4,572,210	130,085,022	4%
FIB	20	427	4.7%	5,823,747	98,979,227	6%
G'tee Trust Bank	4	1,458	0.3%	15,925	155,319	10%
Int'l Comm. Bank	0	165	0.0%	0	32,557,153	0%
Rokel Comm. Bank	21	2,625	0.8%	29,409,416	271,966,466	11%
Stanchart Bank	0	72	0.0%	0	44,511,695	0%
SKYE Bank	4	190	2.1%	688,116	13,601,140	5%
S.L Comm. Bank	9	11,048	0.1%	18,859,698	268,627,856	7%
Union Trust Bank	184	5,735	3.2%	8,756,344	192,914,091	5%
Zenith Bank	0	194	0.0%	0	27,426,683	0%
TOTALS/AVERAGE	244	40,540	0.6%	69,742,583	1,119,559,839	6%

Source: Bank of Sierra Leone

²¹ The statistics obtained are actually for loans outstanding and not for loans given out which could, theoretically, mean that agribusiness loans were much greater and perhaps have even mostly been repaid. However, the team has taken the view that the loans outstanding statistic also reflects the overall lending pattern.

²² Note that in the sectoral groupings, agriculture is also grouped with forestry and fishing, so these statistics may even be less for agriculture

The Rural Finance Community and Community Improvement Programme/Apex Bank (IFAD program): 51 Financial Services Associations (FSAs) and 17 Community Banks (CBs) have been established by the program and are now fully functional. Bombali district has three FSAs and one community bank while Tonkolili district has two FSAs and three community banks. This program has now been converted into the Apex Bank. During program implementation and to meet the specific demand for agricultural financing, an Agricultural Development Fund (ADF) Refinance Facility Fund (RFF) dedicated to agriculture was piloted for on-lending to 5 CBs, under a developed set of agricultural policies and procedures. A facility of US\$ 200,000 from the RCPRP recovery fund has cumulatively disbursed US\$ 339,496 to a total number of 1,234 smallholder farmers through five CBs. A Global Agriculture and Food Security Programme (GAFSP) facility of) \$500,000 was set up to provide refinance facility fund to CBs and FSAs. A disbursement of \$1,000,000 to five CBs and six FSAs and a total of 879 clients have so far benefited. A draft agricultural policies and procedures has been developed to guide the provision of agricultural financing and which is facilitated on a pilot basis through the ADF/RFF. The ADF/RFF is currently available only to eligible CBs who have in place a more appropriate structure and staffing to undertake appraisal and follow-up. The RFCIP/APEX Bank is also now increasingly involved in developing special facilities for ABCs, and products for agricultural service providers. The Apex bank products being piloted are:

- a. Inventory Credit Scheme in Kono and Kailahun and financing oil palm farmers
- b. Agricultural Input Loans
- c. Agricultural Rehabilitation Loan financing oil palm, coffee and Cocoa
- d. Agricultural Processing and Marketing Loan

All of these products are delivered through the community banks.

3. OTHER FINANCIAL SERVICES PROVIDER

There are a number of other types of financial services providers. Unlike banks, they are all non-deposit taking which limits their ability to meet demand of their areas of operations. They include:

- MFIs
- NGOs
- Community-based groups such as ABCs, Village Savings and Loans Associations and Financial Co-operative Societies.

Two notable MFIs with operations in Bombali and Tonkolili districts are: BRAC and Salone Microfinance Trust Ltd.

4. MICROFINANCE INSTITUTIONS

BRAC undertakes the usual micro and small enterprises financing which invariably captures some operators along the value chains such as buyers/traders. However, it also does have a dedicated agricultural financing facility through its Livestock and Agriculture component. The crop sub-component has five (5) products:

1. The Community Agricultural Promoters (CAPs) Scheme. The Masuba branch in Makeni has 30 (i.e. 10 each from three BRAC branches in Bombali) CAPs to date. This scheme concentrates on vegetables.

The CAPs scheme is the only one of the five where finance is provided to the promoter (the CAP). The loan amount is Le.480,000 to be repaid over 12 months and is known as a cost-recovery loan and attracts no interest. The objective is for each CAP to encourage and recruit others into agriculture and into one of the

other schemes under this agriculture sub-component. The target is to bring in 250 new farmers by year three of the scheme. If achieved that will give a total of over 800 beneficiaries in the agriculture sub-component.²³

The other four schemes are:

- Model farmers' scheme, which has 30 farmers and deals in various crops
- General Farmers' scheme which has 45 farmers and concentrates on rice and vegetables
- Demonstration Plot farmers with 75 farmers in the scheme and focuses on rice
- The Kitchen gardeners focusing on vegetables with 450 farmers.

All beneficiaries in these schemes are women only. In each scheme, the beneficiaries are all given training first by BRAC after which seeds, fertilizers and farm implements are given.

The other sub-component is the Livestock sub-component. This targets the 'ultra-poor' i.e. those that live on less than 1 cup of Rice a day. The scheme uses poultry and goats and has recently also included piggery in its portfolio. The BRAC officer visits all villages within his area of operation and observes the lives of the villagers in order to identify the 'ultra-poor'. Those identified as such are trained on how to take care of the livestock, say, poultry. They are then given 22 chicks to begin with. The eggs and chicks from these 22 are used to improve the livelihoods of the beneficiaries. The project is operated in 30 communities at present. A similar methodology is applied for goats where each beneficiary is given three females and two male goats. Currently there are 210 goat beneficiaries and 60 chicken beneficiaries.

5. COMMUNITY BASED GROUPS

Among the community groups met was the Tarma Tuma ABC which was established in 2010 under the Smallholder Commercialisation Programme (SCP). ABCs have generally not fared well and very few remain viable. Tarma Tuma appears to have the potential to be viable. It comprises two FBOs. The ABC, grows groundnuts, maize, peas, crain crain, garden eggs and okra. The group farms mainly for sale of harvest and only keeps some of the produce if the harvest is particularly large. There are 67 members and it has an administrative structure comprising a chairperson, vice Chair, secretary, financial secretary, treasurer and three advisers. It maintains a bank account at



the FI Bank but has never asked for a loan from the bank. The ABC has also undergone training from NGOs to enable them manage the organization which has included developing a business plan. The group is run as a village savings and loans association where members make minimum monthly payments per week and can borrow up to 4 times their savings. Their financing includes:

1. A bridging loan during the low season to enable them store their produce for sale during the high selling season.
2. Purchase of farm machinery especially a ploughing machine
3. Funds to pay for regular visits from a veterinarian to treat their livestock which are prone to diseases.

Interest is charged at the high rate of 10 percent per month.

²³ This is 250+30 (280) CAPs plus the 600 farmers in the other four agricultural sub-component schemes

D. SUMMARY OF OVERALL FINDINGS

Most of the FIs that currently specifically target agricultural value chains do not have enough funds to adequately meet the financing needs of most of the value chain operators. The providers that do i.e. commercial banks such as UTB and Ecobank-MF are still testing the waters but at least that is a start. Some sort of safety net such as insurance or guarantees would give the banks more comfort and encouragement to lend to agricultural value chains. Perhaps the FI with the most potential is the Apex bank since its target group is exclusively rural populations for whom agriculture is their major enterprise either as on or off-farm operators in the value chains. Community based groups which are operating well such as some ABCs and VSLAs would also qualify for support in several areas such as capacity building to enable them to better manage their groups. A well-run group will be seen by FIs (even the community banks which are part of the Apex bank) as being less risky propositions for wholesale funds for retail on-lending. As mentioned in the introduction, while there appears to be a multitude of financial services providers, the majority of operators in the value chains cannot access adequate finance. The other problem is that several of the FIs do not maintain specific records for agriculture value chain financing such as by each type of operator within a value chain. For these reasons, the limited time to undertake the study meant that lending details which could have been derived from a detailed examination of the FIs books to determine among other things, the breakdown of male and female borrowers, average loan sizes, repayment rates, etc., for each type of value chain operator, was impossible to obtain.

4. Sources of Seed: S.M.P./Local farmers.

5. Sources of Finance: Monthly contribution by FBOs and V.S and L.

6. Promotional strategy: By radio jingles, through meetings and advertisement.

7. Risk and risk mitigation: (1) Proper storage facilities (2) Cleaning of the surrounding (3) store guard.

8. BUSINESS PLAN ASSUMPTION

Description	Year-1	Year-2	Year-3	Year-4	Year-5
Total Cost of Purchase rice seed	3,600,000	4,250,000	6,750,000	8,550,000	10,500,000
Total Income	3,360,000	4,020,000	5,975,000	7,300,000	9,190,000
Gross Profit	6,960,000	8,270,000	12,725,000	15,850,000	19,690,000
Tax (15%) of gross Profit:	1,044,000	1,240,500	1,908,750	2,377,500	2,953,500
Net Income	5,916,000	7,029,500	10,816,250	13,472,500	16,736,500

VIII. POLICY AND ENABLING ENVIRONMENT

A. NATIONAL REGULATIONS AND POLICIES

The development of the agricultural sector is viewed as an essential priority in Sierra Leone’s broader development programs. For example, its importance is detailed in the “Diversified Economic Growth Pillar” of Sierra Leone’s Third Generation Poverty Reduction Strategy Paper, The Agenda for Prosperity. It also is critical in fulfilling the Millennium Development Goal 1, Eradicate Extreme Hunger and Poverty, by reducing poverty and food insecurity. As noted prior, agriculture is the backbone of the economy, accounting for 41 percent of the GDP in 2001 prices and 47 percent of the GDP in current prices in 2013 (MAFFS 2015).²⁴ It also employs about 69 percent of the labor force (MAFFS, SSL, J-PAL/IPA 2011). As such, it is regarded as a valued resource for employment and sustainable livelihoods.

In September 2009, MAFFS developed a National Sustainable Agriculture Development Plan (NSADP; GoSL 2009), and signed the Comprehensive African Agriculture Development Programme (CAADP) compact, an umbrella program under the auspices of the African Union/Economic Community of West African States. The NSADP is regarded as the main implementation channel for the country’s commitments to the CAADP compact. The NSADP comprises four major investment sub-programs: commodity commercialization, infrastructure development, private sector promotion, and sector coordination and management. Among the four sub-programs in the NSADP, the Smallholder Commercialization Program (SCP) was prioritized for national implementation as the component with greatest impact on food security and income for the most vulnerable populations in the near term. Building on a premise of increasing farmers’ incomes by moving them further up in the value chain the commercialization sub-component supported the creation and development of ABCs and FBOs. Per an interview with FAO, ABCs, which contain about three or four FBOs, number about 383. Many FBOs are not in ABCs, making the number more than a simple multiple of ABCs.

Feedback from a number of interviews was that a substantial number of ABCs had greatly suffered from governance issues and were either non-functional or operating far below their expected levels of performance. Key informants reported that certain highly placed individuals captured or controlled resources that were meant for program interventions and groups use in some cases, defeating the purpose of the ABCs while causing specific centers to fail. In addition, an enduring lack of managerial capacity at the community level could also be viewed as a critical constraint in the ability of end beneficiaries in achieving the original goals of these programs. A visit to a relatively successful ABC, Tarma Tuma, demonstrated that, in addition to the excellent social cohesion existing amongst the members, support and training from an NGO, MADAM, was instrumental in providing business support mentoring. It would be beneficial for future programming to take into account the need for ongoing long-term mentoring focused on basic business and management skills.

²⁴ Total GDP at market prices is the denominator.

A number of related policies in other areas are also designed to enable agricultural development further, such as the revised Decentralization Policy and the Local Government Act (2004) which transfers power to local communities and enhance service delivery to farmers through devolution of technical and financial resources. Agriculture was identified also a target growth sector in the National Export Strategy (2010-2015), and championed by the Sierra Leone Investment and Export Promotion Agency (SLIEPA).

