FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

Feed the Future Mozambique Agricultural Innovations Activity (FTF Inova)

VALUE CHAIN ANALYSIS

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USAID FROM THE AMERICAN PEOPLE

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Acronyms

AICAJU	Cashew Industry Association (*Associação dos Indústriais de Cajú*)
API	Association of Producers Ikuru
BRC	British Retail Consortium
CAL	Corredor Agro Mozambique Lda.
CPP	Crop Protection Product
CLUSA	Cooperative League of the USA
ECF	Emerging Commercial Farm
ETG	Export Trading Group, operating in Mozambique as Export Marketing Group
EU	European Union
FTF	Feed the Future
FTF Inova	Feed the Future Mozambique Agricultural Innovations Activity
Ha	Hectare
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IIAM	Mozambique Institute of Agricultural Research (*Instituto de Investigação Agrária de Moçambique*)
IITA	International Institute for Tropical Agriculture
INCAJU	Institute for the Production and Promotion of Cashew
InovAgro	Mozambique Innovation for Agribusiness
IPAC	Portuguese Institute of Accreditation
K2	Klein Karoo
Kg	Kilogram
LCF	Large Commercial Farm
MASA	Ministry of Agriculture and Food Security (*Ministério da Agricultura e Segurança Alimentar)*)
MOU	Memorandum of Understanding
MT	Metric Ton
MZN	Mozambique New Metical
NGO	Non-Governmental Organization
RCN	Raw Cashew Nut
SADC	Southern African Development Community
SEMEAR	Feed the Future Mozambique Improved Seeds for Better Agriculture
SGS	*Société Générale de Surveillance*
SHF	Smallholder Farmer
SME	Small and Medium Enterprise

SNV	*Stichting Nederlandse Vrijwilligers,* now operating as SNV Netherlands Development Organization
TECAP	*Tecnologia e Consultoria Agro-Pecuária, Lda.*
USAID	United States Agency for International Development
USEBA	Basic Seed Unit *(Unidade de Semente Básica*, part of IIAM*)*
VCA	Value Chain Analysis
VSLA	Village Savings and Loan Association
ZOI	Zone of Influence

1. Introduction

1.1. Background and Purpose of the Assessment

The United States Agency for International Development (USAID) Feed the Future Mozambique Agricultural Innovations Activity (FTF Inova) seeks to increase equitable, pro-poor agricultural growth by linking private and public actors to create more effective value chains in high-priority sectors. FTF Inova takes a flexible, portfolio-based approach to identify value chain development opportunities that would benefit smallholder farmers (SHFs) and women, and uses technical assistance and project funds to buy-down risk and scale-up innovative inclusive growth activities.

As part of FTF Inova's inception, the team conducted a value chain assessment which consisted of analyses of the eight Feed the Future (FTF) target value chains (pigeon pea, common bean, soybean, bananas, sesame, cashew, groundnut, and cowpea), with a special focus within the FTF target Zone of Influence (ZOI) (see Figure 1).

FTF Inova's approach to value chain analysis (VCA) built directly upon the initial findings and recommendations of USAID's global Leveraging Economic Opportunities agricultural VCA in Mozambique. In addition, a number of other value chain studies have been completed across the FTF ZOI provinces and districts, including market studies from the Swiss Agency for Cooperation and Development-funded Innovation for Agribusiness (InovAgro) project, the USAID Southern Africa Trade and Investment Hub activity, the USAID Southern Africa Seed Trade activity, and TechnoServe's projects (such as their comprehensive August 2016 Mozambique Cashew Industry Analysis). This assessment incorporates key results of these other research reports into the value chain strategies to support the development of FTF Inova's Year 1 Work Plan, but does not necessarily provide a comprehensive summary of all the other value chain studies that have been recently conducted in Mozambique.

1.2. Objective of the Analysis

The primary objective of the VCA was to generate an initial strategy for interventions that would: yield short-term results; test critical assumptions about the evolving market system dynamics through direct engagement with market actors; and allow FTF Inova's team to develop its longer-term strategy and activity design accordingly.

The first section of the VCA provides an overview of the current Mozambican agricultural market system and value chain structures and dynamics, focusing on key cross-cutting market systems such as input supply, seed sector, financial services, business support services, and logistics. The Detailed VCAs presented in section four provide more in depth analysis for each of the eight FTF value chains.

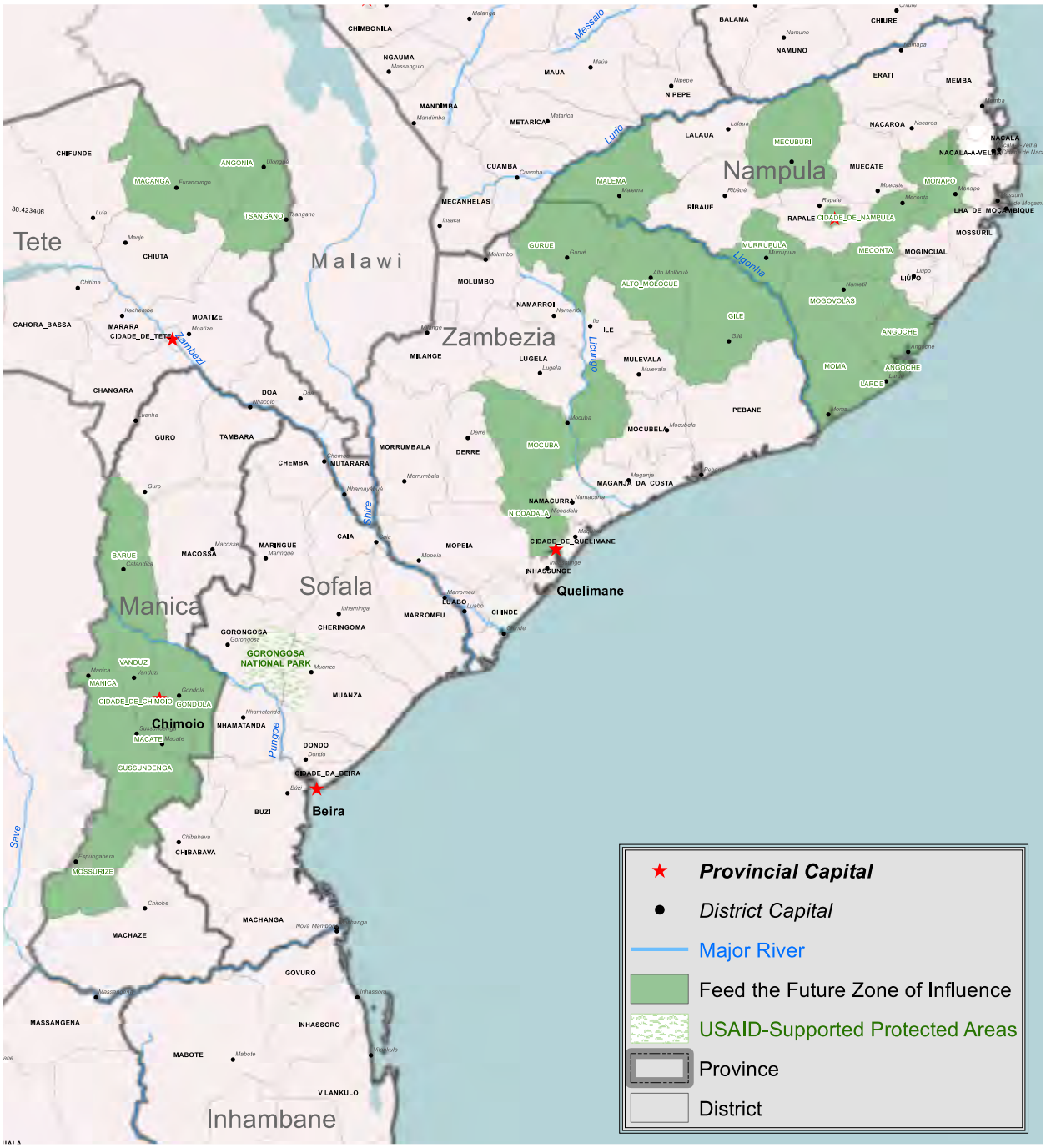
Research for each value chain is based on criteria of: *Competitiveness potential* (export or domestic market growth potential; long term competitiveness potential in export or domestic markets; upgrading potential to increase productivity and/or reach higher value segments; and potential to attract investment); *Development impact* (scalable impact on SHFs; potential to increase incomes; participation or potential for participation of many women; contribution to improved food security; and opportunities for domestic backward linkages and job creation); and *Feasibility* (prospects for future replication/adoption without donor assistance; potential to generate impact within 3-5 years; and alignment with national government priorities).

1.3. Methodology of the Assessment

The research and analysis process was iterative, beginning with a review of the literature related to the eight targeted value chains. After desk research, the assessment team conducted key stakeholder meetings with: agro-dealers and input suppliers, farmer cooperatives in select value chains, emerging and contract farmers, commercial farmers, certified GlobalGAP consultants, retailers, supermarkets, agro-processors/pack houses

and exporters, agri-investors, key host government staff, and a wide range of development partners supporting the Mozambican agriculture sector including donors, implementing partners, and local Non-Governmental Organizations (NGOs).

Figure 1: Feed the Future Zone of Influence



2. Current Mozambican Agricultural Market System and Value Chain Structure and Dynamics

This first section of the VCA provides an overview of the current Mozambican agricultural market system and value chain structures and dynamics, focusing on key cross-cutting market systems such as input supply, seed sector, financial services, business support services, and logistics. The assessment team selected these issues for upfront discussion because they in general are shared across all of the FTF value chains, and provide an overview to understanding Mozambican market systems and value chain structures and dynamics. Some of the key cross-cutting market systems that have value chain specific nuance (e.g. the need for strengthened certification systems, where British Retail Consortium [BRC] certification is important cashew export, but organic/fair trade certifications are important for sesame export) are discussed in more detail in each value chain's respective detailed VCA, presented in section four.

2.1. Commodity Trading and Export

Agricultural marketing in Mozambique is very fragmented, with many intermediaries handling crops between the farmer and the end-market, making it difficult for effective communication of end-market demand down to the farmer. The top of marketing channels for all non-perishable export oriented crops (pigeon pea, sesame, cashew, etc.) are dominated by few large companies, primarily Export Trading Group (ETG[1]) and Olam, followed by a larger number of smaller exporters. ETG and Olam are international commodity traders with a strong presence across Africa, and have strong end-market relationships with buyers in key markets such as India, China, Indonesia, and Vietnam, making them strong potential partners. However, as they are also accessing supply from most of the countries in Africa, these mega trading companies can switch their sources of supply to the most favorable countries, depending on where the best prices are to be found (a function of varying exchange rates and local productivity). Their dominant position in the market and special relationships with key government ministries and many donors allows them to exert power on the value chains. A recent development to note though, according to the General Director of Olam Mozambique, is that Olam has announced that they will be withdrawing from trading in pulses, including pigeon pea, on a global level.

With such a dominant position, the large exporters may be strong points of leverage to reach SHFs. However, as they have limited competition, they often try to exert their power in the value chain to crowd out competitors, and reduce the cost of their raw material. For example, a current 18 percent export tariff on cashew penalizes small farmers, and in 2016 ETG tried to replicate this effort by attempting to introduce a similar export tariff and ban on exports of pigeon pea until local processing capacity – of which they control 95 percent – had been met. The effect of this policy would have been to lower the producer price of pigeon pea.

2.2. Seed Supply and Agro-Inputs Sector

Access to quality inputs is a constraint across almost all of the value chains. The upgrading of the sesame value chain into white sesame is dependent on the commercialization of white sesame seeds.[2] Growth in cashew is constrained by the low outreach of government programs for the distribution of cashew seedlings. The yield of pigeon pea is limited by the lack of use of certified seeds. In groundnuts, the level of aflatoxin

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[1] In Mozambique, ETG trades as Export Marketing Group.

[2] The *Instituto de Investigação Agrária de Moçambique* (IIAM) has two varieties available of white sesame seeds, one known as the Lindi variety, and one known as the Nicaragua variety.

could be reduced by introducing mechanized shelling.[3] Marketing efforts that expand reach toward the SHF market segment are necessary for the upgrade of most value chains.

The government and NGOs have historically distributed seeds, but that changed in 2013 due to a lack of funding by the government for the seed subsidy program. Large and small companies lost their primary market (i.e. government contracts). The large companies (Pannar, MozSeed, and *Sementes de Moçambique*) stopped production in Mozambique, while the smaller companies began selling directly to farmers and building their own markets. The result is that there is now a weak but more dynamic seed industry, which is composed mainly of small to medium companies that are actively competing and innovating to reach their end buyers. Many seed suppliers are still selling directly to NGOs who distribute to farmers, but the seed suppliers are also directly marketing to farmers.

Many seed and fertilizer companies and major suppliers of crop protection products (CPPs) believe there are viable growth opportunities in the agro-inputs sector. Certainly, with utilization rates so low (see detailed VCA section for further analysis), there is room – and need – for growth. However, it is unclear how much current investment in, for example, local seed production and expansion of distribution outlets is fueled by promising returns and upward trends; it could be that current investment may be due more to donor resources to bridge distribution channels with SHFs or fund the operations of seed companies, and hence further research is needed.

Regardless, current company investments in pursuit of market share do not seem to have resulted in any substantial shift or improvement in cooperative relations between suppliers, agro-dealers, retailers, and farmers. There are some exceptions, notably where agro-input companies try to provide customers (farmers) with access to markets for their crops, either directly or by connecting them with buyers. Some of these exceptions discovered during the VCA were primarily fueled by the year-round production of vegetables. The frequent turnover and perishability of these crops, in some cases, has provided sufficient incentive for agro-dealers to shift to more cooperative relations with farmers. In another, but seemingly isolated, instance, the Zembe Seed Company is in the practice of cultivating relations with emerging commercial farmers in order to sell improved varieties of seed with the promise of buying the harvested crops.

Strengthening the capacity of agro-input suppliers to reach out to the SHF segment and deliver value seems to be one key component of strengthening this market, necessary to the expansion of yields in value chains like pigeon pea. Improving cooperation between agro-input dealers and buyers is also a key area for support.

2.3. Agricultural Finance

Access to finance remains a principal constraint at multiple functional levels in all of the value chains. Despite the existing concessional credit lines, banks remain unprepared to provide value chain financing other than short-term loans to buyers to meet the needs of the buying season. Expanding credit to SHFs remains very challenging, although the availability of finance remains pivotal for the development of the inputs market, and the priority value chains. For this reason, while cross-cutting services will be important, improving finance for

[3] Most SHFs continue to shell their groundnut by hand; one of the most labor and time-demanding activities, especially for women who provide most of the farm labor in Mozambique. Shelling by hand leads to sore thumbs and farmers are often tempted to soak unshelled nuts in water to soften the shells and ease the burden of hand shelling. This practice leads to increased moisture conditions that facilitate growth of molds, leading to aflatoxin contamination of the nuts.

agriculture could potentially have the biggest impact on improved productivity, and should be an area or priority for FTF Inova and a dedicated work program should be developed in this area.[4]

Several government-sponsored, low-interest lending facilities to agribusinesses exist, but these are seldom utilized. Anecdotal evidence suggests that commercial banks do not promote donor-sponsored credit lines, since these facilities may not be aligned with the bank's commercial objectives, so that access to credit and financial services in general by agribusinesses remains difficult. Interventions in this area should be prioritized for additional research and analysis since access to finance is a major constraint for the growth of priority value chains.

2.4. Cross-cutting Support Services

In general, the provision of cross-cutting services including marketing, business management, information and communications technology, testing, and technical support is weak. There are, however, several cases where supporting services have emerged in response to recent market opportunities. For FTF Inova, the growing availability of such services could be useful forms of support to better enable value chain and agro-input actors to derive benefit from more cooperative inter-firm relations. For example, information and communication technology services have the potential to streamline inter-firm relations, making higher levels of interaction more cost-effective (e.g., performance management systems or marketing and promotion activities). The following assesses several key cross-cutting sectors identified by the team:

- *Land tenure services* have emerged to help, for example, district governments, large commercial farmers, and SHFs make sense of the complex land tenure regulations and secure title to land. In two instances, two large commercial farmers in Nampula brought in land tenure service providers to assist SHFs on the periphery of their concessions secure title to land, thereby ensuring their potential as out-grower suppliers. In another instance, a district government in Chimoio province used land tenure service providers to assist graduates of a local technical school to acquire land and equipment services.
- *Extension services*: As with land tenure services, large commercial farmers are an emerging market for extension services to SHFs who are either out-growers or who farm land on the periphery of concessions.
- *Testing services*: Several testing services have come on line, notably one at the UniLurio University in Nampula that can assess aflatoxin levels and other food safety parameters and, managers claim, evaluate seed quality. These services have only recently become available, and their commercial viability is unclear.
- *Internship programs, research, and business management support services* from academic institutions: At least two institutions, in Nampula and Chimoio, market business support services to agribusinesses, offer to conduct research with private sector partners, and are keen to expand internship programs to include agribusinesses.

[4] Since July 2016, the Financial Sector Deepening Trust Moçambique has piloted a new form of collaboration with *Sociedade Algodoeira do Niassa – João Ferreira dos Santos*, also known as SAN-JFS, to help bring in commercial banking partners to make the supply of finance more sustainable and build a better ecosystem for SHFs, thus securing a steadier and increased production for cotton supply. Working in partnership with the Financial Sector Deepening Trust Moçambique, FTF Inova could help other buyers replicate these experiences and models. Support could also be brought to commercial banks to make use of existing concessionary credit lines to expand their portfolios in growing agricultural markets. While extending access to credit to SHFs has proven challenging, Village Savings and Loan Associations (VSLAs) have adopted new savings products specifically to enable purchase of inputs/seeds at planting season. With more than 3,700 female farmers already participating in the VSLA's "savings for seed" products, FTF Inova can accelerate the number of participating VSLAs by linking them up with input suppliers, production activities, and aggregators in the value chains of focus.

3. Overview of FTF Value Chains

In the section below, an overview of the eight FTF value chains is presented. This overview lays the foundation for the subsequent value chain selection table, and provides the introduction to the detailed VCAs in the next section.

