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New Alliance Policy Acceleration Support: Malawi project (NAPAS: Malawi)

Analysis of the Value Chains for Root and Tuber Crops in Malawi: The Case of Cassava

Joseph S. Kanyamuka, Joseph K. Dzanja and Flora J. Nankhuni

Introduction

Cassava is the second most important crop after Maize in Malawi, providing staple food to over 30 percent of the country's population (Alene et al. (2013). The crop currently occupies 41% of the area under roots and tubers and 43% of the total production of roots and tubers according to Ministry of Agriculture Production Estimates for 2016/17 (MoAIWD APES 2016/17). Cassava is relatively more drought tolerant compared to Malawi's staple crop, maize. IFPRI research also indicates that cassava can contribute to multiple growth and development outcomes (reducing rural poverty, improving/diversifying diets, and promoting agricultural food system Gross Domestic Product growth (Benfica and Thurlow 2017). Despite these benefits and an increasing demand as both a food and industrial crop, the cassava subsector remains largely underdeveloped. A value chain study on cassava was therefore conducted in 11 districts of Malawi across all the three regions to identify and analyze the roles of key players across the value chain and inherent opportunities for possible investments.

The study was conducted against the backdrop of the Government of Malawi's approval, in September 2016, of the National Agriculture Policy (NAP), which is the overarching policy for the agriculture sector of Malawi. The policy spells out the vision for a transformed agriculture sector as a key engine for economic growth and development of the country. It aims "to achieve sustainable agricultural transformation that will result in significant growth of the agricultural sector, expanding incomes for farm households, improved food and nutrition security for all Malawians, and increased agricultural exports." In order to achieve this goal, the

Key Findings and Recommendations

- Cassava productivity has increased over the past decade partly due to introduction of improved high yielding and pest and disease resistant varieties but yields still fall short of the potential.
- Some of the factors constraining productivity growth include: over-recycling of seed among farmers and poor agronomic practices due to limited extension services.
- Demand for cassava and associated products is increasing due to increasing urbanization where cassava offers one of the sources of cheap carbohydrates. The crop's drought tolerant nature also offers one of the adaptation strategies to the impacts of climate change that Malawi is facing.
- Cassava has a wide range of products that can be processed, including High Quality Cassava Flour (HQCF), whose potential for wheat import substitution in the confectionary and brewery industries has not been fully exploited. Developing the cassava processing industry can contribute to reduction in Malawi's high importation bill.
- To improve Malawi's cassava value chain, the following recommendations are made: significant investments in seed systems, greenhouses, irrigation, post-harvest, value addition and agro-processing technologies in response to identified market and industry needs; investments in research and extension on improved varieties, good agronomic practices, and pest and diseases prevention and control; and investments to link farmers, farmer organizations and processors through contract farming arrangements.

sector will have to make strategic investments in various value chains that have the potential for sustainable and



inclusive economic growth. One of such value chains is cassava.

Methodology and Data

The study applied both quantitative and qualitative methods. Primary data was collected from 250 farmers using Focus Group Discussions (FGDs) and 19 traders and 21 processors using Key Informant Interviews. Applying the value chain approach, the study used several analytical techniques that include Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis, profitability analysis at various stages along the value chain and input (seed) demand analysis.

