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# Analysis of Supply-Chain Models

For Maize, Rice, Beans & Cassava Sub-sectors  
in Selected Areas of Tanzania

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## LIST OF ACRONYMS

AGRA	Alliance for a Green Revolution in Africa
AMCOS	Agriculture Marketing Cooperative Society
BRITEN	Building Rural Incomes Through Enterprise
DRC	Democratic Republic of the Congo
FAO	Food and Agriculture Organization
FDG	Focus Group Discussion
FMC	Farmer Marketing Centre
GAP	Good Agricultural Practices
HQCF	High Quality Cassava Flour
MIVARF	Market Infrastructure, Value Addition and Rural Finance
MT	Metric Tons
NFRA	National Food Reserve Agency
NGO	Non-Government Organization
POS	Point of Sale
RUDI	Rural and Urban Development Initiative
SACCOS	Savings and Credit Co-Operative Society
SMEs	Small and Medium Enterprises
SPVS	Special Purpose Vehicle
UNCDF	United Nations Capital Development Fund
USD	United States Dollar
VSLAS	Village Savings and Loan Associations
WFP	World Food Programme
WRS	Warehouse Receipt System

## EXECUTIVE SUMMARY

Agriculture is the predominant economic activity in Tanzania with over 80% of the households engaged in agricultural and related activities. Among of the major crops produced is maize, paddy, cassava and beans. The leading productive regions are Kagera, Kigoma, Katavi, Rukwa, Njombe, Ruvuma, Iringa, and Mbeya. Alliance for Green Revolution in Africa (AGRA) that works in Tanzania and other African countries is focused on putting smallholder farmers at the center of the continent's growing economy by transforming agriculture from a solitary struggle to survive into farming as a business that thrives. Among of the AGRA strategies is to support establishment of inclusive, competitive and sustainable business and supply chains that will enable the small holders to overcome the existing systemic challenges in the value chains of maize, paddy, cassava and beans in Tanzania.

As among of the strategic activities for implementing the strategy, AGRA assigned Sundry Merchants Company Limited to conduct a survey of the existing supply chains for the sub-sectors targeted and propose models that will inclusively take all stakeholders in the sub-sectors on-board effectively and efficiently. The purpose of the assignment was to critically analyse existing marketing models for maize, rice, beans and cassava and provide a strategy for market linkages in areas where AGRA is developing comprehensive market led interventions which will enable Tanzania smallholder farmers be sustainably linked to profitable structured markets for their excessive produce. Before going into analyzing the subsectors, the ranking of the sub-sectors were performed based on the production levels. It was observed that leading producers (in chronological order i.e. 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> etc) are; For maize-Rukwa, Mbeya, Njombe Iringa and Ruvuma; For Paddy-Katavi, Mbeya and Ruvum; For beans- Kigoma, Kagera, Rukwa, Iringa and Mbeya, and; For Cassava-Kagera, Kigoma, Ruvuma and Mbeya. The market analysis focuses on the existing supply chains for each crop by portraying the institutional relations among the actors, power relations, effectiveness and efficiency of the models, opportunities and challenges and the gains in relation to costs and margins resulting from value creation and value captured by each actor.

Two main models have observed for maize aggregation models; (i) spot market deals, and; (ii) collective marketing. There is significant improvements of value created and captured through collective aggregation and selling compare to sport marketing. While at farmers level value created remains the same at USD 0.21 kg in the two supply channels, same created value results into increase of 6% in collective marketing arrangements. Collective aggregation and linkages model has potentials for enabling actors to function under inclusiveness arrangements with an assurance of sustainability and economic benefits to each of the actors. Basically cassava has five major supply chains and all originate from farmers and passes through several layers of intermediaries (large-scale aggregators, small-scale aggregators/processors, local large buyers, importers, , urban markets, rural markets, aggregation groups, and final consumers). Two models were recommended for cassava. First-comprises of three supply channels targeting the production and marketing of cassava flour products, production of HQCF and production of animal feeds, and; the second-involved cooperative driven model operating from Farmer Marketing Centers through Public-Private-Producer Partnership.

Further, paddy marketing assessment revealed two existing supply chain models, namely spot market deals and collective market. Majority of small scale farmers (almost three quarter), do sell directly to traders either at the farm-gate or at local markets and the remaining quarter progressive farmers do sell small portion and store other portion till prices improve or become stable. While the other model, where farmers were found to market their produces collectively through producer organizations (POs) or a modified Warehouse Receipt System (WRS). Across the country, the current common-beans supply chain basically comprises of cooperative and private led channels. In the cooperative led channel, which is new, and an upcoming, the key actors are smallholder producers, informal farmer groups and AMCOS functioning as aggregators, off-takers that some of them are also brokers and/or wholesalers, retailers and end consumers. In the private led channel which is the most well established and capturing most of the traded volumes across the country is formed by smallholder producers, rural collectors, district/regional aggregators, wholesalers, retailers and exporters. The proposed supply chain model are

those already initiated by the development actors and thus needing technical support for making them effective in linking farmers to markets competitively and sustainably.

In addition, this analysis provided major challenges for these subsectors in these regions, which include; inadequate availability of good quality storage facilities; low usage of improved varieties; low level of mechanization; limited or access to soft loans for small-scale maize producers; limitation to access direct market; limitation to extension services; weak farmers' organizations; lack of business skills; unstable crop prices, and; poor vertical and horizontal linkages in the overall value chain. The recommended paddy supply chain is the one aims at improving the procurement of paddy from small scale farmers by small, medium and large-scale millers and traders. The model aim at improving availability and quality of paddy and reduction of transaction costs to all actors through reliable supply to all types of buyers who wants to aggregate, mill and sale within and outside the country.

## **1.0 Introduction**

### **1.1 Back ground information**

Agriculture is the predominant economic activity in Tanzania with over 80% of the households engaged in agricultural and related activities. Among of the major crops produced is maize, paddy, cassava and beans. The leading productive regions are Kagera, Kigoma, Katavi, Rukwa, Njombe, Ruvuma, Iringa, and Mbeya. The crops are increasingly becoming important to households food security and sources of income to the producers. Trading of the crops is rapidly increasing due to higher rates of urbanization, which is estimated to be 33% in cities and urban towns in the country. The major trading centers and destinations are Dar-es Salaam, Mwanza, Mbeya, Tanga, Dodoma, Morogoro, Arusha, Zanzibar, Kigoma, and Moshi. Same crops are mostly exported to the East African Countries such that with coherent strategies the countries could become major future export destinations. The crops are produced by small-scale farmers (95% of the producers) who are facing systemic challenges in the supply chains. The challenges include production, storage, and transportation, financing, processing and trading.

Alliance for Green Revolution in Africa (AGRA) that works in Tanzania and other African countries is focused on putting smallholder farmers at the center of the continent's growing economy by transforming agriculture from a solitary struggle to survive into farming as a business that thrives. Among of the AGRA strategies is to support establishment of inclusive, competitive and sustainable business and supply chains that will enable the small holders to overcome the existing systemic challenges in the value chains of maize, paddy, cassava and beans in Tanzania. As among of the strategic activities for implementing the strategy, AGRA assigned Sundry Merchants Company Limited to conduct a survey of the existing supply chains for the sub-sectors targeted and propose models that will inclusively take all stakeholders in the sub-sectors on-board effectively and efficiently.

### **1.2 Objective of the assignment**

The purpose of the assignment was to critically analyze existing marketing models for maize, rice, beans and cassava and provide a strategy for market linkages in areas where AGRA is developing comprehensive market led interventions which will enable Tanzania smallholder farmers be sustainably linked to profitable structured markets for their excessive produce.

### **1.3 Report contents**

The report presents the analyzed supply chain models for the four sub-sectors (maize, paddy, cassava and beans), from 8 regions, namely; Kagera, Kigoma, Katavi, Rukwa, Njombe, Ruvuma, Iringa, and Mbeya where AGRA is developing market-led interventions. The key targeted parties in this assignment were; large, medium and small aggregators and processors, institutional buyers farmer organizations, farmers, agricultural-marketing support organizations and programs, as well as institutions dealing with regulating or overseeing produce markets of the above selected value chains.

Specifically this report covers the following:

- Sub-sectors overview focusing on key players and their profiles, volume estimates to gauge market size, supply and demand, growth and trends.
- Analyzed supply chain structures focusing on types of models, long or short supply chains, backwards and forwards linkages including village middlemen and aggregators, bulk buyers and end-markets like millers, processors and exporters.
- Analyzed capacities, key opportunities/constraints of each segment in the chains, and sources of competition.
- Evaluated attractiveness focusing on costs, price stability, profitability along the value chains, barriers to entry, key success factors.

- Local markets serviced by the supply chains focusing on product availability, price dynamics, and margins, market gaps, inefficiencies, and economics of smallholder production and opportunities of value addition.
- Recommended supply chains focusing on types of models, potentials, challenges, development strategies and actions.

### 1.3 Overview of the Sub-sectors

#### **Maize**

Maize is the primary staple crop in Tanzania grown in nearly all agro-ecological zones in the country, with southern highlands regions (Iringa, Njombe, Mbeya, Songwe, Rukwa, Katavi and Ruvuma) being the major producers of the crop. In the last four decades, Tanzania has ranked among the top 25 maize producing countries in the world, and it is a major maize producer in Sub-Saharan Africa. In the 2018/19 growing season Tanzania produced 6.2 million metric tons of maize, whereby 85% of the maize is produced by smallholder farmers. Despite the steady production of maize in Tanzania, still postharvest handling, poor infrastructure, weather variability, biotic factors such as insects and pests, bacteria, pathogens, viruses, and fungi, often aggravate the supply chains that results to huge losses. Losses along the supply chain are on average 30%. 80% of maize in Tanzania is locally consumed, while its per capital consumption is 80-135 kg/person /year (Bill & Mellinda Gates Foundation, 2014; Bymolt, 2017; Enzama, 2016; GrowAfrica, 2016; Wiggins & Compton, 2016; Wilson & Lewis, 2015).

#### **Cassava**

Cassava is an increasingly important crop in Tanzania and mainly a subsistence crop where 84% of its total production is used for human food, making it the second most important food crop after maize in terms of production volume and per capita consumption. The remaining amount is for other uses such as animal feed, alcohol brewing and starch production. As of 2014-2018, annual cassava production on average was 1.4 million metric tons per annum (FWSNET Report, August 2018), and hence making the crop one of the emerging market-oriented commodities that could contribute to improve the livelihoods of smallholder farmers in the country. Same source estimates that 70% of the production is consumed while 30% is marketed within the country and outside. Cassava is widely grown by small-scale farmers in all farming systems in Tanzania due to its adaptability to various soils and agro-ecological conditions. A smallholder farmer that owns about 0.4-2 hectares dominates production as they produce 95% of the cassava products. The main products currently are dried and fresh sweet cassava. Production is subsistence based and thus small scale commercialized farming is almost non-existence with production below the expected levels. Regions with substantial surpluses and hence trades within the country and in East African Countries are Mtwara, Lindi, Coast, Tabora and Kigoma.

#### **Rice**

Rice is the third most important staple crop in Tanzania after maize and cassava. Annual rice production averages about 2.87 million tons. As for maize and cassava, smallholders are also the major growers of the majority of paddy in the country. In Tanzania, paddy is produced in three main areas; (i) in Rain-fed lowlands (68%), which has an average productivity of 3.5 tons/ha; in Rain-fed uplands (20%), which has an average productivity of 1.2 tons/ha; and at Irrigation schemes (12%), which have an average productivity of 3.8 tons/ha. About 30% of rice produced in Tanzania is consumed by producing households, while the rest is absorbed into either domestic market (60%), with highest consumption in urban areas or exported (40%) to mainly; Burundi, Kenya, Rwanda and Uganda. Tanzania has not been self-sufficient in rice for many years and its demand for rice is projected to triple by 2020 from 1.15 million tons in 2009 to 2.84 million tons in 2020 (FAO, 2014; GrowAfrica, 2016; Paglietti & Sabrie, 2013; Townsend & Mtaki, 2018; Wilson & Lewis, 2015). The leading regions with large surpluses for trading are Morogoro, Mbeya, Rukwa, Katavi and Shinyanga while those with minor surpluses include Ruvuma, Pwani, Iringa, Tabora, Geita and Mwanza.



## Beans

Common beans are one of the major sources of food and income for smallholder farmers in Tanzania. Annual production of the crop is about 1.02 million MT which makes the country a leading country in Africa followed by Uganda with 0.88 million MT, Kenya 0.66 million MT, Ethiopia 0.57 million MT and Rwanda 0.42 million MT (Sellian Research Institute, 2018). The crop is the most exported among pulses from Tanzania that contributes to more than 62% of all Tanzanian pulse exports (URT, 2016). However, the national average yield for common beans that ranges between 0.72 and 1.10 tone/ha, is far below potential yields recommended by agricultural research (1.5-3 tones/ha) using improved varieties<sup>1</sup>. Kigoma and Kagera are the regions with highest bean production with each harvesting an average of 90,000 MT annually. Other regions in the top seven include Tanga (50,000 MT), Kilimanjaro (45,000 MT), Geita (35,000 MT), Arusha (35,000 MT) and Njombe (20,000 MT)<sup>2</sup>. Approximately 40 percent of annual beans production is destined for household consumption by farmers, while 48% is traded domestically and 12% exported to regional markets. The regional markets are Kenya, Uganda, Rwanda, Burundi, Zambia, Malawi, Mozambique, Zimbabwe, South Africa and the Democratic Republic of Congo (DRC), as well as India (GrowAfrica, 2016; Townsend & Mtaki, 2018). Countywide there are three main production and marketing seasons. Regions in the Southern Zone that comprises of Iringa, Njombe, Ruvuma, Mbeya, Songwe, Rukwa and Katavi harvesting and marketing season is from May to July which is the same like the North-Western zone of which Kagera and Kigoma regions are included. The second season is mainly of Kigoma and Kagera who harvest and market as from late December to March.

## 2.0 Ranking of Subsector by Regions

Analysis of the four subsectors (Maize, paddy, beans, and cassava) in the 8 regions (Kagera, Kigoma, Katavi, Rukwa, Mbeya, Njombe, Iringa, and Ruvuma) was done looking at data on total production area per crop per region for the past five years (2013 – 2017). The resulted ranking is summarized in Table 1. Based on the ranking, the subsectors observed as follows; For maize-Rukwa, Mbeya, Njombe Iringa and Ruvuma; for Paddy-Katavi, Mbeya and Ruvuma, for Beans; Kigoma, Kagera, Rukwa, Iringa and Mbeya, for Cassava-Kagera, Kigoma, Ruvuma and Mbeya.