As noted in the inputs and services chapter, a National Seed Policy is being implemented through a National Seed Board (hosted by SLARI), a Variety Release Committee, a Seed Industry Development Unit, and a Seed Quality Control Unit (under SLARI). This is intended to provide a comprehensive means to identify needed varieties, ensure a standard approval process with necessary safeguards, develop seeds domestically, and ensure quality. The MAFFS crops division plays a key role.

The business enabling environment has improved over time but still presents challenges. The World Bank (2014) ranks Sierra Leone 91 out of 189 countries in terms of ease of starting a business, while ranks lower in ease of enforcing contracts (109), paying taxes (130) and registering property (158). In a bid to stimulate entry into the agricultural sector the Government adopted a set of incentives including the complete exemption from corporate income tax until 2020, and a 50 percent exemption from withholding taxes on dividends. In addition, investments in tree crops and rice are currently eligible for a ten-year tax holiday and enterprises operating within the sector are eligible for full duty exemption on their imports of machinery and equipment and entitled to full exemption on parts and other equipment for three years, as well as a reduced rate of three percent on any other raw material.

This policy has been extended to the importation of seeds and fertilizers, which also are exempted from import duties and from the goods and services tax. However the implementation of duty waivers has proven problematic in some instances, particularly for inputs. For example a major seed importer informed the team that he was entitled to these waivers, but delays in processing paperwork and the possibility of huge losses due to lack of temperature- controlled storage facilities for imported seed led him to opt to pay the charges and attempt to seek a refund later. It is unknown the degree to which such extra operating costs are passed on to end customers. It would be informative to identify the factors affecting the ability or willingness of port clearing agencies and relevant government departments to turnaround applications for such waivers in a timely manner. This issue can be addressed if it is known whether the causal factors are systemic weaknesses resulting from cumbersome procedures, issues of capacity or other human factors. The World Bank (2014) ranks Sierra Leone 133 out of 189 countries in terms of ease of trading across borders. Improvements are needed to facilitate more efficient and cost-effective importation of critical inputs, and exports of commodities that would reach higher-value markets to return improved profits to VC actors in country.

The operating landscape is dominated by public sector type of institutions, government ministries and agencies as well as NGOs seem to be the largest and most influential players with this sector. In most cases the private sector is very thin and primarily aggregators, traders (retail and wholesale) and providing some minimal processing facilities. At the level of input suppliers, private sector players have been a bit successful either by tendering for government-subsidized inputs such as fertilizer, or seeds and tools or similar tenders by the NGOs. A significant case of apparent state intervention in the market for inputs is the appointment of a dealer in the Northern Province for agro products by the Ministry. Although there were assumedly other companies bidding to serve as representatives, a situation where a single firm/enterprise appears to have received governmental sanction as a preferred dealer obviously is problematic to free and open competition.

A more targeted regime of subsidies and tariffs and long-term resource planning on the part of the ministry would greatly enhance the market clearing prices of these inputs and most probably render the sector more attractive to other players.

B. ENABLING ENVIRONMENT FOR THE ANIMAL VALUE CHAIN

As noted above, there is demonstrated growth potential in the egg and small ruminants industries. This requires improved policies. An importer the team met indicated that he would buy from domestic producers as well as exporters, if their supplies were predictable and of a sufficient quantity and quality, which requires standards. He also indicated that he would consider becoming a domestic producer, either as a joint venture or on his own, if the domestic industry were healthier. At present, few farmers in the animal value chain are organized as groups or cooperative societies, and registered with the livestock arm of the Government/MAFFS. There are no livestock ABCs, though the Tonkolili District Agricultural Officer indicated one was launching in October 2015.

Under current policies, MAFFS' funding for vets is far below the sector's needs. There are few government-trained vets and other technical professionals to help farmers at the national and local levels. Vet services and vaccines must also be scaled up to foster profitable, self-sustaining growth. The shortage of such support elements can increase perceived risk, driving high credit rates for sector lending. On the production end, two large players control the domestic market for poultry and eggs. Both have received support from the government and NGOs. Smallholder-centric policies and supports cannot be forgotten. Farmers' abilities to access markets limited, as the enabling environment does not provide for training on business management, marketing, to quality or sanitary standards. In some nations, excess demand for such services has been met by multinationals, with costs covered by fees or factored into prices. It is beneficial to foster dialogue regarding service provision by the government and private sector.

Import considerations also must be addressed, given the sectors current reliance on diverse imports. Tariffs and customs for chicks, high-protein feeds and disease control products are too high to allow the egg and small ruminant industries to grow rapidly. Import tariffs and customs duties are also high for egg importers. Domestic egg producers and importers understand this and have called it to the attention of the government. The lack of government action may be because domestic egg producers, egg importers and feed producers have not acted as a "coalition" to argue for reduced tariffs and customs duties. Credit is another factor that is slowing the growth of the industry. Common short-term loans have 25 to 30 percent rates of interest. This seems to be related to the avian flu and a scare that occurred in the past. Now, maize farmers are taking delayed payments as a way of supporting the egg producers. There are better methods to be developed through inter-industry cooperation between the feed producers and the domestic poultry producers, both in terms of pricing and guaranteed supplies to the poultry industry.

C. ENABLING ENVIRONMENT FOR THE CROPS VALUE CHAINS

The crops sector shares many of the challenges noted above. MAFFS focuses most of its resources on a small set of target crops, which include some key horticultural products, groundnuts and maize (MAFFS 2015). However, these are regarded as minor crops by MAFFS, and receive much less support than major crops such as rice and cassava. ABCs are focused primarily on rice and cassava, chiefly drying, post-harvest processing storage and marketing; as well as information sharing and, in some cases, access to credit. However, ABCs are a platform that can be expanded to support processing through marketing of grain and legume crops; and information sharing and credit access across all crops.

There is a very thin private sector representing the target crops in Sierra Leone. Thus, there is a minimal platform for voicing issues concerning these crops, promoting and developing them, and addressing the general and specific needs of VC actors. The Sierra Leone Chamber of Agribusiness Development (SLeCAD) seeks to fill this role, and advised the team that they have a lead contact for each of the focus value chains. However, they operate largely on a volunteer basis, limiting their reach and scope of activities. Additionally, government intervention in the private sector, discussed previously, affects their potential impacts further. It is critical to bring together actors across the value chain, from farmers and input/service providers to end marketers, to articulate mutually beneficial strategies and a vision for public-private partnerships and a thriving, independent private sector.

Like the animal sector, the enabling environment for crops has many gaps that impair producer outcomes, such as a lack of food and seed storage facilities, limitations in infrastructure such as roads, airports, communications; limited capacity for testing and certification of seed and other products; a lack of comprehensive quality standards, and little means to implement those that are in place. This disadvantages domestic producers relative to imports, reduced marketable surplus and prices, and severely restricts access to higher-value export markets. It is important to take a cross-value chain approach to development, which includes addressing enabling environment factors where feasible, such as facilitating the development of standards, private-sector testing/certification and access to credit.



D. LAND OWNERSHIP, SECURITY OF TENURE, AND FARM SIZE

1. LAND OWNERSHIP

Sierra Leone has approximately 850,000 hectares of arable land (Chaytor 2010). Land in the provinces excluding the Western Area makes up over 90 percent of this arable land. Sierra Leone's land tenure system has a dual structure. Ownership in The Western Area including the Freetown Peninsula being governed by a freehold system (British origin). In the rest of the country, which contains the majority of agricultural land, land is held under customary tenure and by traditional authorities such as the paramount chiefs who have the final authority in granting or obstructing land access to any individual. In the fieldwork, the team met with several individuals and groups who farmed on rented land.

2. FARM SIZE

The average plot size under cultivation per smallholder family is 1.68 hectares, typically made up of a combination of upland sites and inland valley swamps or gently sloping riverine terrain (GoSL, SSL, IPA and J-PAL 2011). In the fieldwork, the team encountered individual smallholders with plots of five acres or more, and groups that farmed plots of several acres collectively, in what is termed the block farming system.

3. SECURITY OF TENURE

The country's dual system of land tenure is both complex and prohibitive to the use of land as an economic instrument for commercial transactions. Reforms to the land tenure system have been initiated with the drafting of bills such as Commercial Use of Land Act and Customary Law Courts Act. Issues such as archaic legal instruments, dysfunctional land markets, boundary disputes, weak land administration and lack of clarity on the criteria for accessing land for development amongst a host of others were some of the challenges highlighted in the 2005 National Land Policy. Although the situation regarding female ownership of land varies countrywide under unwritten customary norms tend to limit access by women to own landed property. Access in some cases from key informant interviews had been obtained via marriage and in some instances as death benefits.

4. CUSTOMS AND DUTIES; NON-TARIFF TRADE BARRIERS

For the movement of any plant material or products across international borders a Phytosanitary certificate is required. A pest-risk analysis is carried out prior to the issuance of the certificate by the Ministry of Agriculture, Forestry and Food Security (MAFFS). Phytosanitary inspections are conducted at six border ports of entry: the Queen Elizabeth II Quay (Freetown); the Freetown International Airport (Lungi); the Gbalamuya Customs (Kambia District); the Jendema Customs (Pujehun district); the Koindu and the Buedu Customs (both in Kailahun district). At these border points, staff from MAFFS inspect and certify import and export consignments, issue phytosanitary certificates, clearance certificates, or import and export permits. Using the United Nations Conference on Trade and Development Classification of Non-Tariff Measures (2012) as a guiding framework, the relevant measures for commodities in the value chains of interest and the relevant government legislation governing these measures are detailed in Table 11.

5. LABOR POLICY AND ITS IMPLICATIONS

Labor participation in the formal sector is governed by The Regulations of Wages and Industrial Relations Act (1971) and the Employers and Employed Act (1960). A National Employment Policy was developed in 2012 with assistance from GIZ and the ILO.

These statutory instruments regulate labor issues such as minimum wages; contributions from workers and employers; determination of leave allowances; procedures for declaring redundancy or dismissal of workers; compensation to workers; contract breaches and management of disputes between employees and employers.

Between 60 to 80 percent of GDP is generated in the informal sector, meaning that most employment arrangements are informal and unregulated. The agricultural sector represents the bulk of this. Even among the employed, self-employment in the both urban informal sector and the rural cash crop economy is the largest category and accounts for roughly half of total employment.

Given the lack of a discrete policy on employment in the informal sector most individuals engaged in rural agriculture rely on informal relationships for minimal pay and the bartering of time, labor and, in some instances, produce.

Table 11: Trade Measures Relevant to Agriculture

NTM chapter		Relevant laws
A	Sanitary and Phytosanitary Measures	The Agricultural Act, (Cap 185) 1974 Phytosanitary Control Revised Legislation (Draft) 2009 & Update and Reform of Phytosanitary Policy for Sierra Leone. (Background documents).
B	Technical Barriers to Trade measures	The Standards Decree 1996. The National Provisional Ruling Council Decrees (Repeal and Modification Act), 1996. (Repealed The Standards Decree).
C	Pre-shipment inspection and other formalities	No longer operative as the UNCTAD Automated System for Customs Data (ASYCUDA) is under implementation.
D	Contingent trade protective measures	No regulations identified.
E	Non-automatic licensing, quotas, prohibitions and other quantity control measures	No regulations identified.
F	Price control measures including additional taxes and charges	Not currently in place in Sierra Leone.
G	Finance measures	The Finance Act 2009. Section 4. Paragraph (a).(i),(ii),(iii)
H	Measures affecting competition	The Sierra Leone National Carrier (Amendment) Act 2014
I	Trade-related investment measures	The Investment Promotion Act 2004 The Customs Act 2011 The Local Content Policy
P	Export-related measures	The Customs Act 2011 The Sierra Leone National Carrier (Amendment) Act 2014

IX. CROSS CUTTING: GENDER, NUTRITION, CLIMATE CHANGE, EBOLA

A. GENDER

Women play a central role in the family and farming. They care for and keep their families together, play a key role in securing food, handle the brunt of work for many commodities, and are in general the backbone of socio-economic activities. However they face many gender inequality challenges that include local customs and legal institutions that often discriminate against women owning and controlling land and resources; accessing employment, education and public services; and are disproportionately affected by domestic violence. Such exclusion based on gender is manifested in acute inequalities, particularly in relation to marriage, inheritance and succession, personal security, labor market access, access to basic services, and more.

