INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

IFPRI

RESEARCH PROGRAM ON Policies, Institutions, and Markets

CGIAR

Led by IFPRI

IFPRI Discussion Paper 01748

August 2018

Measuring Distortions along Tanzanian Agricultural Value Chains

Fahd Majeed

Simla Tokgoz

Summer Allen

Bas Paris

Markets, Trade, and Institutions Division

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

AUTHORS

Fahd Majeed (fmajeed2@illinois.edu) is a Graduate Student in the University of Illinois Urbana-Champaign Department of Agriculture and Consumer Economics.

Simla Tokgoz (s.tokgoz@cgiar.org) is a Research Fellow in the Markets, Trade, and Institutions Division of the International Food Policy Research Institute (IFPRI), Washington DC.

Summer Allen (s.allen@cgiar.org) is a Senior Research Coordinator in the Markets, Trade, and Institutions Division of IFPRI, Washington DC.

Bas Paris (bas_paris@hotmail.com) is a Consultant at AGREFOS Consulting Ltd.

Contents

Figures

Tables

ABSTRACT

Policies targeting agricultural value chains impact Tanzanian farmers, so it is important to understand how these policies affect producer incentives and price transmission along the value chain. This research focuses on maize and groundnut value chains, estimating Nominal Rates of Protection (NRPs) along the value chain and analyzing their implications for producers. The results for border NRPs and trade status imply an anti-trade bias in maize; imported maize faces an import tariff, while exported maize often faces taxes. Furthermore, maize NRPs at the farmgate are negative, suggesting trade policies are negatively affecting Tanzanian farmers. For the groundnut value chain, border NRPs are consistently negative for all years, regardless of whether Tanzania imports or exports groundnuts and groundnut oil. Farmgate NRPs for groundnuts are negative as well. Groundnut processing and marketing remain undeveloped in Tanzania, and inefficiencies in the groundnut value chain create disincentives for groundnut farmers. For both maize and groundnut value chains, farmgate prices and NRPs for each region show significant variation, indicating the impact of regional/state-level policy framework or other market inefficiencies. Further research on the value chain participants and processing channels is needed to identify opportunities for increasing efficiencies in processing and value addition across these two value chains.

Keywords: agricultural distortions, NRP, policy analysis, Tanzania, value chains

ACKNOWLEDGMENTS

This work was undertaken as part of, and funded by, the CGIAR Research Program on Policies, Institutions, and Markets (PIM) led by the International Food Policy Research Institute (IFPRI). PIM is in turn supported by the CGIAR Trust Fund Contributors (https://www.cgiar.org/funders/). This paper has not gone through IFPRI's standard peer review procedure. The opinions expressed here belong to the authors, and do not necessarily reflect those of PIM, IFPRI, or CGIAR.

1. AGRICULTURAL VALUE CHAINS IN TANZANIA

Economic policy in Tanzania is guided by Tanzania's National Development Mission 2025, which aims to transform Tanzania from an agricultural economy to a semi-industrialized economy supported by a productive agricultural sector. Tanzania's agricultural policies, such as the Agriculture Sector Development Strategy (United Republic of Tanzania, 2014) and the National Agriculture Policy (United Republic of Tanzania, 2013), focus on developing agricultural value chains and supporting the transition from subsistence to commercial agriculture (United Republic of Tanzania, 2013). The Tanzanian government has promoted agriculture as the key to achieving broad-based development, and agriculture plays a central role in Tanzania's National Development Vision 2025 and its latest 5-year plan (United Republic of Tanzania, 2014; United Republic of Tanzania, 2016). In particular, Tanzanian agricultural policy strategies aim to support public expenditures to increase farmers' access to inputs, finance, technology, and markets. However, it is important to note that budget limitations still constrain research, agricultural extension, and quality control.

The agricultural sector dominates the Tanzanian economy, providing 80 percent of employment, 30 percent of GDP, and 85 percent of export earnings in 2014 (FAO, 2014). Despite achieving relatively high-income growth rates in recent years, crop and livestock productivity in Tanzania's agricultural sector remain low and poverty levels remain high (46 percent in 2011) (World Bank, 2017a; United Republic of Tanzania, 2010). Agricultural production is mainly rain-fed, and the vast majority of farmers are smallholders cultivating an average farm size of 0.9 to 3 hectares (FAO, 2014). In this context, any progress in the country's food and agricultural sector can have important implications for poverty and livelihoods.

Since independence in 1961, Tanzania has experienced shifting economic and agricultural policies split into three main phases: the continuation of colonial economic policy, the implementation of the Arusha declaration, and a period of liberalization and structural adjustment (ESRF, 2008). In the immediate post-independence phase starting in 1961, Tanzania promoted the market-driven economy in tandem with import substitution programs and a focus on cash crops (OECD, 2013). In 1967, Tanzania implemented the Arusha declaration, which attempted to centralize the economy through nationalization, trade and price restriction, and import substitution programs (*Ibid*.). Central to this policy was Tanzania's Ujamaa (Brotherhood) policy, which led to the large-scale collectivization of agriculture (*Ibid.*), nationalization of key industries, and broader state control over the economy.

It has become increasingly recognized that these types of policies led to a severe economic crisis throughout the Tanzanian economy in the 1980s. The agricultural sector, in particular, experienced a protracted crisis due to extensive corruption and mismanagement and the mass displacement of rural people into Ujamaa villages, as well as to successive droughts and oil crises in the 1970s (Isinika et al., 2005). These crises fostered the adoption of liberalization programs beginning in 1983. By the early 1990s, the government had abandoned Ujamaa, largely liberalized trade, opened the country to international markets and sources of finance, and significantly reduced government intervention across the economy (OECD, 2013). Since 2000, Tanzania has achieved relatively high economic growth rates and a moderate growth rate of 4.1 percent per year in agriculture (World Bank, 2017a). In 2016, this rate was competitive with the agricultural growth of neighboring countries, such as Kenya (4 percent), Uganda (3.2 percent), and Ethiopia (2.3 percent) (*Ibid.*).

In this context, this study analyzes two agricultural value chains in Tanzania (maize and groundnut) that have the potential to add to agricultural development, create value for the Tanzanian economy, and increase rural incomes and employment. These two value chains comprise an important share of the agricultural sector in Tanzania, affecting a large number of smallholder farmers. This analysis attempts to provide a complete picture of the value chain, including farmers, traders, processors, and other economic agents along the entire chain.

We discuss the value chain characteristics of these two value chains, including but not limited to marketing, processing, and trade. We also aim to summarize the policy framework affecting these value chains and to understand its implications for all economic agents along the value chain. To this end, we utilize the nominal rate of protection (NRP) methodology from Krueger, Schiff, and Valdes (1988) and apply it to different nodes of these two value chains. The NRP methodology allows us to provide estimates of distortions to agricultural incentives along the value chain for both of these agricultural commodities.

Given the policy environment in Tanzania that affects both producer and the consumer decisions across the value chains, this analysis measures the impact of sector-specific and national policies on agricultural incentives in Tanzania for maize and groundnut. National- and regional-level price data at different points in the market are used to measure distortions to agricultural incentives at the national and regional level.

The paper is structured as follows. We first provide a literature review of the methodologies used to evaluate distortions to agricultural incentives and specify the methodology we use based on this literature. Then, we present Tanzanian maize value chain characteristics, followed by the data used for our estimations, and the NRP results for maize value chain. The analysis of the groundnut value chain follows, including value chain characteristics, data description, and NRP results. Finally, we provide some conclusions regarding what these results might signify for producers in Tanzania and the impact of the policy environment for these value chains.