Cashew Snapshot		
Number of SHFs	1–1.4 million	20–30% of all SHFs
Geographic Areas *Percentages of total trees in production in the Feed the Future ZOI and other top production areas*	Nampula Cabo Delgado Zambezia Tete Manica	37% of total production 29% 10% 4% 0%
Production volumes (range from 2012 to 2016)	65,000–85,000 Metric Tons (MT)	80% formal export 20% informal regional export or domestic market
Yields	3 kilograms (kg)/tree	20% of potential
Average number of trees in production	16 per SHF	

Sesame Snapshot		
Number of SHFs	375,000	7% of all SHFs
Geographic Area *(percent of total area planted in Feed the Future ZOI and other top production areas—data on production volumes not available)*	Sofala Nampula Cabo Delgado Zambezia Manica Tete	28% of total production 23% 17% 15% 11% 5%
Production volumes (2014)	61,000 MT	98% exported
Yields	300 kg/hectare (ha)	30% of potential
Average plot size and harvest	<.35 ha yields 105 kg	

Groundnut Snapshot		
Number of SHFs	1.5 million	35% of all SHFs
Geographic Areas *Feed the Future ZOI and other top production areas*	Nampula Cabo Delgado Zambezia Tete Manica Other	43% of total production 20% 11% 6% 2% 18%
Production volumes (2014)	140,000 MT	7–15% exported
Yields	350 kg/ha	20% of potential
Average plot size and harvest	.33 ha yields 115 kg	

Pigeon Pea Snapshot		
Number of SHFs	1.1 million	25% of all SHFs
Geographic Areas *Feed the Future ZOI and other top production areas*	Zambezia Nampula Tete Manica Other	70% of total production 15% 1% 1% 13%

Production volumes MT 2014	Total 110,580 Consumed 33,174 Export to Malawi 2,212 Export to India 75,496	 30% 2% 68%
2016	Export to India 125,021	Unknown
Yields	385 kg/ha	40% of potential
Average plot size and harvest	.25 ha yields 96 kg	

Soybean Snapshot		
Number of SHFs	15,000 – 30,000 *SHFs shift in and out of soy as prices vary*	<1% of all SHFs
Number of emerging commercial farms (ECFs)	175	
Number of large commercial farms (LCFs)	12	
Geographic Areas of Production	Zambezia Tete Manica Nampula Other	63% of total production (*50% of total in Gurue district)* 22% *(most in Angonia district)* 6% 3% 6%
Production Volumes 2014	33,000 MT	70% SHFs 5% ECFs 25% LCFs
Average Yield/ha	SHF 1.2 MT ECF 1.45 MT LCF 1.75 MT	40% of potential 48% of potential 58% of potential

Common Bean Snapshot		
Number of SHFs	350,000	7% of all SHFs
Geographic Areas *Feed the Future ZOI and other top production areas*	Niassa Tete Zambezia Manica Nampula Other	43% of total production 29% 14% 9% 1% 4%
Production Volumes 2014	52,000 MT	
Yields	SHF yields average 535 kg/ha but vary widely (200 kg/ha to 700 kg/ha)	71% of worldwide average, 36% of optimal yield
Average SHF plot size	.3ha yields vary from 60–210 kg	

Cowpea Snapshot		
Number of SHFs	1.7 to 2.2 million	38–50% of all SHFs
Geographic Areas *Feed the Future ZOI and other top production areas*	Nampula Zambezia Cabo Delgado Tete Manica Other	34% of total production 13% 12% 9% 6% 26%
Production Volumes 2014	104,000 MT	

Yields National average Traditional varieties Improved varieties	 275 kg/ha 400 kg/ha (best performers) 960 kg/ha	 61% of global average 88% of global average 200% of global average
Average SHF plot size and harvest	.2 ha yields 55 kg	

Banana Snapshot		
Number of SHFs	440,000	10% of all SHFs
Number of Commercial Producers	15 medium- to large-scale commercial plantations (between 100 to 6000ha)	
Geographic Areas *Feed the Future ZOI and other top production areas*	Nampula, Zambezia, Sofala, Southern Mozambique	
Production volumes 2015	450,000 MT	85% domestic market 15% exported
Yields	SHFs: 11 MT/ha Plantation: 40–60 MT/ha	20–30% of potential 100% of potential

3.1. Selection of Value Chains to Stimulate Systemic Market Change

FTF Inova's value chain selection is based on three criteria - *competitiveness potential, development impact and feasibility* - where each criterion is a combination of several sub-criteria. The analysis used a combination of quantitative and qualitative data: 1) global trade data, 2) national statistics on imports and production data, 3) interviews with end-market buyers and industry experts to understand market growth trends and benchmark performance against competitors, and 4) the local team's collective on-the-ground experience and knowledge.

The value chain selection is not a linear, but is an iterative process that includes five steps: 1) define selection criteria; 2) identify a long-list of opportunities; 3) analyze trade data; 4) assess opportunities against selection criteria; and 5) develop a short-list for selection and further analysis. Below in Figure 2 we show the value chain selection methodology applied to FTF Inova.

As the first step, we customized the three selection criteria to FTF Inova's objectives. In Table 2, we have pre-assigned each selection criterion and sub-criterion tailored to FTF Inova's priorities.

Figure 2: Value Chain Selection Diagram

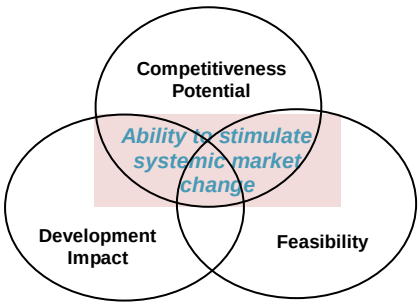


Table 1: Value Chain Selection Criteria

Selection criteria and sub-criteria	Analytical Questions
Competitiveness Potential	**Assesses potential for growth of the value chain and/or market system.**
Market growth potential, export or domestic	▪ Has the market been growing and is it projected to grow in the FTF ZOI? ▪ In export markets, has Mozambique's market share been decreasing or increasing? ▪ Has demand in these markets also been growing, or is Mozambique exporting to contracting markets? ▪ In domestic markets, are local producers competing with imports?
Long term competitiveness potential in export or domestic markets	▪ Does Mozambique have a competitive advantage against key competitors? ▪ Potential to generate large increases in sales in light of international prices and import trends? ▪ Are there buyers who have already expressed interest in purchasing Mozambican products? ▪ Are there ready market opportunities in higher value segments?
Upgrading potential	▪ Ability of the value chain to meet market requirements in higher value market segments. ▪ Opportunities to address productivity gaps, via new technologies, processes and innovations, and improve competitiveness (i.e. value addition prospects).
Potential to attract investment	▪ Presence of ready investors – are foreign and domestic investors looking for opportunities/seeing growth potential in the value chain?
Development Impact	**Assesses the breadth and depth of the impact of value chain/market system growth.**
Scale	▪ Number of SHFs and micro, small, and medium enterprises involved (or could be involved) in the value chain or market system and able to benefit from growth – in FTF ZOI.
Income	▪ Potential to increase income with potential geographic distribution of benefits
Women	▪ Sector already has many women participating – or has the potential for many to participate – at either production or other points in the value chain/market system. ▪ New opportunities for women exist (e.g. entrepreneurship, employment, income growth) and potential for positive impact on gender disparity.
Food security	▪ Contribution of value chain growth to household hunger scale and dietary diversity scores, particularly during dry season and start of rainy season when food insecurity peaks.
Backward linkages	▪ Opportunities for domestic backward linkages and domestic job creation.
Feasibility	**Assesses the ability to systemic market change and achieve results within the project timeframe.**
Prospects for future replication/adoption without donor assistance	▪ Presence of market "champions" who can serve as lead farmers or lead firms to drive growth. ▪ Capacity of key market actors to cost-share upgrading investments. ▪ Presence of value chain/market systems nodes that offer attractive assistance entry points for large-scale, systemic market change (e.g. possible drivers).
Achievement of results	▪ Potential to generate impact within 3-5 year timeframe.
National priorities	▪ Alignment with the Government of Mozambique development priorities.

Guided by the value chain selection criteria above, the table below presents an overview of each of the eight FTF value chains. Green arrows indicate a strength or opportunity for the sector, especially in the FTF ZOI, and red arrows indicate a weakness or threat for the sector; black bullet points provide further context.

Cashew, sesame, **groundnut**, and **pigeon pea** were selected as priority value chains for Year 1. The justification for the selection is presented in Table 2 below. FTF Inova's CLA process will be used to continuously monitor changes in sector dynamics. While the project is committed to investing in these sectors in year 1, it will re-evaluate next year – especially for sectors such as pigeon pea which has seen some significant price fluctuations in just the past year and mixed market signals from its major end market, India.The agricultural inputs and financial services markets were also identified as priority areas, since the lack of availability of quality inputs at the right price, and of financial services tailored to agriculture are recurring constraints across almost all value chains.

Table 2: Summary Opportunity Assessment in FTF ZOI Districts against Selection Criteria

Competitiveness Potential	Development Impact	Feasibility
Cashew		
▪ Demand for Mozambican cashew shows average growth of 7–8% per year since 2013, although in 2016 a drop of 20% has been recorded. ▲ Cashew is a profitable, high-demand export cash crop, with consistently increasing global prices for shelled cashew. ▲ Although global prices for Raw Cashew Nut (RCN) have not been rising, prices for Mozambique RCN exported to India (the majority of exports) have commanded higher prices, increasing by 53 percent since 2013. ▲ Excess global demand for cashew is predicted to continue for some time, guaranteeing a healthy price for African cashew and offering an opportunity for Mozambique as both a production and processing hub.	▪ *Production Concentration in FTF ZOI*: 80% ▪ *Production / Exports*: 85,000 MT total; 68,000 MT exports (2014) ▲ With more than 1.4 million SHFs involved in growing, collecting and harvesting cashew, it has scope to reach many SHFs. ▲ Women involved in production and in processing. ▲ As an internationally traded crop, growing demand continues to rise above supply and suppliers in Mozambique are already shifting to satisfy international grades and standards, some of which necessitate closer arrangements with suppliers for technical support, agro-inputs, and planting material.	▲ Market has excessive processing capacity and competition for RCN exists. Condor and other processors are investing in additional processing. ▲ Of particular importance is the presence of numerous points of leverage for FTF Inova to impact SHFs, including through: processing companies which are interested in increasing quality supply to meet higher quality markets; the Institute for the Production and Promotion of Cashew (INCAJU) as a service provider to the value chain; and *Société Générale de Surveillance* (SGS), a company providing services, including inspection, verification, testing, and certification, which wants to develop a quality certification program.
Sesame		

Competitiveness Potential	Development Impact	Feasibility
▪ Global demand increasing at 10% per annum. Opportunities to produce higher quality white sesame variety to enter higher-value markets. ▲ Growing global market demand for the current grade of sesame produced, and for higher-value grades of sesame, offers opportunities for increasing export volumes and upgrading quality/grades in the value chain. ▲ The most readily available opportunity is for more homogenous supplies of sesame with higher oil content and consistent color. ▲ Export markets offer price premiums for graded, differentiated, and dehulled sesame seed that meets internationally accepted quality grading standards.	▪ *Production Concentration in FTF ZOI*: 54% ▪ *Production/Exports*: 61,000 MT total; 60,000 MT exports (2014) ▲ Many SHFs can increase incomes by improving productivity and by producing higher-value varieties to meet market demand. ▲ Higher SHF incomes will be sustainable because the crop is not easily mechanized or scaled up, and thus will remain a SHF dominated crop. ▲ Labor intensive crop, without benefit from economies of scale. Quality variety and good agricultural practices can improve yields by 70%. ▲ There is high demand for women's labor for sesame harvesting.	▲ The feasibility of targeting growing global markets has been demonstrated by major buyers in Mozambique that are already piloting SHF production and export of improved varieties. ▲ It is feasible to target increased productivity and production of improved varieties through interventions that support input distribution firms and seed companies that express commitment to increasing SHF access to the required inputs. ▲ ETG and Olam want to expand backward links. *Tecnologia e Consultoria Agro-Pecuária, Lda.* (TECAP) and Klein Karoo (K2) are two firms promoting higher-value seed. The FTF Mozambique Improved Seeds for Better Agriculture (SEMEAR) activity is engaging with the Basic Seed Unit (USEBA), the unit of the Mozambique Institute of Agricultural Research (IIAM) responsible for seed production. ▼ Limited availability for white sesame variety is a constraint. Strength of white sesame end-market remains to be fully tested.
Groundnut		
▪ International market is growing 8% per annum. Very strong domestic growth opportunity for processing. ▲ Growing global and nascent domestic market demand for low-aflatoxin groundnut offers an opportunity for	▪ *Production Concentration in FTF ZOI*: 62% ▪ *Production/Exports*: 140,000 MT total; 10,000 MT exports (2014) ▲ Many SHFs can increase incomes by responding to market demand through improved agriculture and storage practices	▲ Though challenging, the feasibility of attaining the required aflatoxin reductions is demonstrated through previous successful attempts, and financial commitments such as NuTrade's. ▲ Support services (testing, training, and

Competitiveness Potential	Development Impact	Feasibility
increasing export volumes and creating a new higher-value domestic market segment. ▲ NuTrade[5] and Ikuru SA[6] are key buyers and traders interested in buying more groundnut. Ikuru SA is also selling groundnut seed, and Oruwera is selling certified seed. ▲ For groundnut, there is a regional market for blanched groundnut, notably in South Africa, and internationally for groundnut with lower aflatoxin levels, which are exceedingly high in Mozambique.	that reduce aflatoxin contamination. ▲ Groundnut is the FTF value chain with the highest concentration of women. ▲ Staple food, commercial crop with significant value for nutrition purposes. ▲ Women play a large role in the production and processing (manual shelling) of groundnut.	innovative processing equipment) are increasingly available to enable the growth of emerging commercial farmers in this sector. ▲ The poultry feed industry presents potential market for groundnut, but aflatoxin remains an issue and, to date, Mozambican feed mills are not using groundnut. ▲ Some buyers (Ikuru SA and NuTrade) to offer consistent purchasing at adequate prices to justify farmer investments in improved crop management.
Pigeon Pea		
▲ The export market opportunity to India continues to grow, with India's import demand estimated to double by 2030 to 1 million MT. ▲ Recently India's food security policy has restricted exports of pigeon pea and other pulses, which opens higher-value markets for processed (split) pigeon pea in Europe and the Middle East, which were previously served by cheap Indian exports.	▪ *Production Concentration in FTF ZOI*: 87% ▲ *Production / Exports*: 220,000 MT total; 125,000 MT exports (2016), up from 49,000 MT in 2013 ▲ Many SHFs can increase incomes by increasing volume and productivity of pigeon pea cultivation without needing to improve quality. ▲ SHF income improvements can be sustainable, because pigeon pea globally	▲ Input suppliers are interested in selling the potentially large volumes of improved seed and other inputs required to increase productivity. ▲ Low barriers to entry for SHFs, so immediate benefits from extensive production leading to intensive production. ▲ Small-scale mechanization can support the growth of emerging commercial farmers. ▲ ETG's investments in new processing

[5] NuTrade Africa is the trading division of CASS Group, a diverse South African company invested in seed and input trading, grain production and origination, processing, commodity trading, and agricultural business and food systems consulting services. Located in Cape Town, South Africa, NuTrade Africa has a procurement network and distribution capacity that spans the globe. NuTrade is interested in making an investment in groundnut production for export to South Africa for peanut butter, and for the manufacture in Mozambique of therapeutic nutrition-dense foods. They have already brought processing machinery to Nacala, but are not in production due to insufficient supply and aflatoxin contamination. NuTrade is interested in contributing to an aflatoxin solution. They estimate their market to be 80,000–100,000 MT/year. Eventually they would like to move into the European market for chocolate coating/snack foods, etc. They want to use a model of intercropping with other crops, potentially with cashew (in partnership with Condor).

[6] Ikuru SA is a seed company and trading arm associated with one of the largest producer associations in Mozambique – the Association of Producers of Ikuru (API). API is made up of Fora. Each forum is made up of 29 associations. Each association is made up of approximately 20 members. It is comprised of 20,000 members and has direct buying relationships with 3,000-4,000 of these members. Ikuru SA is currently owned by GAPI, API (a representation of its members), Norgesvel (from Norway) and SIDE (from France). Norgesvel and SIDE are holding partners.

Competitiveness Potential	Development Impact	Feasibility
▲ India and Mozambique have also recently signed a Memorandum of Understanding (MOU) committing the Indian government to facilitate purchase of 750,000 MT of pigeon peas and other pulses from Mozambique by 2021, effectively doubling current amounts.	has remained a SHF-dominated crop. ▲ Pigeon pea has been primarily a female-driven crop, so potentially positive impact for women. ▲ The steady expansion of SHF production over the last 7 years, up from 71,400 MT in 2006 to about 220,000 MT in 2016, in response to strong export market demand demonstrates the feasibility of scaling up volumes.	facilities (adding up to 60,000 MT capacity for splitting) makes them well-placed to take advantage of new opportunities for split pea in the EU/United States/Middle Eastern markets, because supply from India is restricted.
Soybean		
▪ Potential market demand to grow to 85,000 MT if reinforced by weak Mozambique New Metical (MZN). ▲ Import substitution and unmet regional market demand offer opportunities that may be worthy of further consideration. ▲ Conducive to mechanized, large farm production.	▪ *Production Concentration in FTF ZOI*: 94% ▪ *Production/Imports*: 33,000 MT total; 20,000 MT imports (2014) ▼ Soybean is unlikely to provide long-term sustainable income increases for SHFs, since it is an easily mechanized and scalable crop. ▼ No immediately clear gender issues or impact found in this sector for a market systems project such as FTF Inova to support.	▲ Major poultry feed companies, seed companies present/interested. Farmers are already sensitized to benefits of soy. ▼ Large commercial farms are rapidly moving into this sector in Mozambique. ▼ In medium term, opportunities may exist for SHFs, but extensive donor interventions have created market distortions, particularly for input supply.
Common bean		
▪ 20% potential domestic market gap totaling 10,000 MT. ▼ There is no documented evidence of significant unmet demand. ▼ The market does not offer premiums for product differentiation (quality, variety).	▪ *Production Concentration in FTF ZOI*: 53% ▪ *Production / Exports*: 52,000 MT total; ~7,800 MT exports (2014) ▼ SHF productivity is already relatively high, so improvements are unlikely without significant investments, which are not justified by the profitability of the crop. ▼ Minimal potential impact for SHFs. ▼ Women produce primarily for home consumption, so little incentive to invest.	▼ No opportunities were identified to increase SHF incomes through interventions in the common bean value chain. ▼ Few points of leverage.

Competitiveness Potential	Development Impact	Feasibility
Cowpea		
▼ There appears to be no evidence of market growth. ▼ The crop is not widely commercialized.	▪ *Production Concentration in FTF ZOI*: 62% ▪ *Production/Exports: 104,000 MT total; ~ < 100 MT exports (2014)* ▼ Minimal potential impact for SHFs. ▼ Women headed households represent over 50% of all cowpea producers, despite representing only 24% of total households.	▼ Few points of leverage. ▼ No opportunities were identified to increase SHF incomes through interventions in the cowpea value chain.
Banana		
▪ Global demand is strong, but Mozambique has varietal and sanitary and phytosanitary problems limiting exports. ▼ No evidence of unmet domestic demand.	▪ Production in Zambezia, Nampula, Sofala, Manica, Southern Mozambique. ▪ *Production/Exports*: 450,000 MT total; 85,000 MT exports (2015) ▼ No evidence that SHF incomes can be improved through value chain interventions. ▼ Large numbers of women are employed on banana plantations. SHF production does not have significant gender issues or impact.	▼ Export market demand will not benefit SHFs, because they do not meet export standards and small-scale production cannot support the investments necessary to upgrade. ▼ Few points of leverage for SHFs. ▼ Primarily a large-scale plantation crop for commercial growth (outgrowers must be >50ha).