According to the United Nations (2014) Gender Inequality Index (GII), which reflects gender-based inequalities in the areas of reproductive health, empowerment, and economic activity, Sierra Leone ranked 139 out of 149 countries in 2013. The UN estimates that gender inequality resulted in a 64.3 percent loss in human development in the country. Only 9.5 percent of adult women have completed secondary schooling, while 20.4 percent of males have done so. Labor force participation is fairly equivalent, at 65.7 percent for women and 68.9 percent for men.

Women are marginalized within the agricultural sector, though they play a large role in it in it. The African Development Bank (2011) estimates that they represent nearly 66 percent of crop production activities. Field research found that they predominate in the retail sector as well. They have little or no access to credit facilities, improved technologies, extension services and post- harvest technologies. Furthermore, they do not have permanent land rights and can be dispossessed of their lands by male relatives or through divorce or death of their spouse.

Field research showed limited female participation in the Government Input Support Programme, due to women's lower participation rates in FBOs and ABCs. This is a result of lack of time, or sufficient monies for membership fees. Women are likewise less likely to be able to afford the inputs ABCs sell, and those from private sector input providers. It is important to support women's participation in farmer organizations, particularly vulnerable women and those in female-headed households. This would also benefit other vulnerable and very poor populations, and youth. FBOs can receive training on establishing alternate fee structures and means of payment, ensuring meeting times and places are appropriate to women, and fostering women in leadership roles.

1. POLICY

Established in 1998, the Ministry of Social Welfare Gender and Children's Affairs (MSWGCA) is mandated to formulate gender-responsive policies and to coordinate and monitor their implementation within different sectors of the society. It advises government on all matters relating to the full integration of women in

national development at all levels; serves as the official national body for coordinating and liaising with national and international organizations on all matters relating to the status of women; and serves as the official central source of information on women in Sierra Leone, among other matters. However, MSWGCA is underfunded and understaffed. Ministries such as MAFFS are not qualified to undertake the technical responsibility of gender mainstreaming in their sectors and are marginalized from the decision-making structures in their institutions. As part of the decentralization process, all Local Councils have established Gender and Social Welfare Committees but they, too, are underfunded and marginalized within Council operations.

Two national policies, the National Policy on the Advancement of Women and the National Policy on Gender Mainstreaming, were adopted in 2009 to guide the Government's gender equality project. These were reinforced by the National Gender Strategic Plan (2009-2012), and the Sierra Leone National Action Plan (SILNAP) on United Nations Security Council Resolution (UNSCR) 1325 on Women, Peace and Security and UNSCR 1820 on Sexual Violence were adopted in 2009 and 2010 respectively. To date, the GoSL has enacted various laws to ensure the protection and promotion of the rights of women and children, such as the Anti-Human Trafficking Act (2005), the Sierra Leone Citizenship Amendment Act (2006), the Prevention and Control of HIV/AIDS Act (2007) and the three Gender Acts (2007) on domestic violence, customary marriages and divorces and the devolution of estates, and Child Rights Act (2007).

The government has adopted various economic policies to move the country toward sustainable economic development, and has included gender in such policies. The Agenda for Prosperity (also known as the third generation Poverty Reduction Strategy Paper/PRSP 3, GoSL 2013) identifies gender equality as one of its eight pillars. This component encompasses education, gender-based violence, decision-making power and the business environment. Sierra Leone became a signatory to the Convention on all forms of discrimination against women in 1988 and in recent years it has achieved major milestones in promoting women's rights, namely, with the adoption of the Gender Act, the Domestic Violence Act of 2007, the Registration of Customary Marriage and Divorce Act of 2007, and the Devolution of Estate Act of 2007, and is currently undertaking a process to reform the land tenure policy. However, despite this progress, many women in Sierra Leone continue to face sexual and gender based violence (SGBV) including the deprivation of access and control of essential economic resources.

2. GENDERED NORMS

Land and property rights

Despite their significant contribution to agriculture women do not have full access or control of property or land, a key agricultural resource. This has serious repercussions on their effective engagement in economic activities. Some of the root causes can be found in traditional land tenure systems, which might grant women access to land use while guardianship remains in the hands of men. Additionally, formal legislation may guarantee equal opportunity to men and women in accessing land, but are in most cases, not effectively enforced due to gender inequalities prevailing in the implementation mechanism. For example, some legal clauses do not allow joint ownership of land by married couples under statutory tenure. The land tenure system in the Bombali and Tonkolili districts is based on customary law and gives the right of tenure to the heads of lineage and families who were the original settlers. The majority of women in these districts are subject to the traditional patrilineal system of inheritance, meaning they can only access property and land through their relationships with men: their fathers, brothers or husbands. In situations where women can own and control land, such as where one can buy the land from the land market, women are constrained by

several socio-economic factors, such as illiteracy, lack of capital and implements, lack of collateral, lack of farm management experience, training and advice. Access to land by poor producers for cultivation, commerce and shelter is achieved principally by inheritance, gifting, renting and to a lesser extent, by purchasing.

Women and their children can end up entrenched in poverty or in extremely vulnerable situations. The team came across instances where women growers who were married to their husband for years were asked by their husband to move out of their houses with their children to enable them to start a relationship with a younger woman. These women and their children lost access to their home, and the garden they used for farming.

Sierra Leone is in the process of reforming land legislation that provides for women's access to land and recognizing the equitable sharing of land between husbands and wives. In many countries the constitution confers equal rights to all citizens – men and women. However even though the constitution and the legislation are favorable, many forms of discrimination remain evident especially where customary law is applied. For example Sierra Leone Estate legislation on ownership has adopted legislation that provides for women's access to land and recognizes the equitable sharing of land between husbands and wives, as well as the granting of land titles with names of husbands and wives.

Through a joint project managed by COOPI and OXFAM, numerous cases of women's property and land rights violations have been identified. This and other projects have learned women often do not understand their rights. When they try to mediate the case with local traditional leaders, they find that customary practices such as women not being able to own property and land are often quoted leaving them without resources.

Households, Food Security and Gender-based Violence

Full engagement of women remains limited by the demands of household and childbearing/rearing. Women typically assume the role of food provision, childcare, management of the home, and so forth. In the Bombali and Tonkolili districts these responsibilities cover extended family, and females, regardless of age or direct relationship, are expected to contribute to household chores. This social construct is deeply embedded in Sierra Leone and poor infrastructure, particularly in rural areas, heightens this challenge. Under these conditions, women must spend a significant amount of time seeking out even the most basic supplies, such as water and firewood. In Tonkolili and Bombali, women reported spend at least two hours more per day than men on domestic chores. In some cases, this limits participation in the industry entirely, while in others, it is a burden women bear in addition to their paid labor.

Significant differences in gender roles exist between women and men in terms of assuring food security. Women are involved in all three pillars of food security: availability, access and utilization. They produce crops, and have primary responsibility for purchasing and preparing food, to which they devote their time and their income. Women are more involved in the way food is utilized, making sure that the family derives good nutrition from the food they grow, buy and prepare. In many cases, food preparation involves a substantial amount of time for collecting fuel and preparing ingredients. Policy-makers often ignore the gender dimensions of food security, assuming that food insecurity impacts on men and women equally, and therefore responsive policies are gender blind. For example, women's unequal access to and control of land and assets, and their lesser ability to purchase inputs and services, may not be addressed. Women's participation is further constrained by limited access to capital, education and the HIV and AIDS and recent Ebola epidemic.

Gender-based violence in Sierra Leone disproportionately affects more women than men. The major types of gender-based violence include domestic violence; childhood sexual abuse especially of girls; harmful traditional practices such as early marriage, son preference and female genital mutilation, trafficking in women, and forced prostitution. The factors that contribute to violence against women include poverty, socio-cultural factors, conflict and insecurity. These factors can be more prevalent and severe in rural and agricultural communities, particularly poverty, making gender-based violence Furthermore, lack of economic autonomy, property rights, and access to shelter; illiteracy and fear of losing their children restrict women's ability to escape domestic violence, obtain protection and access the criminal justice system. Social and cultural practices manifested in unequal power relations between men and women such as patriarchy, which may also be stronger in rural communities, can result in different forms of violence against women.

Violence against women has several health, human rights and socio economic impacts on women and their families. Abused women are more likely to suffer from mental health problems such as depression, anxiety, psychosomatic symptoms, eating disorders, and sexual dysfunction. Women who have been sexually abused as children also are at greater risk of having unprotected sex, and are therefore at risk for contracting HIV/AIDS and other STDs, and experiencing gynecological problems and unplanned pregnancies.

Employment and Entrepreneurship

Recent estimates indicate that over half of women work in the informal economy (GoSL and ILO 2010). Women tend to be concentrated in lower-value functions in the value chain, are vastly under-represented in managerial and decision-making roles, and face limited access to credit. The African Development Bank (2011) estimated that women's participation in crop farming, and trade and repairs, stood at 65.8 percent and 21.9 percent respectively in 2011. In the informal sector, women face poor working conditions, low salaries and no social protection leaves them open to exploitation and increases their vulnerability to poverty. Women would benefit from efforts to increase their participation in the formal economy, such as assistance registering processing, trade and retail businesses.

Culture and Diet

Gender differences also exist in dietary and eating patterns. They may be among the last to eat nutritious food at the family table. In some traditions, pregnant women are discouraged from eating healthy foods, like chicken, eggs and meat, according to a trader in Makeni. In others, men often receive the best, and most nutritious, foods at the family table. "If she prepares a chicken," the trader says, "all she can eat is wings, feet, the neck and the head. The fleshy and nutritious part is given to the husband. This is a show of love to your husband. In some communities, [it is believed] if you [give a pregnant woman] meat, she will give birth to a child who is a witch." He says pregnant women also may harm their unborn child by fasting, which he says can deprive the fetus of needed nutrients. Cultural traditions forbid women and girls in the assessment area from consuming whole goat's milk. The focus group discussants said this was due to a belief that if a woman drinks goat's/sheep's milk, she will become strong and refuse to obey her husband's orders.

3. GENDER CHARACTERISTICS OF THE MAIZE VALUE CHAIN

In the study areas women do most of the planting, weeding and harvesting including post-harvest handling. Men do the majority of the ploughing, especially when animal draught power is used. Women participate more in land preparation when it is done using the hoe, increasing their labor burden. According to focus groups, women have lower access to and use of improved seed and fertilizer, and used saved seed more than men.

Post-harvest handling can be especially labor intensive. Hammer milling such as those used in ABCs offer a good means of reducing labor and improving income for women. A few women are involved in selling maize bran (product of hammer mills) to feed mills in Bombali and Tonkolili. They bulk the product and make a small margin. Hammer mills also produce cheaper maize meal, thus freeing cash income for other household necessities. Focus groups indicate that the proportion of women participating in grain milling using hammer mills as a commercial service is much lower than men. Expanding ABCs to maize, and training ABCs on gender equity, would benefit women.

In male-female households, more women than men engage in the distribution and marketing of maize but men control the resulting income. Female-headed households are particularly disadvantaged in the maize value chain. They are highly represented in production but not well represented in selling. Women's participation in more profitable downstream trading and processing activities can be improved. They face challenges such as lack of capital, mobility constraints that limit proactive marketing in the best markets, and the need to deal with heavy product—60-kg sacks. Facilitating access to credit for women's groups and individuals would enable them to have sufficient capital to start trading, and develop infrastructure for commodity bulking in rural areas.