2. DISTORTIONS TO AGRICULTURAL INCENTIVES

Literature Review

An extensive literature and multiple institutional databases have measured distortions to agricultural incentives. The Nominal Rate of Protection (NRP) methodology was introduced by the seminal work of Krueger, Schiff, and Valdes (1988), and Anderson et al. (2008) continued this effort with nominal rate of assistance (NRA) methodology and its application. The OECD has also made continuing efforts to measure agricultural distortions as part of its Producer Support Estimates (PSE) database, covering OECD and other countries (OECD, 2017). A wide range of other monitoring efforts cover countries not covered by the OECD, including the FAO-MAFAP, which originally focused on Africa and is now being expanded to Asia, and the IDB-Agrimonitor, which uses the OECD methodology and focuses on Latin America and the Caribbean countries. In addition, the World Bank has conducted recent studies of agricultural distortions in South Asia.

These methodologies provide a direct measurement of policies through budget expenditures on specific policies for the agricultural sector or for each commodity (for example, the PSE database), an indirect measurement of incidence (using price difference methodology, such as NRP and NRA), or a combination of both methodologies. We give a brief summary of the previous efforts on this topic; while this review is not exhaustive, it attempts to cover the main methodologies and provide key examples.

The NRP estimations by Krueger, Schiff, and Valdes (1988) for the period 1975-1984 are the first major attempt to estimate the impact of direct sector-specific and indirect economy-wide policies on agricultural incentives in developing countries. While researchers have agreed that protectionist activities for some sectors negatively discriminate against other sectors, before the work of Krueger, Schiff, and Valdes (1988), there had been no standardized way to measure these impacts. Their study measures the direct effect of policies using the proportional difference between the producer price and the border price, adjusted for distribution, storage, transport, and other marketing costs. The indirect effect is measured through the impact of the unsustainable portion of the current account deficit and of industrial protection policies on the real exchange rate (the price of agricultural commodities relative to non-agricultural, non-tradable commodities) and through the impact of industrial protection policies on the relative price of agricultural commodities to that of non-agricultural, tradable goods. To capture the net effect of these policies, the authors measure impact relative to prices that would have been in place had there been no interventions.

The authors note that developing countries tend to do four things in terms of policy implementations to encourage growth: (i) establish import substitution and protection policies; (ii) maintain overvalued exchange rates through exchange control regimes and import licensing mechanisms; (iii) suppress producer prices of agricultural commodities through different mechanisms, such as procurement policies, export taxation, and export quotas; and (iv) attempt to offset part of the disincentive effect on producers by subsidizing input prices and investing in capital inputs (Krueger, Schiff, and Valdes, 1988).

Krueger, Schiff, and Valdes (1988) propose the following. Let P_i denote domestic producer price, P_i^B denote border price, P'^*_i denote border price evaluated at the equilibrium nominal exchange rate, P'_i show border price at the official exchange rate, P_{NA} be price index of non-agricultural sector, E_0 be the official exchange rate, and E^* be the equilibrium nominal exchange rate adjusted for transport costs, storage costs, etc. In this case, the authors define direct nominal rate of protection (NRP_d) and indirect nominal rate of protection as (NRP_i) as follows:

$$P'_i = P_i^B \cdot E_0 \tag{1}$$

$$NRP_d = \frac{P_i / P_{NA}}{P'_i / P_{NA}} - 1 = \frac{P_i}{P'_i} - 1 \tag{2}$$

$$P'^*_i = P_i^B \cdot E^* = P'_i \cdot E^* / E_0 \tag{3}$$

$$NRP_i = \frac{P_i / P_{NA}}{P'^*_i / P^*_{NA}} - 1 = \frac{P_i / P_{NA}}{P'_i \, E^* / E_0 \, / P^*_{NA}} - 1 = \frac{P^*_{NA}}{P_{NA}} \frac{E_0}{E^*} - 1 \tag{4}$$

Anderson et al. (2008) expand this analysis by measuring nominal rates of assistance (NRA) and outline the many methodological issues regarding estimation (e.g., output and input *NRA*s, transmission of prices along the value chain, etc.). The authors note that most developing countries have policies in place that depress farm incomes. Similarly, policies in developed countries depress cash earnings of farm households in developing countries through their own increased production. The authors note that national objectives such as poverty alleviation may be achieved more efficiently and effectively through other policies or, in some cases, through the removal of current policies. In the methodology below, NRA_BS is the NRA to farm output resulting from border price support, while NRA_DS is the assistance resulting from the domestic price supports. S_f is the subsidy provided to farmers, while t_m is a tariff. E is the exchange rate and P is the foreign currency price of the product on the international market. Anderson et al.'s (2008) methodology can be summarized as follows:

$$NRA_{BS}: \frac{E \cdot P \cdot (1-t_m) - E \cdot P}{E \cdot P} = t_m \quad (5)$$

$$NRA_{DS}: \frac{E \cdot P \cdot (1-S_f) - E \cdot P}{E \cdot P} = S_f \quad (6)$$

$$NRA_{OUTPUT} = NRA_{DS} + NRA_{BS} \quad (7)$$

The authors calculate an estimate of NRA to inputs, in which each input's NRA is multiplied by its input-output coefficient. Summed over all inputs, this becomes NRA_{INPUT} and is then added to NRA on outputs:

$$NRA_{TOTAL} = NRA_{INPUT} + NRA_{OUTPUT} \quad (8)$$

The authors also break down the transmission of prices along the value chain, specifying where prices are adjusted for the analysis. This includes factoring in both international and domestic trading costs, domestic processing costs, and intermediary margins through wholesale and retail costs. Quality adjustments must also be considered, as there may be a quality difference between goods meant for export versus goods meant for domestic consumption. The authors also note the need to account for non-exportable goods that could become exportable after processing, as well as the challenges to classifying products as importable, exportable, or non-tradable.

The OECD PSE database publishes nominal indicators, such as Market Price Support (MPS), Consumer Support Estimate (CSE), and PSE, based on categorization of different types of payments to farmers and consumers. These nominal indicators are annual monetary value of gross transfers from one set of economic agents to another arising from policy measures (OECD, 2017). The OECD PSE database also publishes ratio indicators and percentage indicators, such as producer and consumer nominal protection coefficients (NPC). Producer NPC includes budgetary outlays. NPC is the producer price relative to the reference price, with the unit value of payments based on output included as follows:

$$NPC = \frac{Producer\ Price + \left(\frac{Payment\ based\ on\ Output}{Quantity\ of\ Production}\right)}{Reference\ Price} \qquad (9)$$

FAO-MAFAP (Monitoring and Analysing Food and Agricultural Policies) and IDB-Agrimonitor (Inter-American Development Bank) use methodologies developed by the World Bank and OECD, respectively. MAFAP (2017) reports the NRP at two nodes of the value chain: at the farmgate and at the point of competition. To do so, MAFAP (2017) methodology utilizes the border price to compute two reference prices (the reference price at the point of competition and the reference price at the farmgate) in order to compare to domestic prices. MAFAP (2017) implements quality and quantity conversion factors when required to generate reference prices that can be comparable to domestic prices.