**Table 1: Summary of Crop Ranking per Region**

Ranking of Crops	Kagera	Kigoma	Katavi	Rukwa	Mbeya	Njombe	Iringa	Ruvuma
1	Beans	Beans	Paddy	Maize	Maize	Maize	Maize	Maize
2	Cassava	Maize		Beans	Paddy		Beans	Paddy
3		Cassava			Beans			Cassava
4					Cassava			

Note: Shaded parts means “no crop”

## 3.0 Analysis of Supply Chain Models

The analysis focuses on the existing supply chains for each crop by portraying the institutional relations among the actors, power relations, effectiveness and efficiency of the models, opportunities and challenges and the gains in relation to costs and margins resulting from value creation and value captured by each actor. The values created and captured are summarized at the end of analysis of each supply chain. Thereafter, proposed supply chains are suggested that takes into consideration their potentials for

<sup>1</sup>Musimu J,J (2018), Economics of small holder common beans production in Mbeya, Tanzania

<sup>2</sup><http://www.africanfarming.net/crops/agriculture/tanzania-s-bean-exports-feed-10-countries>

enabling an inclusive, resilient and competitive business among the key actors in each of the value chains. The key factors for the recommendations are:

- Potentials for providing returns to farmers and buyers while enabling them to remain competitive
- Enabling producers to bulk and buyers to purchase economic lots and hence lowering transaction costs to both.
- Enabling farmers to establish stronger negotiation positions
- Enabling to establish business relations based on formal agreements that are guided by transparency, trust and risk sharing between buyers and producers
- Enabling each actor to access information that will guide them in decision making and planning
- Potentials for being scalable and allow more producers and buyers to come in.
- Creates crowding opportunities for other essential services and businesses such as inputs supply in bulk, value additions and financial services at affordable costs/prices.

### 3.1 Maize Supply Chains

#### 3.1.1 Existing Supply Chains for Maize

The assessment observed that, in Southern Highlands and Western regions two main aggregation models for maize were found to feature prominently. The identified supply chain models are (i) spot market deals, and; (ii) collective marketing (see figure 1).

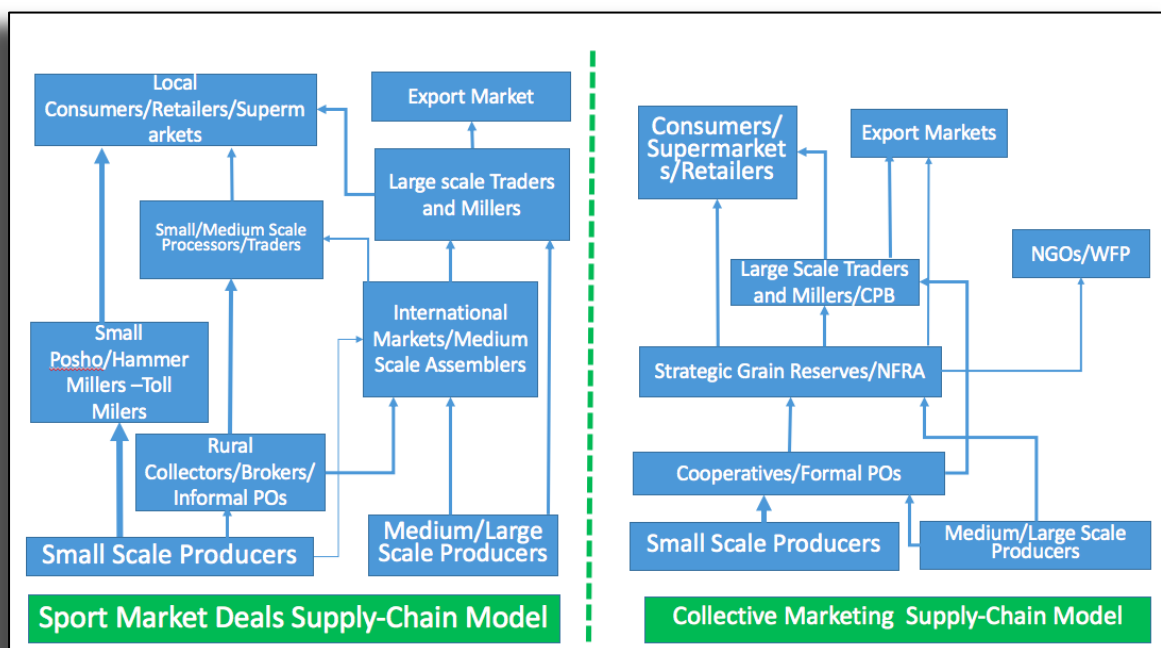


Figure 1: Existing Supply -Chain Models for Maize

#### Spot Aggregation Model

Spot aggregation model in Maize takes one of the following forms:

- Farmers’ weekly markets in rural areas where maize is traded in small quantities within the village from surplus households to deficit households or consumers. Farmers take part of their produce

to the local fee-for milling (toll millers-posho milling) for home consumption while the surplus is sold in local spot markets. The sale of surplus maize at the village household level is often triggered by a specific family cash requirement such as school fees, funeral expenses, and wedding rather than being part of a longer-term commercial strategy for income generation.

- A second channel, which is more common, is when middlemen collectors buy maize grain during harvest season at very low farm-gate prices and sell to millers, wholesalers or aggregators at higher prices during season of scarcity. These channels include medium-sized grain traders and millers who serve rural and urban centers, but also the cooperatives societies (AMCOS) and grain markets centers like Tunduma and Laela in Songwe and Rukwa regions.
- A third channel is when millers use agents who they support with finances and logistics to set up buying centers with storage facilities in the areas of production to buy and store maize before transporting to the processing facilities. This channel normally comprises a small number of well-established, large-scale millers and traders based in major maize deficit cities like Dar es Salaam, Mwanza, Dodoma and Arusha, operating in both national and regional markets.

Spot aggregation and middlemen collection model is widely used in most parts of the southern highlands and west regions of Tanzania where 60-70% of maize supplied in the market is believed to pass through this channel. Despite of this being a dependable channel by majority of key actors like farmers and buyers, the model has proved to be very expensive and inefficient because of the high transactions costs involved. Information gathered from the field shows that farmers incurs aggregation cost of up to USD 0.039 per Kg while buyers through the same transaction do incur cost of USD 0.067 per Kg (Annex 6). Intermediaries or agents do contribute 12-30% of the costs incurred by both farmers and buyers (Annex 6). Agents or intermediaries are also the source of the low and inflated prices of maize to both farmers and buyers respectively. The information gathered from the field shows that farmers are paid an average of between USD 0.17 to 0.22 while big buyers do buy the same maize at a price of between USD 0.24 and 0.3 (Annex 6).

### **Collective Aggregation Model**

Collective marketing aggregation model in maize are in two forms that both works through producer groups (formal registered groups and Agricultural Marketing Cooperative Societies -AMCOS).

The first form of collective aggregation is through informal farmer groups organized by either a Non-Government Organizations (NGOs) or Projects and linked to off-takers. In most cases, these groups are provided with capacity building support and then linked to inputs suppliers and the off-takers which in most cases are medium and large maize millers who mostly are millers trading at regional and national levels. This model is also applied by some AMCOS in the regions of Songwe, Rukwa, Ruvuma, Iringa, Mbeya and Njombe. In those regions, the off-takers linked to the groups and the AMCOS are Apeck International, Musoma Food Company Limited and Ruaha Milling Company Limited. Collective aggregation is an emerging model that received organizational and market linkages support from NGOs like Building Rural Incomes Through Enterprises (BRITEN), Rural and Urban Development Initiatives (RUDI) and the Market MIVARF Programme. Part of the support provided by MIVARF is construction of warehouses that ranged from 1,000 Tons and marketing centre with 5,000 Tons daily handling capacity including provision of milling machines of between 15-30 Tons milling capacities. Moreover, Marketing Infrastructure, Value Addition and Rural Finance Support (MIVARF) pursued development of market linkages through Warehouse Receipt System (WRS) and consortium arrangements in Southern Highlands and Western Regions but the efforts were affected by the government directive of requiring farm products to undergo processing particularly for exports.

The second form of collective marketing model in maize operates through producer groups and AMCOS that work with institutional buyers like strategic grain reserve authority, National Food Reserve Authority (NFRA) and World Food Program (WFP). Institutional buyers do assure these groups of a good market if they can meet agreed upon market conditions. Institutional buyers are the only buyers in Tanzania who pay farmers based on cost of production and the prices paid to farmers have usually been better than the rest of buyers in the country.

Evidence from the field indicates that collective marketing aggregation models are cheaper to both farmers and buyers although when it comes to institutional buyers the costs incurred by farmers do rise because of stringent market quality requirements. The costs incurred by farmers when dealing with large buyers are not more than USD 0.02 per kg while buyers do incur a cost of USD 0.063 per kg, which is way low in comparison to spot market aggregation model. Cost incurred by farmers when dealing with institutional buyers is higher at USD 0.035 per kg but in most cases is compensated by high price paid by these buyers (Annex 4). Through collective action, farmers are paid an average of USD 0.26 per kg instead of USD 0.21 per kg paid in spot market deals and the value created is better, especially to farmers than in other forms of aggregation (Table 2 below).

### 3.1.2 Value Created and Value Captured

There is significant improvements of value created and captured through collective aggregation and selling compare to sport marketing. While at farmers level value created remains the same at USD 0.21 per kg in the two supply channels, same created value results into increase of 6% in collective marketing arrangements. At processors level, buying price is USD 0.245 per kg of maize in spot purchases arrangements while in collective arrangements is USD 0.217 per kg with value created being USD 0.361 per kg compare to USD 0.365 per kg in spot purchases. Due to lower value creation costs in collective purchase arrangements then the end value captured is 31%, which is higher by 12% compare to spot purchase of 19%. Products traded are dry maize and maize flour.

**Table 2: Value Created and Captured in Maize Supply Chain**

Maize Supply Chains: Value Created and Captured (USD/Kg)			
Market Actors	Supply Channel		
	Sport Marketing-middlemen to aggregators	Collective aggregation to large buyers	Collective aggregation to institutional buyers
<b>Farmer</b>			
Sales price	0.217	0.239	0.261
Production costs	0.135	0.135	0.135
Sales costs	0.039	0.013	0.036
Profit	0.043	0.091	0.126
Value created	0.217	0.239	0.261
Value captured	0.043	0.091	0.126
Value captured (%)	20%	38%	48%
<b>Aggregator</b>			

Buying/Collection price	0.217	0.239	0.261
Collection costs	0.020	0.005	0.005
Commission/fees	0.008	0.003	0.003
Value created	0.245	0.248	0.270
Value captured	0.008	0.003	0.003
	3%	1.40%	1.29%
<b>Buyer/Processor</b>			
Buying price	0.245	0.248	0.261
Transportation and storage costs	0.043	0.037	0.037
Processing and sales costs	0.077	0.077	N/A
Sales price	0.435	0.435	0.298
Profit	0.070	0.073	N/A
Value created	0.365	0.361	0.298
Value captured	0.070	0.073	0.037
Value captured (%)	19%	20%	12.41%

### 3.1.3 Challenges in Existing Maize Supply Model

- Poor post-harvest management by small-scale farmers and inadequate availability of good quality storage facilities and inefficiencies related with management of these storage facilities is one of the challenges hindering proper functioning Maize aggregation and supply chains. The inadequacy of storage, handling, processing and other post-harvest management practices have led to increased post-harvest losses which would have otherwise increased farmers' income and/or food security. Inadequate storage has also constrained farmers from being strategic sellers because they cannot keep their produce for longer periods and prevents them from adding more value to their produce through further processing and consequently earning more income. Outdated post-harvest technology, and poor and unhygienic storage facilities cause farmers to lose much of their grain, and post-harvest losses are excessive; ranging from 15- 40%. This means lost opportunities for revenue and return on investment.
- Poor access to agricultural financing; Limited or no access to affordable loans to majority of small-scale farmers leads to difficulties in covering critical expenses and thus causing repetitive vicious cycle in a form of inability to afford improved inputs resulting in poor crop yields and low incomes. This in turn leads to farmers selling crops immediately after harvest when prices are lowest, in order to have cash to cover some expenses.
- Unstructured Markets; Most maize farmers have no direct access to markets or means of transporting large quantities of maize to market. They also have limited (or no) access to market information; farmers are consequently subjected to the low prices offered at the farm gate by local traders. Traders capture a higher amount of profit compared with farmers and this is why value created by middlemen in spot market aggregation model is higher than value created to farmers.
- Poor reach of Extension Services; many farmers have been found to have limited reach to extension and business development services, which further reduces their access to new technologies and innovations and ability to apply improved agronomic practices and innovations.

The situation leads to limited understanding of the benefits of accessibility to collective financial services and improved inputs.

- Weak farmers' organizations, lack of business skills and traditional attitudes to markets, leads to the disaggregation of supply and a limited ability to meet the quality and quantity of maize required for commercial contracts.
- Widely varying prices for maize from year-to-year due to various reasons such as poor rural infrastructures, droughts and export that further creates significant additional uncertainties and unpredictable production of maize.

### 3.1.4 Recommended Supply Chain Model for Maize

The assessment explored the factors inherent in the current supply models that led to the inefficient functioning of business to each actor involved in the models. Among of the two major models, the collective aggregation and linkages model has potentials for enabling actors to function under inclusiveness arrangements with an assurance of sustainability and economic benefits to each of the actors. Hence the model is recommended and its schematic flow is presented in Figure 2 below.

Farmers through Producer Organizations (POs) will be connected with private and institutional off-takers that will include medium and large-scale traders/millers, NFRA and WFP) directly or through grain market centers like Tunduma and Laela and the recently constructed grain market in Songea. The POs expected are AMCOS and umbrella associations. In the places where there are AMCOS they will be able to function as aggregators and establish linkages directly to off-takers and other services required for enabling production and marketing.