4. GENDER CHARACTERISTICS OF THE GROUNDNUT VALUE CHAIN

Women participate in the value chain as producers to a high degree, are well represented in trade, and predominate in retail markets. Depending on the region, production ranges from the sole responsibility of women with men having no involvement, to an arrangement whereby men engage in some productive activities, such as preparing land and also digging up nuts for harvesting. In such cases women still perform most of the work, particularly weeding, which is very onerous. Women often seem to resist planting in rows which should make weeding easier. The reasons for this are poorly understood. Women also buy groundnuts at all stages of the value chain as raw nuts, roasted peanuts, peanut butter, groundnut flour, and processed oil.

On-farm processing, from shelling to processing into peanut butter, is mostly done by women. Focus groups show that women are considerably more involved in oil processing than men. Females generally lack access to higher quality, higher performing equipment due to cash constraints. Women predominate as aggregators though men's participation in marketing has shown a marked increase in most areas due to its profitability. Current experience is that men typically take over marketing when it becomes profitable. Sensitization using the Household Approach whereby the whole household works towards a shared vision, could enhance equitable distribution of benefits accruing from this activity regardless of who is involved in the marketing.

5. GENDER CHARACTERISTICS IN THE HORTICULTURE VALUE CHAIN

Women are highly involved in vegetable production. Fieldwork showed that the proportion of female-headed households growing and selling the target crops such as leafy vegetables, okra and pepper is higher than that of male-headed households. The participation of female-headed households in the production and marketing of imported vegetables (tomato, rape, onion, cabbage) is much lower than that of their male-headed counterparts due to a lack of money to buy inputs especially seed, seedlings, fertilizer and chemicals. Localized distribution of seedlings, together with the provision of fertilizer and chemicals on credit, would enable women and other vulnerable farmers to participate in this lucrative value chain.

Key informants estimated that women represent about 85 percent of the labor input in the production of vegetables including post-harvest handling. Several small-scale appropriate technologies for processing vegetables exist including paste making and canning. Vegetable processing, mostly drying or boiling before

drying, is done almost entirely by women at the farm level. Dissemination and uptake of improved technologies is poor. Women in male-headed households play a minor role in marketing and benefit little. They also have little control over resources while those in female-headed households play a major role have near total control of resources. Women predominate in retail vegetable marketing, but can be intimidated by brokers at wholesale markets. Women farmers attempting to sell produce are more disadvantaged than men since they are more intimidated by the chaotic brokerage activities. Improving market linkages must take into account soft market infrastructure such as brokerage facilities at wholesale markets. Women cannot access appropriate transport to take vegetables to better markets. Most women vegetable traders depend on transit trucks that are owned and driven by men.

6. GENDER CHARACTERISTICS IN THE POULTRY AND SMALL RUMINANT VALUE CHAIN

Poultry

As with other value chains, numerous gender differences in roles and activities arise from customary rules that tend to view certain tasks or activities as “male” or “female”. Women participate in all stages of the poultry value chain. Female-headed households are represented more in poultry production than male-headed households. Generally, chickens scavenge but are provided with overnight housing, usually built by men. Women look after the chickens and sometimes provide grains as feed supplements. They have also been known to administer herbal remedies to their chickens. Vaccination is not widespread. Urban traders go to rural areas to buy chickens for urban markets. Some local men may aggregate and sell chickens in urban areas. Chickens are normally sold live at markets, where they fetch premium prices. Dressing, when it is done, is done by women.

Small Ruminants

Women own and manage small ruminants in the target districts, participating in activities across the value chain. However, men take the lead in herding goats and sheep in remote areas (the main herd), and fattening, selling and trading the animals. Women are expected to be in charge of feeding and watering kids around the homestead, milking the goats and sheep, and selling butter. It is rare to see these roles reversed in the assessment area. This is due to the respect given to females in society and fear of sexual violence. Men are more involved in slaughter and butchering. Butter is an source of income for females, with proceeds covering miscellaneous household expenditure but not costs for goats or sheep.

Women’s lower access to markets than men, and their limited role in the commercialization of livestock and livestock products, can be attributed to poor marketing skills, low levels of literacy and customary practices that prevent women from freely leaving their properties. As a consequence, there is a marked imbalance in the benefits women and men accrue from livestock income. Women also face greater challenges than men in accessing, maintaining and improving small ruminants; and accessing veterinary services, financial services, extension, natural resources, and education. Women’s lower status and input into household decisions restricts their control and decision-making power over rural assets (i.e. sale of livestock), and the income generated from farming activities at the household and community level. Any intervention must consider the impact of added labor for women on top of their current home and farm load, and engage men and women in discussions about gender equity in farm and financial management.

B. NUTRITION AND FOOD SECURITY

Malnutrition is prevalent, as measured by stunting, low weight for height (wasting) and underweight (low weight for age) (SSL, MOHS, ICF 2013). Among children below age five, about 38 percent are stunted, and 18 percent are severely stunted. Stunting is highest in children aged 1.5 to two years, at 49 percent, while severe stunting is greatest in those aged 24-35 months. Additionally, nine percent of children below age five show wasting, with four percent having severe wasting. Wasting is highest among children aged 9-11 months, at 18 percent. About 16 percent of children under five are underweight, and six percent are severely underweight. This measure is most prevalent among children aged 6-11 months. Males generally show a higher prevalence of all measures than females.

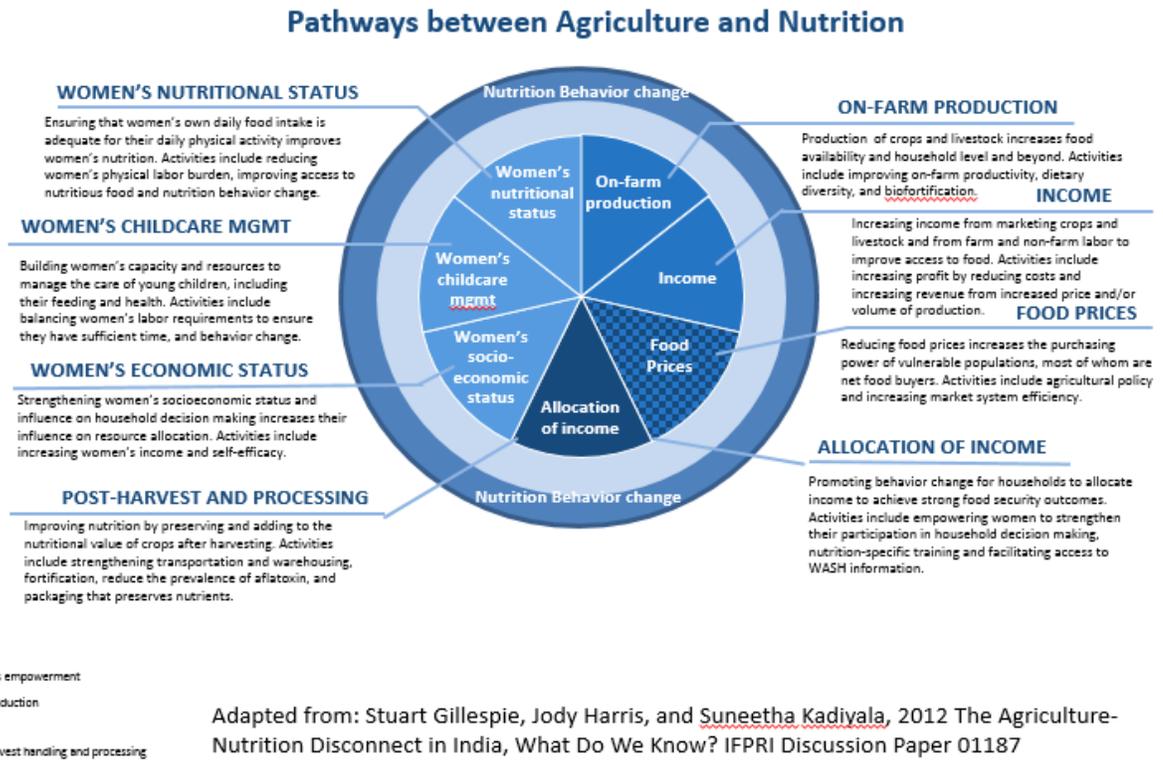
As noted above, the assessment used the FAO (2003) definition of food security, which combines stable (long-term) access, availability and utilization of safe, nutritious and culturally appropriate (preferred) foods. The assessment considered nutrition in terms of the characteristics of the target commodities, and other foods households can purchase for consumption, with their farming income. The analysis evaluated the direct and indirect ways in which commercial smallholder agricultural systems can impact food security and nutrition both directly and indirectly, among producers and the broader population in the target districts, and across the value chain.

1. NUTRITION AND FOOD SECURITY PATHWAYS

Figure 11 specifies eight pathways through which agriculture affects food security and nutrition, which guided the evaluation of how the target crops would contribute to nutrition and food security, with regard to the production and household context in the target districts. Behavioral change touches on all of these, as discussed below. The eight pathways are:

1. Production: The direct impact from consuming household production
2. Income: Household income across agriculture and non-agriculture
3. Food prices: the cost of purchased foods, and output sold
4. Income Allocation: How smallholders choose to spend their income
5. Post-harvest and processing: Preservation of food and its nutrients in on-farm primary processing (e.g., drying) and storage, transportation, marketing, and preparation
6. Women's Economic status: women's role in earning and allocating household income
7. Women's Childcare Management: Women's role in feeding children, a population for which nutrition is particularly critical, and the labor demands this entails
8. Women's Nutritional Status: Whether women's food and caloric intake are sufficient

Figure 11: Agriculture and Nutrition (Food Security) Pathways



2. TARGET COMMODITIES AND NUTRITION/FOOD SECURITY

Production

To assess the impact of production, the team considered the nutritional value of the target commodities. Table 12 presents basic nutrition data. Generally, the FTF initiative is particularly concerned about malnutrition and measures such as stunting, therefore the team looked at the daily values (DV) for Vitamin A, Iron and Zinc, which are essential in early child development, as well as calories, fat and protein. The database the team used (Nutrition Data 2015) also provides an amino acid score that measures protein completeness (scores above 100 denote complete proteins). Groundnuts are a good source of zinc, while animal proteins and pigeon pea are a good source of iron. Animal proteins provide a complete protein, while other foods would need to be combined to obtain a complete protein—underscoring the value of integrated farming systems. Overall, the target commodities provide a nutritious diet. However, fieldwork revealed that producers are more likely to sell than eat some commodities, such as vegetables and small ruminants. Horticulture focus group participants did not express strong awareness of nutritional issues. As such, BCC would be an important component in an intervention, to foster consumption of home production, and the purchase of nutritionally balanced foods in cases where it is more profitable to sell one food and buy another.