4. Detailed Value Chain Analyses

4.1. Cashew Value Chain

Sector Overview

An export-oriented crop grown primarily in the rural coastal areas of Cabo Delgado, Inhambane, Nampula and Zambezia by 1–1.4 million SHFs (20–35 percent of all SHFs) who grow, collect, and sell RCN, cashew plays an important role in the Mozambican economy. Productivity is extremely low (20 percent of potential), because SHFs do not view their cashew trees as a managed cash crop, but rather as an inherited source of supplemental income. RCN is sold by farmers, through traders and aggregators, to processors and exporters. Mozambique is the largest cashew processor in Africa, and cashew processing provides formal employment to more than 8,000 individuals. Eight processors were operational in 2015, but cashew trade is dominated by three large firms: ETG, Olam, and Condor. Official statistics state that 40 percent of cashew production is exported as RCN, while 40 percent is processed domestically before export as shelled cashew, and 20 percent is retained in the domestic market. However, global trade data show 65–80 percent of exported cashew is RCNs while only 20–35 percent is processed shelled cashew. Mozambique product is characterized as low quality and undifferentiated product as both RCN or processed shelled cashew. Despite this, Mozambican cashew, as a southern cycle crop, commands a 15–20 percent premium as its cycle runs counter to the more common northern (West Africa) cycle crop.

The government has intervened significantly in the cashew industry. To incentivize domestic value addition, Mozambique has imposed an 18 percent tax on export of RCN, which has led to significant levels of illegal exporting and the difference between official industry statistics and global trade data. The government also supports production through INCAJU[7] with a policy of distributing free seedlings and agricultural chemicals. The 18 percent export tax is used to support the input distribution program. Although actual distribution of these inputs is very limited and poorly planned, the policy still constrains the development of private sector input supply.

Sector Dynamics

Cashew is a profitable, high-demand export cash crop, with consistently increasing global prices for shelled cashew. Although global prices for RCN have not been rising, prices for Mozambique RCN exported to India (the majority of exports) have commanded higher prices, increasing by 53 percent since 2013. Excess global demand for cashew is predicted to continue for some time, guaranteeing a healthy price for African cashew, and offering an opportunity for Mozambique as both a production and processing hub.

The government is currently engaged in the revision of the Cashew Law and regulations, which has created uncertainty around the RCN export tax and the free distribution of seedlings and chemicals. These two policies have been the foundation of the development of the cashew industry in Mozambique. Cashew processors are lobbying to maintain or increase the export tax, at the same time as defining effective mechanisms to promote production. The probability of major legal and regulatory reform or its potential impact is unknown.

[7] INCAJU is the Government Institute for the Production and Promotion of Cashew. Its headquarters are in Maputo, but it also has offices in the major cashew-producing provinces, Cabo Delgado, Nampula, and Zambezia in particular. INCAJU provides SHFs with seedlings and chemical services free of charge, but it has limited outreach.

End-Markets

Total global demand for cashew (shelled and unshelled) was growing by 7–8 percent per year since 2013, but dropped in 2016 by almost 20 percent. Volumes have varied from 1.2–1.4 million MT over the last 4 years. India dominates global imports for unshelled cashew, and imports close to 100 percent of Mozambican formal exports. The United States is the largest importer of shelled cashew globally, as well as from Mozambique. Mozambique also exports shelled cashew to Europe and South Africa. Overall, quality conscious markets such as the European Union (EU) and the United States constitute 30 percent of global shelled cashew consumption, and those markets are likely to grow at 6 percent per year.

Table 3: Exports of Unshelled Cashew from Mozambique

	Unit	Quantity			
		2013	2014	2015	2016
India	MT	14,212	7,580	7,208	19,224
South Africa	MT	-	-	21	40
TOTAL	**MT**	**14,212**	**7,580**	**7,229**	**19,265**

Table 4: Exports of Shelled Cashew from Mozambique

		Quantity			
	Unit	2013	2014	2015	2016
United States	MT	2,187	1,770	2,369	2,457
South Africa	MT	563	649	466	621
Canada	MT	335	32	80	138
EU and Other	MT	520	1,212	1,007	1,911
TOTAL	**MT**	**3,605**	**3,664**	**3,923**	**5,126**

Vision for Equitable Growth

The productivity and incomes of up to 50,000 SHFs (5 percent of the total number of farmers growing cashew) can improve by increasing volumes for export, particularly of shelled cashew. Strengthening more cooperative backward and forward linkages between producers and processors can stimulate investment in improving productivity. Attaining quality and food safety standards demanded in the EU and United States markets will enable Mozambique to tap the growing potential for shelled cashew in these quality conscious markets.

Identified Interventions in the Cashews Value Chain

The overarching goal of interventions is to facilitate cashew processors to adopt and adapt supply chain management practices that deliver access to higher-value export markets and that ensure farmers' access to quality inputs and technical support:

- Strengthening a service provider system that supports buyers to achieve market certification and traceability, allowing them to reach higher-value international market segments.
- Supporting cashew processors to strengthen linkages with producers' securing volumes of production and sending the right signals to stimulate investment by SHFs.
- Supporting input/chemical dealers to adopt new marketing approaches that target the SHF market segment.

Leverage Points

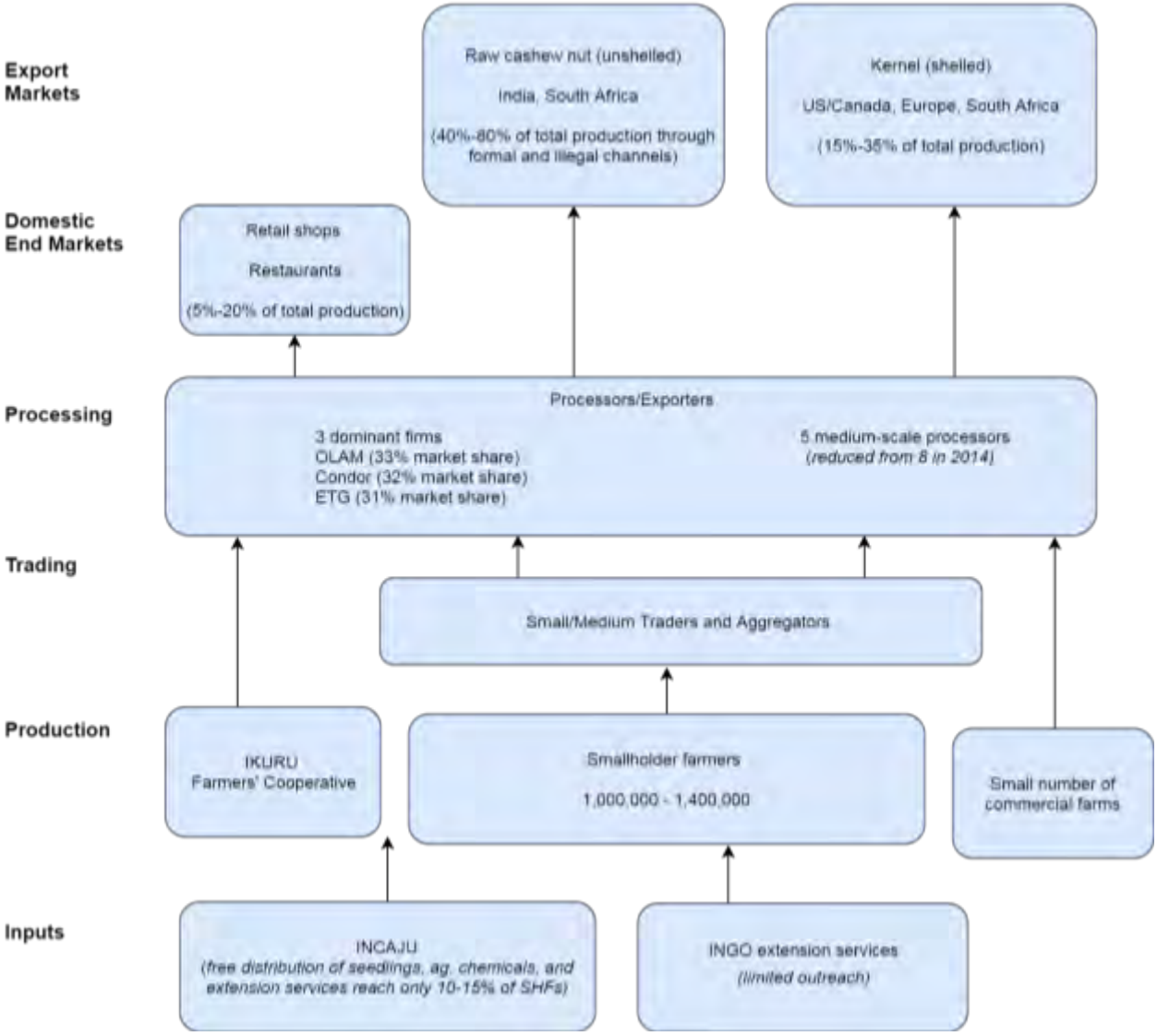
During VCA field work, Condor expressed an interest to work with FTF Inova to secure BRC certification,[8] or Food Safety System Certification 22000[9], a technical production sanitary standard that would allow the company to export to the EU and other developed markets. The adoption of BRC standards will require developing full traceability along the supply chain. Since the VCA, FTF Inova has negotiated a partnership agreement with Condor. At the same time, FTF Inova has approached SGS, an inspection, verification, testing, and certification company based in Maputo, who is the only known service provider in the country that can provide food safety certification. Using Condor's experience, FTF Inova plans to support the marketing of food safety certification to other processors. More partners will be recruited at the start of implementation. The chemical service market will be supported in coordination with interventions that are more broadly directed to the input market, but with specific attention to cashew, and the role of INCAJU.

[8] The first edition of the BRC Food Technical Standard and Protocol for food suppliers was produced in 1998. This has been widely adopted around the world. BRC is a trade association in the United Kingdom that represents retailers from small, independently owned stores to large chain stores and department stores. BRC represents 80 percent of retail trade in the United Kingdom by turnover.

[9] The Food Safety System Certification 22000 is fully recognized by the Global Food Safety Initiative (GFSI) and is based on existing International Organization for Standardization standards. www.fssc22000.com

Cashew Value Chain Functions

Figure 3: Cashew Value Chain Map



Exporters/Processors

Mozambique is the largest cashew processor in Africa. Three large processors and exporters, Olam, ETG, and Condor, dominate the cashew market in Mozambique, and are responsible for 96 percent of reported formal exports. The large farmer cooperative API is also active in cashew buying, processing, and exporting. As of 2015 there were five other processing companies, with three additional processors reported to have closed operations in 2014. The processors are organized into an association, the Cashew Industry Association (AICAJU), which has effectively lobbied to create and maintain the 18 percent tax on RCN in an attempt to ensure adequate supply. In addition, INCAJU determines allotments of RCN to be divided among the processors. AICAJU is in 2017 deeply engaged in discussions with the government regarding the review and revision of the Cashew Law, with involvement from USAID's Supporting the Policy Environment for Economic Development activity. Despite these government supports, the greatest challenge for processors is procuring adequate amounts of RCN. Installed processing capacity is 46,000 MT, but processors are regularly operating at below 70 percent of capacity. AICAJU has traditionally been focused on restricting exports,

rather than on supporting policies that improve productivity and production volumes, although current discussions on the revision of the Cashew Law may change this.

Other challenges for processors include working capital and quality certifications. Working capital is a constraint to operating at full capacity. Adequate cash funds are required to procure product during the peak harvest season, and to pay the large workforce on a daily basis. Processors have difficulty accessing adequate working capital credit due to the constraints listed previously. In terms of quality certifications, markets for higher-value shelled cashew in the United States and EU are quality conscious and demand international quality and food safety certifications. Quality standards and certifications are not in place in Mozambique. Condor is leading in the industry in seeking the BRC certification.

Sunshine Nuts is the only secondary cashew processor in Mozambique, manufacturing high-quality flavored nuts for snack markets. Flavor coating, packaging, and labeling (as a Mozambican social enterprise) occurs in-country with buyers in EU and United States markets. As a social enterprise business model, Sunshine Nuts returns 90 percent of profits to social projects.

Traders

Almost all RCNs are sold at the farm gate for low prices to small traders. Some traders are agents for processors and exporters, and receive working capital advances. However, the majority of traders are informal and fragmented. High demand and prices have driven a recent influx of "parachute traders", financed by Asian importers, buying RCNs in bulk to export to Asia for processing. Farm gate prices have increased in response to higher global prices and the increase in competition among traders over the last five years. Traders buy primarily from individual farmers, so have a large bargaining power advantage. The large farmer cooperative API, which is active in multiple crops, provides better negotiating strength for its members.

Production

Cashew production in Mozambique is dominated by SHFs. It is estimated that there are 1–1.4 million SHF cashew producers (collectors). There are very few organized producer groups, though some groups may collaborate for aggregation purposes. The farmer cooperative API is an exception to the norm of self-organization.

The major production zones are in the northern provinces of Nampula, Cabo Delgado, and Zambezia, as well as in Inhambane. The population of cashew trees is estimated at approximately 40 million. Only a fraction (60 percent) of the trees are productive. Diseases such as Oidium and pest infestation, as well as deterioration of aging trees, afflict the remaining 40 percent. The average yield of a cashew tree is only 3.0 kg per tree, even though there is potential to yield up to 15 kg per tree. SHFs do not view cashew as a dynamic cash crop, but rather as an inherited legacy that provides supplemental income. The typical family farm will have 20–30 trees. SHFs use few inputs and make very limited investments in improving production (pruning or renewing trees). There are a few instances of larger commercially-oriented farms in southern provinces, particularly in Inhambane and Gaza. Annual commercialized production is inconsistent and has not been increasing steadily. Production has varied between 65,000 MT and 85,000 MT since 2012. Mozambique RCN is characterized as low-quality and undifferentiated.

INCAJU subsidizes input programs, particularly seedlings and fungicides. Although actual distribution of these inputs is very limited (reaching 10–15 percent of SHFs) and is poorly planned, it seems to undermine any effort to stimulate private sector input supply or extension. INCAJU and the processor association AICAJU have focused almost exclusively on policies to restrict exports, rather than on designing effective programs to increase production volumes and productivity. In an effort to address this issue, a partnership between INCAJU, TechnoServe, and NorgesVel is developing a mobile and web-based program that will include functions to undertake producer registration, receive producer requests (for extension, chemicals, seeds), and track the management, distribution, and impact of chemicals and seedlings by INCAJU.

4.2. Sesame Value Chain

Sector Overview

Sesame seed (grain) is an export cash crop grown by approximately 375,000 SHFs in all of the FTF ZOI, within which the greatest concentration is in Nampula. Two large international commodity trading firms (ETG and Olam) dominate the market in Mozambique. Mozambique currently exports 98 percent of all production as low quality, undifferentiated, unprocessed raw sesame grain for oil crushing—this is the lowest-value product in the global value chain. Exports in 2014 were 60,000 MT, with the majority exported to China (61 percent), and with Japan and Turkey as other large buyers. These three nations are also the largest global importers of the product. The dominant business model for domestic traders is to compete for volumes of low quality product, and capture limited market premiums by carrying out sorting and grading internally. Mozambique's productivity is only 30 percent of potential, primarily due to farmers' use of continuously recycled seed and poor agricultural practices. Although low productivity limits farmers' incomes, growing global market demand and high prices for sesame seed (oil crushing grade and edible grade) have drawn large numbers of SHFs into the value chain. Since it is not a crop that can be highly mechanized, it offers a sustainable opportunity as a cash crop for SHFs.

Sector Dynamics

Opportunities to capture price premiums are available for higher-quality, graded sesame seed for oil crushing, and for edible grade white sesame seed used in bakery/confectionary. However, the dominant firms are not engaged in performance management within the value chain to attain higher-value products. The main constraints to upgrading this business model is the lack of sustained market channels and incentives to deliver white sesame seed[10] to SHFs and stimulate investments by farmers in growing the higher-grade variety.

Increasing global market demand for all grades of sesame also offer opportunities for Mozambican farmers to increase their incomes through improved productivity and production of larger volumes. Demand for sesame in the top five importing countries has grown 75 percent in the last four years, to 1.4 million MT, and is projected to continue growing, particularly in China. This presents profitable opportunities for buyers, traders and farmers to expand and upgrade operations. However, as the global market responds and production levels increase, oversupply will eventually start to drive down prices and reduce margins. Thus, value chain actors should take advantage of higher margins now to make investments in upgrading to higher-value differentiated products.

End-Market Opportunities

Opportunities for growth in the sesame value chain in Mozambique include growing demand for the current grade of sesame, and for edible grade white sesame. Global growth in demand for sesame has been 44 percent over the last four years, while demand in the top 5 importing countries has grown 75 percent, to 1.4 million MT. In particular, China's demand for sesame has grown over 100 percent in the same period, while Mozambique's exports China grew by only 39 percent, and currently represent only 4 percent of China's total imports. Mozambique's top six competitors for the Chinese market are all in Sub-Saharan Africa, led by Ethiopia. Further research on production and marketing models in Ethiopia, Niger, Sudan, Tanzania and other countries would provide valuable information regarding Mozambique's competitiveness in this market.

Export markets offer price premiums for graded, differentiated, and dehulled sesame seeds that meet internationally accepted quality grading standards. These premiums are applicable for sesame seed used for oil crushing and for bakery/confectionary. According to the SNV Netherlands Development Organization (SNV) in 2013, price premiums for product meeting standard quality criteria (for color, oil content, humidity,

[10] IIAM has two varieties of white sesame seeds available, one known as the Lindi variety, and one known as the Nicaragua variety.

impurities) range from 10–30 percent above prices for the current quality of Mozambican product. If the product were also able to be certified organic or fair trade, the additional premium could be an additional 20 percent for each certification.

Moving from seed that is of oil crushing quality to edible grade seed (whole, usually white, seeds used for bakery/confectionary) would offer significantly higher premium prices. Demand is also growing in the United States, Middle East and Asia for processed sesame products (oil, tahini) which could provide a future target market for Mozambique.

Vision for equitable growth

The income of more than 15,000 SHFs (4 percent of total farmers growing sesame) can improve through sesame value chain upgrades that allow Mozambican product to enter higher-value markets. Improved quality, oil content, and varieties – particularly white sesame – can bring greater revenues and greater margins for farmers and traders. These upgrades require improved commercialization of inputs, particularly white sesame seed. Greater collaboration among input suppliers, traders, and buyers are needed so that SHFs and traders can capture greater value through grading and sorting.