Findings

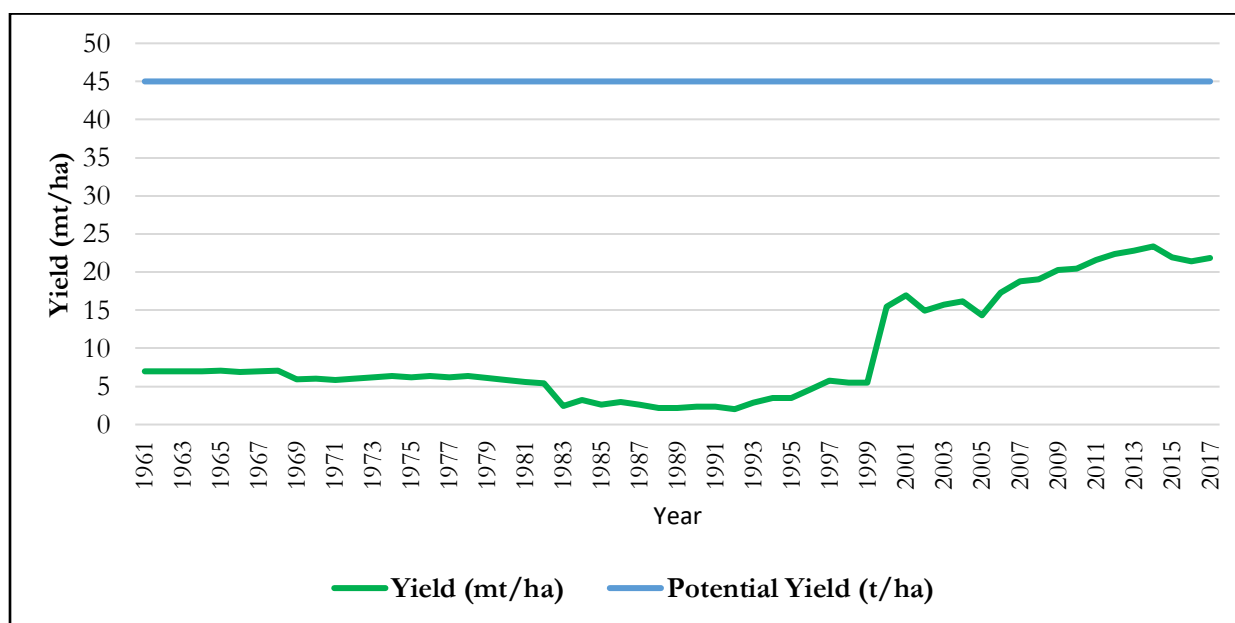
Production

The main cassava growing areas in Malawi are the northern belt along the lakeshore (Karonga, Rumphi, Nkhatabay, and Nkhotakota) where bitter varieties are common, the southern cassava belt (Mangochi, Machinga, Zomba, and

the southern Shire Highlands) and the central belt of Dedza, Lilongwe, Kasungu and Mchinji (Alene et al., 2013), where sweet/cool varieties are predominant. Cassava is also grown in the rest of the country.

Cassava production in Malawi is dominated by smallholder farmers and is becoming commercially important due to maize's vulnerability to climate change impacts. Cassava production has nearly tripled (Figure 1) since early 2000s, partly due to yield improvement programs by the Government, Non-Governmental Organizations (NGOs) and CGIAR centers (mainly IITA through the SARNETT project). Cassava productivity has increased from 15.5 mt/ha in 2001 to 21.8 mt/ha in 2017. The current productivity of cassava remains far below potential of 45 mt/ha (see Figure 1). Available cassava crop suitability maps (under traditional management) show that the crop is mostly grown in areas where it is generally not suitable (Figures 2 and 3).

Figure 1: Cassava yields trend in Malawi, 1961 to 2017



Source: *Agricultural Production Estimates Survey (APES), Ministry of Agriculture, Irrigation and Water Development (MoAIWD)*

Figure 2: Estimated cassava production in Malawi by district, 2016/17 cropping season, in metric tons