Table 12: Nutrition Value of Target Commodities, 100-gm Portions

Commodity	Calories	Fat (g)	Protein (g)	Vitamin A	Zinc Amount and % DV (RDA < 4 yrs)		Iron Amount and % DV ^a (RDA < 4 yrs)		Protein quality: Amino acid score ^b
					6 mos - 3 yrs	4 years and up	1-3 yrs	4 years and up	
				4 years and up					
Eggs, single, raw	143	10	13	487 IU 10%	37%	1.1 mg 7%	28%	1.8 mg 10%	136
Goat meat [roasted]	143	3	27	0 0%	177%	5.3 mg 35%	53%	3.7 mg 21%	116
Lamb [ground, broiled]	283	20	25	0 0%	156%	4.7 mg 31%	26%	1.8 mg 10%	141
Maize, raw kernels [sweet yellow]	86	1	3	187 IU 4%	17%	0.5 mg 3%	7%	0.5 mg 3%	83
Maize flour [Cornmeal, wholegr.]	362	4	8	214 IU 2%	60%	1.8 mg 12%	50%	3.5 mg 19%	Na
Millet, raw grains	378	4	11	0 0%	57%	1.7 mg 11%	43%	3.0 mg 17%	38
Groundnut, raw	567	49	26	0 0%	110%	3.3 mg 22%	66%	4.6 mg 25%	70
Groundnut, roasted, no salt	585	50	24	0 0%	110%	3.3 mg 22%	33%	2.3 mg 13%	70
Groundnut, paste [Unsalted chunky]	589	50	24	0 0%	97%	2.9 mg 19%	27%	1.9 mg 10%	n/a
Pigeon pea, raw seed	343	1	22	28 IU 1%	93%	2.8 mg 18%	74%	5.2 mg 29%	91
Chili pepper, red	40	0	2	952 IU 19%	10%	0.3 mg 2%	14%	1 mg 6%	93
Eggplant, raw	24	0	1	27 IU 1%	6.7%	0.2 mg 1%	2.9%	0.2 mg 1%	67
Cassava leaf, raw*	97	0.9	7.5	286 mcg	23%	0.69 mg 4%	79%	5.5 mg 15%	N/A
Krain krain, raw	Not found								
Potato leaf, raw* [Sweet Potato]	54	0.2	4.4	489 IU mcg	9.7%	0.29 mg 1.9%	51%	3.6 mg 20%	N/A
Okra, raw	31	0	2	375 IU 7%	20%	0.6 mg 4%	11%	0.8 mg 4%	79

^a The RDA for iron for children aged 6-12 mos is 11 mg, while the RDA for children aged 1-3 years is 7 mg.

^b The amino acid score (0 – 100) is a basic measure of protein quality, unadjusted for digestibility or preparation method.

Sources: All from Nutrition Data (2015)²⁵, except * = FAO (2012), and DV % for children under age four calculated per Food and Nutrition Board (2002/2005)

Income and Income Allocation

These two pathways are linked. Agricultural development can help boost incomes and make it easier for families to purchase more and better foods. Smallholders who specialize can buy commodities they do not

²⁵ Nutrition Data uses the USDA's National Nutrient Database for Standard Reference for basic foods. It provides corresponding analyses such as % DV and the amino acid score based on guidance and information from the USDA, FDA, and research..

produce to round out their diets. Improved storage can support income smoothing and expenditure reduction for more of the year. However, more income does not guarantee better diets, since households may not be informed about the value of nutritional foods (and women, who are often responsible for food preparation and child care, are not empowered to participate in decision making, as noted prior). This was something the team heard about in the study areas. As above, education and BCC are important to foster allocation of increased incomes to better foods. Multiple crops in a production system will further support incomes by reducing risk, since the family's income will not depend on a single commodity.

Food Prices

High food prices are a plus for sales but can hinder consumption. It is important to consider prices for foods a household produces, and good substitutes (nutrition wise) for those items in the market. If producers grow high-value commodities, they may be better off economically if they sell more, and use that income to buy less expensive, but still nutritionally adequate foods. For home-produced lower value commodities, producers may fare better if they retain more for consumption. In an integrated system, producers can include both high and low value crops to balance income and expenditure, and improve overall profits. Value-added production can also help boost food prices further. An integrated system stands to help even out food prices by preventing a market glut for a single commodity. Efforts to aggregate traders, and link buyers to sellers, can create efficiencies that improve product affordability for communities, and profits (income) for VC actors.

Post-harvest and Processing

Improper drying can result in aflatoxins in groundnuts, maize and other commodities. Training and testing are important to address this, in any intervention. Given the limited availability of refrigeration in transport and for storage, absolute food losses can be high. Fostering credit access, and strengthening horizontal VC linkages to foster shared financing of necessary facilities, can help address this. BCC may be important with respect to preparation. Several of the Sierra Leoneans on the research team noted that vegetables are traditionally cooked in ways that result in nutrient loss, such as long cooking times. Many B-vitamins, and flavonoids (antioxidants) are water-soluble, and would be lost in cooking water if boiled (Nutrition Data 2015). Households also may not be aware of the need to consume fats with fat-soluble vitamins (A, D, E, K) to ensure uptake (utilization).

Women's Economic Status

This pathway is very relevant to income and allocation, as it concerns what women earn, their decision making power, and how much they can spend at their discretion. Fieldwork found that women in the target areas had mixed, and often limited, control of income. BCC around this issue, and gender sensitization for males, can help the intervention drive nutrition and food security better.

Women's Childcare Management

Incorporating education about child nutrition into an intervention will play an important role in fostering improved childhood nutrition through that intervention. The labor demands that an intervention places on women must also be considered, in terms of both time and physical demands. Integrated farming systems might combine commodities traditionally seen as "men's" and "women's," such as maize and groundnut, so any interventions emphasizing intercropping or integrated farming should take this into consideration. Introduction of labor saving technologies as well as improved processing and storage methods can further allocate more time for women to spend on childcare. Subsidizing these interventions with BCC around

infant and young child feeding will further enable the environment to support good nutrition. Supporting the aggregation of farmers, traders and small processors can further reduce women’s load across the value chain.

Women’s Nutritional Status

This issue dovetails with several pathways, as it relates to how households allocate income and food, and women’s economic status. Women, particularly pregnant and lactating, require additional calories and micronutrients and therefore BCC can help educate influencers in the household to support their food consumption. Much like childcare management, labor saving interventions, which ease the physical burden for women, especially those who are pregnant, will help improve women’s nutritional status. As specified in the 1,000 Days approach, when women of childbearing age have good nutrition, their children are less likely to start life malnourished.

C. CLIMATE CHANGE

Global climate change is a growing concern, and centrally relevant to agriculture. It stands to have negative impacts on production, which would be particularly troublesome for poor smallholders. Additionally, agricultural value chain activities from farm to market can contribute to climate change by increasing greenhouse gasses (carbon dioxide, ozone, methane, nitrous oxide, halocarbons and other industrial gases). Greenhouse gases form a “blanket” in the upper atmosphere, and trap infrared radiation. This increases atmospheric temperature, bringing a cascade of weather effects, such as warmer temperatures (on average), more intense storms, changes in the timing and amount of rainfall, drought, and heavy wind.



There are two types of measures one can take to address climate change:

- a) **Adaptation:** This refers to actions that reduce or prevent the negative impacts of climate change. In agriculture, this includes measures such as adopting drought-tolerant varieties, and switching crops to those more suited to changing conditions. In some cases, actors are able and willing to adapt on their own. In some cases however, actors may need information and assistance to take action
- b) **Mitigation:** This involves reducing or preventing greenhouse gas emissions resulting from human activity. In agriculture, this includes reducing deforestation, increasing soil organic matter to boost sequestration, managing animal wastes in ways that minimize emissions, and other measures.

The agricultural sector is increasingly working to address climate change through practices that jointly foster adaptation and mitigation, while increasing productivity and supporting smallholder livelihoods. This approach is called “climate smart agriculture (CSA) (CCAFS 2013). USAID seeks to incorporate CSA into its programming, particularly through efforts that enhance adaptation, along with mitigation activities where appropriate (USAID 2014/15)

In order to identify interventions that are best positioned to support CSA in the target value chains, this assessment sought to understand a) the specific climate changes that producers and value chain actors have realized to date, b) the effects these have had on small-scale farmers, other VC actors and their communities with respect to livelihoods and food security, c) VC actors’ awareness of climate change and ways to address

it, d) measures VC actors have taken to date, e) climate change effects that are predicted in the future. In order to do so, the team interviewed value chain actors and key informants about impacts to date, and conducted secondary research on demonstrated and predicted effects. The findings and implications are below.

1. FIELDWORK FINDINGS

Fieldwork revealed that smallholders of the target commodities in the Bombali and Tonkolili districts, actors across the relevant value chains, and their communities, are already experiencing the effects of changing weather patterns. Traders, producers and processors noted the following

- Longer and hotter dry spells, negatively impacting crop production
- Heavier rains that damage crops, cause erosion, and delay product transport (sometimes resulting in lost commodities and/or sales) due to washed out roads
- Termite outbreaks due to early rains, leading to crop loss
- Heavier winds that damage crops
- Increased wild fires due to drier conditions during lightning storm times, resulting in lost crops (e.g., fodder)
- Erratic weather that makes it harder to select the best planting date
- Heavier rains that impair animal health
- Heat waves that cause hair loss in animals, especially small ruminants

Smallholders show little understanding of how climate change is defined and what changes are forecasted. Key informant interviews indicate that MAFFS is clearly aware of, and trying to address climate change. However, they are not undertaking education or training to help farmers understand and adjust their practices. Sierra Leone is engaging in the REDD+ process, and has defined a national plan for adaptation (GoSL 2007), including activities related to agriculture. Despite the lack of education and training, value chain actors are taking numerous steps to adapt:

- Purchasing tarps to cover commodities in transit, and building stronger structures to cover stored product
- Building fences for wind protection
- Leaving grass on farms, and planting legumes and trees, to reduce erosion
- Creating fire strips to break wildfires
- Building shelters for animals, and increasing ventilation in animal housing
- Providing animals with extra water in heat spells

In order to help smallholders face climate change, and reduce the negative effects farming can have on the environment, it is important to include principled communications on climate changed impacts to date, projected effects, and steps VC actors can take for adaptation and mitigation. This may require facilitating access to finance to support the implementation of some practices.

2. DATA ON IMPACTS TO DATE, AND MODELS ON FUTURE IMPACTS

Secondary research enabled a robust climate vulnerability and risk analysis, evaluating historical and recent rainfall and temperature patterns and future trends. This analysis served to identify key risk factors based on three components of climate vulnerability: 1) exposure of commodities to a wide range of climate shocks and stresses (droughts, floods, changes in seasonal temperature and precipitation); 2) sensitivity of commodities (i.e., tolerance) to such shocks and stresses, such as heat waves, dry spells, erratic distribution of rainfall, high winds, severe storms, etc.; and 3) adaptive capacity of individuals to draw upon key assets (production inputs,

knowledge of improved farming methods and storage/processing technology, market transport, etc.) to adjust and recover from a myriad of climate risk factors.

There is minimal of observational data from weather stations in Sierra Leone, posing unique challenges in reconstructing climate trends and making predictions, especially at the local level. This directly affects the sector's ability to develop sound strategies to adapt to emerging climate trends.

a. Climate Change Trends to Date

Sierra Leone is located in a humid tropical forest region in West Africa, and therefore has received less attention and lower priority for climate resilience development interventions.

Recent trends indicate that rainfall variability is already increasing. For example, intense rainfall in March (almost unprecedented) disrupted the burning and planting of farmland, and led to serious problems with weed infestation. The Ministry of Finance and Economic Development (MOFED 2009) reported that erratic rainfall caused acute water shortages in Freetown in 2006, and floods in Port Loko and Kambia Districts in 2004. Sierra Leone has less than 1,000 kilometers of paved roads and more than 10,000 kilometers of unpaved roads. Most of the unpaved road network is already has more areas that are impassable during the rainy season with increasing intensity of rainfall events. This affects transportation of agricultural commodities; this is particularly true of more perishable (horticulture) crops.

Summary of Recent Trends for Sierra Leone (World Bank 2015c)

EXTREMES

- Between 1961 and 2000, the number of cold days and nights have decreased over West Africa, while the number of warm days and nights have increased. This affects germination, evaporation, flowering and pollination, among other impact.
- Sea levels have risen along coastal Sierra Leone and have caused loss of property and coastal degradation.

RAINFALL

- Over the past 50 years, Sierra Leone's precipitation regime has become more erratic.
- Between 1951-2000, May through October seasonal precipitation decreased at the Lungi New meteorological station on the northern coast of Sierra Leone.

TEMPERATURE

- Average annual temperature in Sierra Leone has increased by 0.8° C between 1960-2006
- Temperatures over West Africa have risen with greater magnitude during the latter 20 years of the period 1970-2010 than the former.