Intervention areas

The overarching goal of interventions in the sesame value chain will be to strengthen the incentives and capacity of SHFs to invest in improving quality and productivity of sesame, particularly white sesame. The intervention areas will consist of:

- Supporting input dealers and sesame buyers to adopt collaborative business models with shared information regarding sesame varieties and prices, so that input dealers can effectively market to SHFs through education about market demand and prices, particularly for white sesame. This will increase understanding throughout the value chain about market segmentation and profitability, improve the confidence of SHFs in a stable market for sesame, and ensure the right inputs are available at the right time.
- Supporting input traders to adopt new marketing approaches to target SHFs for sales of improved sesame seed, particularly white sesame seed, and other inputs (drawing from interventions targeted to the input market, and in partnership/coordination with SEMEAR and the Southern Africa Seed Trade Activity).
- Supporting traders to establish innovative and cost-effective approaches to quality sorting and grading at the farm gate, such as producers' performance clubs[11].
- Improve access to market information through a rapid assessment of the white sesame seed market, to identify criteria for competitiveness, specific geographic and supply chain constraints, and segmentation of demand.

Leverage points

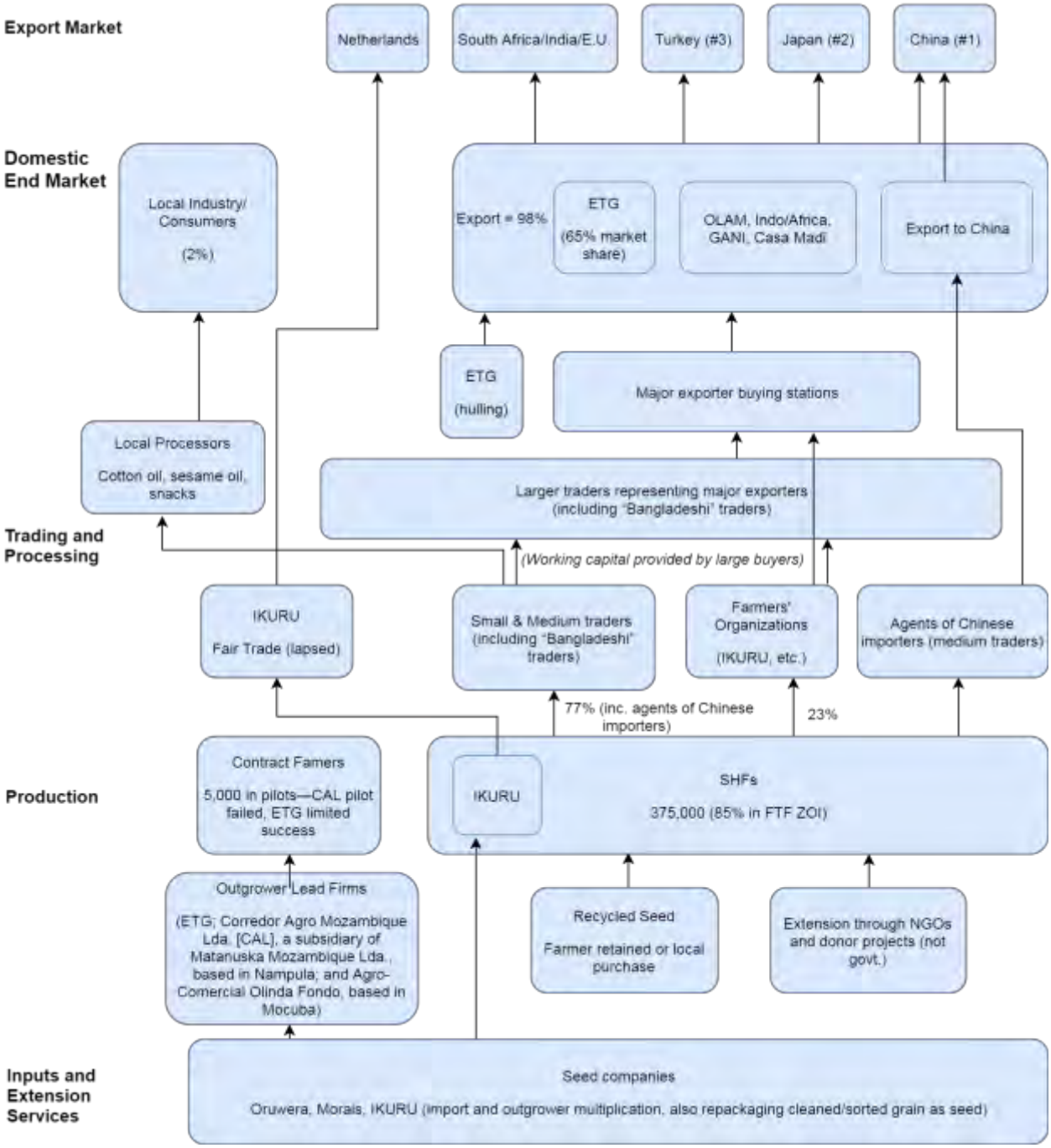
During the VCA field work the following market actors were identified as interested parties for intervention in sesame. Olam showed a strong interest to expand its investment in white sesame. Discussions are at the early stages with Olam for a possible partnership. The partnership could involve the piloting of performance clubs and similar approaches to grading at farm gate. ETG has already piloted white sesame production,

[11] Performance clubs can be referred to by different names, such as preferred supplier clubs, performance networks, or supply chain clubs. They are used as a common supply chain management business tactic in mature or advanced supply chains and markets. Through a performance club, a buyer would be able to segment the producers he/she is buying from into higher- and lower-performing suppliers. The buyer can then implement initiatives targeted at the better-performing suppliers, with the aim of strengthening their loyalty and upgrading their capacity to deliver quality.

including completing food safety testing at UniLurio microbiology lab, and is eager to scale up. K2, a seed company, is requesting support to establish a customer relationship management system which could embed a number of marketing innovations. A Market Actor Partnership Agreement has been signed with K2. Additional partnerships will be recruited at the start of implementation.

Sesame Value Chain Functions

Figure 4: Sesame Value Chain Map



Exporters / Processors

The sesame market in Mozambique is dominated by two large exporting companies, with ETG holding 65 percent market share and Olam 25 percent. Other participants include IndoAfrica, Gani Comercial, Casa Modi, Senwes, and Sunsmile. Ikuru SA also exports sesame (previously focused on a link to a fair-trade market in the Netherlands, but their fair-trade certification has lapsed). Exports, which have increased by 44 percent since 2013, are shipped from Nacala to the following countries.

Table 5: Exports of Sesame from Mozambique

Reporting Country	Unit	Quantity				Percentage Increase
		2013	2014	2015	2016	
China	MT	24,870	48,549	47,702	34,535	39%
Japan	MT	3,814	4,178	7,365	7,496	97%
Greece	MT	151	513	399	646	328%
Turkey	MT	683	5,099	1,317	478	-30%
South Africa	MT	394	365	95	209	-47%
India	MT	272	301	-	114	-58%
Netherlands	MT	94	92	14	0	-100%
Other	MT	418	801	257	584	40%
TOTAL	**MT**	**30,696**	**59,898**	**57,149**	**44,062**	**44%**

There is important inter-firm horizontal cooperation, with buyers regularly purchasing from each other in order to fulfill order quantities and coordinating in order to fill shipping containers. Recently, competition with these large buyers is being introduced from independent agents of Chinese importers purchasing directly from SHFs. This dynamic presents interesting opportunities to enhance producer bargaining power or to explore new strategic alliances.

Despite the potential for higher prices for higher-quality product, the large buyers/exporters are not engaged in performance management to improve quality. The main driver in the market remains competition for quantity. One exception has been ETG's pilot production of edible grade white sesame done in conjunction with SNV.

Buyers aggregate product, clean, sort, and process for export. Olam, ETG and Gani Comercial have color sorting machines which allow mixed color product to be separated automatically. Ikuru SA has a processing facility which is reportedly unused. ETG also has a dehulling machine and processes a portion of their product for export. They plan to increase their capacity in dehulling, and are piloting an oil processing facility in Nacala. Further research into the potential for oil processing would be beneficial, since it can add value to the crop quality that is currently being produced.

Very small-scale processing (2 percent of total production) is conducted by San-Oil (uses sesame as a cleaning agent in production of cotton oil) and Irmãos Semedo (processes sesame oil). Trade data show small exports of sesame oil to Belgium and South Africa. NGOs sell roasted sesame/cashew as a local snack food.

Donor assisted attempts by several large buyers to vertically integrate operations through contract outgrower schemes have had poor results. The nature of the sesame market, where there is strong competition for non-differentiated product, has too many opportunities for side-selling and too few options for sanctions to contracted producers.

Traders

Large numbers of small/medium traders, sometimes pre-financed by large buyers, purchase directly from farmers either at the farm gate or at small buying stations. The large buyers, particularly ETG, use hundreds of temporary traders from Bangladesh/South Asia during the commercialization season. These traders remain in Mozambique for several months to engage in the sesame and pigeon peas trade, primarily.

Traders may do minimal processing, to manually clean and color sort the product. Large buyers set up buying stations along roadways in high production areas to serve traders and farmer organizations. Ikuru SA has a large-scale operation in sesame and buys through its API network. Although previous fair trade sales provided higher prices to API members, it is not known whether membership in the API regularly delivers better prices to farmers. The recent increasing presence of small trader agents of Chinese importers purchasing directly from SHFs presents interesting opportunities to enhance producer bargaining power or to explore new strategic alliances.

Producers

Sesame is produced by approximately 375,000 SHFs on average plots of .5 ha. It is not a crop that can be mechanized, so it holds promise as a sustainable source of income for SHFs. Farmers use of recycled seed is the key constraint to improving productivity and quality. Current yields are only 30 percent of potential yields, and the resulting crop is of mixed color, size, oil content, etc. The average farmer markets only 100 kg of product. Thus, despite high prices, the average farmer income from this cash crop is still less than $100 annually. Data from the Ministry of Agriculture and Food Security (MASA) does not include total volumes of sesame produced.

Productivity has stagnated, with increases in volume due to growing number of producers, not better yields or increased plot sizes. SHFs use few inputs; less than 10 percent use improved seed and almost none use fertilizer or CPPs. Farmers have difficulty increasing plot sizes and optimizing yields because labor is a constraint during weeding and harvesting. In particular, the timing of harvest is critical to optimize yields before seed pods burst. Labor is also a constraint for on-farm threshing, which is done manually and results in high levels of impurities in the final product. On farm storage is rudimentary and further reduces quality while waiting to sell.

Sesame production also drains nutrients from soils. Sesame farmers generally use a three-year cycle for sesame production plots. Farmers have good yields in Year 1, but diminishing returns in Years 2–3 as nutrients are reduced, and they abandon the plot in Year 4. This cycle reduces the amount of land available for overall household needs, and requires new labor intensive land preparation every three years. Crop rotation with legumes and increased use of fertilizer would improve consistent yields and reduce labor requirements.

A number of outgrower or contract farming schemes have been attempted with donor assistance to partners such as ETG and Corredor Agro, but with limited results[12]. Contract enforcement has not been possible in the current sesame market, where there is strong competition for non-differentiated product, too many opportunities for side-selling, and too few options for sanctions to contracted producers.

Inputs and Extension Services

As mentioned, SHFs use few inputs. Much of the seed available on the market is simply grain that is cleaned, sorted, and repackaged as seed, rather than product grown specifically to be used as seed, with associated improved purity, germination, yield, etc. A quantity of grain worth 10 MZN can be sold as seed for 120 MZN. Several of the large buyers mentioned that they are engaged in this practice, and do not see it as a problem but in fact as a service to farmers. Seed companies such as Oruwera and Morais Comercial market grain as seed, undermining confidence in the certified seed market, as SHFs often make little distinction between the two.

IIAM in Nampula confirmed that Oruwera and Ikuru SA regularly request basic seed from IIAM, but availability is limited. Ikuru SA manages an outgrower certified seed multiplication program, using basic seed from IIAM. They have a seed treatment facility (cleaning, sorting, treating, and packing) in Nampula which

[12] Corredor Agro has closed. The ETG outgrower scheme in Nacala has been heavily dependent on the SNV management of the program.

they make available on a fee basis to other seed companies. In a recent development, Morais Comercial is working with SNV to set up a warehouse and to buy processing machines to sort, package and sell seed to SHFs.

There is very limited knowledge of sesame production among government extension services. Outgrower schemes and donor/NGO support programs include embedded extension services, and have had a limited positive impact on production practices, despite their ultimate commercial failure.

Enabling Environment

Grading Standards and Certifications: No internationally accepted grades or standards exist in Mozambique. To reach higher-value market segments, a collaborative effort with industry and government needs to be undertaken. A short-term solution would be the informal adoption of India's AGMARK[13] grades which set purity, oil content, and humidity standards. An independent verification structure would add legitimacy to such a solution.

Food Safety Testing: Edible grade sesame seed must pass microbiological food safety testing. The microbiology lab at UniLurio University in Nampula has recently received international certification from the Portuguese Institute of Accreditation (IPAC). Food safety tests performed at the lab should be acceptable worldwide.

Organic and Fair Trade: Certifications are available from third-party certifiers, and Ikuru SA has previously attained both certifications (organic certification from a South African organization). However, both of those certifications have now lapsed. Attaining and maintaining certification is costly and time consuming, and in the case of Ikuru SA was attained with donor support (USAID's AgriFUTURO and Sana projects). The fact that Ikuru SA let it lapse indicates that it was not sustainable.

Oilseeds Platform: A multi-stakeholder working group was established by SNV and AgriProFocus, a donor-funded multi-stakeholder network in Nampula, but its current status is unknown.

[13] AGMARK is a certification employed on agricultural products in India, assuring that they conform to a set of standards approved by the *Directorate of Marketing and Inspection*, an agency of the Government of India.

4.3. Groundnut Value Chain

Sector Overview

Groundnut is an important staple food as well as cash crop for SHFs. Approximately 1.5 million SHFs, or 35 percent of all SHFs, produce and market groundnut. Women play a major role in production and farm level processing (manual shelling and drying), as well as being the dominant domestic market traders and retailers. Quality is poor and yields, at 20 percent of potential, are among the lowest in Sub-Saharan Africa. Groundnut in Mozambique contains high levels of aflatoxin (a fungal contamination) due to poor agriculture practices. High aflatoxin levels constrain exports and present a health hazard within Mozambique.

Domestic end-market prices vary between the small Spanish variety (grown in the south) which is preferred for cooking and is an important ingredient in southern Mozambican cuisine, and the large Virginia variety (grown in the north) which is used for roasting and eating whole. Some product is processed manually by retailers or household level enterprises, and sold as crushed powder used in cooking, or as peanut butter. There is very little consumer awareness of aflatoxin, and a low quality product, with shriveled or broken nuts and pest damage, is broadly accepted. The current market does not offer price premiums for reduced aflatoxin levels or for higher quality groundnut.

As a consequence, the domestic market has no segmentation and the prevailing business model is for buyers to engage SHFs in spot market transactions with the aim of purchasing and trading whatever the market is ready to produce, with little or no incentive to invest to upgrade quality along the value chain.

Mozambique's exports are small. Total exports of 20,000 MT in 2013 fell to 10,000 MT in 2016. Exporters such as Gani Comercial, ETG, and Alpha Mozambique Trading have continued to sell small amounts to Indonesia (58 percent of exports) and South Africa (37 percent of exports). Although export volumes are small, they still represent 10 percent of total production, and have the potential to grow.

Sector Dynamics

In the domestic market, buyers and traders perceive latent demand for additional volumes of current quality product, and nascent demand for improved quality/low-aflatoxin product among urban elites. However, there is almost no SHF investment in improving productivity or quality, and there has been no significant growth in area under production. Further research is needed to estimate the extent of unmet domestic market demand, particularly whether there could be a higher-value market for groundnut with reduced aflatoxin levels from consumers or manufacturers. Producing low-aflatoxin groundnut for the domestic market would be a first step toward Mozambique re-entering the global market for groundnut.

Global markets for imported groundnut have grown 44 percent over the last four years, driven by China whose growth in imports was almost 2,000 percent. However, since 2013 Mozambique's exports have dropped by half. With better aflatoxin control Mozambique could re-enter export markets, where reaching the same export volumes as 2013 would create demand for approximately 10 percent increase in production. Within export markets, there is a particularly high-value market for fair trade groundnut in Europe, which was previously tapped by Ikuru SA.

End-Market Opportunities

Potential for domestic growth: Informal imports from Swaziland and minimal formal imports from South Africa offer an import substitution opportunity. A recent investment in a processing facility for the manufacture of therapeutic foods by NuTrade could create large-scale demand for high-quality, low-aflatoxin products. The poultry feed industry also presents a potential market for groundnut, but aflatoxin remains an issue and, to date, Mozambican feed mills are not using groundnut. Higher-value opportunities include increasing peanut powder/cake processing, and initiating larger-scale roasting or blanching.

Potential for export growth: Mozambique's exports have always been small, but falling exports over the last five years should be further analyzed to determine the potential for returning to 2013 levels. This would

represent more than a doubling of export volumes and would require an approximate 10 percent increase in production. Global market growth for imported groundnut has been 44 percent over the last four years, driven by China's growth at almost 2,000 percent (global growth excluding China was 18 percent).

Indonesia is the third-largest importer of groundnut, and has higher allowable limits for aflatoxin, at 15 micrograms/kg versus 4 micrograms/kg in the EU. Indonesia's main source is India, which in 2016 provided almost 90 percent of total imports (167,000 MT of 190,000 MT). However, Mozambique harvests on the opposite seasonal schedule, which offers an opportunity for good prices for approximately 10 percent (20,000 MT) of Indonesia's current demand. Although Indonesia's demand for imports has dropped by 33 percent over the last five years, the market opportunity for approximately 20,000 MT is still 10 times the volume of Mozambique's current exports to Indonesia, and double the volume of exports to Indonesia in 2013.

South Africa may be a less-likely growth opportunity, since South African import demand varies with domestic production, which is similar to Mozambique's due to regional weather patterns and crop prices. Current trade to South Africa is sporadic and opportunistic, often via backhaul opportunities. However, Mozambique could take greater advantage of preferential trade within the Southern African Development Community (SADC) region, if aflatoxin can be controlled.

European markets pay high price premiums for organic and fair trade groundnut. Ikuru SA has previously exported small amounts of fair trade product to the EU, but aflatoxin contamination created an obstacle to that market (the EU has the strictest limitations), and Ikuru SA has allowed their fair trade certification to lapse. Ikuru SA is participating in efforts to pilot aflatoxin control measures, and could recapture high-value trade to the EU.

Vision for Equitable Growth

Improved incomes for 75,000 SHFs (5 percent of total SHFs producing groundnut), and improved nutrition outcomes for the Mozambican population can be achieved through quality upgrades in the value chain responding to expanding domestic market demand for groundnut with lower aflatoxin levels. Once improved supply chain management models are piloted and proven to reduce aflatoxin levels, they can be scaled up to produce larger volumes of low-aflatoxin product, and Mozambique can re-enter broader export markets.