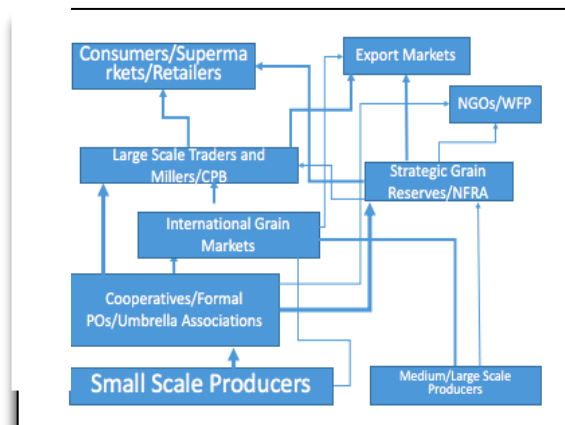


Figure 2: Recommended Aggregation Model for Maize

In other places where AMCOS do not exist groups could be formed and jointly form and register umbrella associations that will function as platforms with responsibilities of organizing and coordinating group members in accessing the critical market linkages services. The critical services that will be provided by the AMCOS and the umbrella organizations are linkages to off-takers, inputs, financing and aggregation/storage services. BDS services and extension services can as well be organized through the AMCOS and the umbrella associations.

For the model to work efficiently capacity-building, support on how to establish and operate the linkages will be needed to the key actors. The key actors are the operators of maize marketing centers, AMCOS and the umbrella associations. Importantly also, is on orienting off-takers to understand and appreciate the benefits of buying maize through the collective marketing arrangements and assisting them to align their business models to fit the aggregation supply model. Similar orientation will be needed for the inputs suppliers to understand the business benefits of working with farmers through collective actions guided by consortium model.

## 3.2 Cassava Supply-Chains Models

### 3.2.1 Existing Supply-Chains for Cassava

Basically cassava has five major supply chains and all originate from farmers and passes through several layers of intermediaries as describe hereunder. The analyzed supply chains are all operating in Kigoma Region as is the only Region among of the targeted that has large volumes of surplus that are traded at inter-regional, national and also traded in East African Countries. Noted is that in all supply chains farmers either trade dried cassava (makopa), or sale the cassava while it is still in the farm and is the responsibility of the buyer to engage laborers that will uproot, peel, dry and pack. Nevertheless, the practice of selling cassava while still in the farms currently is minimal in most of the places in the region.

**Supply Chain A:** The chain comprises of the small-scale farmers that trades directly with small scale cross border traders who themselves trade with small scale importers in Burundi. Products traded are makopa and fresh cassava. Those farmers and the traders are nearby the borders of the two countries and have some kind of social relationships among themselves. They do not trade cassava only but also other goods needed in either side. The transactions are either the cross-border trader delivers to importers or importers cross to Tanzania and collect. This happens to almost all villages bordering Burundi and is estimated substantial volumes are traded. The importers are small scale processors, wholesalers or retailers or all of the three trades and eventually the products ends up to consumers in Burundi.



Figure 3: Supply Channel A for Cassava

**Supply Chain B:** This channel that trades mainly makopa comprises of largely the small-scale farmers and also large farmers (5%) that trades with large scale aggregators. Some of the large-scale aggregators are also large farmers themselves. This is the most used supply chain that handles large volumes compare to the others. Aggregators in this category most of them own storage facilities that accommodates 50 to 200 Tons.

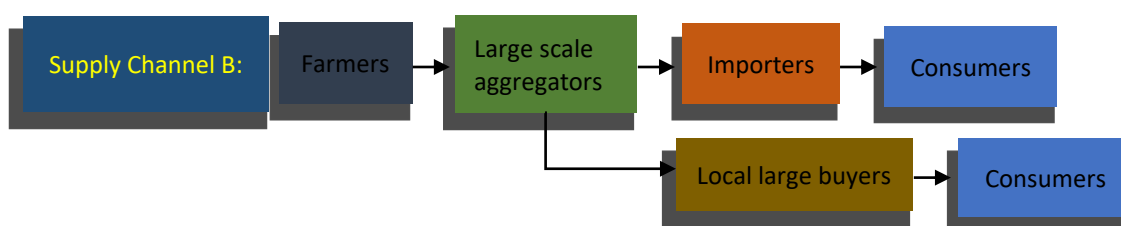
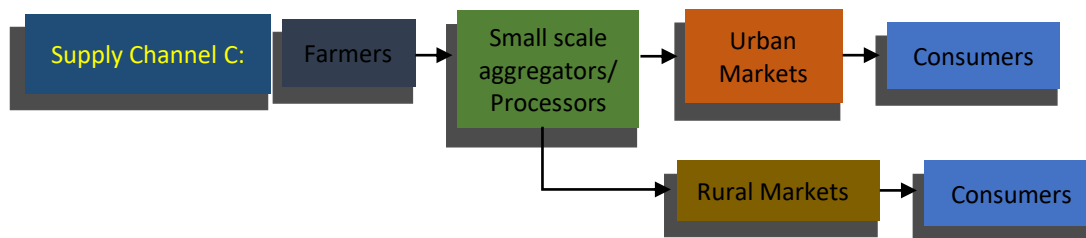


Figure 4: Supply Channel B for Cassava

For the model to work efficiently capacity building support on how to establish and operate the linkages will be needed to the key actors. The key actors are the operators of maize marketing centers, AMCOS and the umbrella associations. Importantly also, is on orienting off-takers to understand and appreciate the benefits of buying maize through the collective marketing arrangements and assisting them to align the business models to fit the aggregation supply model.

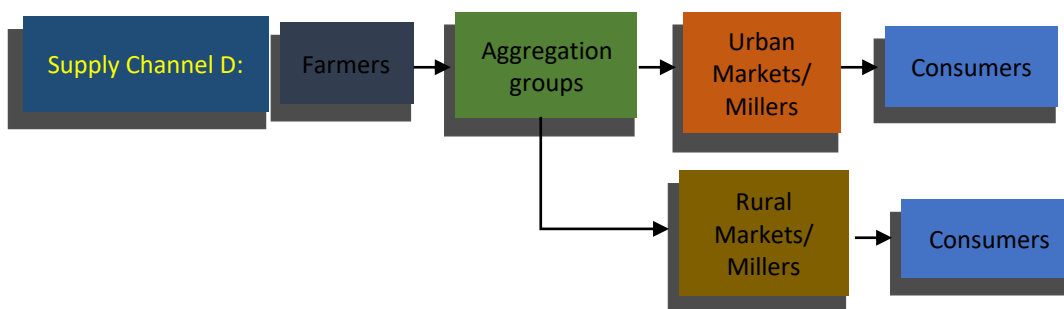
**Supply Chain C:** The channel comprises of farmers who sale to small scale aggregators and processors who are based in the main aggregation centers and in some villages. The aggregation capacities are

between 10 to 50 Tons that they trade with urban and rural small-scale traders in markets and millers. This channel deals with both makopa.



**Figure 5: Supply Channel C for Cassava**

**Supply Chain D:** Main products in channel D is sweet cassava and makopa. The channel is composed of farmers organized in aggregation groups that trades with small scale urban and rural market traders and millers who sale the products directly to consumers. The collective actions for aggregation enable them to bulk and thus are able to hire vehicle for taking the products to nearby urban markets and rural periodic market centers. Those who takes to urban markets they wholesale to retailers in those markets and to small scale millers who apart from providing milling services they also sale dried cassava for the clients that needs to mix makopa with maize during milling of the maize. The clients could either be the final consumers or retailers who sale maize flour mixed with makopa or small scale food vendors.



**Figure 6: Supply Channel D for Cassava**

### Challenges in existing cassava supply model

The main challenges identified along the supply chain fit in production, products, quantity and quality, and price. Briefs are provided below while details for each systemic challenge are annexed.

**Production level:** As high as 92% the farmers use traditional production techniques with only 8% using some high yield production techniques including acquisition of high yield seeds and pesticides. However, the yield difference among the two is minimal as it is only about 200 to 250 kgs/acre. The recycling of seeds is among of the means for high rates of diseases transfer as the farmers share such seeds between themselves. Harvesting and post-harvest management techniques are poor that leads to higher losses estimated up to 30% and low quality of the marketable products. Low yields at an average of 1.67-2.0 Tons/acre, including post-harvest loses of up to 30% and low qualities and the controlled low pricing by aggregators are the main challenges among the farmers.

At production level also, financial services required for financing production, post-harvest and marketing is missing including low entrepreneurial and organizational capacities. The low entrepreneurial and organizational capacities makes them unable to trade directly with the aggregators or directly with importers and local regional based buyers, access financial services and inputs especially high yield seeds and improvements in the overall quality of the products and reduction in post-harvest losses. As a result, the estimates are that about 32% of the farmers are making profits that range from 24-42% (for details



see section 3.2.2 below on value created and captured for different channels). That means the rest (685) are operating at near or subsistence levels.

**Aggregation levels and processing:** The actors comprise of large and small aggregators, small scale processors, aggregation groups, small scale collectors including small scale millers. The millers provide milling services directly to consumers and retailers of cassava flour and mixed maize and cassava flour. The aggregation actors are the crucial links between farmers and the buyers within and outside the country through the channels indicated in the supply chains. Apart from the links they have created opportunities for women and youths who work as laborers in the aggregation activities and also to transporters. All aggregators depict the basic features of SMEs but are operating informally. Some have their own storage facilities while others operate in rented structures.

Through aggregation arrangements the aggregators capture between 2.3-6% of the value created which is about TZS 6-14/kg depending on which channel they trade. At processing levels the processors on average capture 7-21% of the value created by the aggregators. However, some of the aggregators who mostly are large they store and sale in the months of January to March in which their profit margins grow to between 18-36%. Noted and largely, value addition is done outside Kigoma region and outside the country (Burundi, Rwanda, DRC and Uganda).

Through this actors, value addition combined with inclusive rather than extractive arrangements with farmers could contributed towards developing production capacities of the famers including quality and overall standards of the products. Value addition strategies will solve the challenge of short-term life shell and deterioration of dried cassava quality and the bulkiness of transporting by and/or to buyers that translates to high transport costs. On overall, the central challenge facing the aggregation actors is the capacity to articulate the existing opportunities along the cassava value chain and embark on value additions and thus increase the levels of value capturing near to the farmers and that will enable them to efficiently and inclusively trade with the farmers. That will also reduce the post harvest losses especially from the farmers to aggregators and to the buyers that either exports or trade in far distances within the country. Already in the main makopa trading centers there are aggregators that have invested in storage facilities who could be supported to embark on value addition and trade the products within the country and even export to the same countries that currently are the buyers of makopa.

**Buying arrangements:** Under the current supply chain arrangements the farmers are price takers due to market domination by village level collectors and aggregators that results into large volumes being traded at the beginning of the sales season at the lowest prices. Farmers interviews and FGDs all pointed to highly controlled pricing mechanisms by the aggregation networks. The large volumes sold at the lowest prices have high financial implication to the farmers as the prices are lower than the break-even prices. For instance break even prices/kg for 2016-18 was on average USD 0.0831 while prices on average were 0.0826. Taking into consideration the portions kept for household use then the losses are huge. Moreover, farmers make losses due to improper weighing scales used to gain more volumes compare to legal standard weighing scales such that a bag of 100kgs can weigh up 120kgs if measured by standard weighing scales. The current arrangements do not provide room for the farmers to understand the market dynamics and participate while guided by informed decisions. That situation occurs because the aggregators normally sit together and agree on buying prices and hence the aggregators control the system. Moreover, the aggregators provide financial credits that are recoverable at the beginning of seasons. Equivalent to the volumes payable amounts to between 50% to 100% interest rates. Some farmers fail to repay the whole loan and thus carrying over is done to the next season with added interest over and above the agreed upon initial rate.

### 3.2.2 Value Created and Captured

The assessment of the supply chains through value creation and value captured indicate mixture of results at farmers, aggregators and processors levels. To farmers the supply through groups enables the higher

most value captured which is 21% then followed by farmer to large aggregator, which is 14%. At aggregators level the farmer to small aggregator has value captured of about 6% while for farmer to large aggregators is about 4%. At processing level the large purchasing arrangements gives the processor higher value capturing of 21% followed by purchasing through groups, which is 15% and lastly small aggregators, which is 6.7%. Products supplied and traded are mainly dry cassava and cassava flour.

**Table 3: Value Creation and Capturing in Cassava Supply Chains**

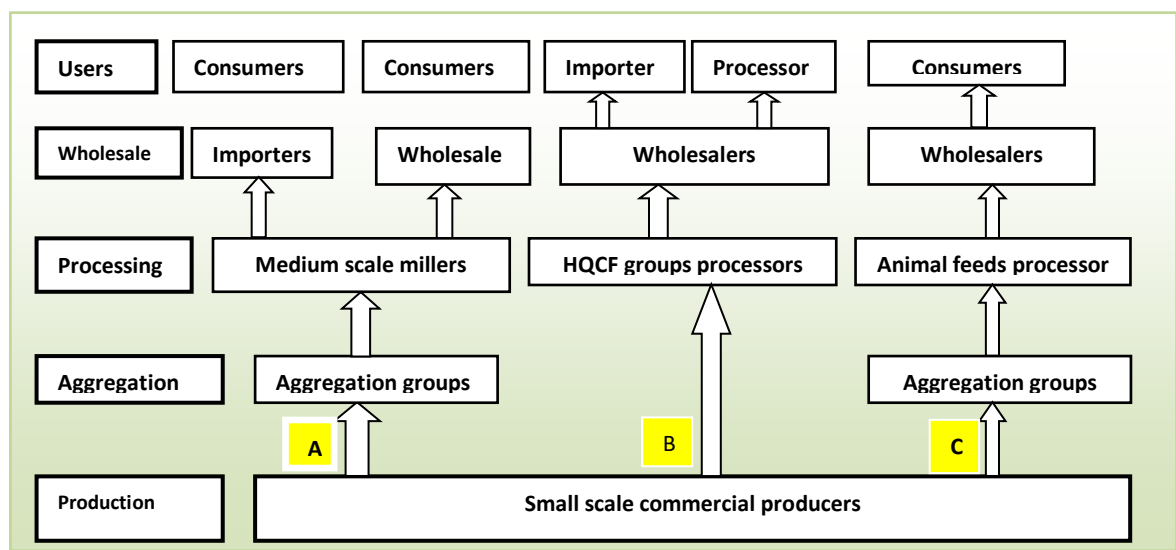
Kigoma Cassava Supply Chains: Value Created and Captured (USD/Kg): Average VCC 2018/19			
Market Actors	Farmer to small aggregator to urban/rural markets	Farmer to aggregation group to urban markets	Farmer to large aggregator to large buyer/importer
<b>Farmer</b>			
Sales price	0.091	0.109	0.100
Production costs	0.070	0.063	0.063
Sales Costs	0.010	0.003	0.010
Profit	0.022	0.045	0.037
Value created	0.091	0.109	0.100
Value captured	0.022	0.045	0.037
<b>Value captured (%)</b>	<b>24%</b>	<b>42%</b>	<b>37%</b>
<b>Aggregator</b>			
Buying price	0.091	0.109	0.100
Aggregation costs	0.008	0.004	0.005
Commission/fees	0.006	0.003	0.004
Value created	0.105	0.116	0.110
Value captured	0.006	0.003	0.004
<b>Value captured (%)</b>	<b>5.79%</b>	<b>2.26%</b>	<b>3.97%</b>
<b>Buyer/ Processor</b>			
Buying price	0.105	0.116	0.110
Transport Costs	0.004	0.004	0.005
Processing costs	N/A	N/A	0.035
Sales	0.117	0.133	0.178
Profit	0.008	0.020	0.038
Value created	0.117	0.133	0.178
Value captured	0.008	0.020	0.038
<b>Value captured (%)</b>	<b>6.67%</b>	<b>15.31%</b>	<b>21.22%</b>