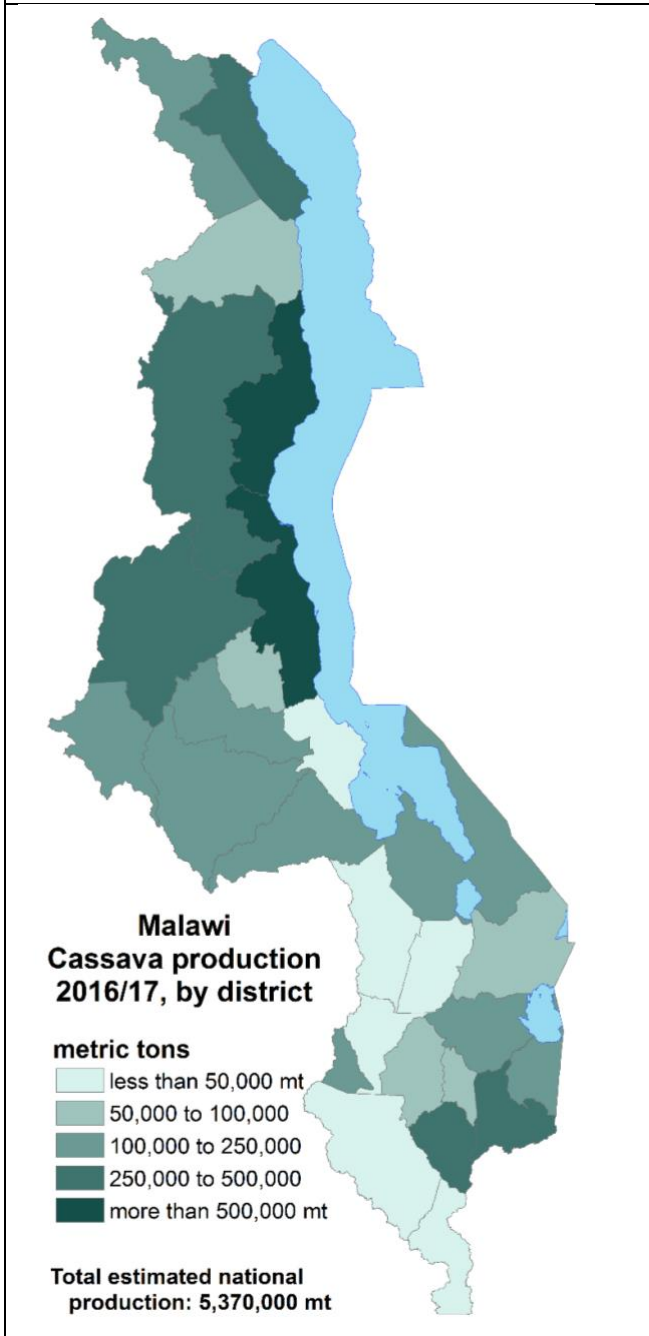
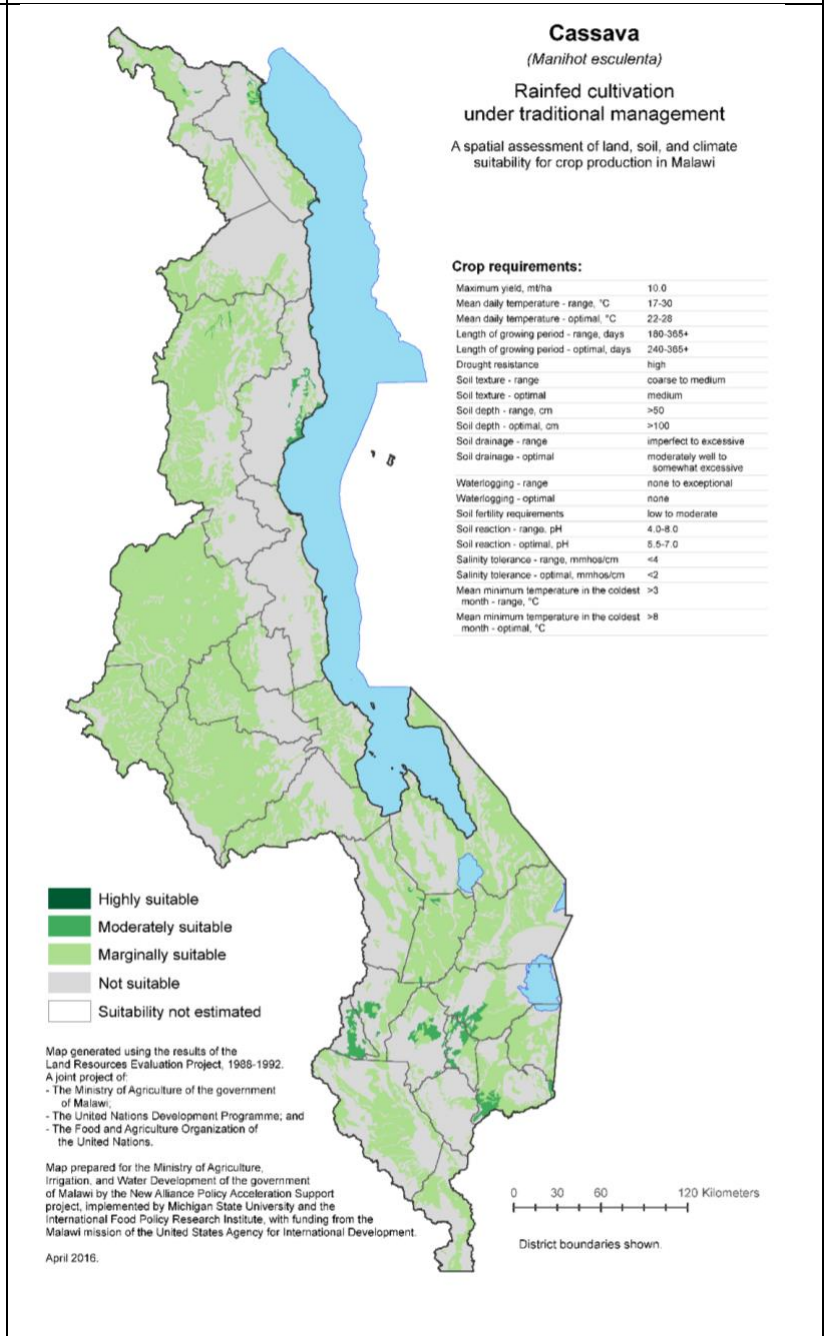