Intervention Areas

Opportunities for change depend on strengthening the business case for investments in quality upgrading along the value chain. This can be driven by both the domestic and the international market. Domestically, a market segment for low-aflatoxin groundnut may exist in affluent areas, and could be leveraged for market upgrades, but the size and market potential of this segment remains to be understood. Internationally, the market demand is known, but incentives to reach the more demanding markets have been insufficient for current market actors:

- Provide market information on domestic and export market demand for low-aflatoxin groundnut to determine the business case for investments in serving these market segments.
- Support buyers (domestic traders and exporters) to adopt innovative approaches to source low-aflatoxin groundnut, including incentives that reward good agriculture practices to control aflatoxin.
- Support the establishment of an internationally recognized aflatoxin testing system.

Leverage Points

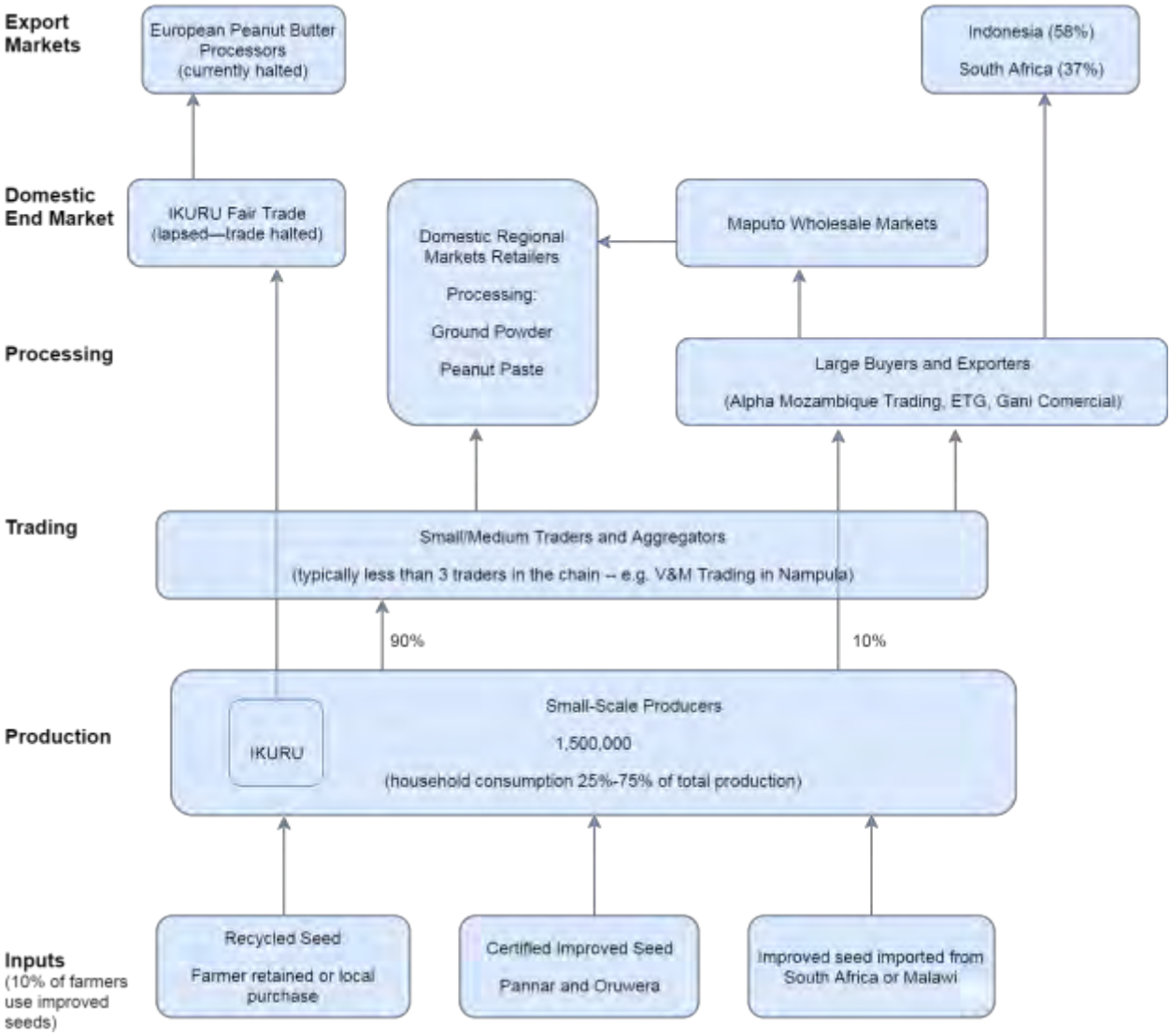
- NuTrade is a South African based firm interested in producing low-aflatoxin groundnut for the manufacture in Mozambique of therapeutic foods to address malnutrition, suitable for export to South Africa for peanut butter manufacturing, and eventually to the European candy/snack market. They have already brought processing machinery to Nacala, but are not in production due to insufficient supply and

aflatoxin contamination. They estimate their market to be 90,000 MT/year, which would require a 65 percent increase over current levels of production and the strict control of aflatoxin. They want to use a model of intercropping with other crops, potentially with cashew in a partnership with Condor. NuTrade has funding from AgDevCo and is well positioned to play a lead role in catalyzing low-aflatoxin production and providing international market access.

- The Aflatoxin Working Group in Nampula includes private sector, public sector, and academic community participants experimenting with improved seed, production technologies, and processing and storage practices to reduce aflatoxin levels. They are well positioned to be a technical resource for FTF Inova partners.
- Ikuru SA is strongly motivated to better understand the domestic demand for low-aflatoxin products, and to master the reduction of aflatoxin in order to re-enter EU fair trade markets.
- The aflatoxin testing lab at UniLurio is committed to achieving internationally certified aflatoxin testing capacity (their microbiology testing has been certified by IPAC).

Groundnut Value Chain Functions

Figure 5: Groundnut Value Chain Map



Trading and Exporting

Almost 90 percent of marketed product is sold at the farm gate or at small buying stations to small traders. The vast majority of traded product is shelled, raw groundnut. Total volumes traded are not known, since no statistics were found on the percentage of product marketed versus consumed at the household level. Traded product moves through small primary traders to larger traders and ultimately to the large aggregators/exporters (such as Gani Comercial and ETG) at their warehouse facilities concentrated in Nampula. Exports are shipped from Nacala to Southeast Asia and the Middle East, while trade to South Africa generally goes through backhaul opportunities from Maputo.[14]

[14] More analysis needs to be carried out to see how these traders can ensure and certify that aflatoxin levels are adequate to meet Indonesian standards, and to identify more precisely which markets in the Middle East are receiving exports.

Table 6: Exports of Raw Groundnut from Mozambique

	Unit	Quantity			
		2013	2014	2015	2016
South Africa	MT	9,089	1,579	54	6,131
Indonesia	MT	10,682	8,830	6,403	2,521
Other	MT	565	6	175	1,468
TOTAL	**MT**	**20,336**	**10,415**	**6,631**	**10,120**

*Exports to Philippines, Malaysia, and Thailand

Similar networks aggregate product for the Maputo/Zimpeto market wholesalers, who are mostly women. The large aggregators and the Maputo wholesalers provide finance through well-developed relationships with networks of aggregators and traders. The large aggregators and wholesalers have access to bank loans as well as informal finance. Maputo/Zimpeto market wholesalers travel up-country with large trucks to purchase from aggregators mostly in Nampula, and sell on to retailers nationwide. They also buy product and store in warehouses to take advantage of future price increases. Larger companies (e.g., V&M Trading in Nampula, a local trading firm with warehousing which generally buys from smaller traders) also buy, store and truck groundnut to the south. Sometimes groundnut is shipped in containers by coastal shipping from Nacala to Beira and Maputo. Unfortunately, throughout the value chain, a lack of proper storage and post-harvest handling further increases aflatoxin levels.

Retail

Retailers at markets throughout Mozambique sell whole nut in bulk. Smaller and larger varieties are separated and priced differently, but there are no premiums for quality—the product will usually include small, shriveled, and pest-damaged nuts. Retailers may process small amounts of ground powder (used in southern Mozambican cooking), and peanut butter (not very popular in Mozambique). This processing may also be done by separate value chain actors at the household level. There were no reports of industrial scale processing except for a therapeutic food processing facility in Beira, which is also not functioning due to aflatoxin issues.

Production

Almost 1.5 million SHFs produce groundnut for their own consumption, and market the surplus. Farmers plant an average of .33 ha, using recycled seed and no other inputs. Yields at 350 kg/ha are only 20 percent of potential, and are among the lowest globally. This results in farmers harvesting an average of only 115 kg. MASA statistics do not indicate the percent of product that is marketed versus consumed within the household, but the value of the entire harvest is likely to fall below $100 annually per household. Women are heavily involved in groundnut production and farm level processing, which requires shelling by hand and drying the nuts. On average, women are able to shell approximately 20 kg per day.

Aflatoxin contamination occurs during production and farm-level processing. Aflatoxin contamination can originate with the seed or in the soil (soil should be tested before growing). There is a common misperception that Spanish variety groundnut does not have aflatoxin contamination, but there is no difference in susceptibility or resistance to aflatoxin between the Spanish and Virginia varieties. IIAM speculates that this belief stems from the fact that the Spanish variety is faster to maturity so it stays in the soil for less time during which aflatoxin could develop.

Aflatoxin contamination can also begin and/or worsen as the fungus grows on the crop during post-harvest handling and farm level storage. Current methods of farm level processing increase aflatoxin levels as harvested nuts are often soaked in water to make shelling easier, and nuts are not properly dried. Sale of groundnut in the shell would be ideal for reducing aflatoxin, but is unrealistic given the costs and logistics of transportation.

Input Market

Improved groundnut seed imported from South Africa or Malawi, as well as certified seed production from Oruwera, meets less than 10 percent of the national groundnut seed requirement[15]. The vast majority of farmers use recycled seed, either from their own saved seed, or purchased from neighbors or local markets at planting season. Saved/recycled seed suffers from loss of hybrid variety characteristics as well as from "negative selection," i.e., saving the smallest nuts for planting since larger nuts are more valuable for sale.

There is little certified seed produced in Mozambique, with Oruwera being the only identified producer. The Tropical Legumes project of the International Institute for Tropical Agriculture (IITA) in collaboration with IIAM have released new varieties, but the capacity to produce large quantities of breeder, foundation or basic seed is very limited. Partnerships with NGOs and donor projects have helped with seed multiplication, but quantities are limited and the distribution networks, as with all seed, remain weak. The seed companies report unmet needs for variety development and selection for specific areas, mechanized seed treatment facilities, and seed storage to maintain quality and prevent aflatoxin contamination.

There have been various NGO projects to encourage use of manual mechanical shellers, but little uptake is evident. With price points for mechanical shellers around $100 minimum, equivalent to more than one year of groundnut revenue, household level investment is unlikely, and remains to be tested. A business model for rental use of mechanical shellers is possible, but the economics of the crop and the low value accorded to women's labor have limited any widespread interest. Further research is warranted to investigate how to increase efficiencies of farm-level processing and to develop a strong value proposition for its adoption. As labor is generally a constraint in Mozambican agriculture at key points in time, the difficulty of processing more groundnut at the farm level may also discourage farmers from efforts to increase productivity.

Enabling Environment

The primary enabling environment issue is the regulation and management of aflatoxin contamination, which presents a health hazard domestically and constrains Mozambique's ability to export. To date, public awareness of and government attention to this hazard is limited. Aflatoxin regulatory enforcement and testing capacity are key challenges – regulation is in place but not enforced, and internationally certified testing cannot be completed in Mozambique. It is important to note that aflatoxin is a concern in numerous crops including maize, but attention has focused on groundnut because of the higher profile brought by groundnut export restrictions. Aflatoxin control requires a set of improved production, harvest, drying, and storage practices. Investment in these practices is not likely when there is no incentive to reduce aflatoxin levels (based either in market demand or regulation). A multi-stakeholder, public/private working group has been established in Nampula by InovAgro to advance knowledge and practice. The group meets several times a year, and members are organizing to test various interventions for aflatoxin control, including Aflasafe, a biological control being tested in Mozambique and other African countries[16].

Aflatoxin testing with international validity can only be done in South Africa; 30 kg samples from container shipments must be prepared and cleared for export to South Africa for testing, which then provides certification for the entire shipment. This process does not provide a high level of confidence from international buyers. Three labs in Mozambique—SGS, Invatec, and the aflatoxin lab at UniLurio University—can do the testing, but their results are not internationally recognized. The lab at UniLurio University recently received international certification from IPAC for their microbiology lab, but does not have international certification for their aflatoxin lab. They report needing an additional $2,000–$5,000 to procure additional strains of bacteria used in testing. This is also a need reported by the IITA aflatoxin lab in Nampula, which currently uses their partner lab in Nigeria for advanced testing. The IITA lab is well

[15] These seed varieties are imported to improve productivity, not to control aflatoxin levels, since the supply of certified groundnut seed in Mozambique is limited.

[16] The commercial viability of Aflasafe is, however, doubtful.

equipped and able to do a lower standard of testing, but is available to support research only. The IITA lab, funded by USAID, is piloting the use of Aflasafe.

If aflatoxin control ultimately improves export marketability of Mozambique's groundnut production, there will still be enabling environment challenges such as the establishment of grading standards. Moving into higher-value export markets would also require a comprehensive quality control and a traceability system that can track weight, variety, grade, humidity, in addition to testing for aflatoxin.

4.4. Pigeon Pea Value Chain

Sector Overview

Pigeon pea is traditionally a dual food/cash crop in Mozambique[17]. In the last 10 years, it has become primarily a cash crop, grown for export and for domestic marketing and consumption, especially in the Indian community. Over the last 15 years, crop volumes have grown steadily at 7 percent per year, ultimately exceeding the growth in all other grain legumes in Mozambique. Increased production has been a function of new farmers and expanded land under production, rather than increased productivity[18]. Approximately 70 percent of production is exported, while 30 percent is marketed domestically or consumed locally – research points to household consumption of 10-15 percent, and domestic sale of 15-25 percent of production. Two large commercial exporters, ETG and Olam, dominate the market. They actively promoted pigeon pea production particularly during the commodity price boom—production almost doubled between 2008 and 2012. Their primary target was the large and attractive market opportunity in India. Mozambique has a competitive advantage for exports to India, since the harvest season in Mozambique coincides with the lowest period of supply within India and from India's primary supplier, Myanmar. India absorbs 97 percent of all pigeon pea imports globally, almost all of which are of unprocessed pigeon pea which is then split into dhal in low-cost Indian processing plants. According to the General Director of Olam Mozambique though, Olam has announced that they will be withdrawing from trading in pulses, including pigeon pea, on a global level.

With good production results and prices, pigeon pea has been adopted widely and is currently grown by 1.1 million SHFs concentrated in Zambezia and Nampula. Pigeon pea exports have shown an extraordinary growth path, with exports increasing from 50,000 MT in 2013 to 125,000 MT just three years later.[19] Volumes have increased due to increasing numbers of farmers producing pigeon pea, rather than from increasing plot size or increasing productivity. Yields are only 40 percent of potential, mainly due to the use of recycled seed and limited use of inputs.

Sector Dynamics

The export market opportunity to India continues to grow, with India's import demand estimated to double by 2030 to 1 million MT. Recently India's food security policy has restricted exports of pigeon pea and other pulses, which opens higher-value markets for processed (split) pigeon pea in Europe and the Middle East, which were previously served by cheap Indian exports. ETG has invested in processing facilities, targeting export markets outside of India. India and Mozambique have also recently signed a Memorandum of Understanding (MOU) committing the Indian government to facilitate purchase of 750,000 MT of pigeon peas and other pulses from Mozambique by 2021, effectively doubling current amounts. While the MOU was put in question by the Indian parliament's passage of import restrictions on pigeon pea and other pulses, in August 2017, the Indian government announced that India would not restrict imports from Mozambique up to the quota in respect of the agreement. In addition, over the course of FTF Inova's inception phase in 2017, the global price of pigeon pea dropped due to a highly productive year.

At this time, FTF Inova assumes that global pigeon pea demand will continue to grow in the medium to long term, including demand in India given domestic production and consumption trends. However, the various developments in this sector will be closely analysed and although the project is committed to investing in the sector in year 1, it will re-evaluate next year whether it should continue working in it or not.

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[17] Pigeon pea is often consumed green (fresh) in rural areas, especially if there have been problems with other food crop harvests. Other domestic consumption by the local Indian community is of dried pigeon pea for dhal.

[18] Walker, et al: Pigeon pea in Mozambique: An Emerging Success story of Crop Expansion in Smallholder Agriculture. Sept 2015, MSU.

[19] Prior to 2012, pigeon pea was not classified with a separate Harmonized Trade System code, so no specific pigeon pea export data is available.

End-Markets

Domestic market: According to MASA statistics, in 2014 approximately 30 percent (33,000 MT) of Mozambique's pigeon pea production was consumed domestically. There are no indications of significant growth in the domestic market, other than general growth in population and urbanization. For the urban market, particularly, investments in small-scale processing (splitting) may be attractive.

Export market: According to MASA statistics, in 2014 approximately 70 percent (78,000 MT) of Mozambique's pigeon pea production was exported. Global Trade Atlas figures show Indian imports of 125,000 MT from Mozambique in 2016. Virtually 100 percent of Mozambique's exports are to India, with minor informal trade to Malawi. India is both the world's largest producer and importer of pigeon peas, purchasing 97 percent of all global pigeon pea imports. India has also been a small exporter, with 11,000 MT exported in 2016.

India's largest supplier is Myanmar with 44 percent market share, followed by Mozambique and Tanzania, each with approximately 20 percent market share. Mozambique and Tanzania harvest pigeon pea when supplies in India and Myanmar are at their lowest, allowing the Eastern and Southern African countries to capture high prices (25 percent higher than during India/Myanmar harvest season). Over the period 2013–2015, exports from Myanmar and Tanzania decreased – further research is needed to understand the causes and how this may impact Mozambique's competitiveness and opportunity.

India's demand for pigeon pea imports grew by 73 percent from 2013 to 2016 (see Table 7, below). It is projected to double from 2015 to 2030, to a total of 1 million MT. Indian market consumer preference is for Indian varieties, followed by those from Myanmar, followed by African varieties. Increasing competitiveness with Tanzania will be key, as these two countries compete for the seasonal peak in demand. A 2016 MOU between Mozambique and India establishes a set of incentives and guarantees aimed to double the export of pulses, including pigeon peas from Mozambique to India. A risk for Mozambique is if Indian farmers greatly increase their own production of pigeon peas, reducing total demand for imports.