### 3.2.3 Recommended Supply-chain for Cassava

The recommendation of cassava supply chain is focused on overcoming the existing systemic challenges existing in the current supply chain. The main challenges identified along the supply chain fit in production process, end products, product quantity and product quality, and product price. Thus based on that, two main supply chain models are recommended as follows:

**1<sup>st</sup> model:** comprises of three supply channels targeting the production and marketing of cassava flour products, production of HQCF and production of animal feeds. The supply chain will be private sector driven with long term business agreements with farmers through organized farmer groups. The basic features are provided in Figure 8 that depicts three main channels. **Channel A** will be led by medium scale processors of dried cassava into pure cassava flour and/or mixed flour comprising of cassava and maize. The products will be exported and traded within the country through urban based wholesalers. Dried cassava contracts will be entered between the processors and the farmers through collection groups. The contracts will allow farmer groups to access financial services required for production, collection and delivery of the dried cassava products to the processors. Similarly the processors will have to seek long term business relationships with importers and wholesalers within the country. Alternatively, they can seek contractual relationships with agents who can export to the importing countries and distribution within the country.

**Channel B** will be for supplying HQCF to companies that mills wheat flour within the country and other countries. Outside the country, the target would be the East African Countries. Production and selling would be done by well-trained groups that have long term agreements with wholesalers who could export and deliver to millers within the country. **Channel C** is the avenue for supplying dried but low-quality cassava that will be used by animal feeds processors who will sale directly to animal keeping enterprises or through wholesalers. Both ends long term business relationships are critical.



**Figure 7: Private sector driven supply chain model**

**2<sup>nd</sup> model:** is of cooperative driven model operating from Farmer Marketing Centers through Public-Private-Producer Partnership. The partnership is made up of Agriculture Marketing Cooperatives (AMCOS) that will in partnership with the District Councils of Kasulu, Kibondo and Kankoko have formed Special Purpose Vehicles (SPVs) for managing the FMCs that currently are under construction. UNCDF through the Kigoma Joint Program is supporting construction of the FMCs, formation of the AMCOs and the SPVs at Kabingo in Kankoko, Kagezi in Kibondo and Mvugwe in Kasulu Districts. The plan is to construct six more FMCs with similar management and operational structures in Kigoma Region within three years. The centers will not deal with cassava products only but also maize and beans. Viability assessment conducted by UNCDF concluded that the centers can be viable operationally and financially. The model is based on the viability assessment that provide answers to how the FMCs will operate and the expected benefits

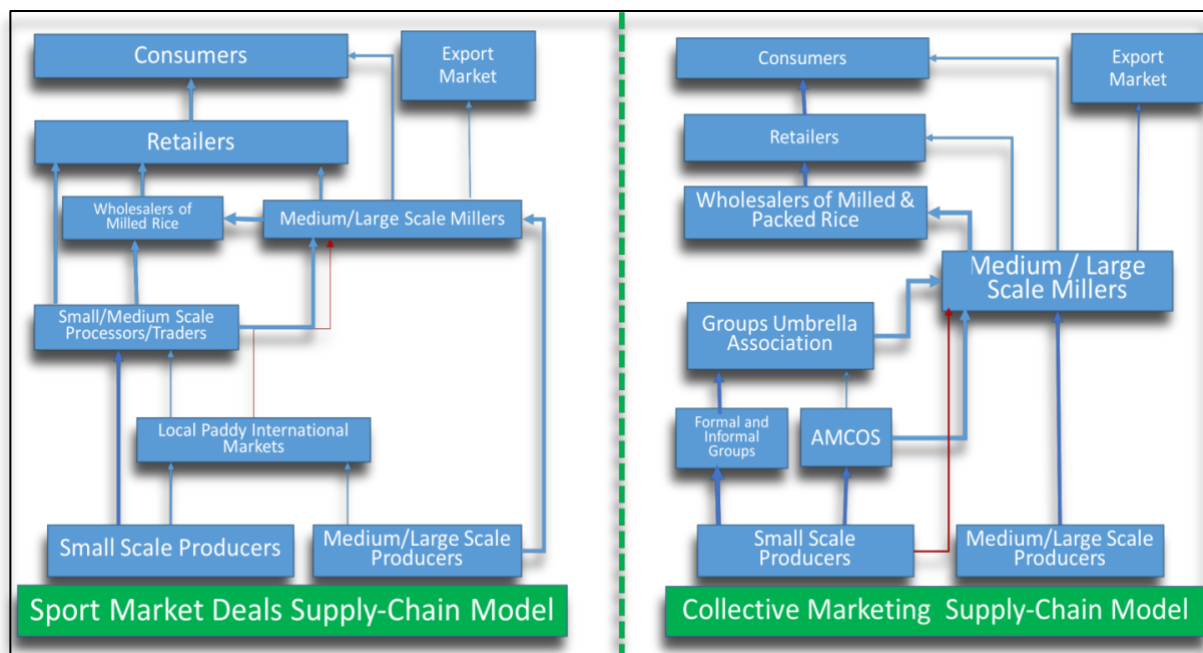
especially to farmers. The viability assessment defines a business model as ‘*the internal and external business relationships and the roles that will enable farmers to trade with upstream actors*’. The upstream actors targeted are the wholesalers and processors within the country and importers based in Rwanda, Burundi and other East African Countries. The partnership will be managing the FMCs services and thus enable the farmers to trade. The business model will function through contractual relationships that are based on consortium arrangements with mentioned below relations.

- There would be buyers and inputs suppliers that would do business with farmers through AMCOS.
- AMCOS would function as inputs and outputs business services provision hubs to farmers through contracts with the buyers and inputs suppliers.
- Innovative agriculture finance and insurance products reaching farmers through contractual agreements with AMCOS.
- District and Village Councils being shareholders through the investment in the marketing center infrastructure and the joint venture (SPV).
- Farmers committing to contractual agreements entered with lead firms through AMCOS,
- Women and youth participating competitively and benefiting from the opportunities that exists in the value chain.

### 3.3 Paddy Supply Models

#### 3.3.1 Existing Supply Chain for Paddy

Paddy marketing assessment revealed two existing supply chain models, namely spot market deals and collective market (See figure 8).



**Figure 8: Existing Supply-Chain Models for Paddy**

#### Spot Market

Majority of small scale farmers (almost three quarter), do sell directly to traders either at the farm-gate or at local markets and the remaining quarter progressive farmers do sell small portion and store other portion till prices improve or become stable. Then traders do either sell instantly to small and medium scale processors or store for some time to warehouses and storage services providers (these could be

associations, specialized paddy/rice international markets e.g. Igurusi, warehouse owners or small and medium scale millers) and wait when prices are good to sell the stored produce.

Traders who opt to store paddy to milling plants owners, always charged a certain fee as storage costs but also have a separate business agreement with the owners of the plant to eventually mill their stocks to those particular milling plants at a fee. After milling, the traders have an option to sell the milled rice either to big buyers or to the plant owner. The plant owners buy milled rice only if they have good quality in order to supply to their esteemed customers in big cities like Dar es Salaam, Zanzibar and Dodoma. Traders and some progressive farmers like this kind of business arrangement with millers because of the security as well as the convenient and ready market for their produce/products offered by these millers. Some well off millers like Raphael Group in Mbeya have introduced a system of supporting some trustful traders with interest free financial support in order to boost their capacities to procure produce from farmers.

Spot markets are convenient for farmers and they get cash on the spot. The drawback for farmers is that they usually have to sell when they have the produce, to a limited number of traders bidding for produce, who may be better informed about prices further down the chain. They thus risk getting low prices than otherwise.

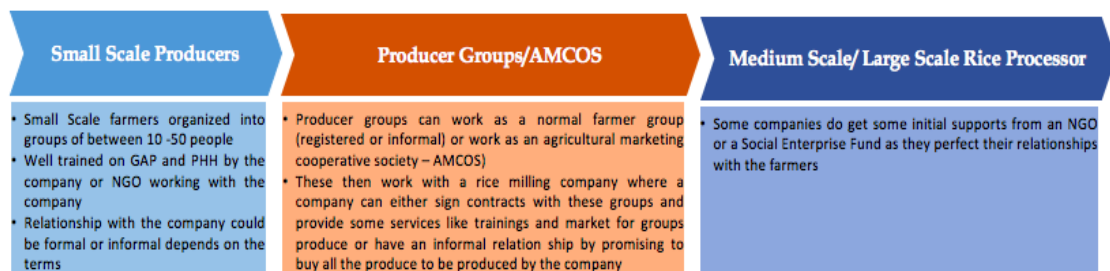
Spot market deals aggregation model is the most exercised in paddy producing regions and it accounts for more than 90% of supply of paddy and milled rice in most regions of southern highlands and west regions except in Mbeya region where there is comparatively more progressive farmers and a good number of larger scale paddy producers due existence of irrigation schemes. In Mbeya, 60-70% of paddy business goes through intermediaries and the remaining 30-40% of the paddy business/supply is carried out through producer groups (POs). The dominant players in this model are agents or intermediaries who also act as traders at different levels of the value chain.

The spot market aggregation channels have high transactions costs and reduce margins to both farmers and paddy buyers. Intermediaries incur 20% to 40% of the aggregation costs depending on how many agents are involved in a particular transaction. Based on the field assessment, total transaction costs incurred by both farmers and paddy buyers in spot market deals is USD 0.04 and USD 0.05 per kg of paddy respectively, where agents contribute 20% and 17% of the total costs (Annex 5). Due to agents interventions the price paid by buyers is higher by a margin of between 0.004 to 0.01 USD per kg of paddy and the price paid to farmers is lower by the same margin of 0.004 to 0.013 USD per kg of paddy (Annex 5).

### **Collective Marketing**

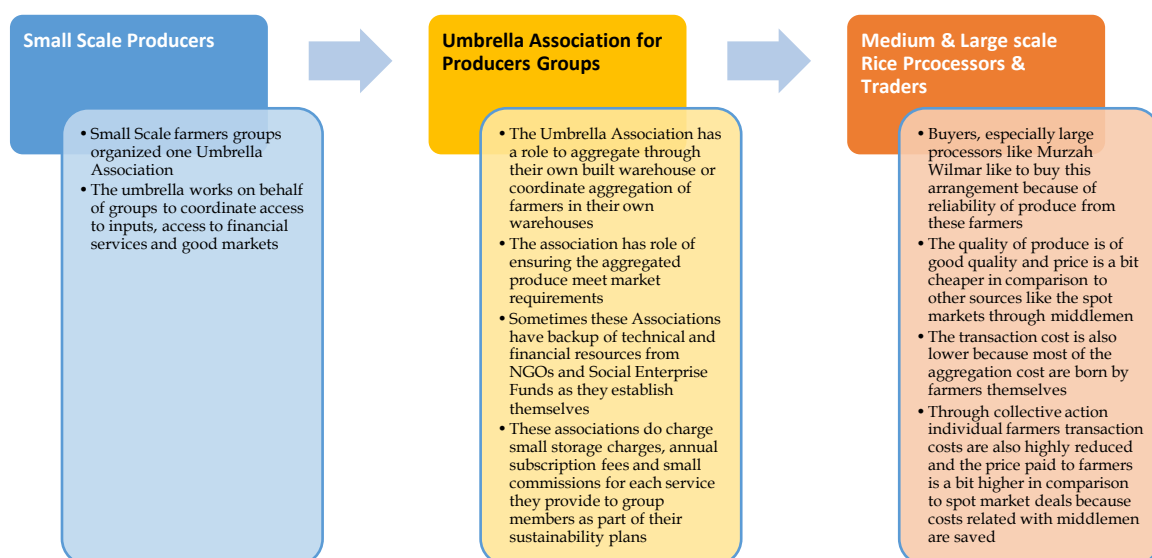
Another form of aggregation that was established during the field assessment in paddy subsector is collective marketing where farmers were found to market their produces collectively through producer organizations (POs) or a modified Warehouse Receipt System (WRS). They aggregate produce themselves, and bypass local traders and sale direct to the final buyer or processors. Collective marketing reduces transactions costs of trading since a single deal replaces the separate deals that members would otherwise have undertaken; may well economize on costs of transport and storage; and may give the producer organization bargaining power when selling to large-scale traders or main buyers. The transactions undertaken were found to be either a spot deal or on contractual basis.

Producers groups involved in paddy supply chains were found to take any of the following forms; the first type is where producer group takes a role of organizing supply of inputs, production and aggregating its members produce in warehouses, which could be theirs or rented from the village authorities (Figure 9). The aggregated produce is sold collectively to buyers through some pre-arrangements, which could be in the form of market contracts or contract farming. Most of the groups involved in this form of aggregation were found to be registered farmer groups or farmers cooperatives societies (AMCOS). These groups were found to work with well-established processors who sometimes have a backup or support of development partners like NGOs and Social Enterprise Funds.