Figure 3: Suitability map for cassava grown under traditional management in Malawi



Sources: Malawi APES data, Department of Land Resource Conservation data and Todd et al. 2016

Table 1 presents the different varieties grown in Malawi and their attributes. Interviews conducted with cassava farmers indicated that Manyokola, Gomani, Silira, Sauti and Sagonja are some of the most popular varieties.

Table 1: Cassava varieties grown in Malawi and their attributes

Variety	Category	Release year	Major attributes		
			Yield (t/ha)	Maturity (MAP)	Taste
Chitembwere	Local selection	1980s	20-23	15-18	Sweet
Manyokola	Local selection	1980s	25	9-15	Sweet
Nyasungwi	Local selection	1980s	12-21	12-15	Semi-sweet
Gomani	Local selection	1980s	25	9-12	Bitter
Mkondezi (MK91/478)	Improved	1999	40	9-15	Bitter
Maunjili (TMS 91934)	Improved	1999	35	9-12	Bitter
Silira (TMS 60142)	Improved	1999	25	12-15	Bitter
Sauti (CH92/077)	Improved	2002	25	12-15	Bitter
Yizaso (CH92/112)	Improved	2002	25	12-15	Bitter
Phoso (LCN 8010)	Improved	2008	35	9-15	Bitter
Mulola (TMS 83350)	Improved	2008	40	9-15	Bitter
Sagonja (CH92/082)	Improved	2009	25-35	9-15	Bitter
Chiombola (TME 6)	Improved	2009	45	9-15	Bitter

Source: Alene et al. (2013); **Note:** MAP means 'Months After Planting'

Input Provision

The most common source for cassava planting material (cuttings) is recycling from own field or fellow farmers' fields after harvesting the roots from the previous season. This is due to limited availability and access to clean planting materials that contributes to the spread of pests and diseases and reduces the quality of production. Farmers also buy cassava seed from Farmer Organizations (FOs) and selected individual farmers who are certified seed multipliers. Government also provides planting material to farmers through certified multiplication farmers and as part of recovery programmes in case of droughts and floods (usually with support from relief organisations) to hedge against anticipated maize shortages. Notably, farmers are also supported with planting materials through non-Governmental organizations (NGOs) and donor-funded projects like the Cassava: Adding Value in Africa (C:AVA).

Distribution and Marketing

After harvesting, cassava is mainly sold fresh as raw roots either at farm gate (to intermediate vendors or village dwellers) or transported to nearby trading centers, towns and cities. Farmers also sell their surplus cassava (especially bitter varieties) to nearby processors. However, most processors have been complaining that households are not

able to supply enough cassava as they have to meet their own food security needs first before they consider taking the cassava to the factory. This is so because most households do not produce enough cassava for both household consumption and for sale.

Processing

Several actors are involved in the processing of cassava. Households do their own traditional processing of cassava into fermented cassava flour (*kandoole*). Rural women also process the cassava into fermented cassava flour (*kondoole*) or sun-dried un-milled cassava roots (*makaka*), which they sell in trading centers, towns and cities. At formal level, cooperatives and individual entrepreneurs process both *kondoole* and High Quality Cassava Flour (HQCF), which they sell in shops and supermarkets. Some companies and cooperatives are also involved in the processing of cassava starch and livestock feeds.

Figure 4 presents a value chain map for cassava in Malawi and Table 2 presents a summary of typical cassava products in Malawi.