On the mitigation side, land degradation and deforestation contribute to GHG emissions and also are exacerbating global warming. A recent study in Northern Sierra Leone found that net deforestation was about zero from 2000-2010 (Munro and van der Horst 2012). The report does show that there are local or regional areas of deforestation but fallow regrowth in other areas makes up for those losses. These finding run contrary to the typical narrative about the problem of deforestation in Sierra Leone. This is a critical issue relevant to developing recommending and design adaptation solutions, as it emphasizes the need to look at the bigger picture. Localized deforestation a can lead to land degradation when grazing is introduced or there is increased land pressure. It is critical however not to single out farmers or the domestic forest products traders as the main causal factors behind land degradation and localized deforestation.

b. Climate Change Forecasts

Climate change forecasts are reported by Johnson et al. (2012) and the World Bank (2015c) using various models. Climate change impacts are predicted in Sierra Leone, but are expected to be less severe relative to other West Africa countries, particularly Sahelian West Africa. Mean annual temperatures over West Africa are projected to increase by 3° C to 6° C by the end of the 21st century for both CMIP3 and CMIP5 Global Circulation Models (GCMs, Johnson et al. 2012). In Sierra Leone, by contrast the average annual temperature is projected to increase between 1.0° C and 2.6° C by the 2060s. According the United Nations Environment Program (undated), Sierra Leone could lose between USD 600 million and USD 1.1 billion annually in crop revenues by the end of the century, as a result of predicted climate changes. In many of parts of northern Sierra Leone, including areas within Tonkolili and Bombali, increases in rainfall are projected (World Bank 2015c).

Climate models are not consistent in predicting changes in the average daily maximum temperature in Sierra Leone by 2050 (Johnson et al. 2012). The CNRM-CM3 Model shows an increase of 2.0°–2.5°C throughout the country except for a small portion, mainly in the coastal area. CSIRO Mark 3 and MIROC 3.2 show increases of 1°–1.5°C. ECHAM 5 shows the northern and northeastern regions experiencing greater temperature changes than the rest of the country, with the highest increases ranging from 2.0° to 2.5°C. The average annual temperature is projected to increase by 1.0 to 2.6°C by the 2060s. All climate models project substantial increases in the frequency of days and nights that are considered hot compared to the current climate.

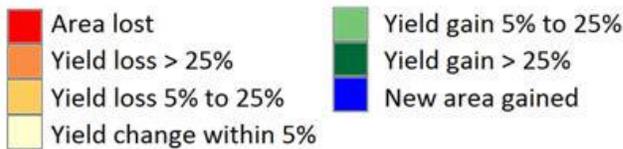
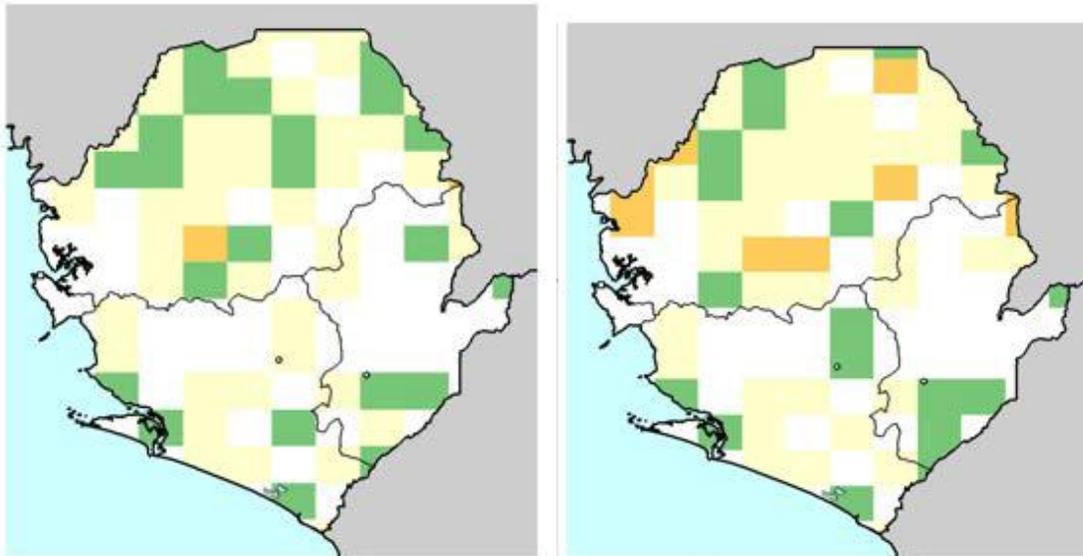
Summary of Projected Climate Trends for Sierra Leone (World Bank 2015c)

- In Sierra Leone, average annual temperature is projected to increase between 1.0° C and 2.6° C by the 2060s and 1.5° C and 4.6° C by the 2090s.
- Mean annual temperatures over West Africa are projected to increase by 3° C to 6° C by the end of the 21st century for both CMIP3 and CMIP5 Global Circulation Models (GCMs) under the A2 and A1B scenarios (CMIP3) and RCP4.5 and RCP8.5 (CMIP5).
- GCM projections for mean annual rainfall over Sierra Leone indicate increases, particularly during the seasons of July-September and October-December.
- By the end of the 21st century many CMIP5 models project mean precipitation over West Africa to increase during the rainy season with a small delay to the start of the rainy season.
- There is low to medium confidence in GCM (global circulation models) projections for heavy rainfall over West Africa by the end of the 21st Century, but RCMs (regional climate models) indicate an increase in the number of days with extreme rainfall in May and July over West Africa.
- Sea level is projected to rise throughout the 21st century and increase by 0.4 m (low emissions scenario) to 0.7 m (high emissions scenario) by 2100.
- ‘Hot’ days and nights are projected to increase substantially throughout the 21st century and increase most rapidly in the months of July-September. By the 2060s ‘hot’ days are projected to occur on 26-63 percent of days and by the 2090s 37-84 percent of days. ‘Hot’ nights are projected to occur on 41-79 percent of nights by the 2060s and 54-92 percent of nights by the 2090s.
- ‘Cold’ days and nights are projected to decrease substantially in frequency and become exceedingly rare throughout the 21st century.

Figure 12: Projected Yield Changes Under Climate Change, Rainfed Rice

MIROC Model

CSIRO Model



Source: Johnson et al. (2012)

The effects of climate change will be mixed. Figure 12 shows rice overall yield gains, for example. However, a 5 to 25 percent yield loss is predicted for groundnuts by 2050. Likewise, climate change would have variable impacts on livestock and pasture lands in Tonkolili and Bombali. For example a precipitation increase could lead to changes in the distribution of disease vectors that could pose new problems for ruminants and other animals. However, in areas that are predicted to be warmer and drier, overgrazing combined with fire could destroy the natural resources base on which herders depend (O'Donnell, Cook and Magistro 2015)

3. CLIMATE-SMART AGRICULTURE INTERVENTIONS

The FTF program should use “climate smart” approaches to production, storage, processing, and transport to assure that economic gains accrue to VC actors. Such practices will need to intensify crop production by increasing efficiencies in soil and water management, enhancing the storage capacity of carbon in soils, trees, and vegetation, and maximizing productivity on less land. Two agricultural practices in particular should be actively supported and integrated within a new regional program strategy by the mission to promote agricultural value chains: intercropping, and agroforestry. Both practices are essential to respond to land degradation. While tree crops are not among the target commodities, intercropping of trees with cereals, legumes, and other crops is practice that can reduce vulnerability to the impacts of climate change.

Agroforestry practices that mix tree crops with cereals and legumes can boost crop productivity by providing shading and lower soil temperatures while simultaneously

Potential interventions to incorporate CSA include:

- Educate producers and technical staff about climate change impacts and projected effects as they relate to agriculture. MAFFS is engaged in this and can be a partner in such efforts.
- Promote short-duration and drought-resistant crop varieties where appropriate, such as groundnut, pigeon pea and grains, that can adapt to changing conditions
- Train producers on production in swamp lands
- Train producers on erosion control practices, such as planting pigeon pea along farm edges
- Train producers on water harvesting, storage and management; and irrigation efficiency
- Facilitate the transfer of information from weather stations to farmers and other VC actors.
- Collaborate with national seed breeding and banking efforts to facilitate the development, dissemination and storage of climate-ready crops and varieties
- Promote sustainable intensification over extensification

Any intervention should be conducted in collaboration with GoSL and MAFFS, as many of the above are element of Sierra Leone's climate adaptation program (GoSL 2007). This program also calls for the development of irrigation infrastructure, boreholes, and land management plans, all of which have implications for agricultural development work.

The fieldwork and secondary data concur that VC actors are facing the impacts of climate change, and that these will increase in the future. Strengthening small-scale producers' capability to adapt to climate change and designing interventions that do not increase emissions but support sequestration are critical. This makes good business sense by reducing disruption in supply chains, and improves the ability for smallholders and other VC actors to secure their livelihoods in the face of a changing climate. This, in turn, safeguards community livelihoods and food security.



D. EBOLA

The effects of Ebola (EVD) on the target communities are both direct and indirect, and range from short term to longer term. These include death and illness, low sales due to travel restriction, low output due to inability to go to farming plots, and decreased nutrition as a result of a ban on bush meat. Recovery efforts have been put in place to address the more severe effects. Some of these effects stand to constrain program outcomes, while other effects, and recovery programs, point to jumping off points for the program.

Overall, the World Bank (2105) reports that EVD shifted the economy from consistent growth to a 2.8 percent economic contraction in 2014, and a projected two percent contraction in 2015. This will have a generalized effect on reducing economic wellbeing, and thus VC actor incomes, in the near future. Fieldwork and secondary research identified specific economic effects on the target districts. The major impacts on producers and other VC actors stem from travel restrictions and market closures, as the field team heard this in many interviews. Government-mandated market closures resulted in ongoing lost income across value chains. FEWSNET (2015) has conducted regular market/trader surveys and identified varying degrees of

closures. In early August government allowed the reopening of markets, except on Sundays, so the situation should improve. Travel restrictions impacted two growing seasons by reducing the sale/revenue from one harvest and farmers' abilities to buy seeds and inputs for the next season. Some farmers also could not go to their fields due to quarantines. These have been eased gradually. As such, producers and other VC actors can be expected to be cash constrained in the near term, and demand may also be depressed. Incorporating access to finance, and ongoing demand surveys into an intervention can help the program address these. A ban on bushmeat reduced protein consumption and bushmeat trader income in particular. This makes the development of animal and plant protein value chains particularly important, for nutrition as well as income.

Numerous recovery efforts have been underway, such as the provision of free food and seeds; and cash transfers. These efforts are providing VC actors and consumers with an immediate source of support to reignite production, marketing and demand. However, these interventions are meant to be short-term, meaning that it is particularly essential to implement projects that foster self-sustaining, mutually beneficial value chains. FTF is poised to meet this very need, and move communities from acute recovery phase to longer-term sustainability, given the timing. Broad-based value chain facilitation, and capacity building for community ownership are needed to achieve this.

There is evidence that dietary pattern shifted, apart from the ban on bush meat. Some interviewees referenced taboos about sourcing from areas with Ebola cases. The FTF program should include an evaluation of such beliefs in communities, and behavioral change communications to move consumers back to such foods.

X. SUMMARY FINDINGS AND POTENTIAL INTERVENTIONS

KEY FINDINGS

- A diversified, integrated production system would have broad-based benefits for producers and other value chain actors, and is an excellent approach to take. It would allow for risk diversification, income smoothing, home nutrition and food security, and broad market opportunities.
- Farmers in the target districts can produce the target commodities competitively, and there is strong market demand for them. Thus, there is potential for upgrading, and inclusive growth.
- Upgrading is needed across the value chain, from production through marketing, to drive efficiency and incomes, to reduce poverty.
- There are many common constraints across value chains, particularly access to finance (to support modern practices), technical capabilities and market linkages.
- Farmers in both districts are already producing such an integrated system, but are not using modern practices due to limited resources and training. As a result, yields are low and post-harvest losses are high.
- Storage and post-harvest loss are major issues across value chains and must be addressed.
- Several commodities have the potential for on-farm value addition, which can raise incomes and further diversity market opportunities.
- Some chains provide opportunities for youth income generation and employment, such as groundnut paste production.
- The private sector is thin and affected by government intervention. This is particularly the case for inputs such as fertilizer.
- Women's empowerment and gender must be addressed in any programming. They bear the brunt of labor, particularly for vegetables and groundnuts, but do not have control over land, income or other assets. They also factor highly in retail, and trade in some cases, so such efforts must cover the value chain.
- Climate change impacts have not been severe to date but have begun. Thus, efforts to support adaptation are important and will position producers well for the future.