Methodology

Our main aim is in this paper is two-fold: to measure agricultural distortions on different points along two value chains in Tanzania and to separate different sources of agricultural distortions from policy distortions. Following the work of Krueger, Schiff, and Valdes (1988) and Anderson et al. (2008), we measure NRPs at the farmgate and at the border. To do so, we use the price gap between the domestic price and the reference price at the same point in the value chain, divided by the reference price. The reference price is an undistorted price; thus, NRP measures the effect (in relative terms) of the domestic market on prices relative to an undistorted price. In this methodology, it is crucial to account for market access costs along the nodes of the value chain so that the final NRP results only show the impact of the policy on prices. These market access costs include transportation, distribution, processing, storage costs, brokerage fees, and market access fees (Krueger, Schiff, and Valdes, 1988).

Since this analysis follows Krueger, Schiff and Valdes (1988), it is based on the law of one price. Thus, the prices must refer to goods that are comparable (in terms of quality, processing level, and location). By using a representative international price (IP) from world markets that is similar in terms of type or quality, to the commodity that Tanzania is exporting or importing, we know the opportunity cost for domestic market participants that is free of domestic policy interventions or market functioning.

We define the reference price at border as:

$$RP_{border} = IP * EX \tag{10},$$

where EX is the official exchange rate in Tanzanian Shillings per $US.

If Tanzania is a net exporter of the commodity, we use RP_{border} as above, with IP as FOB (free on board) price from world markets. If Tanzania is a net importer of the commodity, we need to adjust RP_{border} to be CIF (cost, insurance, freight) price for Tanzania, using transportation costs from port of IP to port of Tanzania.

Next, we define Tanzanian prices at the border, either as FOB export price if Tanzania is a net exporter or as Tanzania import price if Tanzania is a net importer, and denote this as DP_{border}.

NRP at the border is

$$NRP_{border} = \frac{DP_{border} - RP_{border}}{RP_{border}} \tag{11}$$

For producer NRP, we calculate underlying price gaps at the farmgate node of the value chain. Thus, RP_{border} needs to be made comparable to the observed producer price at the farmgate. To do so, we conduct necessary quality and quantity adjustments; we also consider marketing costs between border and point of competition and between point of competition and farmgate.

For example, if Tanzania is a net importer of the commodity, we add marketing costs between the border and the point of competition to take into account all of the costs incurred by importers to bring the commodity to market, resulting in the RP at point of competition (*PoC*). On the other hand, if Tanzania is a net exporter of the commodity, we subtract the marketing costs between the border and the point of competition to take into account all of the costs incurred by exporters in bringing the commodity from the point of competition to the border, resulting in the RP at *PoC*:

$$RP_{POC} = RP_{border} \pm marketing\ costs \tag{12}$$

RP_{POC} is made comparable to the observed domestic price at farmgate by subtracting the marketing costs between the farmgate and the *PoC*. This takes into account all of the costs incurred by farmers to bring the commodity from the farm to the *PoC*, resulting in the reference price at the farmgate (FG) as:

$$RP_{FG} = RP_{POC} - marketing\ costs \tag{13}$$

Producer price at the farmgate ($PP_{farmgate}$) is data, specifically the price received by the agricultural producer from the purchaser for a unit of a good produced as output.

NRP at the farmgate is

$$NRP_{FG} = \frac{PP_{FG} - RP_{FG}}{RP_{FG}} \tag{14}$$

3. MAIZE VALUE CHAIN OVERVIEW

Maize constitutes the most important food staple crop in Tanzania, accounting for an estimated 60 percent of the calories and 50 percent of the protein consumed by the average Tanzanian (Wilson and Lewis, 2015). Previous studies have highlighted that Tanzania's maize value chain is fragmented and not well-coordinated (Wilson and Lewis, 2015; Barreiro-Hurle, 2012; Bill and Melinda Gates Foundation, 2014a). According to the latest agricultural survey released by the Ministry of Agriculture, around 8.8 million households were involved in maize production in Tanzania in the 2014-2015 agricultural year (United Republic of Tanzania, 2016). From a production perspective, maize represents 30 percent of the total food production and 20 percent of the total value of Tanzania's agricultural sector (USAID, 2010). In the Northern Highlands and Lake regions, which experience bimodal rainfall (a short rainy season), harvests occur in and around January and July, while in the Southern Highlands, Western, and Central regions, which experience unimodal rainfall (a long rainy season), one harvest occurs around May (WFP, 2015).

The majority of maize grown in Tanzania is white maize, although a small percentage of green and yellow maize is also produced (Bill and Melinda Gates Foundation, 2014a; Barreiro-Hurle, 2012). The majority of maize produced (between 60-80 percent) is consumed at the farm level, while about 40 percent of production is processed and marketed (Bill and Melinda Gates Foundation, 2014a; Wilson and Lewis, 2015). Locally, maize is processed into flour (for instance, for use in ugali, Tanzania's national dish) and marketed and sold in both rural and urban centers. Smaller amounts of maize and maize products are exported along both official and unofficial channels to neighboring countries, as well as internationally (Bill and Melinda Gates Foundation, 2014a). The previous literature highlights that a number of significant challenges exist along the maize value chain, including lack of adequate inputs for farmers, poor infrastructure connections, and a policy environment which supports food security achievements, but that reduces the price farmers receive for their produce (USAID, 2010; Wilson and Lewis, 2015). However, studies have also highlighted Tanzania's significant potential to expand the entire maize value chain (including production, processing, and marketing) in the coming years as high population growth, significant amounts of arable land, and improved agricultural productivity and value chain connections can drive demand and production (Wilson and Lewis, 2015; Bill and Melinda Gates Foundation, 2014a).

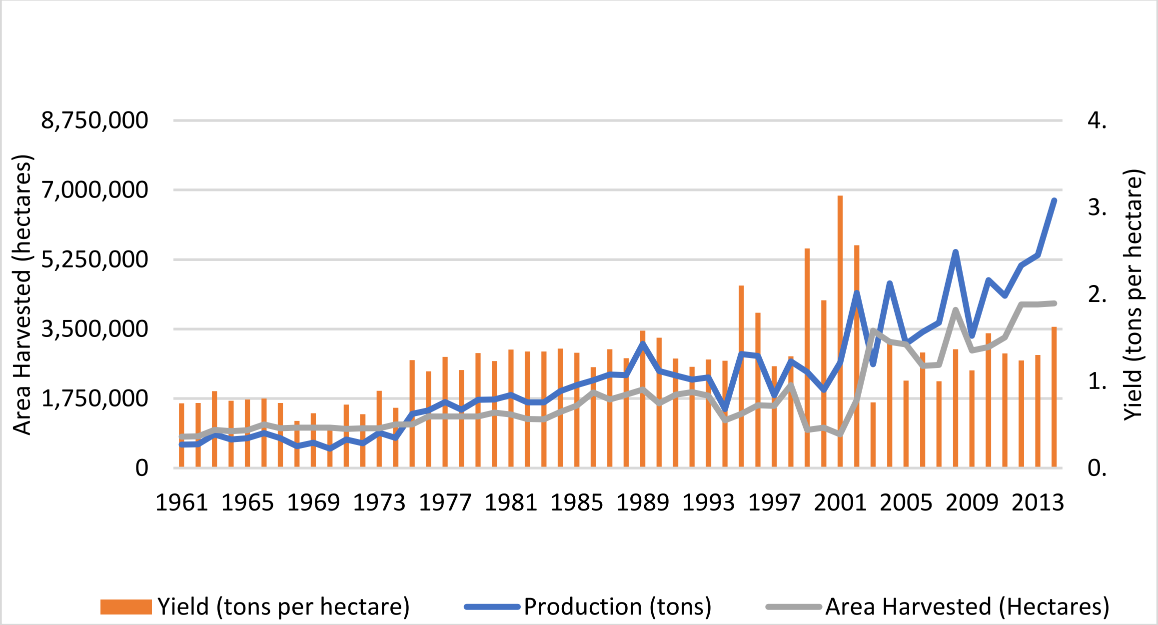
In this context, an analysis of the Tanzanian maize value chain can improve our understanding of the movement along the chain, from production to consumption, as well as the roles of the different actors involved at each stage of the value chain. This understanding can aid in designing and improving interventions that enhance linkages along the value chain and that support productivity and value addition along the chain.