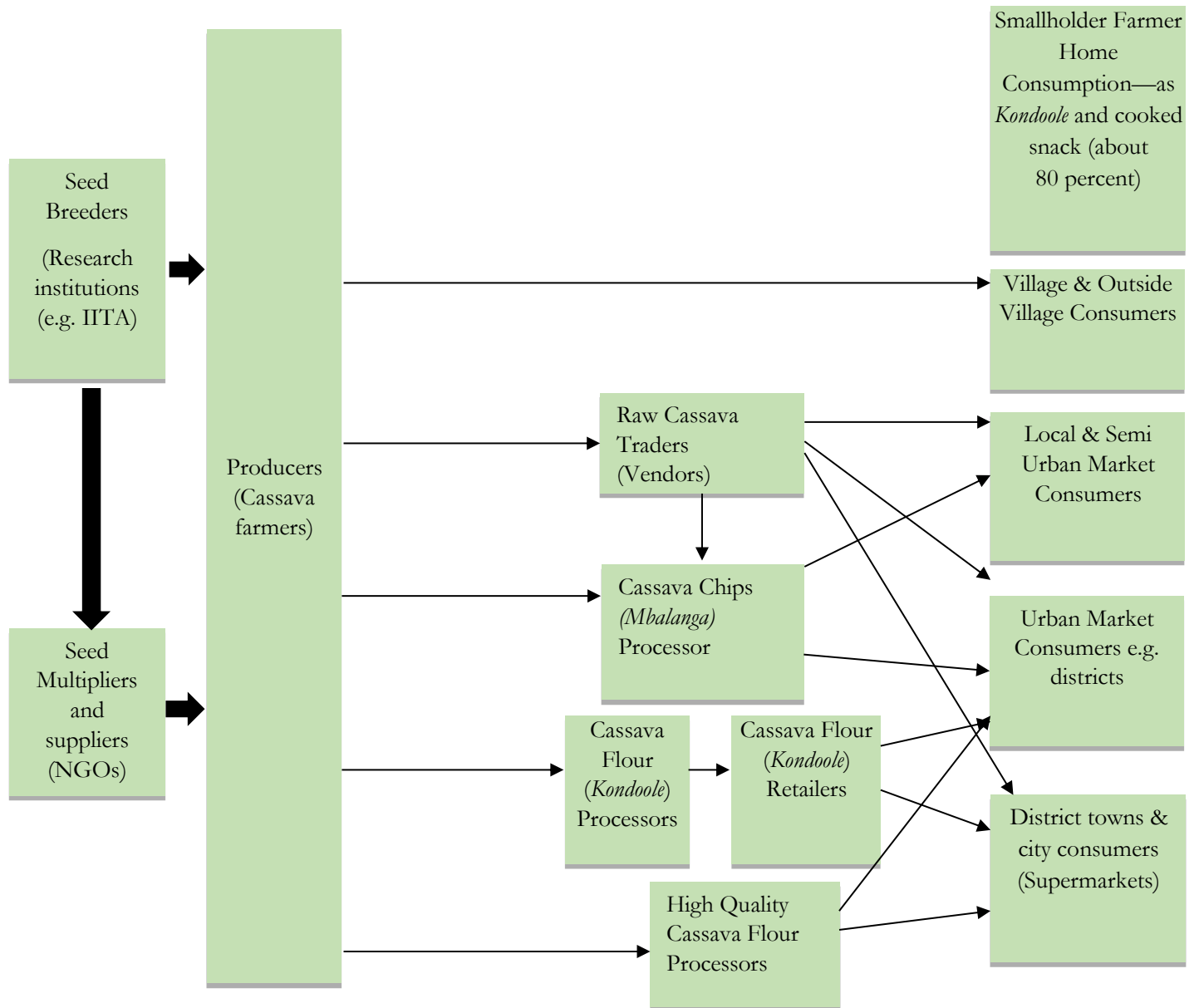


Figure 4: Value chain mapping for cassava in Malawi

Table 2: Typical cassava products in Malawi

Product	Processing	Use
Traditional use of (semi-)bitter varieties		
<i>Kondowole</i>	Traditional processing of cassava into fermented flour.	In Nkhotakota, for example, <i>kondowole</i> is eaten like the staple dish <i>nsima</i> .
<i>Makaka/ Mtandaža</i>	Sun-dried tubers are milled into non- to semi-fermented flour that is of lower quality than non-fermented cassava flour.	In the Shire Highlands, e.g. Zomba. <i>Nsima</i> is prepared from <i>makaka</i> flour.
Non-traditional use of sweet and bitter varieties		
Fresh roots	At the point of consumption, sweet cassava is peeled, washed, and chewed raw or cut into pieces and boiled.	It is a popular snack and substitute for bread in urban areas.
Cassava flour	Fresh roots are peeled, washed, grated, pressed, sun-dried and, later, milled into flour.	Available in local markets and supermarkets, it has wide application. It is frequently used to substitute HQCF despite is relatively lower quality (compared to HQCF).
High-quality cassava flour	HQCF is industrial-grade cassava flour (that has gone through repeated processing steps) containing over 90 % starch.	HQCF can replace wheat or corn flour and starch in baked goods like bread and biscuits.
Starch	Cassava starch is of even higher purity than HQCF which requires additional sedimentation. It serves as the base for a variety of uses.	Starch can be used for glucose syrup for breweries, glue extender in cardboard and plywood manufacturing or livestock and fish feed.
Cassava peel/ waste products	Products made from cassava byproducts are bio-ethanol and cassava bricks.	One example is a Norwegian funded project in Nkhotakota that experimented with bio-ethanol from cassava.

Source: Authors' own compilation from NAPAS:Malawi Cassava Value Chain Study Survey, 2017

Profitability and Value Changes Analysis

Besides smallholder farmers, other actors in the cassava value chain include input suppliers, transporters, traders, development partners, private sector, Government, Non-Governmental Organizations (NGOs), processors and consumers (individual households, restaurants and hotels). Based on the commodity prices obtained at each stage in the value chain, the value changes from the producer to the processor were analyzed (Table 3). The mean price received by farmers was MK115.8/kg or \$0.16 and that received by traders was MK192.54/kg or \$0.27. This