**Figure 9: Producers Groups Driven Collective Marketing Model**

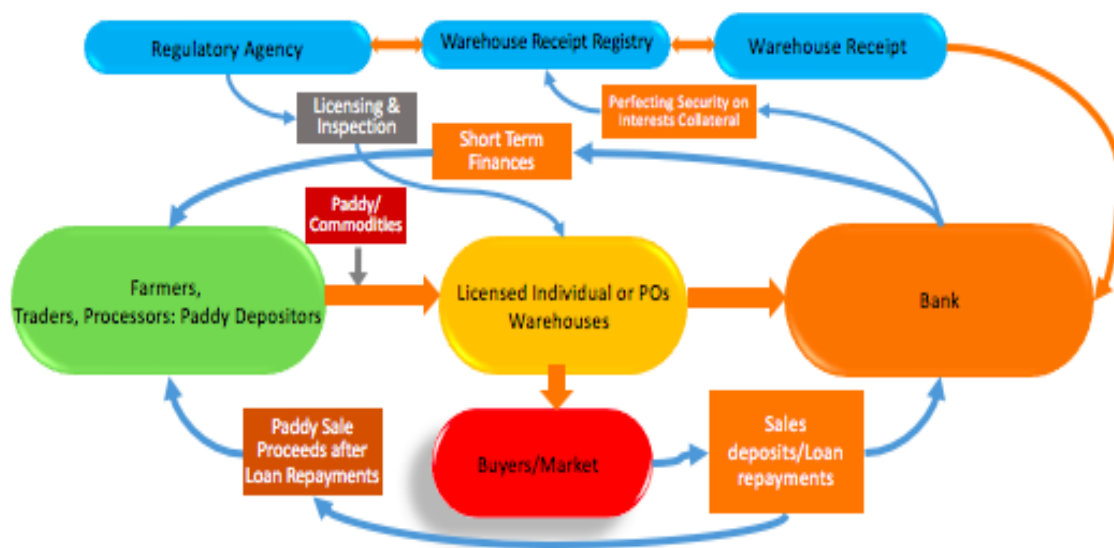
The second type is where registered groups come together and form an umbrella association, which work as a formal linkage platform for the members. The umbrella association is always responsible for organizing and coordinating supply of inputs, access to financial, production, aggregation and marketing of member produce (Figure 10). A good example in this type is Association of Mbeya High Quality Rice Producers Company Limited (AMBERICO), which has 22 producer groups and 4 Agricultural Marketing and Cooperative Societies as members. This aggregation model seems to work best with normal producer groups rather than AMCOS because of less management cost, decision-making structures and procedures governing the groups.



**Figure 10: Umbrella Association Driven Collective Marketing Model**

A third form is where owner of warehouses, which could be individuals, processors or producer organizations enter into contract with financial institutions to implement a WRS where individual farmers, aggregators and traders store their produce in those particular warehouses and a particular bank provide a loan equivalent to 75% of stored produce to these depositors. This is an improved WRS where there is

no an independent collateral manager involved. The owner of the warehouse works as a collateral manager and custodian of the produce deposited in their warehouse. A good example for this model is a warehouse owned by Usangu Cooperative Society in Chimala, Mbeya. This improved WRS works well in paddy than conventional WRS because of the flexibilities and reduced transaction cost advantage the improved system offers to both banks and clients. The conventional WRS was rigid and bureaucratic as it did involve only public owned warehouses and independent professional collateral managers. Public warehouses are always not commercially managed and most of them are located in remote areas, which is far from convenient rice markets along the main roads. The illustration of the WRS driven collective aggregation model is as depicted in Figure 11 below.



**Figure 11: WRS Driven Collective Aggregation Model**

Collective marketing aggregation model has been found to be cost effective in terms of transaction incurred but also it provides competitive prices to both farmers and buyers due high reduction of agents' commissions. Total transaction cost incurred by farmers and buyers are less by 30% and 20% respectively and the price received/paid by both farmers and buyers are higher or lesser by an average of USD 0.009/kg of paddy. In spite of low transaction costs collective marketing aggregation model creates better value to farmers than other aggregation models (see table 4 below). In contrary, the collective aggregation model creates less value to large buyers, aggregators and processors because of inefficiencies compounding collective marketing channels like AMCOs and Umbrella Association and this is the major reason why most large buyers and processors shy away from working with farmer organizations and rather prefers the spot markets channels.

### 3.3.2 Value Created and Captured

In paddy the supply channel with highest value capturing to farmers is through collective aggregation and trading with medium and large scale processors which enables them to capture about 40% of the value created which is average of USD 0.28/kg across all supply channels. To farmers also the selling channel through marketing centers provides them a value capturing of almost 38% while the remaining provides about 36.20% each. At processing levels the purchasing channel with highest value capturing is through middlemen with 26%, while the rest provides 23%. In all supply channels the traded products is paddy

and rice. Some farmers’ process and trade through wholesalers and retailers while for medium and large scale processors trade through wholesalers who in turn trade through retailers. Some also are private and public institutional suppliers such as schools, hospitals, government entities such as the army camps and also relieve agencies.

**Table 4: Value Creation and Capturing in Paddy Supply Chains**

Paddy Supply Chains: Value Created and Captured ( USD/Kg): Averages 2018/19 Season			
Market Actors	Supply Channel		
	Small farmers through middlemen	Small ,medium, large farmers through market canters	Medium & Large Scale Farmers/traders direct selling to medium and large buyers through agents
<b>Farmer</b>			
Sales price	0.283	0.283	0.283
Production costs	0.132	0.132	0.132
Sales costs	0.040	0.039	0.040
Agent commission	0.009	0.005	0.009
Profit	0.102	0.107	0.102
Value created	0.283	0.283	0.283
Value captured	0.102	0.107	0.102
<b>Value captured (%)</b>	<b>36.15%</b>	<b>37.69%</b>	<b>36.15%</b>
<b>Medium and Large Processors</b>			
Buying price	0.283	0.283	0.283
Transport	0.039	0.039	0.039
Crop -Cess	0.005	0.005	0.005
Drying and cleaning	0.002	0.002	0.002
Agent commission	0.009	0.009	0.009
Processing costs	0.057	0.048	0.043
Sales costs-ex milling plants	0.067	0.062	0.052
Sales	0.545	0.580	0.563
Profit	0.141	0.134	0.130
Value created	0.545	0.580	0.563
Value captured	0.141	0.134	0.130
<b>Value captured (%)</b>	<b>25.92%</b>	<b>23.07%</b>	<b>23.11%</b>

### Challenges in Existing Paddy Supply Model

- Generally, there are inadequate storage facilities for smooth collection and aggregation in rural areas as well as good quality storage facilities in urban centers, which could function efficiently as distribution nodes to regional, national and export markets. Most of the existing warehouses are few, small in size and without proper equipment’s for ensuring quality of produce collected from



farmers. Insufficient of storage facilities in paddy producing areas has been a single major impediments to the development of warehouse receipt system (WRS) which could serve as a proper way to incentivize farmers and other value chain services provision actors like financial services providers and inputs suppliers.

- There still low usage of improved varieties and other key inputs like fertilizers in most of areas where paddy is grown (except where there is concentration of irrigation schemes, e.g. in Mbarali district in Mbeya). This has led into low yields and sometimes mixed varieties of rice products that can't compete well in high end and export markets.
- Low level of mechanization to most areas where they grow paddy. This hampers efficient production of paddy but also it becomes difficult to ensure good quality of paddy during harvesting.
- There are still a lot mistrusts among value chain actors, thus between farmers and traders, traders and millers, but also between farmers and millers. The lack of trust in business transactions has resulted into at times not adhering to contractual obligations that ultimately hampers smooth and efficient supply of paddy/rice up the value chain.
- There is extremely limited access to financial services especially credits. Most of paddy actors in the chains are small-scale farmers and small and mediums scale traders and millers who are not trusted by financial institutions because of their informalities and lack of credible assets. Moreover, interest rates charged and the paying modalities by the financial institutions are not appropriate especially for agro related business. Also some of the financial institutions do not have the required skills for providing financial products required by the agricultural value chain actors. Those factors are part of the aspects that affects smooth production, aggregation and availability of paddy and rice in the markets served by the supply chains.
- There are inadequacies in flow of market information especially to last mile producers' as such the intermediaries and opportunistic traders have been taking advantage to reap from small-scale farmers.
- There is limited producer organizations and membership. There is good number of AMCOS, producer groups and farmers associations in Ruvuma, Mbeya, Iringa, Njombe and Rukwa. However, majority of them are poorly managed and lack proper operational and management systems. Those factors are among of the major reasons for producers not to join them or form new ones and even side selling for those who are already members.
- Although there some improvement on the side of government support still bureaucracy at both levels, thus central and local government levels leads to the slow implementation of positive policies and general business environment, especially when it comes to development of export markets and serious investment by commercial farmers and medium to large scale millers.
- Just as many other values in Tanzania, the paddy/rice value chain is fragmented and still at the low level of development. Basically in most places it is operating under 'supply push' and not on 'demand pull' basis.

### **3.3.3 Recommended Supply Chain Model for Paddy**

The improved paddy supply chain aims at improving the procurement of paddy from small-scale farmers by small, medium and large-scale millers and traders. The model aim at improving availability and quality of paddy and reduction of transaction costs to all actors through reliable supply to all types of buyers who wants to aggregate, mill and sale within and outside the country. As the field findings shows, the total procurement costs are low in collective aggregation model at USD 0.0483/kg of paddy in comparison to USD 0.0535/kg of paddy. Also value created in collective aggregation model The supply chain is illustrated in Figure 12.

The recommended supply-chain model targets to connect small scale, medium and large-scale farmers with small, medium and large-scale millers and traders through paddy market centers such as Igurusi paddy market located in Mbeya. The smallholders will be linked through their groups, umbrella associations and AMCOS. Through this recommended supply-chain groups, umbrella associations and AMCOS will be working as platforms for linking the farmers with accessibility to inputs, markets and financial services.

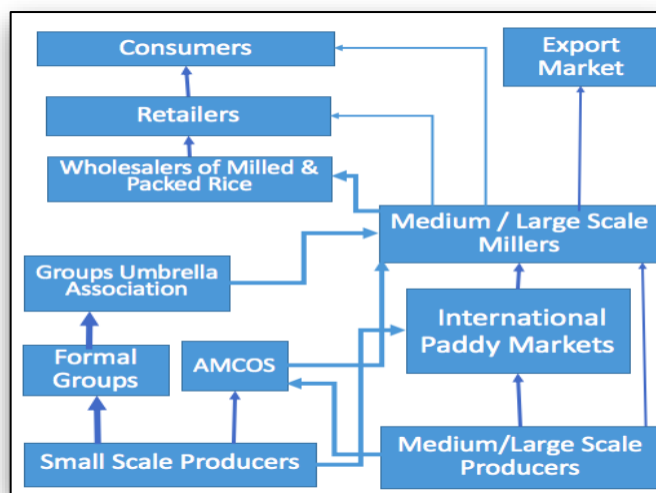


Figure 12: Improved Supply Chain Model for Paddy

Other services will include extension and tractor services, BDS, and aggregation/storage services. Much efforts would be required in building capacities and introduction of proper systems to intermediaries, especially producer groups and paddy market centers for them to perform their intermediary roles between paddy producers and buyers effectively and efficient.

### 3.4 Beans Supply-Chains Models

#### 3.4.1 Existing Supply Chain for Beans

Dry beans are the leading crop among pulses produced and marketed within and outside the country. The crop amounts to between 60 to 75% of pulses produced annually. Current production level is 1.02 million MT while the regions surveyed produce total of 252,852 Tons of which 40% is consumed by producers, 48% traded within the country and 12% is exported. The Regions jointly trades about 401,956 Tons annually. The countries importing beans are those with East Africa and outside EAC is mainly India.

Popular beans varieties grown and sold are Njano Uyole, Roscoco, Lyamungo 90, Kigoma Gololi, Jesca and Black. On overall price trends have been growing over the period of 2013 to 2017<sup>3</sup>. Data captured in the field indicates almost same growth trend. In the season of 2017/18 1nd 2018/19 on average prices ranged from USD 96 to USD 122/Ton as the sales prices to consumers. Data captured indicated prices to farmers over the past five year ranged on average from USD 0.4 to USD 0.8/kgs with profit margins ranging from 25% to 36%. The survey captured that about 87% of the farmers are low GAP practitioners with yields of 300/kgs while the rest are at different levels of utilizing GAP techniques with yield ranging from 600 to 800kgs/acre. It was also established that the break- even levels are higher for low GAP users (60%) while for high GAP users is 35%. Such situation combined with amounts set aside for home consumption and the high PHL (up to 30%) then those low GAP users are operating at subsistence levels.

Across the country, the current common-beans supply chain basically comprises of cooperative and private led channels (Figure 14). In the cooperative led channel, which is new, and an upcoming, the key actors are smallholder producers, informal farmer groups and AMCOS functioning as aggregators, off-takers that some of them are also brokers and/or wholesalers, retailers and end consumers. In the private led channel which is the most well established and capturing most of the traded volumes across the country is formed by smallholder producers, rural collectors, district/regional aggregators, wholesalers,

<sup>3</sup> Tanzania MFR Summary Report, August 2018

retailers and exporters. In the cooperative model, they also trade with institutional buyer mainly the WFP. This model has been operating in Kagera Region with the main intermediary being KADERES/KPD.

The supply relationships indicates the two channels are not totally independent but rather there some linkages such that groups/cooperatives aggregate and trade with urban brokers who in turn trade with wholesalers operating in the private led channel and also the groups/ cooperatives trade with exporters. All channels are basically operating as informal and semi-formal entities. Currently, the private led channel is leading in capturing large volumes while the cooperative model is new and emerging. The cooperative model has potentials for enabling the linkages that could become inclusive and thus created more value to the farmers (see comparisons of value captured and created below).