Historical Overview

While maize has been grown in Tanzania since the 17th century, production increased rapidly in the 20th century due to new, improved varieties introduced from the United States (Baffes et al., 2015). In the 1960s, Tanzania was relatively self-sufficient in cereals; in the first two decades of independence, the government set maize prices and controlled the marketing and trade of maize (Suzuki and Bernard, 1987). This government control continued after the drought of 1973-1975, when Tanzania had to import significant amounts of maize to cover domestic demand (Suzuki and Bernard, 1987; Baffes et al., 2015). However, following the economic crises of the 1980s and the subsequent structural adjustment programs, the government completely liberalized maize markets, as well as agricultural input markets (Baffes et al., 2015). Nevertheless, due to the importance of maize to the country's food security, the government has repeatedly instituted export bans to limit domestic price increases and to ensure domestic supply to meet domestic demand (Makombe and Kropp, 2016). Additionally, through the National Food Reserve Agency (NFRA) (previously the Strategic Grain Reserve), the government procures, stores, and sells maize with the goal of supporting food security (Mhlanga et al., 2014).

Maize production in Tanzania has increased steadily since independence, with different sources providing different figures on production, yields, and area harvested. According to FAOSTAT (2017c), production has increased from just under 2 million tons in the early 1960s to between 6 and 7 million tons in recent years (Figure 3.1). Maize yields per hectare have been increasing slowly since independence but have remained low, rising from 0.75 tons per hectare in the early 1960s to an average of 1.3 tons per hectare for the period between 2004 and 2014 and flattening in recent years (Bill and Melinda Gates Foundation, 2014a). These per-hectare yields remain significantly lower than other countries in the region; for instance, Ethiopia and Zambia have an average yield productivity of 3 and 2.7 tons per hectare, respectively (Bill and Melinda Gates Foundation, 2014a). Within Tanzania, maize productivity varies per region, reaching a high of 2.1 tons per hectare in Iringa and a low of 0.5 tons per hectare in Dodoma (NBS, 2016). Most of the growth in overall maize production has been driven by increases in the area under cultivation, from 800,000 hectares in the early 1960s to 4,146,000 hectares in 2014 (FAOSTAT, 2017c).

Figure 3.1. Maize Tanzania: Area Harvested, Yield, and Production



Source: FAOSTAT (2017c)
Notes: Data is in calendar year.

Maize Value Chain Characteristics

An agricultural value chain connects the actors and activities that bring a basic agricultural product from production to final consumption; value is added to the product at each stage (FAO, 2010). The maize value chain, like most value chains that include processing, comprises multiple stages and a variety of actors. According to the latest agricultural survey (2014-2015), a total of 8,839,276 Tanzanian farmers grew maize on 7,319,629 hectares (representing 42 percent of the total area planted with annual crops) (NBS, 2016). Around 95 percent of Tanzanian maize farmers are smallholders, and there are also an estimated 30 to 50 large-scale commercial maize farms in Tanzania (Bill and Melinda Gates Foundation, 2014a). Maize is grown in all areas of Tanzania, with the main producing areas in the Northern Highlands (Arusha, Kilimanjaro, Manyara, Shinyanga and Simiyu) and the Southern Highlands (Katavi, Rukwa, Mbeya, Iringa, Njombe, Ruvuma) (Barreiro-Hurle, 2012). Farming practices differ by location, with higher rates of fertilizer used in the South of the country and higher rates of improved seeds used in the North (Bill and Melinda Gates Foundation, 2014a).

The main maize genotype grown in Tanzania is white maize; relatively small amounts of green (4 percent of total production) (and very rarely yellow maize) are grown, often under low input/rain-fed conditions (Bill and Melinda Gates Foundation, 2014a). Wilson and Lewis (2015) note that the decision to grow maize in areas that receive low amounts of rainfall, rather than growing more drought-tolerant crops such as sorghum, is driven by a dietary preference for maize. The Tanzania Food Security and Vulnerability Analysis (which uses data from Tanzania's 2011-2012 National Panel Survey conducted by the World Bank and the National Bureau of Statistics) notes that 32 percent of smallholders use fertilizer and 17 percent use improved seeds (WFP, 2013). Maize smallholders generally source organic fertilizer from input dealers in villages or commercial centers, with a smaller proportion of farmers purchasing fertilizer from the government-subsidized fertilizer program (Mutabazi et al., 2013). Farmers plough and weed most of the land planted to maize by hand or ox plough; in very few cases, they use power tillers and tractors (Bymolt and Zaal, 2015).

Regarding socio-economic characteristics of maize-producing households, Abass et al.'s (2014) study on on-farm post-harvest losses in central (Dodoma) and northern (Manyara) Tanzania finds that around half of the farming population is female, that the average maize-growing household size is seven, and that 22 percent of maize farmers have no formal education. Similarly, Mmbando and Baiyegunhi's (2016) study in the Hai district finds that 61 percent of maize-growing households are male-headed with an average age of 42 years, that households are large and have an average farming labor supply equivalent to 5.1 adults, and that farmers have low levels of formal education. The study also finds that most households are completely dependent on farming, with only 24 percent reporting external income sources.

The literature highlights several challenges that farmers face in the production of maize. Climatically, smallholders experience a high degree of risk, due mainly to rainfall variations. Smallholder farmers generally also receive low levels of institutional support; for instance, there are only 4,000 extension officers for the whole of Tanzania (Bill and Melinda Gates Foundation, 2014a). A recent bulletin on drought-tolerant maize highlights that the ratio of extension agents to farm households in Tanzania is around 1:2,500, which is low compared to other countries in the region; for instance, in Kenya, the ratio is 1:1,000 and in Ethiopia, it is 1:1,467 (CIMMYT, 2014). In addition, agricultural inputs are generally costly and hard to access, especially in rural areas (USAID, 2010). Farmers also face high levels of on-farm post-harvest losses due to a lack of modern and adequate methods and facilities for harvesting, processing, and storing; on-farm losses have been estimated at 15 percent in the field, 13-20 percent during on-farm processing, and 15-25 percent during on-farm storage (Abass et al., 2014). In addition, maize prices in Tanzania fluctuate significantly every year, resulting in uncertain returns for smallholder farmers (Gilbert et al., 2017).

Estimates suggest that maize farmers use around 70,000 tons of maize seeds annually, of which around 80 percent are seeds retained from the previous season, 12 percent are hybrid seeds, and 8 percent are non-hybrid seeds purchased by farmers (Wilson and Lewis, 2015). In recent years, significant research has been undertaken by governmental agencies, large multinational corporates, and local and international NGOs regarding maize seed use. Multiple studies underline that if improved seeds are made accessible and affordable, productivity can increase significantly (Wilson and Lewis, 2015; Westengen et al., 2014).