POTENTIAL INTERVENTIONS

The following interventions address key issues and constraints identified in this research, and important to consider for FTF programming. Many are linked, and thus should be implemented in concert, to achieve positive, optimal outcomes.

- Facilitate access to pre-season finance (via VC actors and finance institutions) for seeds, fertilizer, storage bags and livestock stocking; to increase output and profits. This was the major constraint the team saw across commodities. Value chain financing and financial institutions seem to be the most sustainable sources of financing.
- Foster market linkages. Many farmers and traders indicated that they had few buyers, and/or wanted more direct buying relationships. Such relationships would foster mutual gains in terms of efficiency,

quality and mutual profits. The cost/benefit of direct sales must be evaluated, as these require the buyer or seller to bear transport costs that an intermediary would otherwise cover.

- Provide technical and financial training to farmers and linked VC actors, in dual-gender/joint spouse training. Producers showed a keen willingness to learn about better practices and to be able to access pre-season financing. TechnoServe has found that joint spouse training (Coffee initiative, East Africa) drives higher women's empowerment in the household, and higher farm output. Mutual understanding across the supply chain can return mutual gains.
- Organize farmers for collective post-harvest processing and marketing, and build capacity for ownership and management of collective ventures. Basic post-harvest processing such as shelling and drying peanuts can deliver measurable added income. Appropriate facilities, such as clean drying areas, are essential. Foster the expansion of ABCs to the target commodities, with the provision of business and management training, and democratic leadership and decision-making structures. This will enable farmers to take ownership of ABCs and undertake sustained operations with equitably shared benefits.
- Facilitate on-farm value addition, and improved post-harvest handling and storage. Simple processing such as making groundnut paste and grain flour can diversify income streams and boost incomes. Post-harvest handling must be improved with respect to food safety and quality. High post-harvest losses, due to insects and rats, can be prevented through better bags. This would facilitate better storage, enabling off-season sales that yield higher prices and income smoothing.
- Facilitate development of independent private sector input/service producers, with consideration for tactics that help private suppliers compete in distorted markets, and address this distortion. This was identified as another key gap that negatively affects outcomes, especially among poor farmers. The government has intervened in the fertilizer sector in particular, limiting the number of enterprises, which negatively impacts prices and availability. The continued provision of large amounts of free and subsidized inputs, by NGOs and government, has distorted markets and makes them unattractive/non-competitive for the private sector. In a recent report on Ebola effects on the agricultural sector, Mercy Corps (2015) note this issue, and recommended vouchers as a means of addressing this. Producers would use vouchers that offset part of the cost to purchase goods from private firms, maintaining purchasing behavior and fostering a buyer-seller relationship. At the same time, it is critical to engage the government in changing policy to reduce distortion, and promote free competition that draws more suppliers to the sector. Private sector development in inputs and service provision can also cover gaps in extension and veterinary services (due to limited funding at MAFFS), and supplies of animal inputs such as vaccines.
- Facilitate the development of financial products tailored to agriculture, with features such as longer pay-back times to enable end of season repayment. Other products such as savings and weather (index) insurance would be valuable. Mobile banking can be scaled up to reach more rural households (e.g., MPESA in East Africa), though ICT limitations affect potential reach at present. As part of this, train farmers and lenders on each other's respective areas, so they can engage more confidently and successfully.
- Advocate for implementation of MAFFS' gender policy. MAFFS stated that they have a defined gender policy but need resources and support to implement. Gender issues are significant across agricultural value chains and must be addressed in sustainable ways.
- Foster smallholder-friendly climate adaptation such as planting hedgerows to mitigate strong winds, using drought tolerant varieties/crops (e.g., pigeon pea), and planting along farm edges to address erosion.
- Facilitate in particular the re/inclusion of communities that were highly affected by Ebola, particularly due to stigma associated with areas of high incidence, such as Tonkolili and quarantined communities. Help transition households receiving emergency Ebola support, such as free inputs and food, back to market-based systems.

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APPENDICES: INTERVIEWS, TEAM, SURVEY TOOLS

A. LIST OF FARMER GROUP INTERVIEWS BY LOCATION AND COMMODITY/ISSUE

Day	Group: Unaffiliated or FBO Name	District	Chiefdom	Sub-chiefdom	Community	Focus Groups
30 July	One World women's group, others	Bombali	Bombali Seborah	Kagbaran Dokom B (Kagbarah)	Gbanka Potho	Grain, Hort, Legumes, Inputs-services, Gender
30 July	NEPTICS HIV/AIDS Network of women	Bombali	Bombali Seborah	Kagbaran Dokom B (Kagbarah)	Makambo	Hort, Legumes/Grain, Women
30 July	Tarma-Tuma ABC: Tamaraneh FBO Tuma FBO	Bombali	Paki Masabong	Masabong	Makeni Lol	Hort, Legumes, Inputs-Services, Gender
31 July	Unaffiliated	Bombali	Gbendembu Ngowa		Fore Road Loko	
31 July	Mamasiyanday Farmers Association Kargbo Women Farmers Association Hulyhuthy Farmers Association	Bombali	Safroko Limba		Kagbo	Hort, Legumes, Inputs-Services, Gender
31 July	Mathantiaday Group Mobolie Youth Farmers	Bombali	Biriwa	Kamabai	Kamanko/Mabolie	Grain/Inputs-Services, Hort, Legumes,
31 July	Debiyona ABC (non-functioning; 4 FBOs)	Bombali	Biriwa	Kamabai	Masamarankay	Individual interview w/ group

1 Aug	Farmer group	Tonkolili	Konike	Kunike Barina	Makali	Grain/Inputs-Services, Hort, Legumes,
3 Aug	5 FBOs- Rosint Farmers Associations Tayorgbo Farmers Association Robis Farmers Associations Tawoponeh Farmers Association Tantry Farmers Associations	Tonkolili	Tane	Matotaka	Matotaka	Animal/Inputs-Services, Grain, Hort, Legumes
4 Aug	Kabala Vegetable Women Co-operative Livestock farmers & traders	Koinadugu	Wara Wara		Kabala	Animal, Group interview w/women
5 Aug	Multiple trader and producer groups, Our Future MFI	Tonkolili	Yoni	Gaidema	Mile 91	Animal, Grains, Hort, Legumes, Gender

B. LIST OF INDIVIDUAL/ORGANIZATIONAL INTERVIEWS

Producers

Big Thing Poultry
Bumbuna Poultry
Chekkad Poultry
Glorious Poultry
Pa Jah Poultry
Sierra Akker Food Processing

Producer Organizations

National Federation of Farmers
Debiyona ABC
Tarma Tuma ABC

Manufacturers

Bennimix
Project Peanut Butter

Input Providers

Carda Agrodealership
Inputs Dealers Association
Seed Multiplication Unit
Seed-Tech International, Main office, Freetown
Seed-Tech International, Makeni Representative
Stadar Agrodealer Agency

Equipment Manufacturers

Finnac

Medical (Malnutrition)

Makeni Regional Hospital

Financial Institutions

Apex Bank
Bank of Sierra Leone
BRAC Microfinance Institution (MFI)
Ecobank MFI
Future in Our Hands MFI
Gbendembu Financial Services Association (FSA)
Rokel Commercial Bank
Salone MFI
Sierra Leone Commercial Bank
Union Trust Bank

Government

Bombali District Council
MAFFS Agribusiness
MAFFS Crops division
MAFFS Livestock Division
MAFFS District Agriculture Officer, Bombali
MAFFS District Livestock Officer, Bombali
MAFFS District Extension, Bombali
MAFFS District Agriculture Officer, Koinadugu
MAFFS District Agriculture Officer, Tonkolili
MAFFS District Livestock Officer, Tonkolili
MAFFS District Veterinary Assistant, Bombali
Sierra Leone Ministry of Gender

NGOs and Institutions

African Development Bank
Caritas
Food and Agriculture Organization of the United Nations
Sierra Leone Chamber of Agricultural Development (SLeCAD)
SOBA, Adam Smith International
Sustainable Agriculture and Nutrition Program (SNAP, ACDI/VOCA)
World Bank

C. TEAM MEMBERS

Field Team

Melissa A. Schweisguth	Team Lead, Grain VC
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D. FIELD SURVEY INSTRUMENTS

1. Quantitative data forms

2. Qualitative data form for traders/retailers (legume example)

1a. Value Chain Assessment Data Sheet: Sierra Leone Producers

Date _____ Surveyor _____

Survey ID (VC/Issue + number, e.g. AV1) _____ AV, GV, HV, LV; IS; CC, GN, FI, PO

Interviewee Name: _____

Business and Title (if applicable): _____

Age: _____ Gender F M

Highest Education: University Secondary Grade ____ Primary Grade __ none ____

District: _____ Chiefdom: _____ Sub-Chiefdom (Section) _____

GIS Latitude _____ Longitude _____

A. Farmers

1. HH members M__ F ____ Adult _____ youth (< 18) _____
2. Farm size _____
3. Years producing _____
4. Land tenure Own/Family Rent Sharecrop % share ____ Other _____
5. % land irrigated
6. Distance to input supplier (km) _____ to vet (km) _____ (state if N/A)
7. Production and Sales

Commod. Name	Commo. ha	Animals		Services Used	Inputs used	Qty sold last season. State UNITS	Total Revenue for commodity last season	% Post-Harv Loss
		Type	Num					
				Tilling Planting Spraying	Fertilizer Insecticide Fungicide Herbicide			

				Harvest- ing Post-Harv Oth:	Imp. Seed Oth:			
				Tilling Planting Spraying Harvest- ing Post-Harv Oth:	Fertilizer Insecticide Fungicide Herbicide Imp. Seed Oth:			
				Tilling Planting Spraying Harvest- ing Post-Harv Oth:	Fertilizer Insecticide Fungicide Herbicide Imp. Seed Oth:			
				Tilling Planting Spraying Harvest- ing Post-Harv Oth:	Fertilizer Insecticide Fungicide Herbicide Imp. Seed Oth:			

8. Prices

Commodity/Animal Name	Unit	High Unit Price Le	High Unit Price Month/s (1-12, Jan-Dec)	Low Unit Price Le	Low Unit Price Month/s (1-12, Jan-Dec)

9. End markets

Commodity/Animal Sold	Number of Buyers		% sold in district	% sold to other districts	% exported	Profits
	M	F				

Buyer Names _____

In country end market Locations

District: _____ Chiefdom: _____ Sub-Chiefdom/City _____

1b. Value Chain Assessment Data Sheet: Sierra Leone, Producer Groups

Date _____ Surveyor _____

Survey ID (VC/Issue + number, e.g. AV1) _____ AV, GV, HV, LV; IS; CC, GN, FI, PO

Interviewee Name: _____

Business and Title (if applicable): _____

Age: _____ Gender F M

Highest Education: University Secondary Grade ___ Primary Grade ___ none ___

District: _____ Chiefdom: _____ Sub-Chiefdom/Section _____

GIS Latitude _____ Longitude _____

1. Number of Members _____ M _____ F _____
2. Leadership _____ M _____ F _____
3. Purchases: Quantity and Cost

Commodity Purchased	Qty purchased	Qty Unit	Average unit cost	High unit cost Le	High cost Month/s (1-12, Jan-Dec)	Low unit cost Le	Low unit cost Month/s (1-12, Jan-Dec)