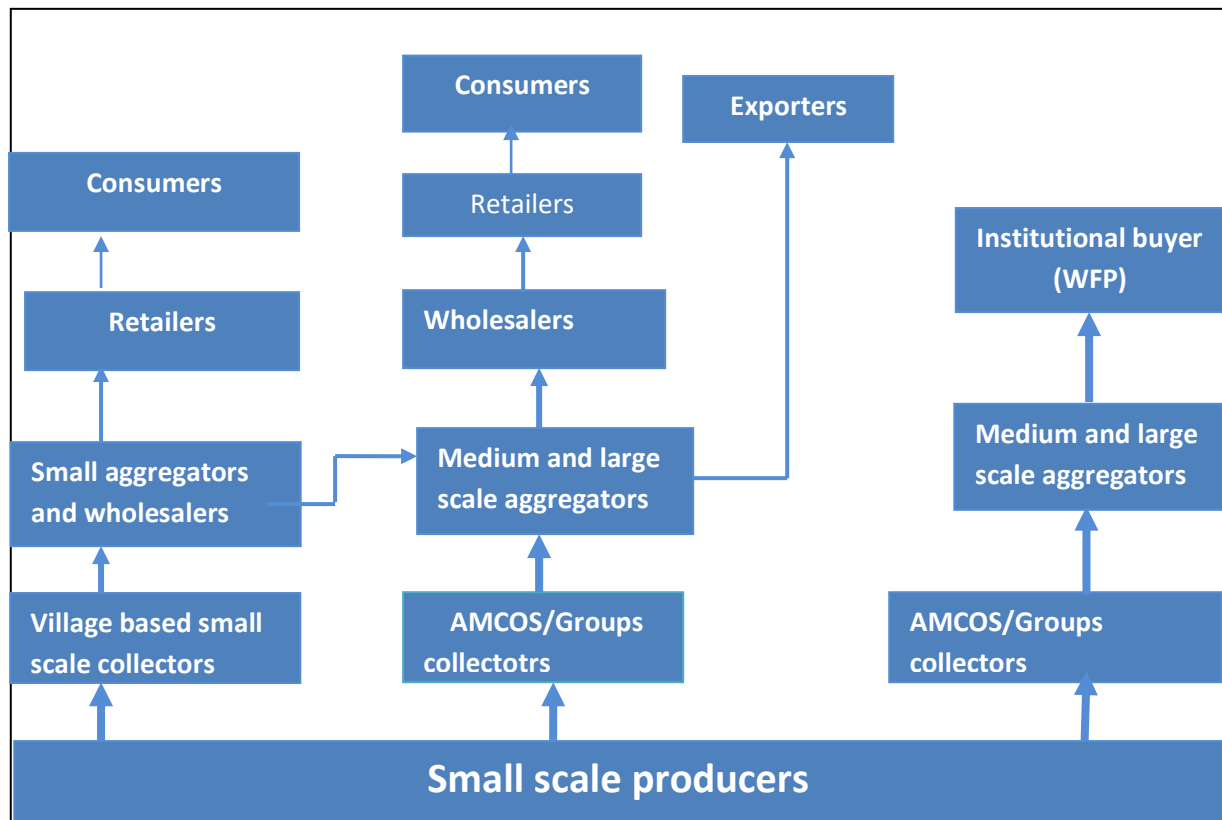


Figure 14: Current Beans Supply Models

### Challenges in existing beans supply model

**Production level:** Currently, the seeds suppliers capacity and hence producers are facing difficulties in accessing high yield seeds. The producers mostly re-use their own seeds or buy local seeds that basically are normal grains from fellow farmers who stock those seeds. Prices are mostly twice the selling prices. The survey captured that about 87% of the farmers are low GAP practitioners with average yields of 300kgs while the rest are at different levels of utilizing GAP techniques with yield ranging from 600 to 800kgs/acre. It was also established that the break- even levels are higher for low GAP users (60%) while for high GAP users is 35%. Such situation combined with amounts set aside for home consumption and the high PHL then those low GAP users are operating at subsistence levels. Apart from the absence of improved seeds, pests and diseases in the field leading to low yield also hamper beans production. There is still scope for improving yields. Beans are mostly intercropped and play significant role in soil fertility management. Beans is in most places treated as women crop as women playing an important role in the production and in the sale and having a relatively good control over the benefits derived from this crop.

However, their capacities to access high yield seeds and other inputs such as fertilizer, pesticides and post-harvest technologies are very low. Bulk of the sales are done immediately at harvest time when prices are low and thus realizing low incomes that mostly are at break-even levels. Moreover, there are very few organized collective actions both at informal groups and formal cooperatives and also the business and marketing skills capacities for those organized in groups/cooperatives are still very low.

**Intermediate level-Private Led Model:** Private operators that comprises of the village collectors, and aggregators within the districts dominate the intermediate level and at regional and national level there are wholesalers. Institutional buyers also access beans through this model. As demonstrated in Section 3.4.2 below, the farmers through this model can capture 29% of the value created while aggregators capture 4% and wholesalers 17%. The challenge for the farmers is to produce the required volumes that can enable them to capture such value. The model is the most dominant and the actors are responsible for providing market linkages and are the means for the farmers to trade. The private sector aggregators business models work towards maximizing profits. On overall farmers are price takers under the current private led market arrangements. The market is controlled by powerfully aggregators based at trading center with linkages to off-takers at regional and national levels. The aggregators work through network of village-based middlemen and also they buy directly from farmers. Large volumes are traded at the beginning of the season at lowest prices, that makes the farmers to make minimal profit margins, and mostly they make losses.

**Intermediate level-Cooperative Led Model:** Cooperative led models are new and yet to function effectively. Most of them are still on the formation stage and yet to start operating while others functioning but still needs to be guided. Those cooperatives models functioning but still needs capacity building support include the WFP/Kilimo Trust Partnerships with KADERES/KPD in Kagera Region specifically in the districts of Karagwe and Kyerwa and those in Mbeya, Njombe and Ruvuma Regions that have some linkages with Raphael Group, Silverland and Mteweke as off-takers. Those in the Southern Highlands formation were formed under the MIVARF Programme, which is ending in March 2020. In Kigoma Region there are 9 cooperatives earmarked for formation of which 3 of them are already being formed to take the responsibilities of linking farmers with off-takers of beans, cassava and maize. Those currently under formation are at Mvugwe (Kasulu District), Kagezi (Kibondo District) and Kabingo (Kakonko District). Noted to all those already functioning they still need technical support on organizational aspects, leadership, business operations and marketing techniques, techniques for enabling members/farmers to access inputs and financial and extension services.

### **3.4.2 Value Created and Captured**

In the three main supply channels, value capturing by farmers ranges from 37% to 48%. The most efficient to farmers is of collective supply to institutional buyers that provides them with 48% followed by collective action to large buyers with 46% and sport supply through middlemen provides 37%. Sport channel provides value capturing of 4% to aggregators while buyers capture 17% of the value. In collective arrangements the buyers trade directly with farmers and thus enabling to capture 22% of the value created. In all channels, the traded product is dry beans from farmers to the buyers who are wholesalers and that trade with retailers operating in different retailing channels.

**Table 5: Value Creation and Captured in Beans Supply Chains**

Beans Supply Chains: Value Created and Captured (USD/Kg): 2018/2019 Average Pricing Structure			
Market Actors	Supply Channels		
	Sport Marketing-middlemen to aggregators	Collective aggregation to large buyers	Collective aggregation to institutional buyers
<b>Farmer</b>			
Sales price	0.565	0.609	0.652
Production costs	0.355	0.327	0.327
Sales costs	0.048	0.007	0.030
Profit	0.163	0.276	0.295
Value created	0.565	0.609	0.652
Value captured	0.163	0.276	0.295
Value captured (%)	29%	45%	45%
<b>Aggregator</b>			
Buying/collection price	0.565	0.609	0.652
Aggregation and delivery costs	0.035	0.007	0.007
Commission/fees	0.026	0.004	0.004
Value created	0.626	0.620	0.663
Value captured	0.026	0.004	0.004
Value captured (%)	4%	0.70%	0.66%
<b>Wholesalers</b>			
Buying price	0.626	0.620	0.652
Handling costs	0.026	0.013	0.022
Transport costs	0.065	0.052	0.052
Into warehouse costs	0.717	0.685	0.726
Sales to Retailer	0.861	0.861	N/A
Profit	0.143	0.176	N/A
Value created	0.861	0.861	0.726
Value captured	0.143	0.176	0.074
	17%	20%	10.18%

### 3.4.3 Recommended Supply Chain Model for Beans

The proposed supply chain model are those already initiated by the development actors and thus needing technical support for making them effective in linking farmers to markets competitively and sustainably. Those already exists and some are being developed in Kigoma, Kagera, Njombe, Ruvuma and Mbeya regions by MIVARF, Kigoma Joint Program and AGRA. The entire current cooperative model portrays the potentialities of becoming inclusive with capacities of linking farmers with both inputs and outputs markets. Figure 15 provides illustration of the proposed model.

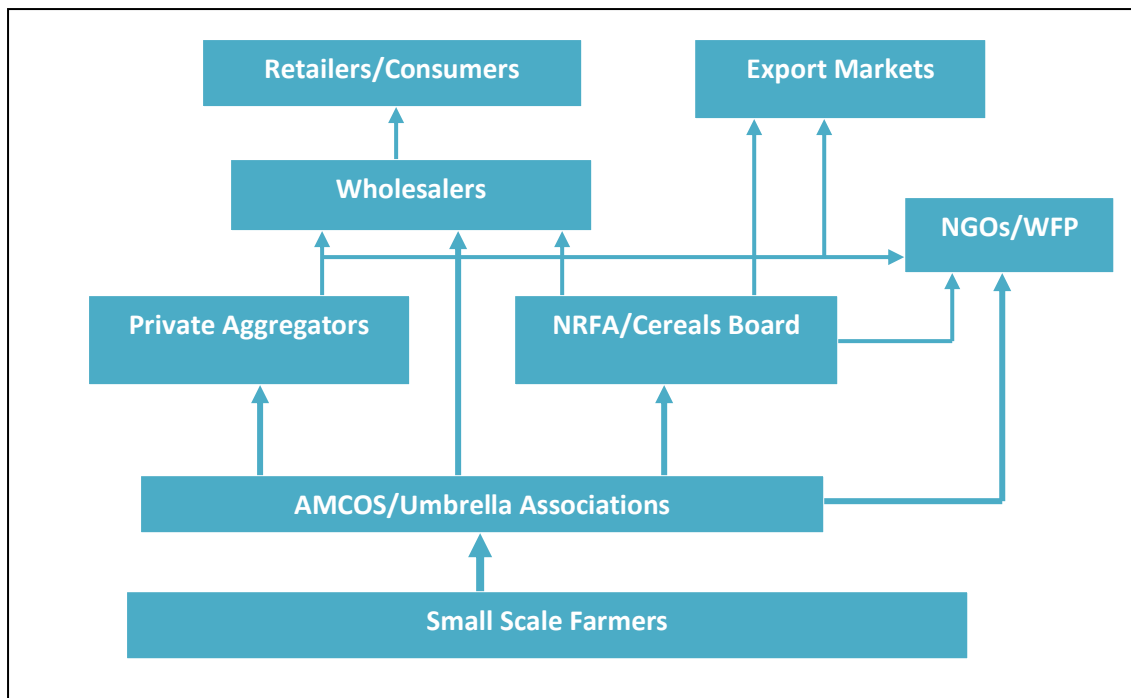


Figure 15: Recommended Beans Supply Chain Models

To establish the models, focus should be on establishment of contractual business relations that are inclusive, competitive and resilient by bringing together the main actors engaged in the beans value chain through Private-Producer-Public Partnership arrangements. The contractual relations expected key features are (i) the value chain private actors that will comprise of the off-takers and inputs suppliers committed to changing from extractive to inclusive relationship with farmers through AMCOS (ii) AMCOS functioning as inputs and outputs business services provision hubs to farmers through contracts with buyers and agro-dealers and (iii) innovative agriculture finance and insurance products reaching farmers through contractual agreements with AMCOS. Other key features are (iv) BDS and extension services provision actors reaching farmers through organizational arrangements agreed upon with AMCOS, (v) farmers committing to contractual agreements entered with buyers AMCOS, and (vi) women and youth participating competitively and benefiting from the opportunities that exists in the value chain.

## 4.0 Recommended Development Strategies and Interventions

### 4.1 Supply Chain Development Strategies

- The overall approach suggested is to promote supply chains built around inclusive business models at production and the market linkages levels. The production level comprises of the individual small-scale producers while the linkages levels comprises of the aggregators, processors, wholesalers and the retailers. The current situation is in each of the supply chain the actors are operating business models that are unique with potentials for reinforcing each other if the actors are brought together and agree to work together under win-win situations. The uniqueness of the models is the activities that each of the actors regardless of being informal or formal creates and markets the products including the means for obtaining finance and the required inputs for creating and marketing the products. Thus, the supply chain development strategies need to focus on strengthening the business models and establishment of compatible institutional relations between the actors on the demand and supply sides of the chain.
- The survey realized that the government and the development actors mostly focuses on the small holders and their organizations which are the suppliers with assumptions that they will be able to influence the private aggregators, processors, exporters and wholesalers which together comprises the demand side of the value chain. There are also ongoing efforts for developing

supply chains that are private led under the Lead Firm arrangements with assumptions that the market linkages will function while the key responsibilities being managed by the firms that have entered into supply agreements with the producers through their organizations. Essentially this is contract farming. The main challenge noted is the development work that such firms need to perform so that such business arrangements operate competitively. Moreover, some of the firms have attempted to operate such arrangements in one geographical area with the existence of development actor spearheading the arrangements while in the other places same firm is operating extractive supply chain arrangements.

- To note is that the bulk of the linkages, which are the pillars for the demand sides, is done by the SMEs that mostly operating informally through local intermediaries with weak organizational and business skills, with limited access to finance and technology. All those factors are part of the reasons for the negative impacts on the unreliable market access by the smallholders. Similarly, on the supply side which comprises of the smallholders and the few emerging producer organizations the main challenges are the low production capacities mainly due to low GAP skills, unavailability of high yield seeds, operational arrangements that are fragmented, minimal availability of extension services, low capacity for accessing financing and minimal business and marketing capacities. On overall, therefore those are the existing challenges that will need to be addressed so as to develop and/or improve the existing supply chains.