In recent years, a new disease, Maize Lethal Necrosis Disease (MLND), has been identified; this disease causes fungal infections, making maize inedible for both humans and livestock (Frenken, 2013). The disease was first reported in Kenya in 2011 and since then has been mainly reported in Northern growing regions in Tanzania (CIMMYT, 2013). Despite research on the disease, no solution has been found other than uprooting and burning the crop (Azaniapost, 2017).

Aflatoxin contamination poses another major constraint to maize consumption. Caused by certain fungi, aflatoxin contamination occurs during planting and can spread during harvesting, storage, transportation, and processing. It is unclear to what extent aflatoxins exist throughout Tanzania; however, research conducted by the Ministry of Agriculture suggests that around 16 percent of maize produced has aflatoxin levels that are unsafe for human consumption (Athumani, 2016), and this number may in fact be higher.

Processing and Storage

Various maize processing pathways occur after production, including on-farm processing and processing by small- and large-scale millers to produce maize flour. Maize processing consists of a cleaning and conditioning phase followed by a milling/grinding phase (Daly et al., 2016). Farmers use different methods of milling/grinding, including grinding by hand and milling by hammer and roller (Wilson and Lewis, 2015). Hammer milling involves pounding the maize into flour, while roller milling involves crushing it into flour (Daly et al., 2016). Roller mills are generally more complex, costly, and difficult to operate; however, they provide a more consistent and higher quality grind (*Ibid.*). The main end product of all processing pathways, maize flour, is mainly used for human consumption but is also fed to livestock (*Ibid.*).

Given that much of the maize produced is not marketed (approximately 57 percent of maize is consumed on-farm and 16 percent is consumed by non-farming households), some maize is likely cleaned and conditioned at the farm and then crushed by hand for consumption. However, small and large maize processors account for 26 percent of the total annual maize processed, of which around 62 percent is used for human consumption and around 38 percent (around 500,000 tons) is processed and used as animal feed (Bill and Melinda Gates Foundation, 2014a).

According to the Bill and Melinda Gates Foundation (2014a), an estimated 30,000 small flour mills operate in Tanzania; these mill 90 percent of the country’s milled maize, and households can also take their maize to these facilities to be milled. Located in both rural and urban areas across Tanzania, these small mills mainly use hammer mills to process maize (*Ibid.*). The literature notes that in some cases, farmers use these small millers to process their maize for a fee, while in other cases, the small millers buy the maize directly from farmers and small traders to process and sell to markets (Wilson and Lewis, 2015; USAID, 2010). Small millers generally have low operating costs and often operate in the informal sector (Wilson and Lewis, 2015).

A few large millers also operate in Tanzania's maize processing sector (such as Mohammed Enterprises Tanzania Ltd, Export Trading Company Ltd, and Said Salm Bakhresa & Co Ltd); these process a small percentage of the total amount of maize processed off-farm (Wilson and Lewis, 2015). These processors use roller mills and are generally considered to produce higher quality flour than the smaller processors. This flour is more expensive and generally consumed by middle- and upper-income urban consumers. Wilson and Lewis (2015) suggest that these millers operate significantly below capacity (e.g., Said Salm Bakhresa & Co Ltd is estimated to operate at only 10 percent of its capacity) and face high costs. As a result, in recent years, a number of large mills have closed, and the sector is generally considered to be losing market share to smaller millers (Bill and Melinda Gates Foundation, 2014a).

However, larger millers can better benefit from economies of scale than smaller millers and have more storage capacity, allowing them to purchase maize at a low price immediately after the harvest and sell it when prices are higher (Wilson and Lewis, 2015). As Tanzania's economy is expected to continue to grow rapidly in the coming years, with strong growth in the middle and upper income segments of society, the demand for maize flour from larger millers will likely grow as well. In 2011, the government passed The Tanzania Food, Drugs and Cosmetics (Food Fortification) Regulations, which required all maize flour produced by medium and large processors to be fortified with 15 vitamins and minerals in a bid to improve nutrition (United Republic of Tanzania, 2011). It appears that this regulation has not been enforced, however, and that only a few processors comply with it (Bill and Melinda Gates Foundation, 2014a).

At the farm level, the vast majority of farmers storing maize in sacks or in basic, locally made structures (USAID, 2010). The agricultural census of 2007-2008, which covers maize storage at the farm level for 3.5 million households, highlights that maize storage facilities and practices used by households remain very basic (NBS, 2012). Of all the crops covered in the survey, maize has the highest levels of storage, indicating its importance to households (*Ibid*.). Barreiro-Hurle (2012) highlights that only large-scale farmers, processors, and traders have access to adequate amounts of storage and financial services, which allow them to take advantage of price fluctuations, while Abass et al. (2014) estimate that between 15-25 percent of maize production is lost on-farm due to inadequate storage facilities.

In the past, a number of initiatives have attempted to improve the storage facilities available to farmers. For instance, in the 1970s and 1980s, the Tanzanian Government built thousands of warehouses; however, most have fallen into disrepair (Mhlanga et al., 2014; Bill and Melinda Gates Foundation, 2014a). Most recently, the Tanzanian Government, in partnership with NGOs, attempted to implement a Warehouse Receipt System, which allows farmers to store most of their produce in a warehouse (Wilson and Lewis, 2015). In this way, the farmers can receive money immediately after the harvest but can also retain most of their produce to sell later in the year when prices are likely to be higher (*Ibid*.). However, multiple concerns remain regarding this scheme, including cost and lack of smallholder awareness of the scheme (Mhlanga et al., 2014); according to the Bill and Melinda Gates Foundation (2014a), the Warehouse Receipt System cannot yet be considered a success.

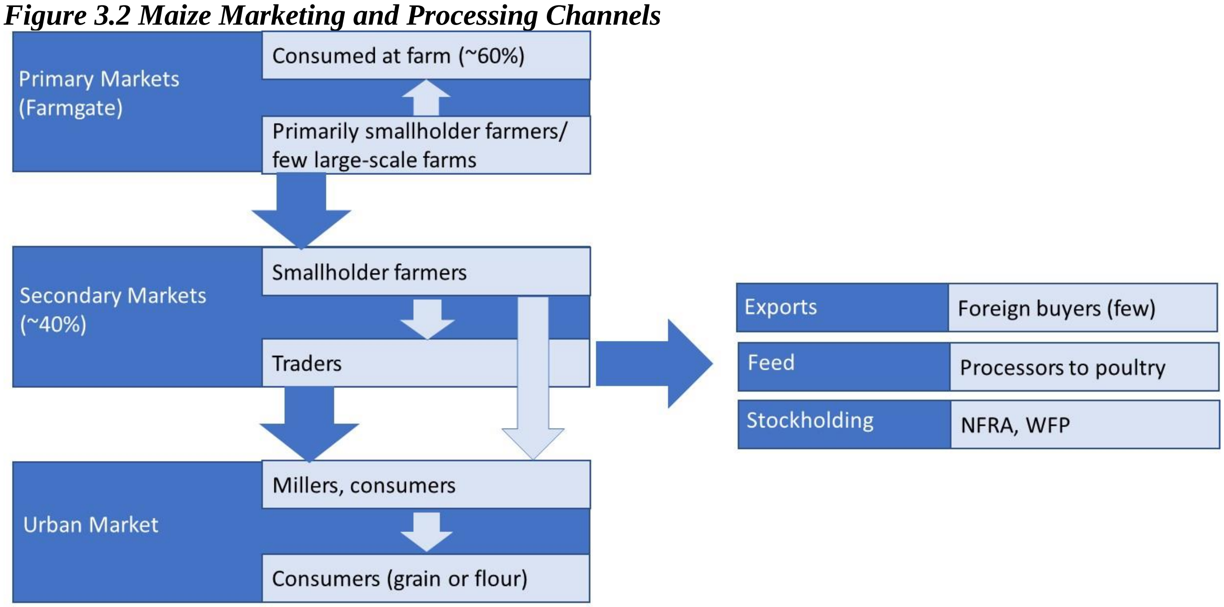
The NFRA also stores maize; this agency, established in 2008, aims to support food security by buying, storing, and releasing food stocks efficiently (Mhlanga et al., 2014). The NFRA purchases maize from smallholders at a fixed price, which is above the market price; it has a storage capacity of 246,000 tons with a mandate to purchase 150,000 tons annually (Mhlanga et al., 2014; Wilson and Lewis, 2015).