Member/Seller Locations

District: _____ Chiefdom: _____ Sub-Chiefdom/City _____

4. Sales: Quantity and Price

Commodity Sold	Qty Sold	Qty Unit	Average unit price	High Price Le	High price Month/s (1-12, Jan-Dec)	Low Price Le	Low price Month/s (1-12, Jan-Dec)

5. End markets

Commodity Sold	Number of Buyers		% sold in district	% sold in other districts	% ex-ported	Gross Revenue	Profits
	M	F					

Buyer Names _____

In country end market Locations

District: _____ Chiefdom: _____ Sub-Chiefdom/City _____

District: _____ Chiefdom: _____ Sub-Chiefdom/City _____

Export market Locations

Country: _____ Region: _____ City _____

Country: _____ Region: _____ City _____

1c. Value Chain Assessment Data Sheet: Sierra Leone. Traders Distributors, Retailers

Date _____ Surveyor _____

Survey ID (VC/Issue + number, e.g. AV1) _____ AV, GV, HV, LV; IS; CC, GN, FI, PO

Interviewee Name: _____

Business and Title (if applicable): _____

Age: _____ Gender F M

Highest Education: University Secondary Grade ___ Primary Grade ___ none ___

Employees M _____ F _____

District: _____ Chiefdom: _____ Sub-Chiefdom/Section _____

GIS Latitude _____ Longitude _____

1. Purchases: Quantity and Cost

Commodity Purchased	Qty purchased	Qty Unit	Average unit cost	High unit cost Le	High cost Mo/s (1-12, Jan-Dec)	Low unit cost Le	Low unit cost Mo/s (1-12, Jan-Dec)

2. Sourcing

Commodity Purchased	Number of Suppliers		% from district	% from other districts	% imported
	M	F			

Supplier Names _____

In-country Supplier Locations

District: _____ Chiefdom: _____ Sub-Chiefdom/City _____

Import Supplier Locations

Country: _____ Region: _____ City _____

Country: _____ Region: _____ City _____

Country: _____ Region: _____ City _____

3. Sales: Quantity and Price

Commod- ity Sold	Qty Sold	Qty Unit	Average unit price	High Price Le	High price Month/s (1-12, Jan-Dec)	Low Price Le	Low price Month/s (1-12, Jan- Dec)

4. End markets

Commodity Sold	Number of Buyers		% sold in district	% sold to other districts	% exported
	M	F			

Buyer Names _____

In country end market Locations

District: _____ Chiefdom: _____ Sub-Chiefdom/City _____

Export market Locations

Country: _____ Region: _____ City _____

Country: _____ Region: _____ City _____

Country: _____ Region: _____ City _____

1d. Value Chain Assessment Data Sheet: Sierra Leone, Processors/Manufacturers

Date _____ Surveyor _____

Survey ID (VC/Issue + number, e.g. AV1) _____ AV, GV, HV, LV; IS; CC, GN, FI, PO

Interviewee Name: _____

Business and Title (if applicable): _____

Age: _____ Gender F M

Highest Education: University Secondary Grade ____ Primary Grade __ none ____

District: _____ Chiefdom: _____ Sub-Chiefdom/Section _____

GIS Latitude _____ Longitude _____

1. Purchases: Quantity and Cost

Commodity Purchased	Qty purchased	Qty Unit	Average unit cost	High unit cost Le	High unit cost Month/s (1-12, Jan-Dec)	Low unit cost Le	Low unit cost Month/s (1-12, Jan-Dec)

2. Sourcing

Commodity Purchased	% from district producers	% from other districts	% imported

Supplier Names _____

Supplier Locations

District: _____ Chiefdom: _____ Sub-Chiefdom/City _____

3. Sales: Quantity and Price

Commodity Sold	Qty Sold	Qty Unit	Average unit price	High Price Le	High price Month/s (1-12, Jan-Dec)	Low Price Le	Low price Month/s (1-12, Jan-Dec)

4. End markets

Product Sold	Num. of Buyers		% sold in district	% sold to other districts	% exported	Gross Revenue	Profits
	M	F					

Buyer Names _____

In country end market Locations

District: _____ Chiefdom: _____ Sub-Chiefdom/City _____

District: _____ Chiefdom: _____ Sub-Chiefdom/City _____

District: _____ Chiefdom: _____ Sub-Chiefdom/City _____

Export market Locations

Country: _____ Region: _____ City _____

Country: _____ Region: _____ City _____

Country: _____ Region: _____ City _____

2. Trader Questions (Legume Example, B. James)

1. What type of grain legume products are you trading in and for how long

Prompt responses on duration e.g., <3 years; 2= 3-5 years; 3= 5-10 years; 4= > 10 Years

Products you sell	Ground-nut	Pigeon pea	Cowpea	Soyabean	Duration
Unshelled pods					
Shelled dried seeds					
Snack foods (on the go)					
Cooking oil					
Peanut butter					
Bennimix					
Other (specify)					

2. Which of the products do you want to sell but are unavailable from your suppliers?

Prompt response: probe to know why s/he wants to sell that product

Products you sell	Groundnut	Pigeon pea	Cowpea	Soyabean
Unshelled pods				
Shelled dried seeds				
Snack foods (on the go)				
Cooking oil				

Peanut butter				
Bennimix				
Other (specify)				

3. What kind of market do you usually go to sell the products?

Prompt responses: Factories; Periodic markets; Daily village/town markets; Road side markets; Street markets

Products you sell	Groundnut	Pigeon pea	Cowpea	Soyabean
Unshelled pods				
Shelled dried seeds				
Snack foods (on the go food)				
Cooking oil				
Peanut butter				
Bennimix				
Other (specify)				

4. What quality/preferences do your consumers look for in the products you sell? (try and rank)

Products you sell	Taste	Colour	Storability	Size	Cleanliness (unblemished)	Others (specify)
Unshelled pods						

Shelled dried seeds						
Snack foods (on the go)						
Cooking oil						
Peanut butter						
Bennimix						
Other (specify)						

5. Are these products always available in the market that you sell and at what periods?

Products you sell	Yes or No	Period of availability ((e.g., rainy, dry season, both))	Period of scarcity (e.g., rainy, dry season, both)
Unshelled pods			
Shelled dried seeds			
Snack foods (on the go)			
Cooking oil			
Peanut butter			
Bennimix			
Other (specify)			

6. What are the sources of the products you sell?

Prompt responses: District Chiefdom Section/sub-chiefdom Own farm Own agro-processing unit Contact farmers Retailers/open markets (name the location of the market) Wholesalers

Products you sell	Groundnut	Pigeon pea	Cowpea	Soyabean
Unshelled pods				
Shelled dried seeds				
Snack foods (on the go)				
Cooking oil				
Peanut butter				
Bennimix				
Other (specify)				

7. How often do you buy grain legume products from your source (s)?

Products	Daily	Weekly	Monthly
Unshelled pods			
Shelled dried seeds			
Snack foods (on the go food)			
Cooking oil			
Peanut butter			

Bennimix			
Other (specify)			

8. Do you have any agreement with your suppliers? Yes or No

If yes, is the agreement verbal or Written

If No, state your reasons for this _____

9. Are you willing to have written agreement with the product suppliers? 1= Yes or No

10. What specific terms and conditions would you like to see in an agreement with a supplier?

Prompt responses: Price Quantity and frequency of transaction (e.g. x tons/week) Product specifications (e.g., colour, odour, moisture content, etc.) Packing specifications (e.g., cups, 50-kg bag, 100-kg bag,

11. In terms of availability/delivery of products how do you rate your supplier(s) for the product(s) you buy?

Products	Very reliable	Fairly reliable	Unreliable
Unshelled pods			
Shelled dried seeds			
Snack foods (on the go food)			
Cooking oil			
Peanut butter			

Bennimix			
Other (specify)			

12. In terms of quality of the products how do you rate your supplier(s) for the product(s) you buy?

Products	Very reliable	Fairly reliable	Unreliable
Unshelled pods			
Shelled dried seeds			
Snack foods (on the go food)			
Cooking oil			
Peanut butter			
Bennimix			
Other (specify)			

13. Have you changed the previous supplier(s) of the product(s) to a/new one(s)? Yes or No

IF YES, give your reasons for the change.

Products	Reasons for the change
Unshelled pods	
Shelled dried seeds	
Snack foods (on the go)	

Cooking oil	
Peanut butter	
Bennimix	
Other (specify)	

14. What services do you provide to your suppliers?

Prompt responses: Credit; Labour Packaging materials; Business advice;

Product	Groundnut	Pigeon pea	Cowpea	Soyabean
Unshelled pods				
Shelled dried seeds				
Snack foods (on the go)				
Cooking oil				
Peanut butter				
Bennimix				
Other (specify)				

15. By what means do you usually transport the products from your supplier to your shop/store?

Products	Suppliers deliver	Public transport	Private transport	Other (specify)
Unshelled pods				
Shelled dried seeds				
Snack foods (on the go)				
Cooking oil				
Peanut butter				
Bennimix				
Other (specify)				

16. Do you have any storage facilities for the products you buy? Yes or No

IF YES, list the type(s) of storage facilities.

Products	Type of storage facility (code)
Unshelled pods	
Shelled dried seeds	
Snack foods (on the go)	
Cooking oil	
Peanut butter	
Bennimix	
Other (specify)	

17. What other costs do you incur in trading the products? (tick)

Products	Storage	Market dues	Others (specify)
Unshelled pods			
Shelled dried seeds			
Snack foods (on the go)			
Cooking oil			
Peanut butter			
Bennimix			

Other (specify)			
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18. Do you re-package the products before you sell them?

Products	Yes	No
Unshelled pods		
Shelled dried seeds		
Snack foods (on the go food)		
Cooking oil		
Peanut butter		
Bennimix		
Other (specify)		

19. Have any of your customers ever rejected any batch of the products you sell

Prompt responses: probe to know which customer rejected the product and why? Was it because of price, quality, untimely delivery, storage effects, source of the supplier

Products	Yes	No
Unshelled pods		
Shelled dried seeds		
Snack foods (on the go food)		
Cooking oil		

Peanut butter		
Bennimix		
Other (specify)		

20. What improvements would you want to see in the quality of the products that you sell?

Products	Type of improvement
Unshelled pods	
Shelled dried seeds	
Snack foods (on the go food)	
Cooking oil	
Peanut butter	
Bennimix	
Other (specify)	

21. Do you receive any information on sources of the products you sell on the markets?

Products	Yes	No
Unshelled pods		
Shelled dried seeds		
Snack foods (on the go food)		
Cooking oil		
Peanut butter		
Bennimix		

Other (specify)		
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IF YES, what are your sources of information?

Products	Extension	Market	Farmers	Media	Other (spec.)
Unshelled pods					
Shelled dried seeds					
Snack foods (on the go)					
Cooking oil					
Peanut butter					
Bennimix					
Other (specify)					

22. Do you get loan for your legume business? Yes or no

IF YES, indicate source and type of loan

Products	Type of loan (Money/credit, Equipment)	Source (e.g., Financial institution, Money lender, Neighbour, Relative, Government, NGO, Customer)
Unshelled pods		
Shelled dried seeds		
Snack foods (on the go)		
Cooking oil		
Peanut butter		
Bennimix		
Other (specify)		

23. What are the main constraints you face in selling the products?

Product	Constraints	Solutions: What should be done to overcome these constraints
Unshelled pods		
Shelled dried seeds		
Snack foods (on the go)		
Cooking oil		
Peanut butter		
Bennimix		
Other (specify)		

24. Do you belong to any association? Yes or no

If yes what motivated you to be part of the platforms?

1. _____
2. _____
3. _____

25. What kinds of assistance will make your business to grow and make more profit?

26. Questions and comments by the respondents to the interviewer