## 4.2 Proposed Strategic Actions

- Focus on the existing cooperative led supply chain models already with or expecting to have linkages to private processors, wholesalers and exporters. The recommended models all require cooperatives to perform the roles of linking the producers to outputs markets and inputs markets. Moreover, the analysis of value added and value captured demonstrates the effectiveness of the cooperative models in creating more value compare to the other models (refer value added and captured analysis for each supply chain). To note is that the models are still new with little coverage and also at the initial development stages while some of the support projects have ended. As provided in the analysis of existing models such cooperative models exists in all value chains in some of the regions, which include Kigoma, Kagera, Njombe, Ruvuma and Mbeya Regions. Thus AGRA apart from strengthening the existing ones it can as well embark on up-scaling the models within the regions and other regions.
- Identify and engage market development facilitators with demonstrated capacities to develop and strengthen inclusive business models for the demand and supply sides.
- AGRA to work with the market development facilitators to identify cooperatives and private firms that are working together or potentially can work together, engage them into dialogue of jointly working towards developing inclusive business models, and agree on the supply chain organizational and business arrangements. The identification of the cooperatives and the private sector already practicing the models would be done in collaboration with the Regional and District Authorities in each of the Regions targeted. Thus the business models would be the tools for creating the market linkages with sustainable economic benefits to each of the actors along the agreed supply chain.
- Based on the agreements an in-depth organizational and business assessment would be done for all actors that have agreed to work together and a business case for developing and/or strengthening the business models will have to be prepared and shared with all actors that have agreed to work together. The business case should also include the wide environments requirements such as policies, laws and the regulations within which the supply chain will operate and the role of the government and the public sectors.
- The business case to be the main guide for the market development facilitator and demand and the supply chain actors to work towards developing the business models while guided by the agreed upon organizational and business relationships among the actors.
- AGRA to work in supporting the larger business environment issues so as to enable existence of

enabling environment for actors that will work towards the agreed upon market linkages. The focus to be on making the supply chain actors to understand the policies, laws and regulations governing cereals and pulses trading locally and exports and work with the government especially at region level and the district councils in improving and streamlining the local level policies and procedures that will enable effective functioning of the actors implementing the models.



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## LIST OF ANNEXES

### Annex 1: Paddy Production Costs Returns and Break-even Points

Paddy Production Per Acre in USD			
S/N	Activities	Farmers without GPA (majority small scale farmers)	Farmers who applies GAP (mostly in Irrigation schemes and other progressive farmers)
<b>1</b>	<b>Inputs Costs</b>		
	Seeds	13.04	13.04
	Pesticides	-	7.83
	Fertilizer	41.09	82.17
	Herbicides	13.04	13.04
	Packaging Materials (Bags & ropes	5.43	13.04
	<b>Subtotal - Input Costs</b>	<b>72.61</b>	<b>129.13</b>
<b>2</b>	<b>Farm Services Costs</b>		
	Ploughing/Tilling	21.74	21.74
	Harrowing/Levelling	13.04	13.04
	Rotary	21.74	21.74
	Fertilizer Transport	0.87	8.70
	Other transport costs (e. g bags from farm to storage etc)	8.70	21.74
	Harvesting by a combiner harvester/Harvesting & Cleaning	65.22	65.22
	Water fee	-	6.52
	<b>Subtotal - Farm Services Costs</b>	<b>131.30</b>	<b>158.70</b>
<b>3</b>	<b>Labor Costs</b>		
	Farm clearance	8.70	8.70
	Nursery preparation	4.35	4.35
	Planting	26.09	43.48
	Fertilizer Application	-	17.39
	Herbicides Application	-	4.35
	Weeding	21.74	21.74
	Other Labor costs	15.22	15.22
	<b>Subtotal - Labaour Costs</b>	<b>76.09</b>	<b>115.22</b>
	<b>Total production Costs</b>	<b>280.00</b>	<b>403.04</b>
	<b>Assumptions</b>		
	Total Production per Acre (bags)	12	30
	Bag Weight (Kg)	90	90
	Average Farm Gate Price Per Kg (USD)	0.28	0.28
	<b>Sales Value/ Revenue (USD)</b>	<b>305.22</b>	<b>763.04</b>
	<b>Profit/Acre (USD)</b>	<b>25.22</b>	<b>360.00</b>

	Return on Investment (RoI)	1.1	1.9
	Break-even Point kg/acre (USD)	0.27	0.61
	Break-even Price/kg (USD)	0.19	0.15
	Margin	8.26%	47.18%

## Annex 2: Maize Production Costs Returns and Break-Even Points

Maize Production Costs Per Acre in USD			
S/N	Activities	Farmers without GAP (majority of them are small scale farmers)	Farmers who applies GAP
<b>1</b>	<b>Inputs Costs</b>		
	Seeds	1.09	26.09
	Planting Fertilizer (basal)	-	24.35
	Top dressing Fertilizer	-	27.83
	Packaging (bags & ropes)	2.17	10.87
	Planting ropes	-	2.61
	Tarpaulin	-	13.04
	<b>Subtotal -Input Costs</b>	<b>3</b>	<b>105</b>
<b>2</b>	<b>Farm Services</b>		
	Ploughing	21.74	21.74
	Harrowing	-	10.87
	Hiring a plot	21.74	21.74
	Transportation	6.09	17.39
	<b>Subtotal - Farm Services</b>	<b>50</b>	<b>72</b>
<b>3</b>	<b>Labor Costs</b>		
	Plot Clearing	8.70	8.70
	Planting	4.35	17.39
	1st weeding	21.74	10.87
	2nd weeding	13.04	10.87
	Harvesting	4.35	13.04
	Threshing and Cleaning	7.61	13.04
	Loading and Offloading	3.04	8.70
	Weed Killer application cost	10.87	10.87
	<b>Subtotal - Labour Costs</b>	<b>74</b>	<b>93</b>
	<b>Total Production Costs</b>	<b>127</b>	<b>270</b>
	<b>Assumptions</b>		
	Total Production per Acre (bags)	7	20
	Bag Weight (Kg)	100	100
	Average Farm Gate Price Per Kg (USD)	0.22	0.22
	<b>Sales Value/Revenue (USD)</b>	<b>152.17</b>	<b>434.78</b>
	<b>Profit/Acre (USD)</b>	<b>25.65</b>	<b>164.78</b>
	<b>Return on Investment (RoI)</b>	<b>1.2</b>	<b>1.6</b>
	<b>Break-even Point kg/acre (USD)</b>	<b>0.25</b>	<b>0.54</b>

	<b>Break-even Price/kg (USD)</b>	<b>0.18</b>	<b>0.14</b>
	<b>Margin</b>	<b>16.86%</b>	<b>38%</b>

### Annex 3: Beans Production Costs Returns and Break-Even Points

<b>Beans Costs and Margins Analysis: 2018/19 Season</b>			
<b>Production without GAP</b>		<b>With some GAP</b>	
Production kgs/acre	250	Production kgs/acre	600
Price /kg (USD)	0.65	Price/kg (USD)	0.65
<b>Sales value (USD)</b>	<b>163.04</b>		<b>391.30</b>
<b>Costs/1 acre (USD)</b>		<b>Costs/1 acre (USD)</b>	
Hiring plot	13.04	Hiring plot	13.04
Plot clearing	8.70	Plot clearing	8.70
Tilling	17.39	Tilling	17.39
Harrowing	0.00	Harrowing	0.00
Ropes	0.00	Ropes	2.61
Seeds (20kgs)	13.04	Seeds (40kgs)	34.78
Planting	8.70	Planting	17.39
Fertilizer	0.00	Planting fertilizer	24.35
Fertilizer application	0.00		4.35
1st weeding	10.87	1st weed killer/weeding	13.04
Weed killer and application	0.00	Weed killer application costs	10.87
2nd Weeding cost	4.35	2nd Weeding cost	8.70
Packaging materials (bags and ropes)	2.17	Packaging materials (bags and ropes)	3.13
Harvesting and cleaning	4.35	Harvesting	8.70
Threshing and cleaning	3.48	Threshing and cleaning	6.52
Transportation (farm to Home)	2.61	Transportation (farm to Home)	5.22
<b>Total Costs</b>	<b>88.70</b>	<b>Total Costs</b>	<b>178.78</b>
<b>Profit/acre (USD)</b>	<b>74.35</b>	<b>Profit/acre (USD)</b>	<b>212.52</b>
<b>Return on Investment (RoI)</b>	<b>1.84</b>	<b>Return on Investment (RoI)</b>	<b>2.19</b>
<b>Break- even point (kgs/acre)</b>	<b>0.06</b>	<b>Break- even point (kgs/acre)</b>	<b>0.12</b>
<b>Break- even price/kg (TZS)</b>	<b>0.35</b>	<b>Break- even price/kg (TZS)</b>	<b>0.30</b>
<b>Margin (%) at home</b>	<b>46%</b>	<b>Margin (%) at home</b>	<b>54%</b>

### Annex 4: Cassava Production Costs Returns and Break-Even Points

<b>Cassava Costs and Margins Analysis: 2018/19 Season</b>			
<b>Production without GAP</b>		<b>With some GAP</b>	
Production per acre (kg)	1200	Production per acre (kg)	2300
Price /kg (USD)	0.11	Price/kg (USD)	0.11
<b>Sales value (USD)</b>	<b>130.43</b>		<b>250.00</b>
<b>Costs/1 acre (USD)</b>		<b>Costs/1 acre (USD)</b>	
Hiring plot	13.04	Hiring plot	13.04
Plot clearing	13.04	Plot clearing	13.04
Tilling	0.00	Tilling	13.04
Harrowing	0.00		0.00
Ropes	0.00	Ropes	0.00

Seeds	5.22	Seeds	10.87
Planting	4.35	Planting	10.87
Planting fertilizer	0.00	Planting fertilizer	0.00
Fertilizer application	0.00		0.00
1st weed killer/weeding	13.04	1st weed killer/weeding	13.04
Weed killer	0.00	Weed killer application costs	6.52
2nd Weeding cost	6.96	2nd Weeding cost	10.87
Packaging materials (bags and ropes)	7.83	Packaging materials (bags and ropes)	10.43
Harvesting and peeling	8.70	Harvesting and cleaning	13.04
Drying	4.35	Drying	6.52
Transportation	6.96	Transportation	10.43
<b>Total Costs</b>	<b>83.48</b>	<b>Total Costs</b>	<b>131.74</b>
<b>Profit/acre (USD)</b>	<b>46.96</b>	<b>Profit/acre (USD)</b>	<b>118.26</b>
<b>Return on Investment (Rol)</b>	<b>1.56</b>	<b>Return on Investment (Rol)</b>	<b>1.9</b>
<b>Break- even point (kgs/acre) in USD</b>	<b>0.33</b>	<b>Break- even point (kgs/acre) in USD</b>	<b>0.53</b>
<b>Break- even price/kg (USD)</b>	<b>0.07</b>	<b>Break- even price/kg (USD)</b>	<b>0.06</b>

#### Annex 5: Paddy Procurement/Aggregation Costs

Paddy Procurement/Aggregation Costs in USD/Kg					
		Sport Market Channel			Collective Market Channels
		Small Farmers through Middlemen	Small, Medium & Large Scale Farmers through International Markets	Medium & Large Scale Farmers/traders direct selling to medium and large buyers through agents	Producer Groups and Umbrella Associations to Mediums and Large buyers
1	Costs Incurred by Farmers during selling Paddy				
	Transport from farmers to collection or storage centers	0.014	0.014	0.014	0.007
	Loading and offloading costs	0.005	0.005	0.005	0.005
	Cleaning Costs per bag	N/A	N/A	N/A	0.003
	Re-bagging costs per bag	0.003	0.003	0.003	0.003
	Storage fee	0.012	0.012	0.012	0.010
	Crop cess – LGAs	0.005	0.005	0.005	0.005
	Agent Fee/Commission	0.009	0.005	0.009	0.005
	<b>Total Procurement Costs incurred by Farmers</b>	<b>0.048</b>	<b>0.044</b>	<b>0.048</b>	<b>0.037</b>
2	Costs Incurred by Medium & Large Buyers/Millers/Traders during Paddy Procurements				
	Crop cess – LGAs	0.0048	0.0048	0.0048	0.0048
	Cleaning/drying Costs per bag	0.0013	0.0013	0.0013	0.0000
	Agent Fee/Commission	0.0087	0.0087	0.0087	0.0048
	Average transport costs from storage facilities to buyers location (Dodoma, Morogoro, Dar)	0.0387	0.0387	0.0387	0.0387

Total Procurement Costs Incurred by Large Buyers/Millers/ Traders	0.0535	0.0535	0.0535	0.0483
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#### Annex 6: Maize Procurement/Aggregation Costs

Maize Procurement/Aggregation Costs in USD/Kg					
		Sport Market Channel		Collective Market Channel	
		Small Farmers through Middlemen to medium and large buyers	Small, Medium & Large Scale Farmers through International Grain Markets to large buyers	Producer Groups and AMCOS to large buyers	Producer Groups and AMCOS to Institutional buyers
1	<b>Costs Incurred by Farmers during selling Maize</b>				
	Transport Fee from farmers to collection or storage centers	0.013	0.013	0.007	0.007
	Loading and offloading costs	0.004	0.004	0.004	0.009
	Cleaning Costs per bag	N/A	N/A	0.001	0.005
	Re-bagging and weighing costs per bag	N/A	0.004	0.002	0.004
	Storage free	0.009	0.009	N/A	N/A
	Crop cess - LGAs	0.004	0.004	0.004	0.004
	Agent fee/Association Coordination fee	0.004	0.004	0.007	0.007
	<b>Total Procurement Costs Involved</b>	<b>0.035</b>	<b>0.039</b>	<b>0.025</b>	<b>0.036</b>
2	<b>Costs Incurred by Medium &amp; Large Buyers/Millers/Traders during Maize Procurements</b>				
	Crop cess - LGAs	0.004	0.004	0.004	N/A
	Cleaning/drying Costs per bag	0.001	0.001	0.000	N/A
	Agent fee/Association Coordination fee	0.009	0.009	0.007	N/A
	Average transport costs from storage facilities to buyers location (Dodoma, Morogoro, Dar)	0.052	0.052	0.052	0.052
	<b>Total Procurement Costs Incurred by Buyers/Millers/Large Traders</b>	<b>0.067</b>	<b>0.067</b>	<b>0.063</b>	<b>0.052</b>