More opportunity in the EU/United States/Middle East markets may open up as a result of India's recent food security policy to restrict the export of pulses, including pigeon peas. India's exports are small, totaling only 11,000 MT in 2016, but their target markets import processed (split) pea which commands higher prices. In 2016, India's average price/kg paid for unprocessed imports was $1.08, while their price/kg earned for exports was $1.95.

Vision for Equitable Growth

Up to 30,000 Mozambican farmers (about 3 percent of all farmers growing pigeon pea) can increase their incomes through improved productivity to meet fast growing demand for unprocessed pigeon pea in India. Farmers also have the opportunity to capture greater margins if product quality can meet the demands of new higher-value market opportunities for processed pigeon pea in Europe and the Middle East.

Intervention Areas

The objective of interventions in pigeon pea is to increase productivity through increased demand and adoption of inputs by pigeon pea SHFs, especially higher yielding certified seed. This will be achieved by sending market signals for a stable off-take market, rewarding increases in production, and by improving the capacity of input traders to deliver tailored inputs and services to pigeon pea SHFs.

- Collaborating with the SEMEAR project which is working to increase the available supply of certified pigeon pea seed for sale to farmers by the private sector.
- Supporting input traders and dealers to adopt new marketing approaches that target SHFs growing pigeon pea.
- Supporting pigeon pea buyers to strengthen linkages with producers securing volumes of production and sending signals to stimulate investments by SHFs.

- Supporting input traders and pigeon pea buyers to adopt collaborative business models in order to encourage investments and production of pigeon pea by SHFs.

Leverage Points

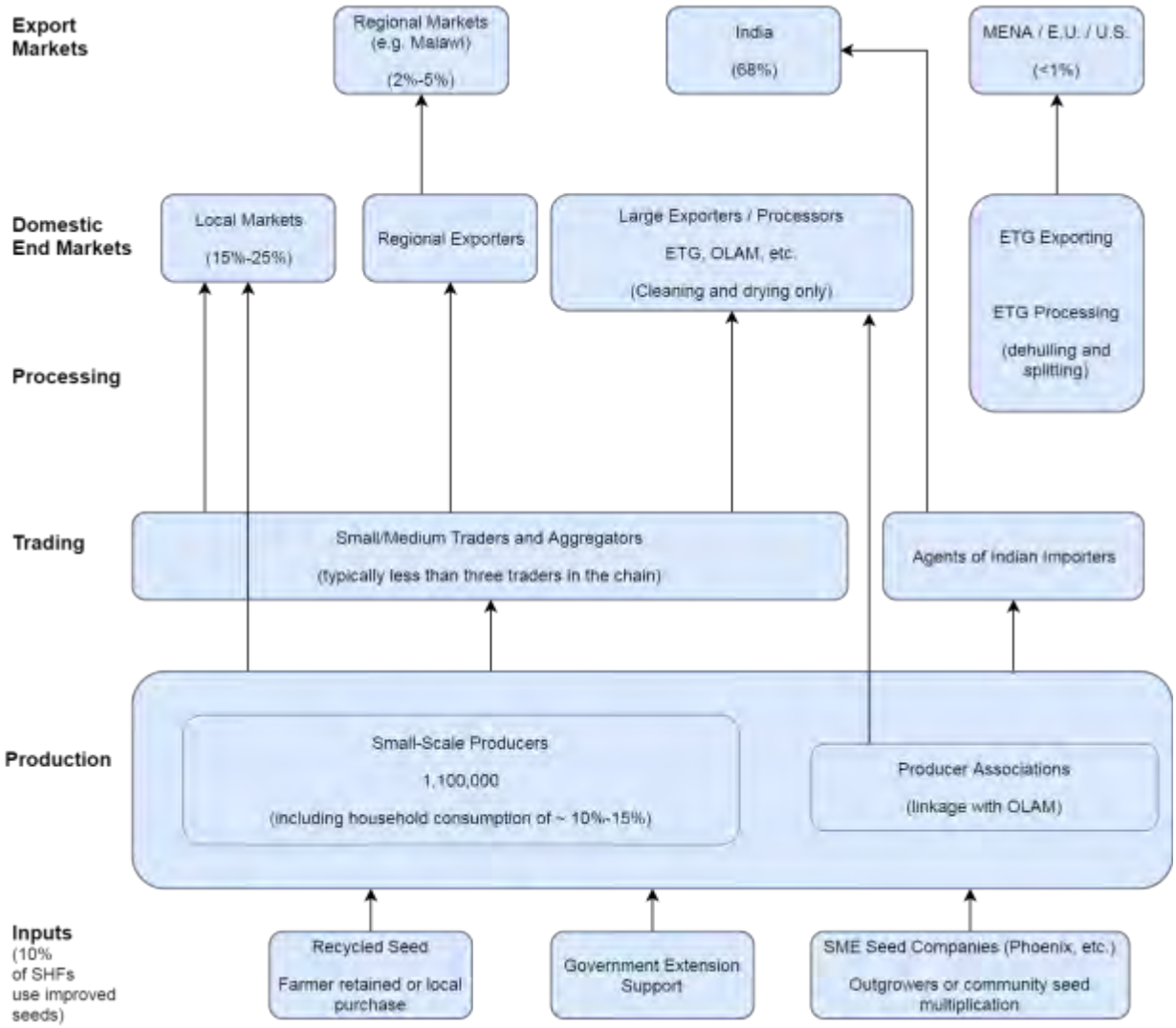
Seed companies are increasingly investing to serve the SHF market segment. TECAP, with support from USAID, has recently expanded its distribution centers by opening new input supply stores in Nampula, Tete, and Chimoio.

The FTF Mozambique Resilient Agriculture Markets Activity-Beira Corridor is promoting the adoption of pigeon pea in the FTF ZOI districts of Angonia, Macanga, and Tsangano in Tete province, so SHFs newly entering this value chain can offer an eager market for inputs demonstrated to deliver high productivity through the activity's extension services, and a large number of SHF producers seeking a secure and profitable relationship with buyers.

ETG has invested in processing facilities to meet export and domestic market demand for processed (split) pigeon pea. These large asset investments create greater incentive for ETG to engage in better supply chain management to ensure consistent supply for their processing facilities. Considering that ETG has recently invested in processing facilities targeting export markets outside of India, these market segments also represent a viable opportunity for export.

Pigeon Pea Value Chain Functions

Figure 6: Pigeon Pea Value Chain Map



Exporting/Processing

Mozambique is the fifth-largest global producer of pigeon pea and the third-largest exporter to India. Large exporters are highly motivated to increase production and trade, given growing demand and the recent MOU between India and Mozambique. Two firms, ETG and Olam, dominate the trade in pigeon pea. Current processing is mostly limited to cleaning and drying for the Indian market, in which Mozambican product is graded "fair to average quality". ETG has invested in processing facilities for hulling and splitting pigeon pea to be sold domestically and exported. Processed pigeon pea brings significantly higher prices, as demonstrated

by the difference in the cost, insurance, and freight price of $1.08 in India for unprocessed pigeon peas compared to the free on-board export price of $1.95 of processed pigeon pea, both in 2016[20].

Table 7: Exports of Pigeon Pea from Mozambique

	Unit	Quantity			
		2013	2014	2015	2016
India	MT	48,797	75,496	95,082	125,021
Malaysia	MT	-	-	19	-
Portugal	MT	-	7	11	-
Australia	MT	-	-	24	-

Several recent developments will create new dynamics among the exporters in the market. As mentioned, Olam has announced that they will be withdrawing from trading in pulses, including pigeon pea, on a global level. Trade continues in Mozambique currently, but the eventual reduction in competition will change the market dynamic. On the other hand, new competition from agents of Indian importers buying directly from SHFs has disrupted the dominant position of the established large Mozambican buyers. Thirdly, ETG's investments in new processing facilities (adding up to 60,000 MT capacity for splitting) makes them well-placed to take advantage of new opportunities for split pea in the EU/United States/Middle Eastern markets, because supply from India is restricted.

Timing is critical to obtain the best prices for pigeon pea from Mozambique. Since Mozambique's production becomes available as supplies in India are low, prices are best just prior to the beginning of India's harvest season. Exporters are sometimes not able to bring product to market quickly enough to avoid falling prices as production from India and Myanmar becomes available. Increasing efficiencies in trading and transportation can improve the consistency with which exporters are able to achieve the best timing/pricing.

Some attempts have been made by large buyers/exporters to build contract outgrower schemes, with limited success. Strong competition for an undifferentiated product means that opportunities for side selling are many, and sanctions for contract enforcement are difficult to implement.

Trading

Large numbers of small/medium traders, often pre-financed by large buyers, purchase directly from farmers either at the farm gate or at small buying stations. The large buyers, particularly ETG, use hundreds of temporary traders from Bangladesh/South Asia during the commercialization season. These traders remain in Mozambique for several months to engage in the pigeon pea and sesame trade, primarily.

Traders may do minimal processing, to manually remove impurities. Large buyers set up buying stations along roadways in high production areas to serve traders and farmer organizations. A recent dynamic is the increasing presence of small trader agents of Indian importers purchasing directly from SHFs. This dynamic presents interesting opportunities to enhance producer bargaining power or to explore new strategic alliances.

Production

More than 1 million SHFs, mostly women, produce pigeon pea using recycled seed with few/no other inputs, with resulting low yields of 385 kg/ha (40% of potential 1 MT/ha). With an average plot size of 0.25 ha, most

[20] The cost, insurance and freight price assigns the cost of the commodity plus the cost of insurance and freight to the seller. The free on-board price includes only the commodity, and loading onto transport.

farmers are marketing less than 100 kg of product and earning less than $100 annually. Pigeon pea does not lend itself to mechanization, so there are currently no large-scale producers or emerging commercial farmers in this crop—the largest producers identified in 2014 had 2–3 ha. Over the last 15 years, crop volumes have grown steadily at 7 percent, ultimately exceeding the growth in all other grain legumes in Mozambique. However, increases in volume are due to growing number of producers, not better yields or increased plot sizes.

Productivity has stagnated, with the key constraints of access and affordability of improved seed and lack of labor. Pigeon pea fixes nitrogen and yields tend to be stable on the same plot over time. Pest problems are fortunately limited - the primary pest in most producing countries, cotton bollworm, is not prevalent in Mozambique. Productivity of both pigeon pea and maize would be improved by intercropping rather than growing each as a monoculture. Soil fertility would be improved through nitrogen fixation for maize, and labor requirements would be reduced[21].

Strategies for scaling up pigeon pea production and marketing to benefit SHFs include both intensification and extensification. To date, in the atmosphere of "benign neglect" which has seen pigeon pea production increase more than any other grain legume in Mozambique, extensification has been the pathway to larger volumes. However, given low productivity and plot sizes, this does not provide a lever to lift SHFs out of poverty. Intensification, with efforts focused on farmer utilization of improved seed, can increase volumes and offer the opportunity for SHFs to move out of extreme poverty.

Input Market

There is very limited access to inputs for pigeon pea production. Only 10 percent of SHFs use improved seed, and virtually none use fertilizer or CPPs. Four new varieties, including the new medium-duration varieties ICEAP 00554 and 00557, were released in 2011. However, IIAM and USEBA have not provided adequate breeder, foundation or basic seed, nor has there been support for seed multiplication or distribution to farmers. Some of the new small and medium enterprise (SME) seed companies, such as Phoenix Seeds, have entered the market for improved pigeon pea seed and are partnering with farmer organizations such as COPAZA for seed multiplication. Impact to date, however, remains very small.

Since pigeon pea is a widely grown crop, government extension agents should be able to provide technical assistance, but overall weakness of government extension is an issue. Limited donor involvement in this crop means that no recent extension materials/trainings have been developed.

Enabling Environment

Pigeon pea has not received significant attention by development actors, and may have thrived in a context of "benign neglect." Several recent policy issues, however, will have an impact on the Mozambican pigeon pea market.

ETG, as discussed above, has the majority of pigeon pea hulling/splitting capacity in the country, and with the recent Indian policy decision to restrict imports of pulses, ETG is well positioned to target higher-value markets for processed pigeon pea. To ensure their supply, ETG has lobbied for export taxes on unprocessed pigeon pea. A bill was introduced but defeated, though ETG's commitment to dominating the market is clear and may be seen through other mechanisms in the future.

In 2016, the governments of Mozambique and India signed an MOU committing the Indian government to promote imports of pigeon pea and other pulses from Mozambique. Table 8 highlights the gradually increasing minimum targeted traded totals by 2021, reaching a target of 200,000 in year 2020-21. Details on price guarantees and other implementation details are being debated in the private sector, but the MOU has

[21] Intercropping maize with pigeon pea would create a shade effect, limiting the amount of sunlight reaching weeds, inhibiting their growth, thus reducing labor required for weeding.

spurred significant interest from all stakeholders in improving volumes. As part of the agreement, the Indian government is also engaged in pigeon pea variety development specifically for Mozambique. While the MOU was put in question by the Indian parliament's passage of import restrictions on pigeon pea and other pulses, on August 18, 2017, the Indian government announced that India would not restrict imports from Mozambique up to the quota in respect of the agreement, but that prices still need to be agreed between the importers and the exporters.

Table 8: India–Mozambique Pulse Trade Quantities

Year	Minimum quantity of export
2016-17	100,000 tons
2017-18	125,000 tons
2018-19	150,000 tons
2019-20	175,000 tons
2020-21	200,000 tons

4.5. Soybean Value Chain

Sector Overview

Soybean is a relatively new cash crop in Mozambique, driven by the growth of the domestic poultry industry which requires soybean for poultry feed production. Multiple large, vertically integrated poultry production and feed mill firms have had a consistent and steadily increasing demand for soybean which has consistently exceeded domestic production by approximately 50 percent. The soybean value chain has had 10 years of significant donor/NGO investment at all levels, which has spurred growth, but also introduced market distortions that constrain private sector development. This period coincided with the global commodity price boom, and drew many SHFs and larger commercial farms into the value chain. While use of improved seed and other inputs for soybean production are higher than in other common cash crops, productivity of SHFs remains low. SHFs also shift in and out of various cash crops as prices vary, creating instability in the domestic supply and reinforcing large buyers' reliance on more consistent and higher quality imports. With growing investments by large commercial farms and the benefits of scale and mechanization in soy production, there is concern that SHFs will be squeezed out of the market as large commercial farms reach their potential output.

Sector Dynamics

Soybean is easily mechanized and produced at large scale. Large commercial farms are making increasing investments in soybean production. It is likely that in the medium term, SHF soybean farmers may be squeezed out of the market. In the short to medium term, there are unmet market demands that offer the potential for SHFs to benefit from increased productivity. However, despite significant levels of donor and NGO support, there remains very limited sustained uptake in the use of commercial seed or Rhizobia inoculant, casting doubt on the potential for SHFs to earn higher incomes through soybean.

End-Markets

The poultry feed industry has a consistent, and growing, demand for soybean that outstrips domestic production by 50–100 percent. In 2016, estimates of soybean demand were 75,000 MT while production was just 32,000 MT. Soybean prices have been dropping precipitously, from $684/MT in 2012 to $370/MT in 2015. Less attractive prices for domestic producers lead to larger shortages. For example, in 2013/2014, there were 40 percent more farmers producing 35 percent more soybean than in 2016. Prices dropped by 45 percent from 2014 to 2016.

Vertically integrated poultry feed/poultry production firms require consistent, quality product. Large-scale commercial production of soybean in countries such as South Africa, Argentina, and Brazil can deliver against those requirements at prices that are competitive to domestic SHF production.

Demand across the region is high. Despite the unmet demand for soybean domestically, approximately 15 percent of total production was exported to Malawi through informal channels. Significant domestic and regional production deficits are expected to continue to 2020+, with estimates from TechnoServe of 2020 deficits nearing 85,000 MT domestically and 2.5 million MT across the region.

Vision for Equitable Growth

Soybean is a crop that is easily mechanized, and thus the opportunities for sustainable incomes for SHFs are uncertain. Competition from recent large investments in soybean production is likely to squeeze out large numbers of small farmers. Therefore, the soybean value chain is unlikely to offer opportunities for equitable or sustainable growth for SHFs. The relatively small number of SHFs in this value chain (<1 percent of all SHFs) also suggest that FTF Inova resources will have greater impact in other value chains.

Intervention Areas

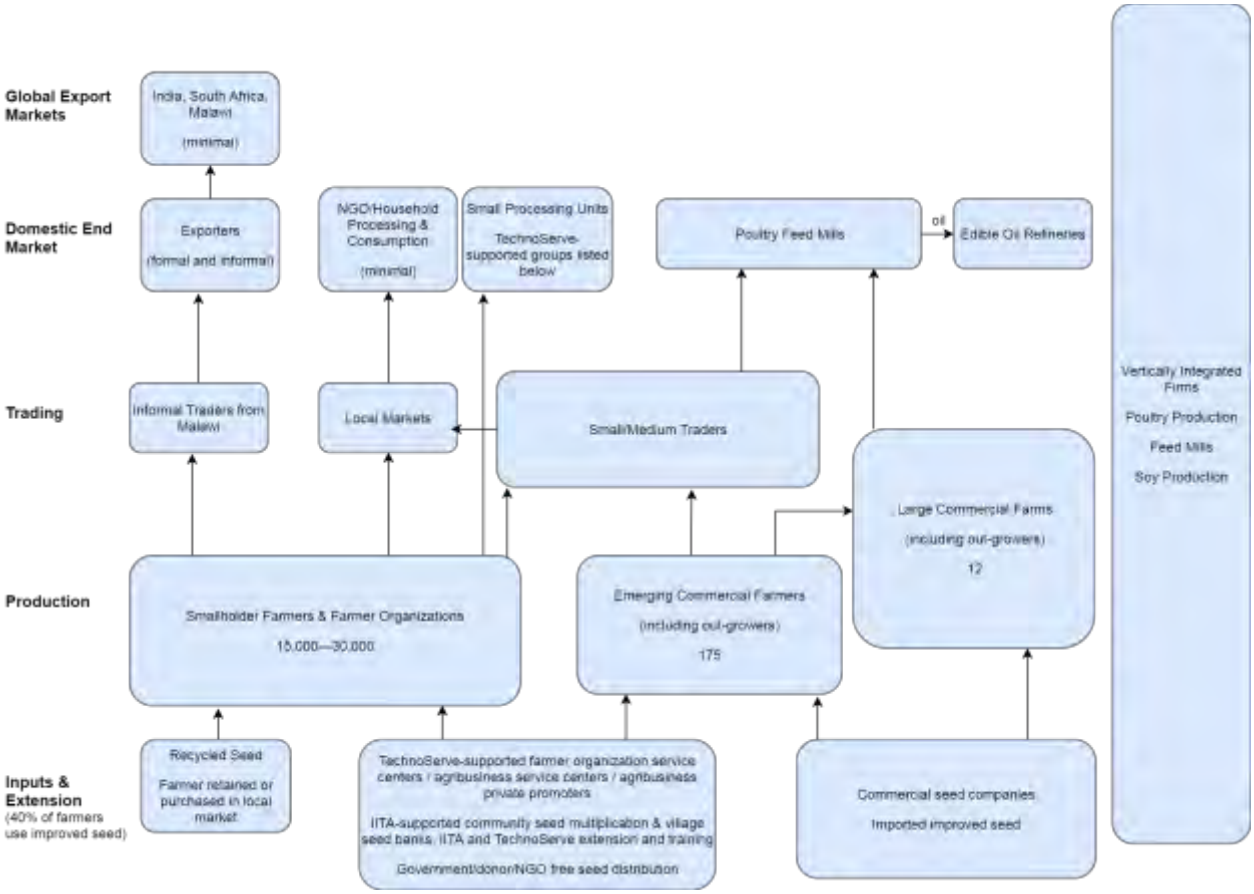
Further import substitution may present a worthwhile short-term opportunity, as demand for soy and soy cake continually outstrips domestic supply. FTF Inova will maintain dialogue with the existing donor projects and NGOs working in this value chain, as well as private sector actors, to identify potential support of market driven initiatives to scale up production and productivity.