In addition to leading to high post-harvest losses, poor storage conditions and practices also increase the incidence of disease, including aflatoxins (Abass et al., 2014; Magembe et al., 2016; Shabani et al., 2015). A recent study on aflatoxins in Manyara and Dodoma confirms that farmers who utilize inadequate storage methods and storage facilities, such as drying produce on the ground and storing in piles, experienced higher levels of aflatoxin contamination (Seetha et al., 2017).

Marketing of Final Product

In 2014, maize-producing households consumed around 58 percent of maize on-farm, saved 1 percent as seed, sold 16 percent to non-producing households, sold 10 percent to feed processers, exported 12 percent, and sold the remainder to the NFRA and WFP (Bill and Melinda Gates Foundation, 2014a). The available literature describes various marketing channels involving a large number of actors at the farm, district, and urban levels. (Match Maker Associates Ltd, 2010; Barreiro-Hurle, 2012; Bill and Melinda Gates Foundation, 2014a; Wilson and Lewis, 2015; USAID, 2010). The literature suggests that smallholder farmers primarily market their maize to small traders either at the farmgate or at rural or urban collection centers. According to Barreiro-Hurle (2012), many of these small traders operate in Tanzania, within both the main areas of production and the main urban areas. Subsequently, from local collection hubs, small traders sell maize to larger traders/wholesalers who in turn transport it over long distances to the main urban markets (such as Dar es Salaam or Arusha) (USAID, 2010). Figure 3.2 describes the maize value chain and lists the main economic agents involved in each node of the value chain.

Figure 3.2 Maize Marketing and Processing Channels



Source: Authors' representation.

In the first channel, most of the maize is sold to small and medium processors who process it and sell the maize flour to retail markets, which then sell the maize to households for final consumption; a small proportion of maize is sold to be used in local feed (mainly for poultry) (Bill and Melinda Gates Foundation, 2014a). In the second channel, large processors purchase and process the maize and sell it either to retail markets for middle- and upper-income urban consumers or directly for international export. The large processors trade, process, and export maize, operating in the main urban areas and in the Southern and Northern production areas; these processors have a network of buying posts and agents in rural areas across the country (USAID, 2010). In the third channel, farmers sell unprocessed maize directly to retail markets, which then sell to households for final consumption; in the fourth channel, farmers sell a relatively small proportion unprocessed as dry maize for livestock feed (Bill and Melinda Gates Foundation, 2014a).

In other maize marketing value chains, the NFRA buys maize from wholesalers or organized groups of farmers and stores the grain, which it then sells to retail maize markets to ensure adequate domestic supply and stable prices throughout the year (Mhlanga et al., 2014). In a recent case, the World Food Program (WFP) has also purchased maize directly from organized groups of farmers and the NFRA and exported it regionally to support food security in surrounding areas (Mhlanga et al., 2014; Bill and Melinda Gates Foundation, 2014a).

Dar es Salaam, Arusha, and Moshi constitute Tanzania's main domestic urban markets (Barreiro-Hurle, 2012). Most of the marketed maize in Tanzania originates in the Southern and Northern highlands, as these areas produce the most maize and have production surpluses. In the Southern highlands, these production surpluses are generally transported to Dar es Salaam and, to a lesser extent, exported to neighboring countries, such as the Democratic Republic of the Congo, Malawi, and Zambia (*Ibid*.). By contrast, in the Northern Highlands, most of the excess production is exported informally to Kenya (*Ibid*.).

Official maize exports from Tanzania have fluctuated significantly since 2000 (from 2,000 tons to 250,000 tons) (Wilson and Lewis, 2015), largely as a result of annual production variations and the implementation of maize export bans. The Government of Tanzania instituted such a ban in June 2017 (after lifting the previous ban in 2016) amid a worsening food security situation stemming from rainfall deficits across the country (FAO, 2017a). Numerous authors highlight the significance of informal exports in Tanzanian agriculture. Kenya appears to be the main destination of informal exports, but Zambia, Malawi, Rwanda, Burundi, and the Democratic Republic of the Congo also receive informal exports (Wilson and Lewis, 2015). Maize is the most informally traded commodity in East Africa, with over 100,000 tons of maize exported informally to Kenya in 2016 (FSNWG, 2016). USAID estimates that 114,000 tons of maize were exported informally in 2011 to neighboring countries (Wilson and Lewis, 2015). Informal maize exports to Kenya are mainly driven by Kenya's higher maize prices (Bill and Melinda Gates Foundation, 2014a; Wilson and Lewis, 2015). Periodic export bans are also likely to facilitate informal exports, as farmers can receive higher prices for exports than for domestically sold produce and as export bans prevent traders from entering large formal long-term export contracts (Mtaki, 2017).

The 2007-2008 agricultural census provides information on marketing problems experienced by maize smallholder farmers. Of the 3.5 million farmers who considered the maize marketing questions applicable, around 60 percent reported that the market price for maize was too low, 14 percent reported experiencing no marketing problems, 10.5 percent reported that the crop market was too far away, and 10 percent reported that transport costs were too high. (NBS, 2012). The literature identifies additional main challenges to maize marketing as poor infrastructure connections and high transport costs, especially in rural areas; these factors contribute to lower farm-gate prices. For example, in the Southern Highlands, feeder roads generally remain unpaved, unreliable, and often inaccessible, resulting in increased post-harvest losses and transport costs (Wilson and Lewis, 2015).

These problems lead to high marketing (access) costs between the farmgate and the final consumer, leading to low prices received by farmers and high prices paid by consumers. The marketing margins are estimated at a total of 24-28 percent (3-5 percent from village collector to town wholesalers, 3-5 percent from town wholesalers to regional wholesalers, and 18 percent to the end markets) (Bill and Melinda Gates Foundation, 2014a). Transportation costs from Southern Highlands to the North for export to Kenya are estimated at US$0.15/metric tonne/km, making such transport prohibitive for many farmers

(*Ibid.*). The World Bank (2009a) estimates total domestic marketing costs between farmgate and main wholesale markets at US$90.5 per tonne in Tanzania, based on a survey conducted in 2008.

Barreiro-Hurle (2012) also reports estimates of marketing and transportation margins. Storage costs make up approximately 7.5 percent of the total marketing costs at the farmgate level, 3.4 percent at the rural market level, and 0.2 percent at the wholesale market level. Transportation costs make up for most of the commercialization cost in the maize supply chain. Compared to its neighbors in the East African region, Tanzania experiences higher transportation costs: US$6.4 per tonne from farmgate to primary markets, US$ 27 per tonne from the primary to secondary market, and US$ 41.51 per tonne from secondary to the wholesale market (*Ibid.*). World Bank (2009a) estimates storage costs between farmgate to first primary market at US$0.8 per tonne per month and storage costs between primary market and secondary market at US$1.2 per tonne per month, based on a survey conducted in 2008.