means that the trader's mean price was 66 percent higher than that of the producer. Considering selected cassava based products, fermented cassava flour at informal level (*kondoole* Flour_1) processor's price was 43 percent higher than that of the trader. The processor's price for cassava flour at informal level (*Kondoole* Flour_1) was 138 percent higher than the mean price received by a cassava producer. The unit price of High Quality Cassava Flour (HQCF) and *kondoole* Flour_2 (fermented cassava flour at formal level¹) were 161 and 418 percent, respectively, higher than that

¹ This is fermented cassava flour supplied in supermarkets such as 7 Eleven.

of the producer. The implication of this is that, should the farmer decide to upgrade through the cassava value chain

into processing activities, he or she would gain 138-418 percent more per unit of processed cassava.

Table 3: Price transmission across the cassava value chain

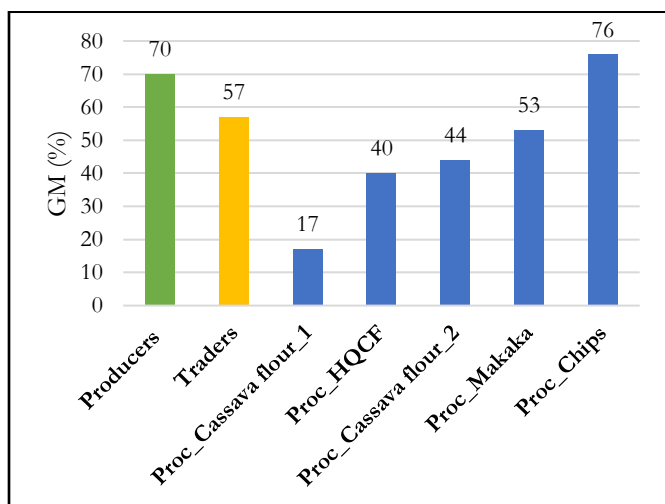
	Farmer	Trader	Processor		
			<i>kondoole Flour_1</i>	HQCF	<i>Kondoole flour_2</i>
Cassava Prices (MK/kg)	115.8	192.54	275.9	303	600
Price value change	Base	66 %	43 %	57 %	212 %
Farmer-to processor	➔		138 %	161 %	418%

Source: Author's own analysis using NAPAS:Malawi Cassava Value Chain Study Survey Data, 2017; Note: US\$1=MK725

Gross Margins Analysis

Gross margins (expressed as percentage of revenue/gross income) of cassava and cassava-based products were also computed and analyzed at farmer, trader and processor level and these are presented in Figure 5. The results indicate that the most profitable product was cassava chips (locally known as *mbalanga*) with gross margins of 76 percent followed by producers (70 percent) and traders (56 percent). Dried cassava (Makaka) processors realized a gross profit of 53 percent while processed cassava flour at formal level (*kondoole_2*) and HQCF both realized 40 percent profit. This result debunks the common perception that traders always exploit farmers.