## Annex 7: Beans Procurement/Aggregation Costs

Beans Procurement/Aggregation Costs in USD/Kg					
		Sport Market Channel		Collective Market Channel	
		Small Farmers through Middlemen to medium and large buyers	Small, Medium & Large Scale Farmers through International Grain Markets to large buyers	Producer Groups and AMCOS to large buyers	Producer Groups and AMCOS to Institutional buyers
1	Costs Incurred by Farmers during selling Maize				
	Transport from farmers to collection or storage centers	0.013	0.013	0.007	0.007
	Loading and offloading costs	0.004	0.004	0.004	0.009
	Cleaning Costs per bag	N/A	N/A	0.001	0.005
	Re-bagging and weighing costs per bag	N/A	0.004	0.002	0.004
	Storage free	0.009	0.009	N/A	N/A
	Crop cess - LGAs	0.004	0.004	0.004	0.004
	Agent fee/Association Coordination fee	0.004	0.004	0.007	0.007
	<b>Total Procurement Costs Involved (USD)</b>	<b>0.035</b>	<b>0.026</b>	<b>0.025</b>	<b>0.036</b>
2	Costs Incurred by Medium & Large Buyers/Millers/Traders during Maize Procurements				
	Crop cess - LGAs	0.004	0.004	0.004	N/A
	Cleaning/drying Costs per bag	0.001	0.001	0.000	N/A
	Agent fee/Association Coordination fee	0.009	0.009	0.007	N/A
	Average transport costs from storage facilities to buyers location (Dodoma, Morogoro, Dar)	0.052	0.052	0.052	0.052
	<b>Total Procurement Costs Incurred by Buyers/Millers/Large Traders</b>	<b>0.067</b>	<b>0.067</b>	<b>0.063</b>	<b>0.052</b>

## Annex 8: Cassava Procurement/Aggregation Costs

Cassava Procurement/Aggregation Costs in USD/Kg					
		Sport Market Channel		Collective Market Channel	
		Small Farmers through Middlemen to medium and large buyers	Small, Medium & Large Scale Farmers through International Grain Markets to large buyers	Producer Groups and AMCOS to large buyers	Producer Groups and AMCOS to Institutional buyers
1	Costs Incurred by Farmers during selling Maize				
	Transport Fee from farmers to collection or storage centers	0.013	0.013	0.007	0.007
	Loading and offloading costs	0.004	0.004	0.004	0.009

	Cleaning Costs per bag	N/A	N/A	0.001	0.005
	Re-bagging and weighing costs per bag	N/A	0.004	0.002	0.004
	Storage free	0.009	0.009	N/A	N/A
	Crop cess - LGAs	0.004	0.004	0.004	0.004
	Agent fee/Association Coordination fee	0.004	0.004	0.007	0.007
	<b>Total Procurement Costs Involved</b>	<b>0.035</b>	<b>0.039</b>	<b>0.025</b>	<b>0.036</b>
2	Costs Incurred by Medium & Large Buyers/Millers/Traders during Maize Procurements				
	Crop cess - LGAs	0.004	0.004	0.004	N/A
	Cleaning/drying Costs per bag	0.001	0.001	0.000	N/A
	Agent fee/Association Coordination fee	0.009	0.009	0.007	N/A
	Average transport costs from storage facilities to buyers location (Dodoma, Morogoro, Dar)	0.052	0.052	0.052	0.052
	<b>Total Procurement Costs Incurred by Buyers/Millers/Large Traders</b>	<b>0.067</b>	<b>0.067</b>	<b>0.063</b>	<b>0.052</b>

#### Annex 9: Prices Paid to Paddy Farmers and Agents through Different Supply-Chain Models

Prices Paid to Paddy Farmers and Agents through Different Supply-Chain Models in USD/Kg				
Category of Buyers/Traders	Sport Market Channels			Collective Market Channels
	Small Farmers through Middlemen	Small, Medium & Large Scale Farmers through International Markets	Medium & Large Scale Farmers/traders direct selling to medium and large buyers through agents	Producer Groups and Umbrella Associations to Mediums and Large buyers
Price paid to farmers by traders and middlemen at farm gate price (USD/kg)	0.283	N/A	N/A	N/A
Price paid to farmers and small traders (who store paddy for sometimes before selling) by agents/middlemen at storage facilities in USD/kg	0.322	0.330	0.322	N/A
Price paid to Agents/Middlemen by the final buyers (Medium and Larger Scale farmers) in USD/kg	0.339	0.330	0.339	N/A
Price paid by final buyer to producers/farmers(USD/Kg)	N/A	N/A	N/A	0.330

#### Annex 10: Prices Paid to Maize Farmers and Agents through Different Supply-Chain Models

Prices Paid to Maize Farmers and Agents through Different Supply-Chain Models in USD/Kg		
Category of Buyers/Traders	Sport Market Channel	Collective Market Channels



	Small Farmers through Middlemen to Medium and Large buyers	Small, Medium & Large Scale Farmers through International Grain Markets to large buyers	Producer Groups and AMCOS to Large buyers	Producer Groups and AMCOS to Institutional buyers
Price paid to farmers by traders and middlemen at farm gate Price (USD/Kg)	0.217	0.217	N/A	N/A
Price paid to farmers and small traders who store Maize for sometimes by agents at storage facilities (USD/Kg)	0.239	0.239	N/A	N/A
Price paid to Agent/Middlemen by the final buyers (USD/Kg)	0.278	N/A	N/A	N/A
Average Price paid by final buyer to producers through International Grain Markets/AMCOS (USD/Kg)	N/A	0.261	0.261	0.261

#### Annex 11: Prices Paid to Beans Farmers and Agents through Different Supply-Chain Models

Prices Paid to Beans Farmers and Agents through Different Supply-Chain Models in USD/Kg				
Category of Buyers/Traders	Sport Market Channel		Collective Market Channels	
	Small Farmers through Middlemen to Medium and Large buyers	Small, Medium & Large Scale Farmers through International Grain Markets to large buyers	Producer Groups and AMCOS to Large buyers	Producer Groups and AMCOS to Institutional buyers
Price paid to farmers by traders and middlemen at farm gate Price (USD/Kg)	0.217	0.217	N/A	N/A
Price paid to farmers and small traders who store Maize for sometimes by agents at storage facilities (USD/Kg)	0.239	0.239	N/A	N/A
Price paid to Agent/Middlemen by the final buyers (USD/Kg)	0.278	N/A	N/A	N/A
Average Price paid by final buyer to producers through International Grain Markets/AMCOS (USD/Kg)	N/A	0.261	0.261	0.261

## Annex 12: Prices Paid to Cassava Farmers and Agents through Different Supply-Chain Models

Prices Paid to Cassava Farmers and Agents through Different Supply-Chain Models in USD/Kg				
Category of Buyers/Traders	Sport Market Channel		Collective Market Channels	
	Small Farmers through Middlemen to Medium and Large buyers	Small, Medium & Large Scale Farmers through International Grain Markets to large buyers	Producer Groups and AMCOS to Large buyers	Producer Groups and AMCOS to Institutional buyers
Price paid to farmers by traders and middlemen at farm gate Price (USD/Kg)	0.217	0.217	N/A	N/A
Price paid to farmers and small traders who store Maize for sometimes by agents at storage facilities (USD/Kg)	0.239	0.239	N/A	N/A
Price paid to Agent/Middlemen by the final buyers (USD/Kg)	0.278	N/A	N/A	N/A
Average Price paid by final buyer to producers through International Grain Markets/AMCOS (USD/Kg)	N/A	0.261	0.261	0.261

## Annex 13: Names and Contacts of Interviewees

S/N	Names of Respondent	Designation	Location	Contacts
1.	Michael Mwalingo	Manager - Mwandemanga Rice Milling	Igurusi International Market – Igurusi, Mbarali Mbeya	0756096390
2.	Petro Ezekiel Mbeleweta	Statistics Officer	Igurusi International Rice/Paddy Market, Igurusi, Mbarali, Mbeya	0716441861
3.	Godfrey Andreas Mlongoso	Paddy Agent/Middleman	Mpollo, Utengule Usangu, Mbarali	0753647187
4.	Stephane Babukei Kamenu	Chairman Traders Association/ Middleman - Tunduma Grains International Market	Tunduma, Momba, Songwe	0765-816539/0784-242124
5.	Kenedy Mbogo	Manager - Tunduma Grains International Market	Tunduma Grains International Market	0755-808731
6.	Dorah Magohe	Revenue Collector - Tunduma Grains International Market	Tunduma Grains International Market	0746-289898

S/N	Names of Respondent	Designation	Location	Contacts
7.	YoungsonSiwale	Revenue Collector -Tunduma Grains International Market	Tunduma Grains International Market	0752-293340
8.	Steven Mwampwani	Manager – AMBERICO	Association of Mbeya High Quality Rice Producers Company Limited (AMBERICO) - Chimala, Mbarali, Mbeya	0764-734804 mwampwanis@yahoo.com
9.	Michael Muyengi	Loan Officer -AMBERICO	AMBERICO, Chimala, Mbeya	0744-466170 fmuyengi82@gmail.com
10.	Witness S Kayanga	Chairperson -Zinduka Women Group	Mshewe Village- Mbeya Rural, Mbeya	0768-186904
11.	Agatha Lukindo	Member- Zinduka Women Group	Mshewe Village- Mbeya Rural, Mbeya	0657-903443
12.	RoydaWanga	Member - Zinduka Women Group	Mshewe Village- Mbeya Rural, Mbeya	0758-121855
13.	Adam Mwita	Store Keeper – Usangu Farmers Cooperative Societies	Chimala, Mbarali, Mbeya	0755-761333
14.	Peter Mlegula	Production Manager – Raphael Group	Uyole, Mbeya	0755-767187
15.	Lazaro Mwakipesile	General Manager – Raphael Group	Uyole, Mbeya	0659-661866
16.	Samson Msigwa	Farmers Project Coordinator – Musoma Food Company Limited	Mlowa, Songwe and Shinyanga	0756-821426 msigwasamson1991@gmail.com
17.	Patrick Kilewo	Procurement Manager – Musoma Foods Company Limited	Mlowa, Songwe and Shinyanga	0756-821426
18.	Josephine MiingiKaiza	Chief Executive Officer (CEO) - BRITEN	Iringa, Songwe, Rukwa and Dar es Salaam	0753-876351 jkaiza@britentz.org
19.	Godfrey Bwana	Head of Programs - BRITEN	Iringa, Songwe, Rukwa and Dar es Salaam	0713-600900 gbwana@britentz.org
20.	Noelia Songaleli	Director/ Owner of Tanganyika Lido Milling	Sumbawanga, Rukwa	
21.	Ramadhan Sibasa Baukuli	Chairman of Mbasila Food Ind. Ltd	Sumbawanga, Rukwa	+255 754 282638 Mbasila200@yahoo.com

S/N	Names of Respondent	Designation	Location	Contacts
22.	Anwary Mohamed Said	Director of Fantashiru Enterprises	Sumbawanga, Rukwa	+255754306978 anwary788@gmail.com
23.	Asayile Paulo Msaku	Director of London Agro Factory Ltd	Sumbawanga, Rukwa	+255 754 625942 asayilemsaku@gmail.com
24.	BenardMaige	Director	Mpanda, Katavi	+255 784 641804
25.	Mashimba Pasion	Manager	Mpanda, Katavi	+255 786 678583
26.	GeofreySupoma	Director/ Owner	Mpanda, Katavi	+255 784 746408
27.	Raymond Kelvini	Managing Director	Mpanda, Katavi	+255 758 380782
28.	Lusajo Msukwa	Director	Sumbawanga, Rukwa	+255 755 194922
29.	Amina Rashid Mjandama	Manager	Sumbawanga, Rukwa	+255 745 529276
30.	Musa Mwayaya	Director of Mwayaya Milling Machine	Sumbawanga, Rukwa	musamwayaya@gmail.com
31.	Zena Ally Said	Director of Super Sembe Star	Sumbawanga, Rukwa	
32.	Frank James	Manager	Sumbawanga, Rukwa	+255 745 061700
33.	Magdalena Kita	Owner	Sumbawanga, Rukwa	+255 755 175205
34.	John Simbaya	Baba Love Store	Sumbawanga, Rukwa	+255 754 645446
35.	NemesSamora Kenya	Director	Sumbawanga, Rukwa	+255 757 453884
36.	AhaziSimwanza	Manager of Lela Arcos	Sumbawanga, Rukwa	+255 764 552123 ahazisimwanza@gmail.com
37.	Semeni John Mwamlenga	Manager-MpuiSaccos	Sumbawanga, Rukwa	+255 766 014134 mpuisaccoslimited@gmail.com
38.	AmnalaNgajilo	Director/ Owner	Sumbawanga, Rukwa	
39.	Leonard Kachebonaho	KPD/KADERES	Karagwe	0754754655
40.	Innocent Kokutona	KPD/KADERES	Karagwe	0763567554
41.	Jackson Mahenga	Nyantozzi group	Kakonko	0767394408
42.	Paulina Damas	Nyantozzi group	Kakonko	0743720566

S/N	Names of Respondent	Designation	Location	Contacts
43.	Timotheo Kifani	Nyantozzi group	Kakono	07632733226
44.	Martin Benedicto	Nyantozzi group	Kakonko	07652200268
45.	Edward Buhanza	Nyantozzigroup	Kankonko	0757255045
46.	Kagemro Paulo	Tusongmembele group	Kasulu	0757681570
47.	Diana Matata	Tusongmbele group	Kasulu	0756072981
48.	VitendoMatama	Tusongembele group	Kasulu	0764142584
49.	SarahaBuogera	Tusongembele group	Kasulu	0764713164
50.	Agricultural Officer	Missenyi D. C	Missenyi	0752008218
51.	Coop Officer	Njombe District Council	Njombe	0756968322
52.	Coop Officer	Songea District Council	Songea D.C	0754616554
53.	Managing Director	Kipipa Millers	Mwanza City	0754583942
54.	Factory Manager	Kipipa Millers	Mwanza City	0763400001
55.	Chairman	Ngara Farmers	Ngara	0784535315
56.	Chairman	Kabingo Farmers	Kakonko	0769302621
57.	Chairman	Mvugwe Farmers	Kasulu	0765023485
58.	Chairman	Kilumbua AMCOS	Songea	0786483821
59.	Chairperson	Maposeni AMCOS	Songea	07536440919
60.	Chairperson	NJORECU Union	Njombe	0754616807
61.	Secretary	UWAMAVIRU	Songea	0755569128
62.	Director (Bahati)	MAVUNO	Karagwe	0754770649
63.	Mohamed Ali	Ag. Director Marketing Support, NFRA-Head Quarter	Dodoma	0754406285
64.	Allen Kilewo	Managing Director ,Apeck International Ltd	D'salaam	0752843249
65.	IKunda Terry	Country Program Manager Eastern Africa Grain Council (EAGC)	D'salaam	0767404232
66.	Michael Kitulizo	Managing Director-MEMA Holdings Co. Ltd	D'salaam	0759210314