Higher levels of asset ownership, family size, and maize price all have a significant positive effect on the market participation of smallholder farmers (Petro, 2015). In addition, increased education level, household size, and market price, as well as ownership of a motorbike for transport and number of livestock, all had a positive and significant effect on smallholder farmers' decision to enter the maize market (Maziku et al., 2015). Maziku et al. (2015) also find that non-tariff barriers have a significant negative effect on maize marketing by smallholders, likely due to the fact that transaction costs are higher for these farmers, making maize marketing less profitable.

Policies Impacting the Maize Sector

The Tanzanian government has broadly liberalized the maize sector, with prices set by the market. However, in recent years, the Government of Tanzania has intervened in the maize sector somewhat through the NFRA, the National Agricultural Input Voucher Scheme (NAIVS), and maize export bans (Barreiro-Hurle, 2012, Chapoto and Jayne, 2010). In addition, the 2014-2015 annual report by the Ministry of Agriculture, Food Security and Cooperatives mentions a few maize-specific policy interventions and developments (United Republic of Tanzania, 2015). For instance, the government has committed to rehabilitating 125 maize Collective Warehouses in an effort to support smallholder maize marketing (which is also mentioned as a goal in the 2016-2021 five-year plan) (*Ibid.*). In addition, the Ministry conducted Maize Lethal Necrosis Disease (MLND) maize awareness programs in 21 maize-producing regions and released several improved maize varieties to farmers in 2015 (*Ibid.*).

In 2008, the Government of Tanzania implemented the NAIVS, which provides a 50 percent fertilizer subsidy to maize and rice farmers (Barreiro-Hurle, 2012). Between 2008 and 2013, the government spent around US$300 million on the subsidy, reaching 2.5 million smallholder households and resulting in an estimated additional 2.5 million tons of rice and maize produced (World Bank, 2014). Currently, the Tanzanian government is phasing out the NAIVS and plans to replace it with different policy measures that support smallholders' access to inputs; however, it is still unclear how the exact policy measures will be implemented (FAO, 2017b).

In a bid to ensure food security and stable prices, the Government of Tanzania only allows maize exports when all regions of the country are food-secure. Export bans have been implemented multiple times, on occasion lasting multiple years (Minot, 2010; Chapoto and Jayne, 2010); the most recent ban was imposed in June 2017 (FAO, 2017a). A USAID paper (2012) highlights that these export bans have been frequently introduced and lifted rapidly without warning, causing a significant amount of uncertainty among producers and traders (USAID, 2012).

Ahmed et al. (2012) notes that trade restrictions prevent Tanzania from taking advantage of maize exports, thus causing the country to forego significant economic benefits. The authors use the Global Trade Analysis Project (GTAP) global trade model to analyze the interaction between trade policy and climate-induced maize production volatility. Their analysis shows that Tanzania has the potential to increase its maize exports to other countries significantly and that having diverse destinations for Tanzanian exports can allow for substantial trade when trade partners are impacted by negative shocks (especially in an era of climate change). Most critically, they note that export bans decrease maize prices, are an ineffective tool for altering the poverty impact of underlying climate/productivity shocks, and come at the cost of significant reductions in exports, GDP, and long-run credibility as a supplier of agricultural products.

Table 3.1 lists the dates of export bans that have been implemented and lifted in Tanzania since 1999. Similar to its policy on exports, in order to stimulate local maize production, the Government of Tanzania generally only issues import permits when domestic supply cannot meet domestic food security needs (USAID, 2010; ESRF, 2008). In the Appendix B, Table B. 6 lists maize import tariffs imposed over the years for most-favored-nation status countries and for East African Community countries. Table B. 7 lists import tariffs on maize flour for the same group of countries.

Table 3.1 Tanzania Maize Export Bans

Date	Export Policy
1999	Re-establishment of new East African Community expanding trade area of maize; Maize Export Ban Lifted
2003	Maize Export Ban implemented through withdrawing export permits already issued to traders and suspending the issuance of new permits
January 2004	Maize Export Ban Implemented
January 2006	Maize Export Ban Lifted
March 2006	Maize Export Ban Implemented
January 2007	Maize Export Ban Lifted
January 2008	Maize Export Ban Implemented
May 2008	Maize Export Ban Lifted
January 2009	Maize Export Ban Implemented
October 2010	Maize Export Ban Lifted
July 2011	Maize Export Ban Implemented
January 2012	Maize Export Ban Lifted
September 2016	Maize Export Ban Lifted
June 2017	Maize Export Ban Implemented

Source: USAID (2012), FAO (2017a), Ahmed et al. (2012), Chapoto and Jayne (2010)

NFRA was established in 2008 with the aim of supporting food security through buying, storing, and releasing food stocks efficiently (Doyle, 2015). NFRA, as explained previously, purchases maize (and to a lesser extent other grains) from smallholders at a fixed price above the market price in order to provide incentives for production; NFRA prices are usually around 5 percent higher than wholesale market prices (Mhlanga, 2014; Doyle, 2015). Maize is predominantly sold at subsidized prices during lean seasons and in some instances is distributed for free. However, multiple concerns exist regarding the Agency, including underfunding and a failure to buy the required amount of grains and to redistribute grains to food-deficit areas (Mhlanga et al., 2014).

A wide array of maize taxation and regulations, cross-border checks, bureaucracy, and corruption exist across different districts in Tanzania. Local taxes on maize vary per district, with some districts collecting no tax and others collecting a low to moderate percentage of tax (World Bank, 2009b). For instance, Mbeya has a local maize tax equivalent to around 2 percent of the wholesale maize price (Barreiro-Hurle, 2012). Importantly, local taxation does not appear to place a significant financial burden on farmers who market maize (World Bank, 2009b). In addition, despite the existence of taxes, Wilson and Lewis (2015) claim that the clear majority of marketed and traded maize remains unregulated and untaxed; similarly, most small and medium processors operate informally.

Data Sources for Maize Value Chain NRPs

To analyze the impact of policy space on Tanzanian maize farmers, we utilize the NRP methodology. To compute NRP, we use price data from various sources (both international prices and Tanzanian prices) for the maize value chain, including flour. Since most of maize produced in Tanzania is white maize, our data collection and analysis focuses on white maize only. We collect price data for different value chain locations in Tanzania, including the border and the farmgate. All farmgate prices are at the regional level and all border prices are at the national level. We include 26 regions in our analysis and divide them into two groups: regions with long rainy season (LRS) and regions with short rainy season (SRS). Crop (marketing) years differ between LRS and SRS, as seen in Figure A.1. For conversion of data in calendar year and the rest of the analysis, we define the marketing year as July to June.

We compute the net trade status of the examined agricultural commodities using FAOSTAT database (2017c) (net trade = exports – imports) for white maize and white maize flour. Tanzania switches between net exporter and net importer for both commodities in our period of analysis.

We chose the international prices for white maize and white maize flour as the best representative price of that commodity in global markets. International prices come from UNCOMTrade (2017) for South African export prices to World for white maize and white maize flour. We convert these prices to Tanzanian Shillings per metric tonne, using the exchange rate of Tanzanian Shillings per US$ from IHS MARKIT.

For years in which Tanzania is a net importer of white maize or white maize flour, we adjust international price to CIF price in Tanzania by adding transportation costs. For years in which Tanzania is a net exporter of white maize or white maize flour, we do not adjust international price and instead use it as FOB price of South Africa. Border (import and export) prices for Tanzania for both commodities come from UNCOMTrade (2017) data, in which we calculate import price based on estimated import quantity and import value and export price based on estimated export quantity and export value.