Figure 5: Gross margins along the cassava value chain



Proc = Processor; GM = Gross margins

Source: Computed by authors using NAPAS:Malawi Cassava Value Chain Study Survey Data, 2017

Seed Demand Analysis

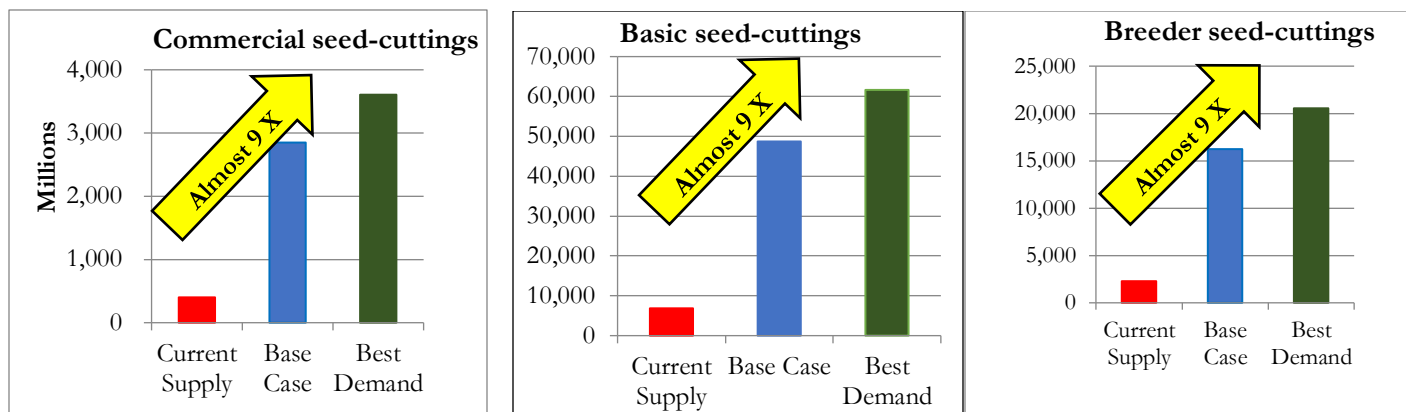
This section presents results of the input demand analysis for cassava early generation seed (EGS). The analysis was based on key model variables that include: adoption and non-adoption rates of improved varieties, seed rate, seed

replacement rates and seed yield, among others. These were modelled and developed as follows:

- Current EGS supply: Current level of supply in the market, based on current adoption rate of improved varieties of 60% and current market conditions.
- Potential EGS demand - base case: Assumed that adoption rate of improved varieties is 80% and all EGS specific recommendations are implemented, with other market impediments assumed to remain in place.
- Potential EGS demand - best case: Assumed 90% adoption rate for improved varieties, all EGS specific recommendations are implemented, and other value chain and policy constraints are addressed (e.g., downstream value chain improvements, and best agronomic practices followed).

Results of the input demand analysis are presented in **Figure 6**. Sixty percent of the 228,000 ha of land allocated to cassava in 2016 (based on MoAIWD APES figures) growing season were assumed to be planted with improved varieties. The base and best demand cases were estimated at 80 percent and 90 percent land allocation to improved cassava varieties, respectively. An assumption of the length of seed replacement period from four years to one year was also used in the base and best case demand scenarios. The results indicate that the current EGS demand for improved cassava cuttings is estimated at 400 million cuttings nationwide at current supply. When assessed on 80 percent and 90 percent adoption, potential demand increases by over 600 percent and 800 percent respectively for commercial cutting of improved cassava varieties. The proportional increase is the same for basic and breeder seed. From the current supply to the best demand potential, demand for EGS of cassava increases almost nine times.