Entry Points

FTF Inova's work in agriculture input commercialization will contribute to growth in soybean and other value chains.

Soybean Value Chain Functions

Figure 7: Soybean Value Chain Map



Large Buyers/Processors

The vast majority of soy production is purchased by poultry feed mills, often part of vertically integrated poultry production/feed mill firms. The Abilio Antunes mill in Manica is the dominant player in the market, absorbing 30 percent of all soy production. All of the feed mills must ensure adequate and consistent quality and volumes to maintain their feed production. They make choices among sourcing product domestically, producing soy directly, or importing the required product. Several of the large buyers have partnered with donor projects to establish contract farming schemes, but in this value chain with many buyers conducting simple spot market transactions for undifferentiated product, there was widespread collapse of these efforts.

As described further in the production section, vertically integrated firms that are establishing large commercial farms still need outgrowers to scale up production quantities, optimize fixed costs, and address social/land issues. Following the failure of traditional donor facilitated contract farming schemes, they are looking for innovative models to provide inputs, technical assistance, and mechanized land preparation or threshing and to receive consistent supply to meet the demands of their poultry production.

Large buyers (independent feed mills or integrated poultry/feed businesses) process soybean into components of poultry feed, which is marketed domestically.

Traders

Large numbers of small/medium traders, often pre-financed by large buyers, purchase directly from farmers either at the farm gate or at small buying stations. The larger Mozambican trading firms (Gani Comercial [Nampula], Insumos Agricultura e Pecuária [Tete], and Vitor Gaspar [Angonia], etc.) and larger-scale truck-traders aggregate the product for delivery to the feed mills.

TechnoServe in collaboration with the Cooperative League of the USA (CLUSA), the non-profit international arm of the National Cooperative Business Association , worked throughout Zambezia (60 percent of all production) to develop an infrastructure of farmer organizations and associations that serve as intermediaries for marketing. These groups have weakened since the withdrawal of donor support, and the efficiencies of aggregation for farmer groups has been reduced.

Informal trader/exporters from Malawi purchase at the farm gate for export. This trade, estimated at 15 percent of all production, is centered in Angonia district in Tete.

Production

Over the last 15 years, growing domestic market demand, high commodity prices, and donor investment in the soybean value chain attracted large numbers of SHFs and significant investment in larger-scale commercial production. As prices have declined at the end of the commodity boom, SHF participation and production has dropped.

Commercialization Year	Indicative Price (prior year average per MT)	Number of SHFs	Volume of Production
2013/2014	$684	30,000	50,000 MT
2014/2015	$500	18,000	33,000 MT*
2015/2016	$370	TBD	TBD

*70% SHF, 25% LCF, 5% ECF according to TechnoServe estimations

Despite decreasing prices, soybean production remains an attractive, profitable option. There is a high-yield potential if farmers are able and willing to use improved production packages including improved seed and inoculant. The costs are low for this package, approximately $50/ha or 15 percent of revenue at current (low) prices. Unfortunately, 10 years of subsidized inputs and soft credit from donors and government has created an understanding among SHFs that the "business model" for soybean is that they receive free inputs, they provide the labor, and they keep the resulting profit. This donor dependency has constrained the growth of a viable private sector input market. There is a general belief (which is generally correct) that if one scheme falls apart, another will soon follow—thus SHFs have little incentive for performance to project standards, contract requirements, debt repayments etc. TechnoServe/CLUSA invested heavily in the formation of farmer groups (forums) through the Federation of Producers of Gurue with the intention to support access to inputs through seed banking and collective marketing in major areas of soybean production. When TechnoServe/CLUSA withdrew, these groups mostly fell apart due to corruption, elite capture, and mismanagement.

SHFs shift in and out of soybean (30 percent variation) and other cash crops based on price expectations, creating inconsistent domestic supply and incentivizing large buyers to rely on imports that offer consistent

and higher quality and quantity. Taking advantage of this import substitution opportunity requires producers to improve and promote the quality, quantity and consistency of their product. On the other hand, soy is a crop that is easily mechanized, and there is concern that regardless of performance, SHFs will be squeezed out of the market by larger, mechanized operations that can guarantee larger volumes with greater consistency and quality.

There is increasing presence and investment by LCFs in soybean production, which in some cases represents a further backward integration of the poultry feed/poultry production firms. These LCFs are bringing advanced knowledge, mechanization and scale to the industry. However, resource limitations (high fixed costs, limited access to tractors, high input inventory stock costs due to limited availability, and limited reliable or skilled labor) have slowed LCFs' ability to scale up. In addition, multiple land conflicts have resulted from government allocation of large tracts of land (including former state-owned farms where SHFs were squatting) to corporate farms. Therefore, LCFs currently need partnerships with outgrowers to scale up production quantities, optimize fixed costs, and address social/land issues. Most of the donor facilitated contract farming models failed, due primarily to farmer side-selling (sometimes caused by lack of working capital to purchase outgrower product). These players are looking for innovative models to provide inputs, technical assistance, and mechanized land preparation or threshing, and to receive consistent supply of product. However, in the medium term the LCFs will attain full production capacity, and SHF outgrowers will no longer be needed.

Between the SHFs and the LCFs is a class of ECFs – TechnoServe estimates 175 – who have reinvested soy production profits to scale up their operations to 10–50 ha. These ECFs may find a sustainable niche in the market, particularly if their yields can increase with improved inputs and access to mechanization (potentially in partnership with LCFs). ECF expansion is limited by working capital to pay for inputs and labor (for land preparation, weeding, harvesting and threshing), and by investment capital for machinery/equipment. However, the growth of these small agribusinesses has been seen as an opportunity by donor/NGO projects to build out input supply and marketing services to SHFs, but the success or sustainability of this model is yet to be proven.

Limited use of improved seed, inoculant, labor, mechanization, and proper production practices keep yields low, though the greater investments and commercial focus of ECFs and LCFs show positive impact. Late planting of soybean decreases yields significantly (by up to 65 kg/ha for every day of delay). The timing of land preparation and planting for soybean and maize overlap, and farmers prioritize using their labor for their maize crop, resulting in late planting of soybean. Increased use of tractors or animal traction, low till/no till technologies, and intercropping of soybean and maize can facilitate timely land preparation and planting for soybean.

SHF yields of 1.2 MT/ha are 40 percent of potential, ECF yields of 1.4 MT/ha are 48 percent of potential, and LCF yields of 1.75 MT/ha are 58 percent of potential. It is important to note that as a result of the intensive donor/NGO engagement in this value chain, 40 percent of SHFs use improved seed, which is significantly higher than in any other cash crop. Whether this is commercially sustainable remains to be seen.

Input Market

Key to soybean productivity is timely planting, improved seed and inoculant use. There is currently little private sector input supply or access to mechanization, though the large increase in soybean production over the last ten years should have been an engine for the growth of such a market. Unfortunately, donor subsidization and control over inputs has disrupted this market response. Currently, the majority of seed multiplication and distribution is carried out through various donor facilitated or supported programs, such as community or farmer association seed banks or seed multiplication (e.g. COPAZA in Gurue district of Zambezia and the SIWAMA association in Manica). These schemes have improved access and, together with donor/NGO/government distribution of seed, have assisted more than 40 percent of SHFs to use improved seed, but the sustainability of these schemes in unknown. The recent growth of the SME seed companies may bring more availability of improved soybean seed, particularly if free/subsidized seed distribution is curtailed.

TechoServe/CLUSA invested heavily in the formation of farmer associations in Zambezia meant to facilitate access to inputs, and had intensive engagement in seed and inoculant distribution and demonstration plots. The Federation of Producers of Gurue and its members have mostly broken down following the withdrawal of NGO support. Many donor/NGO projects are now focusing on "agribusiness service centers", "farmer organization service centers", or "agribusiness private promoters" to fill the gap in input supply, but the success or sustainability of this approach is also unproven.

There is very little supply of inoculant that is applied to soybean to stimulate productivity, so it must be imported and requires strong quality control. While 15,000 SHFs were recorded as using free/subsidized inoculant, AgriFUTURO's "inoculant surge" recorded only 3,000 farmers willing to pay for it.

Similarly, increasing soil phosphorus can improve yields by up to 30 percent, but supplies are imported and low demand coupled with weak distribution systems limits availability and access. Mechanized land preparation is equally critical to enable timely planting, but Mozambique lags behind almost every Sub-Saharan African country in animal traction and tractor use—and soils best for soy production are difficult to open/cultivate. Various development programs have tried to increase availability of tractors through subsidized private sector partnerships with the intention to create tractor service providers, but it is unclear whether this model is appropriate for large numbers of SHFs, or if the assisted service providers will deliver as hoped.

Enabling Environment

The government has indicated a strategic priority for increasing domestic oilseed production to replace the current imports of crude soy and palm oil for edible oil production. This may facilitate a new market opportunity for soy producers.

4.6. Common Bean Value Chain

Sector Overview

In Mozambique, common beans are an important subsistence and cash crop grown throughout the northern and central regions. 350,000 SHFs produced 52,000 MT in 2014, and approximately 15,000 MT were sold. Six varieties (different color/shape/size) are most common, and each has a common local name, a specific agro-climatic profile for optimal production, and a specific set of customer taste preferences and uses in Mozambican cuisine. Overall, common beans have strong domestic and regional (Malawi, South Africa) market demand.

Women play an especially large role in the sector, with some estimates that women are responsible for 80 percent of common bean production. The trading function is dominated by women wholesalers from Maputo, who provide working capital to networks of small traders during the harvest season. Small traders purchase product at the farm gate or at buying stations for cash, without advance contracts or prior sales agreements with the farmers. There is an overall flow of product from small/medium traders in the highest areas of production in the north to wholesalers and retailers in the highest areas of demand in the south.

Sector Dynamics

Large domestic aggregators estimate unmet demand at 20 percent over current production levels, which could easily be met through improved productivity. In addition to greater volumes, there may be segmented market demand for specific common bean varieties. The key challenge to capturing greater value through product differentiation has been the mixing of varieties during production and trading, and the difficulty of aggregating large volumes of single variety good quality beans to meet specific market demands (such as black beans in the Maputo market, and small red beans in the Malawi market). However, more research is needed to determine whether these upgrades would be profitable enough to incentivize new behavior and investments.

Over the last 3–5 years, investments led by IITA/the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)/IIAM in improved seed availability and distribution (including through donor funded programs and cotton/tobacco company programs for their outgrowers) have had positive impacts on the productivity of common beans. Higher yielding, single variety seed is more widely available, resulting in the production of greater volumes generally, and specifically of better availability of larger volumes of single variety beans. Additional market research is needed to determine how targeted marketing of individual varieties could add value for SHFs and traders.

End-Markets

Domestic market: Urbanization and population growth in Mozambique and the region have increased commercial market demand for common beans, an important part of Mozambican cuisine. Domestic commercial markets in Mozambique currently absorb between 8–20% of total production, approximately 8,000 MT in 2014. The majority of the crop is consumed by the producer.

Domestic aggregators and traders estimate that the market could absorb up to 20 percent more production, but no market research has been done. The low value of the product has not attracted investment in scaling up production or improving productivity. Some interest is shown in differentiated product (better quality and single varieties), and traders report that higher prices are paid for better quality (less foreign matter, and more consistent variety).

Export market: The largest commercial market for Mozambique common beans is the informal regional market, particularly to Malawi. Approximately 15 percent of total production was marketed to informal regional markets, and traders report remaining unmet demand. Trade data show minimal formal exports to South Africa, and some exporters report sending product to India, the United Arab Emirates, and China.

Unmet regional demand is reported, but has not been documented. Similarly, preferences for small red beans and for better quality beans in Malawi are reported, but there is no data on price premiums.

Vision for Equitable Growth

There are limited commercial opportunities in the common bean value chain. However, interventions to improve input distribution and marketing can improve productivity, thus increasing farmer incomes. Product differentiation and single variety sales could lead to increased margins, but this opportunity has not been investigated.

Intervention Areas

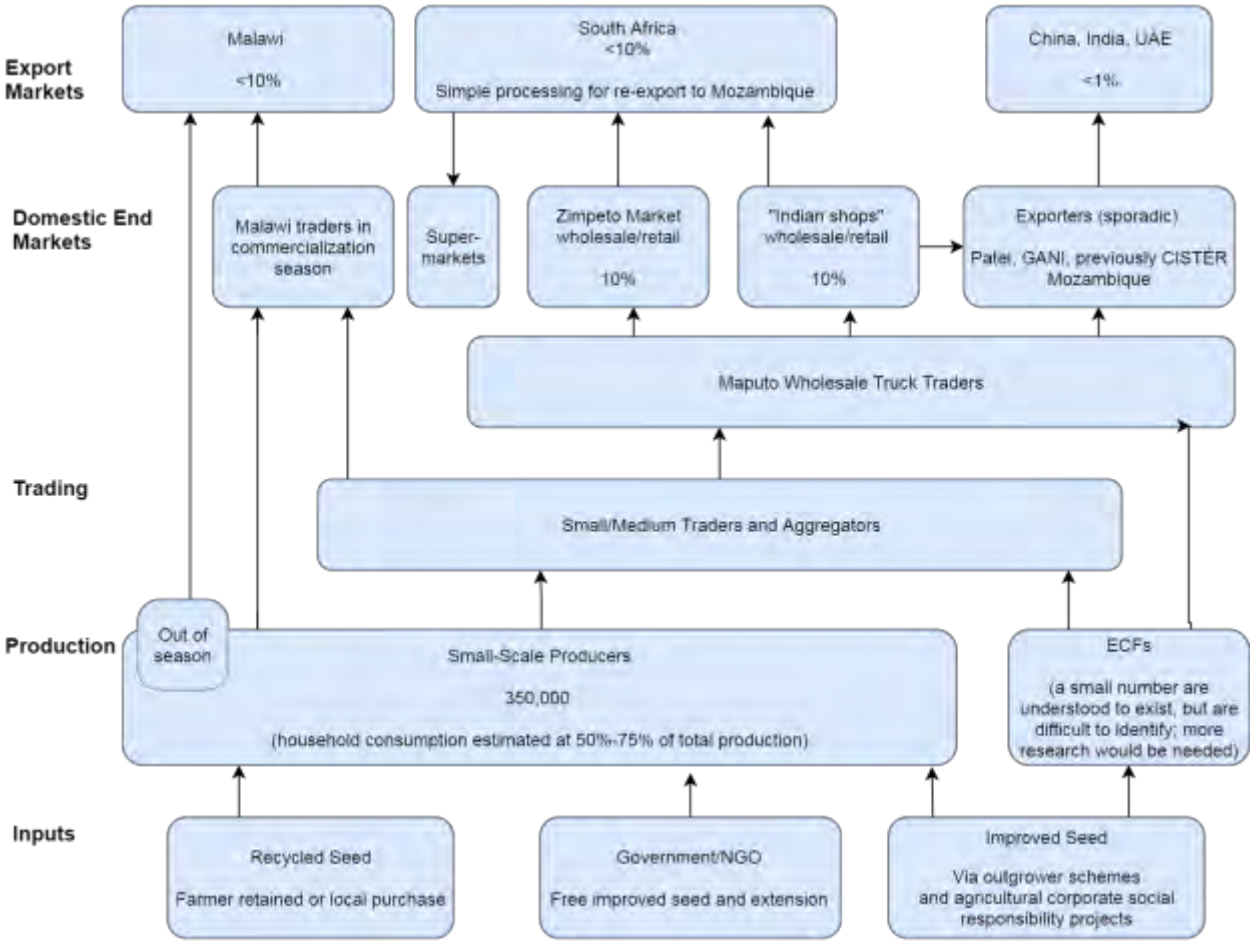
- Market research could indicate whether variety differentiation and single-variety sales could be an interesting area for intervention.
- Additional intervention areas are unclear at this stage.

Entry Points

- No entry points have been identified for exploring product differentiation by bean variety.

Common Bean Value Chain Functions

Figure 8: Common Bean Value Chain Map



Exporting

Informal exports to Malawi absorb an estimated 15 percent of Mozambican production. During the harvest season, informal traders from Malawi purchase common beans at the farm gate and aggregate to sell across the border. During the rest of the year, Mozambican farmers will take product to Malawi for sale, but this is commonly limited to urgent needs for generating cash. There are minimal formal exports to South Africa. Generally, South African traders bringing product to Mozambique will backfill trucks with common beans and groundnut. They generally purchase from Indian wholesalers/traders in Maputo including Gani Comercial and independent wholesalers.

Informal exporters report that regional markets demand higher quality, single variety beans, but it is difficult to aggregate large volumes of differentiated product.

The government of Mozambique is increasingly discouraging exports of staple food products, which has led to greater challenges in moving product across borders and may suppress the scaling up of this trade (see Enabling Environment below).

Trading

The trading function is dominated by women wholesalers from Maputo. They are able to access formal and informal credit to finance their network of smaller traders during the harvest season. Small traders purchase

product at the farm gate or at buying stations for cash, without advance contracts or prior sales agreements with the farmers. Maputo wholesalers come up-country with large trucks to aggregate product for transport to Maputo, where it is sold at retail outdoor markets and the "Indian shops." There is an overall flow of product from highest areas of production in the north to highest areas of demand in the south. Cleaning and sorting are done at each step along the trading network. Prices are dependent on the amount of foreign matter in the bags and the consistency of the variety. Quality was not mentioned as a determinant of price.

Processing

No processing is done in Mozambique except for shelling (at the farm) and cleaning/sorting (by farmers and traders).

Production

Common bean production is dominated by SHFs (350,000 households) using few inputs and attaining low yields. Women produce 80 percent of product, but lag behind men in both productivity and marketing. Female headed household production is only 50 percent of male headed household production. Women market a lower percentage of their production—only 3 percent of women market their product compared to 32 percent of men.

Productivity currently attains only 70 percent of global averages, and 36 percent of optimal yields. The greatest increases will come from improved seed, and from appropriate use of CPPs that would enable two harvests from a single planting each year. However, only 12 percent of farmers use improved seed and only 15–20 percent receive extension advice.

Over the last 3-5 years, investments led by IITA/ICRISAT/IIAM in improved seed availability and distribution (including through donor funded programs and cotton/tobacco company programs for their outgrowers) have had positive impacts on the productivity of common beans. Higher yielding, single variety seed is more widely available, resulting in the production of greater volumes generally, and specifically of better availability of larger volumes of single variety beans.

Enabling Environment

Overall, commercial development of common beans has not received significant attention by development actors or the government. However, as part of its food security policy framework, the Government of Mozambique is increasingly discouraging exports of staple food products. This may increase difficulties with cross border trade, even if it is informal. The MASA district-level economic activities service, *Servicos Distritais de Actividades Economicas*, from the product's originating district is supposed to provide a supporting letter that states that they have adequate stocks for their district and the product is approved for export. This letter must be accepted by the customs officials.

4.7. Cowpea Value Chain

Sector Overview

Cowpea is grown by 40–50 percent of all SHFs in Mozambique; more land is planted with cowpea in Mozambique than in any country in East or Southern Africa. That said, it is very much a subsistence food crop, as MASA estimates only 9 percent of cowpea production was marketed in 2014. "Arguably, the private sector is less interested in cowpeas than in any other food crop in the USAID FTF portfolio" (Walker, 2016). Cowpea is a very important food crop, however, and productivity of cowpea has increased by 40 percent since 2006 due to significant investments in cowpea research and development by USAID, the Gates Foundation, and the Government of Mozambique through IIAM. No significant dynamics are currently at play in the cowpea value chain.

End-Markets

Cowpea has a limited domestic market for which no data is available. MASA reports that 9 percent of SHFs market some of their product, but no information is available on domestic trade volumes. Domestic market prices for cowpeas are approximately 50 percent that of common beans, making it the least commercially attractive of the food crops. Cowpeas are eaten fresh as well as dried. Since cowpea is grown throughout the country, when supply in the south of fresh cowpeas is exhausted, dried cowpea from northern areas will fill the gap.

Global trade data shows minimal exports (>100 MT) to India, Portugal, and South Africa. Small amounts of fresh cowpea is exported to South Africa, washed and packed, and re-exported to Mozambique for sale in Maputo supermarkets. Small amounts of dried cowpea have also been sold to the World Food Program for distribution in Angola and South Sudan. This may present another potential market opportunity for further exploration.

Vision for Equitable Growth

Given the non-commercial nature of cowpea production, there are no identified opportunities for income improvements. However, programming for improved productivity to increase food security remains important. Interventions to improve input distribution, in partnership with efforts to improve the seed value chain by SEMEAR and the Southern Africa Seed Trade activity, will support improved food security for millions of Mozambicans.

Intervention Areas

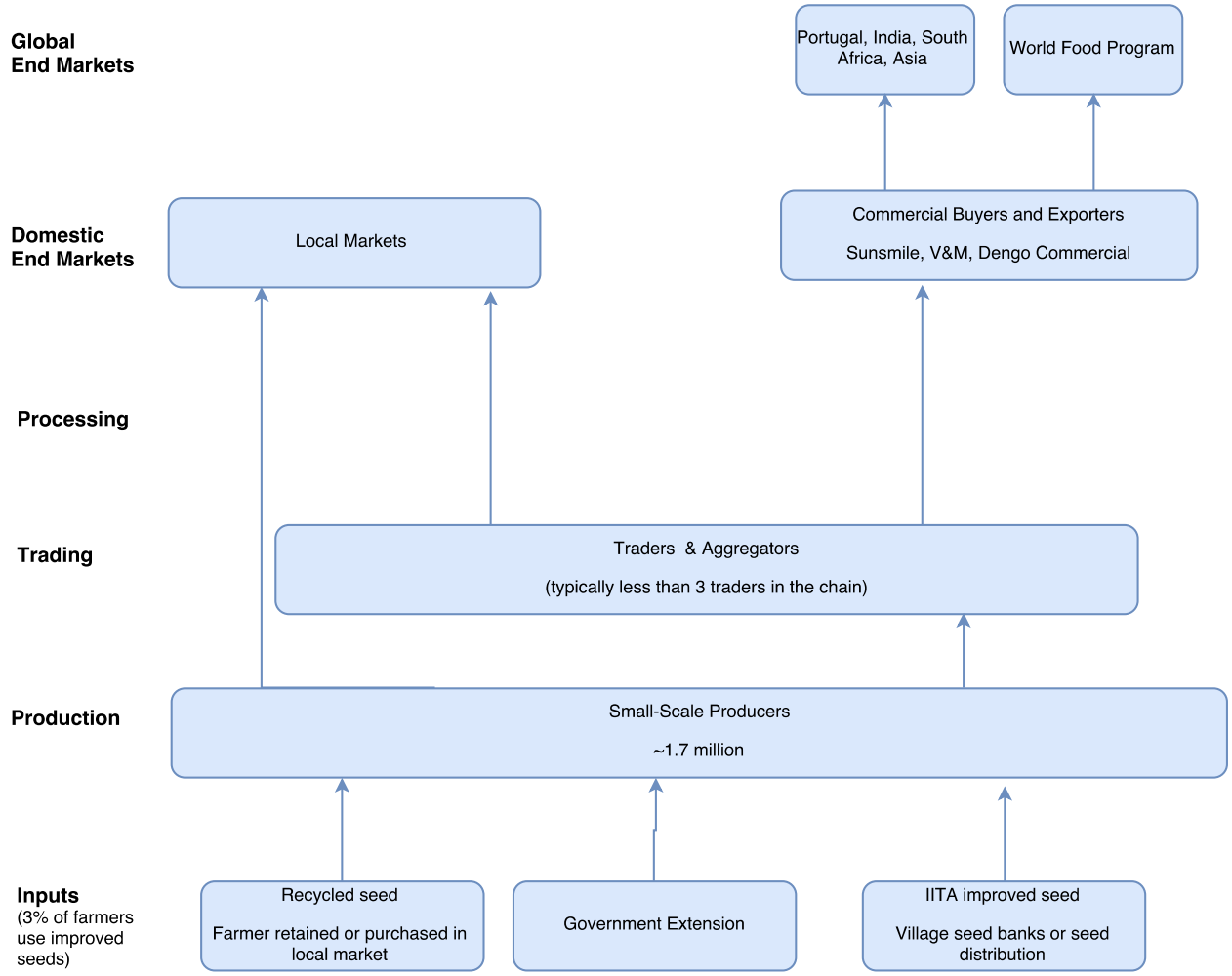
- Intervention areas are unclear at this stage.

Entry Points

- Entry points are unclear at this stage.

Cowpea Value Chain Functions

Figure 9: Cowpea Value Chain Map



Retailers and Traders

Small-scale traders purchase shelled cowpea at the farm gate or at buying points (established for marketing of other crops, not specifically for cowpea) through simple spot market transactions.

Aggregation by medium scale buyers occurs at district and provincial buying centers or simple warehouses. Larger scale traders from Maputo include some cowpea in their wholesale trade of other products such as common beans. Other trade is conducted through regional trader networks to local markets for sale by small retailers. Commercial trade and export is conducted by firms such as Sunsmile, V&M Traders and Dengo Comercial—but similar to the rest of the value chain, this trade is incidental to their larger commodity operations.

Production

Cowpea is grown by more SHFs than any of the FTF crops. MASA estimates that 1.7 million SHFs grow cowpeas as a subsistence crop, with production spread throughout the country. Cowpeas are particularly important for women's and children's nutrition—woman-headed households represent more than 50 percent

of all cowpea producers, despite representing only 24 percent of total households. Producers consume both peas and green leaves, and woody stalks can be used for animal fodder. Cowpea is preferred fresh, but is also eaten dried.

The short duration of production and early maturing of cowpea fits well into integrated production systems. Due to its nitrogen fixing properties, cowpea could be used as a complementary crop to other more profitable cash crops for SHFs, such as sesame. Unfortunately, pests present a greater problem for cowpea than for any other food crop in Mozambique, and quality of production (consistency, purity, pest damage) is inferior to neighboring countries. Still, overall volumes and productivity have increased nationwide due to improved variety releases. Nevertheless, only 30 percent of cowpea farmers that had access to improved seed through IITA programs demonstrated sustained uptake. To further improve food security and nutrition, and for any potential increase in market driven production, it will be important to identify and overcome the challenges to increasing utilization of improved varieties.

4.8. Banana Value Chain

Sector Overview

The banana value chain includes both large-scale commercial plantations and SHFs. Annual production is approximately 450,000 MT; 440,000 SHFs produce 40 percent of total production, while 15 medium- to large-scale plantations produce 60 percent. The growth of plantation production has increased total volumes over 15 years from 100,000 MT to 450,000 MT, an annual growth rate of 12 percent. This growth has been mostly absorbed by the domestic market; the 70–85 percent of production that does not meet export standards or that does not find a market is either consumed domestically or wasted. The remaining 15–30 percent is exported, primarily to South Africa, though exports to the Middle East are growing. SHF production is not (and likely cannot be) able to meet export standards. It is also very unlikely that SHFs can become more competitive or gain additional market share in the domestic market, given the productivity of plantation production (100 percent of potential vs. SHFs' 25 percent of potential) and efficiencies of scale. Bananas are highly perishable, and Mozambique's infrastructure (specifically, poor refrigeration, poor roads and unstable energy supply) reduces overall cost competitiveness for exports. For example, high logistical costs (accounting for 30 percent of total value chain costs) significantly hinder the competitiveness from Nacala and Beira.

End-Markets

Of total banana production, 70–85 percent is sold as ripened bananas in the domestic market; this totaled 365,000 MT in 2016. The domestic market for banana accepts a wide range of quality and price, and bananas (which are produced year round) are found regularly at every level of retail sale nationwide. Consumers appreciate diversity of variety, but there is a clear preference and willingness to pay for larger and more yellow bananas. Due to the recent fruit fly concerns for production from Manica province, Manica bananas are currently banned from Maputo. Whether there is unmet domestic market demand remains an interesting question, considering that the domestic market absorbed the majority of the 12 percent annual growth in production over the past 15 years.

Fifteen to thirty percent of total banana production is exported, primarily to South Africa. Mozambique is the largest exporter of bananas to South Africa—representing between 80–90 percent of all South African imports, and at least 95 percent of Mozambique's annual exports over the last four years. Mozambique's proximity provides a competitive advantage, as does the preferential tariff treatment afforded by SADC. Therefore, any trade policy or pest/disease issues with South Africa would be devastating to the Mozambican industry.

Exports to the Middle East are growing. The market in Qatar has grown by 40 percent from 2012–2016, and Mozambique's exports equaled 15 percent of Qatar's total imports prior to the Panama disease outbreak that greatly reduced the production of the dominant plantation, Matanuska. Exports to Iran have fallen during that same period, but Iran's total imports have grown by 64 percent. Mozambique has not entered the market in China, but global imports to China have grown by 72 percent. Overall, the largest global importers of banana are the United States and European countries, but these markets are not realistically accessible to Mozambique given logistics and quality requirements.

Vision for Equitable Growth

The market dominance of large-scale plantation production of bananas, with vast competitive advantages in productivity and quality, make it unlikely that there will be growth opportunities for small producers in this value chain.

Intervention Areas

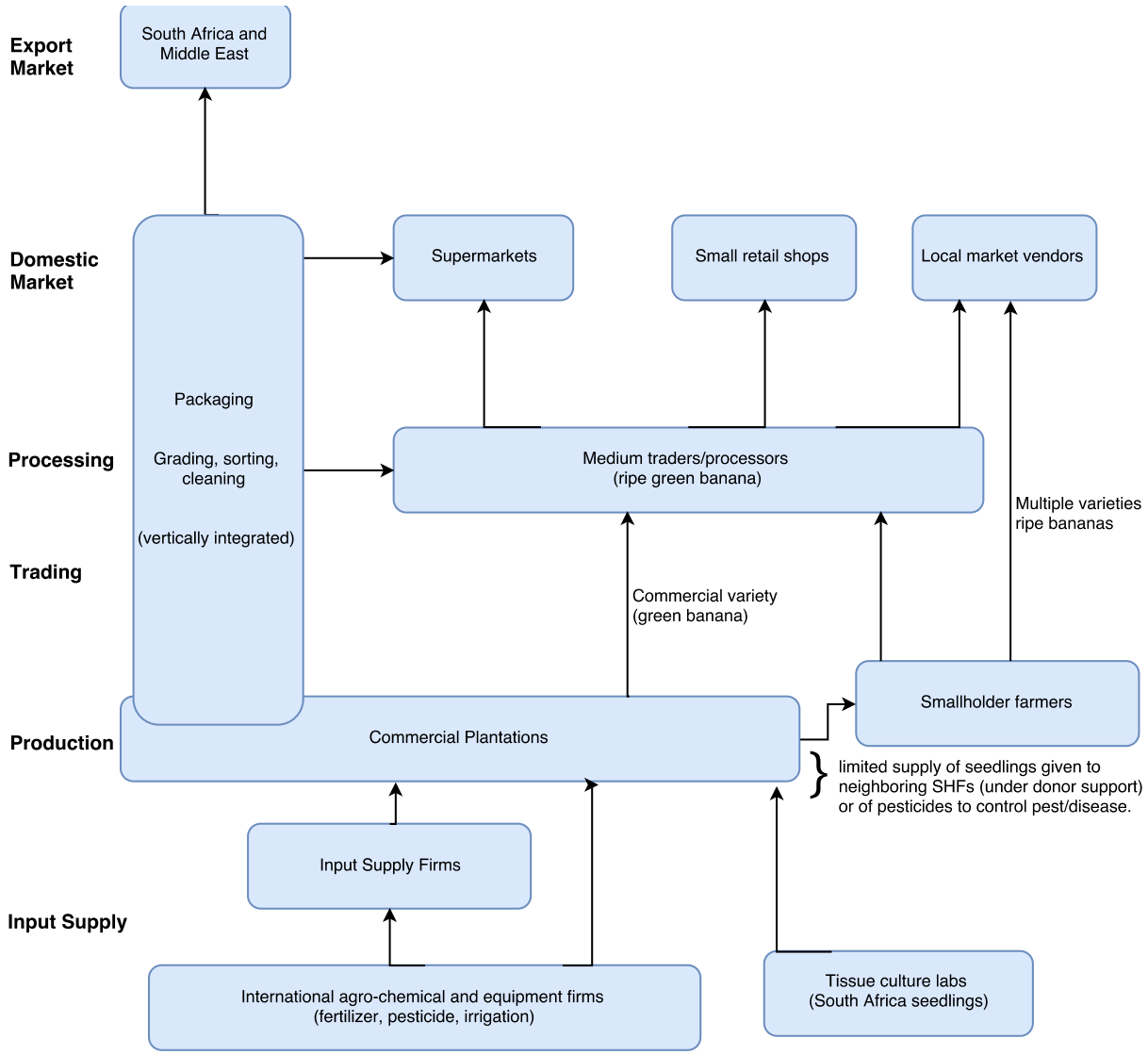
- Intervention areas are unclear at this stage.

Entry Points

- Entry points are unclear at this stage.

Banana Value Chain Functions

Figure 10: Banana Value Chain Map



Exporters / Large Commercial Sellers

15 medium- to large-scale commercial plantations (between 100 and 6,000 ha) are engaged in production and sale of green bananas for both the export and domestic market; 15–30 percent of Mozambique's production is exported as green bananas. In 2016 exports totaled 85,000 MT, or 19 percent of total production.

Table 9: Exports of Banana from Mozambique

Reporting Country	Unit	Quantity					
		2011	2012	2013	2014	2015	2016
South Africa	MT	48,000	58,000	86,861	100,655	105,377	83,877
Qatar	MT	0	11	0	1,712	5,418	0
Iran	MT	20,000	10,000	0	41	0	619
Japan	MT	0	0	41	412	329	0
United Kingdom	MT	36	601	523	2	0	0

For the domestic market, bananas are sold green directly from plantation pack houses to small/medium traders. For export markets, plantations use mechanized "hangar" systems to transport harvested bananas from the production area to pack houses for cleaning, grading, sorting, and packaging for export. Bananas are sold un-ripened (green).

Traders/Processors

Traders and processors serve the domestic market. The processing function of ripening banana is carried out by traders who purchase green bananas from either SHFs or plantations, and then bulk, transport, and ripen in warehouses before transporting to retailers.

For SHF-produced bananas—Primary traders pick up unprocessed bananas, then bulk, transport, and ripen before transporting to retailers. There are three main types of primary traders:

- Small itinerant traders who will buy at the farm gate and sell to truck traders at buying stations or in markets with road access.
- Truck traders who will buy from producers or small itinerant traders who will wait alongside roads (primarily in Manica).
- Established buyers operating wholesaler depots, with consistent buying relationships with SHFs.

For plantation-produced bananas—Plantations' export trade does not have any trader intermediaries—production, processing, and packaging for export are done at the plantation. For the domestic market, primary traders will come to the plantations to pick up unprocessed bananas for ripening and sale to retailers.

Production

Production has grown over 15 years from 100,000 MT to 450,000 MT, an annual growth rate of 12 percent. Growth has been due to increased land usage through introduction of commercial plantations in the past ~10 years. Average SHF yields have not grown significantly over this period. SHFs are responsible for approximately 40 percent of production, while medium/large plantations produce 60 percent.

Approximately 440,000 SHFs produce multiple varieties of banana exclusively for the domestic market, since their production rarely meets minimum export market standards. SHFs do not have the appropriate production systems to support low-cost production of high-quality bananas—most SHFs use rain-fed irrigation on infertile soils, with resulting low yields (25 percent of potential) and inconsistent quality. SHFs invest little in inputs (improved varieties, fertilizer) or production practices. Additionally, poor post-harvest management leads to low quality and low market prices.

Plantation production follows international standards for good agriculture practices, using imported seedlings, pesticides, and fertilizer, along with extensive irrigation. The primary suppliers of chemical inputs are the private sector firms Green Belt Fertilizers and MozFert, while seedlings are sourced from South African tissue culture producers. Plantations employ thousands of Mozambican workers in year-round jobs. Production is of a single variety (Cavendish) and of consistent quality. Plantation yields reach near 100% potential of 40–60 MT/ha.

For both SHFs and plantation producers, there is a high risk of disease and consequent financial loss. Panama disease in particular represents significant risk in Mozambique at this time. A new strain of the Tropical Race 4 Panama disease was identified in 2013 in northern Mozambique (and also in Jordan). This strain had previously been identified only in Asia. Panama disease destroys the banana plant, though the existing fruit remains edible. The disease attacks the Cavendish variety, which is the dominant global plantation variety of banana and is used on all Mozambican plantations. The Mozambique government has curbed the movement of banana plant materials from northern Mozambique in an attempt to control the disease.