Figure 6: Input seed demand analysis for Cassava



Source: Authors analysis

Constraints and Challenges along the Cassava Value Chain

The study identified several constraints and challenges at various stages along the cassava value chain. These are presented in Table 4.

Table 4: Challenges and Constraints along the Cassava Value Chain

Production level (producers)	Traders (marketing)	Processors	Policy level
<ul style="list-style-type: none"> • Limited availability and accessibility to clean planting materials. <ul style="list-style-type: none"> ○ Poor seed management among farmers. ○ Limited seed multiplication affected by heavy reliance on rain-fed production. ○ Late delivery of planting materials by some NGOs. • Pests and diseases contributing to low production and productivity: <ul style="list-style-type: none"> ○ E.g. Cassava Mosaic Diseases, Cassava Brown Streak (CBS) and termites. • Lack of reliable and established markets. • Limited extension and research resulting in: <ul style="list-style-type: none"> ○ Poor agronomic practices; ○ Use of inappropriate varieties; ○ Post-harvest losses • Poorly organized functional farming associations. • Non-establishment of contract farming. • Lack of postharvest storage facilities. 	<ul style="list-style-type: none"> • Limited access to financial services. • Limited capital for business expansion. • Lack of storage facilities such as cold storage facilities. • Low and seasonal production which is affecting consistent supply on the market. • Limited market structures. 	<ul style="list-style-type: none"> • Limited investment in value addition technologies. • Poor quality processing machinery/equipment which is affecting sustainability of most projects targeted at cassava processing. • Poor quality cassava roots. • Unreliable and intermittent power and water supply. • Low supply of cassava roots since most of the farmers are more concerned about satisfying subsistence needs rather than supplying to processors. • Inconsistent supply of raw cassava roots due to over-dependence on rain-fed agriculture. • Undeveloped quality standards for roots and tubers products. 	<ul style="list-style-type: none"> • Lack of product quality standards. <ul style="list-style-type: none"> ○ Limited capacity to enforce standards. • Lack of emphasis in some policy documents e.g. in the NES. • Lack of regulations of product quality standards on the market. • Lack of commodity specific policies and strategic plan for development root and tuber crops value chains, including cassava. • Limited government support relative to other staple food crops such as maize. Most of the government interventions are on adhoc basis. For instance, government distributes cassava planting materials/cuttings in times of droughts and/or floods. Cassava is not included on Malawi’s food balance sheet—thereby misleading the country when it comes to estimating the country’s food security requirements.

Conclusion and Recommendations

This policy brief has presented results of the value chain study for cassava in Malawi. Cassava is one of the most important food and potential income generating crop among smallholder farmers in Malawi. Due to its drought tolerant nature and wide adaptation to agro ecological zones, the crop has gained importance among the farming population. The crop has potential to address food security and nutritional needs. The study has established that cassava is most profitable at processor (chips production) level followed by producer, and trader levels. However, the cassava subsector is constrained by several factors including limited availability and accessibility to clean planting materials, reliance on rain-fed production which is limiting consistent supply of cassava and cassava-based products, poor market access by smallholder farmers, undeveloped processing industry and inadequate post-harvest technologies. Addressing the current challenges in the cassava seed system will go a long way towards addressing the mismatch between demand and supply of cassava planting material.

From the findings of the study, we propose the following investments: production of adequate clean planting materials, development of irrigation, processing and storage technologies and strengthening marketing linkages for farmers. However, these require collaboration and coordination among various stakeholders working in the cassava sub-sector so as to harmonize their efforts in unlocking the potential of the cassava subsector in contributing to food security and socio-economic development of Malawi.

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This brief summarizes the results of the cassava value chain study, Dzanja, J., Kanyamuka, J. and Nankhuni, F.J (2018), “Analysis of the Value Chains for Cassava, Irish Potato, Sweet Potato, and Cocoyam in Malawi” to be posted on the FSP website. **Joseph S. Kanyamuka** is a Research and Policy Analyst, New Alliance Policy Acceleration Support: Malawi Project (NAPAS: Malawi), **Joseph K. Dzanja** is Associate Professor in the Agribusiness Department at the Lilongwe University of Agriculture and Natural Resources (LUANAR), Lilongwe, Malawi and **Flora J. Nankhuni** is Associate Professor, International Development, Department of Agricultural, Food and Resource Economics, Michigan State University and Chief of Party, NAPAS: Malawi.