Farmgate (harvest) prices for maize come from Living Standards Measurement Study (LSMS) survey data provided by World Bank at the regional level for 2008-2009, 2010-2011, and 2012-2013 (NBS (2016a, 2016b, 2016c)). We report farmgate prices for maize flour as LSMS average rather than at the regional level.

BMGF (2014a) gives detailed trade margin information for maize value chain. Margins along the value chain from rural farm to regional wholesalers are between 24 percent and 28 percent in total. BMGF (2014a) provides these margins, and we sum the wholesale-farmgate margin as total percentages.

For the maize flour value chain, we use retail prices in Arusha reported by the Ministry of Industry and Trade under the Department of Trade Promotion and Marketing. We compute marketing costs between retail and farmgate prices using the two price series.

For marketing costs, we are limited by data availability. Since we did not have sources with which to measure marketing costs between border and point of competition and between point of competition and farmgate separately, we applied this data only once between point of competition (retail or wholesale) and farmgate.

We provide detailed data documentation in Appendix C.

Maize Value Chain NRP Results

We compute the NRPs for the maize value chain for two nodes along the value chain: border and farmgate for maize and maize flour. Figure 3.3 shows NRPs at the border for Tanzania for both commodities, and Table B. 1 and Table B. 2 present detailed numbers, along with trade status. Tanzania's trade status is net importer and net exporter in different years for both commodities.

For maize, NRPs at the border vary from negative to positive and show wide divergence. When

Tanzania is a net importer (2006-2007, 2008-2009, 2009-2010, and 2010-2011), the NRPs are -26 percent, 107 percent, 258 percent, and 235 percent, respectively. In three out of four years, there are positive NRPs when Tanzania is a net importer, which is in line with the application of import tariffs. When Tanzania is a net exporter (2007-2008, 2011-2012, and 2012-2013), the NRPs are -57 percent, 47 percent, and -31 percent, respectively; this demonstrates disincentives in the maize export market in two out of three years. Thus, it appears that Tanzania's NRPs and trade status imply an anti-trade bias; when maize is imported, it is faces an import tariff (hence the positive NRPs in most years during which maize imported) and when it is exported, it is often taxed (hence the negative NRPs in most years during which maize is exported).[1]

For maize flour, Tanzania is a net importer for the 2006-2007, 2007-2008, and 2008-2009 marketing years and is a net exporter for the rest of the period. All border NRPs in our period of analysis are negative. For years during which Tanzania is a net exporter, the negative border NRP is expected and in line with maize markets. However, the negative NRPs in years during which Tanzania is a net importer are surprising.[2]

In this paper, we aim to estimate the impact of policies on farmers in Tanzania. We therefore compute NRPs at the farmgate for the main producing regions in Tanzania, using the regional farmgate price data from the LSMS survey (NBS (2016a, 2016b, 2016c)). Figure 3.4 shows these NRPs for white maize in LRS regions, and Figure 3.5 shows these NRPs for SRS regions. Table B. 3 presents the average NRPs for two regions aggregated by seasons (LRS and SRS), and Table B. 4 and Table B. 5 present NRPs for each region. For regions with LRS and SRS, the average NRPs are negative. For 2008-2009 and 2010-2011, Tanzania is a net importer of maize with positive NRPs at the border. However, for these years, farmgate NRPs for most regions and on average are negative. While import tariffs provide support to maize farmers, these policies are not enough to protect farmers from the disincentives in the maize

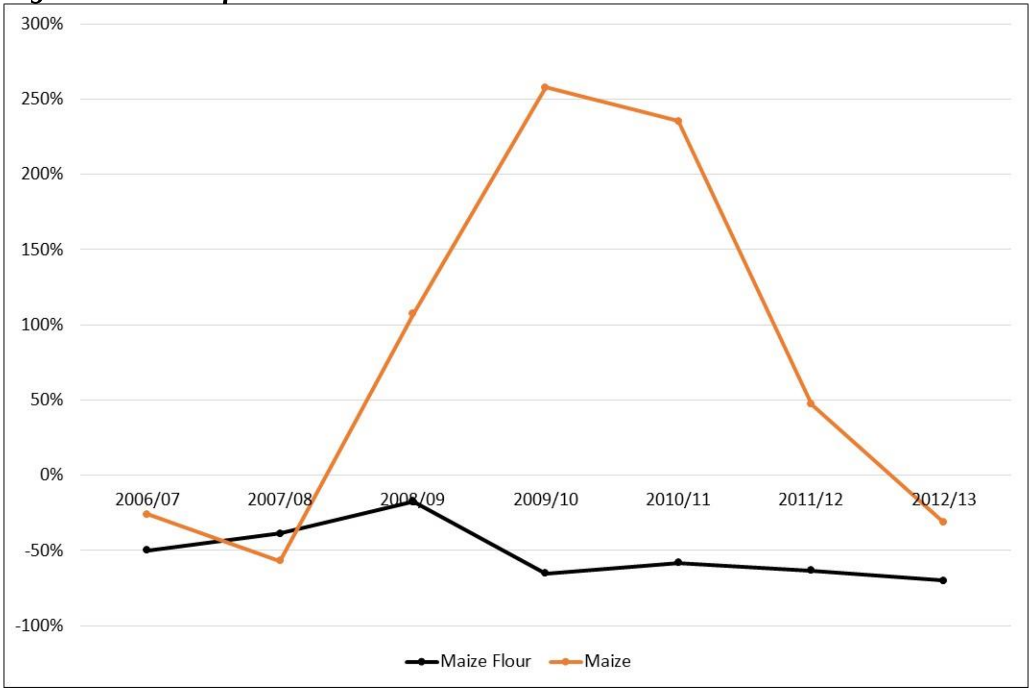
[1] Figure B. 1 presents international and Tanzanian border prices for white maize, showing the variation in *NRP*s to be the result of variation in Tanzanian border price (which switches between an import price and export price depending on trade status).
[2] Figure B. 2 shows international and Tanzanian border prices for white maize flour, showing the variation in *NRP*s to be the result of variation in both prices.

market, which reverberate through the domestic market. For 2011-2012, Tanzania is a net exporter, with negative border and farmgate NRPs. This shows that disincentives in the export market are reverberating through the domestic market. Thus, "anti-trade" policies negatively affect Tanzanian farmers.

The regional farmgate NRPs, as shown in Table B. 4 and Table B. 5, are mostly negative throughout the study period. NRPs in 2012-2013 are higher, and some regions switch to positive NRPs in this marketing year due to higher prices received by farmers (Figure 3.4 and Figure 3.5). Figure 3.6 and Figure 3.7 present the average farmgate prices for each region, showing variation of NRPs across regions even though market access costs were included. The different NRPs across regions may show the impact of regional/state-level policy framework or other market inefficiencies that lead to variation in the prices that farmers receive.

Figure 3.8 shows NRP at farmgate for maize flour (along with NRP at farmgate for maize for comparison purposes). In 2008-2009, Tanzania is a net importer of maize flour, with a positive NRP at farmgate and a negative NRP at border. In 2010-2011 and 2012-2013, Tanzania is a net exporter of maize flour, with negative and positive NRPs at farmgate, respectively. One reason for the variability in NRPs in maize flour is the variability in domestic and farmgate prices. The international price for white maize flour experiences less variation.

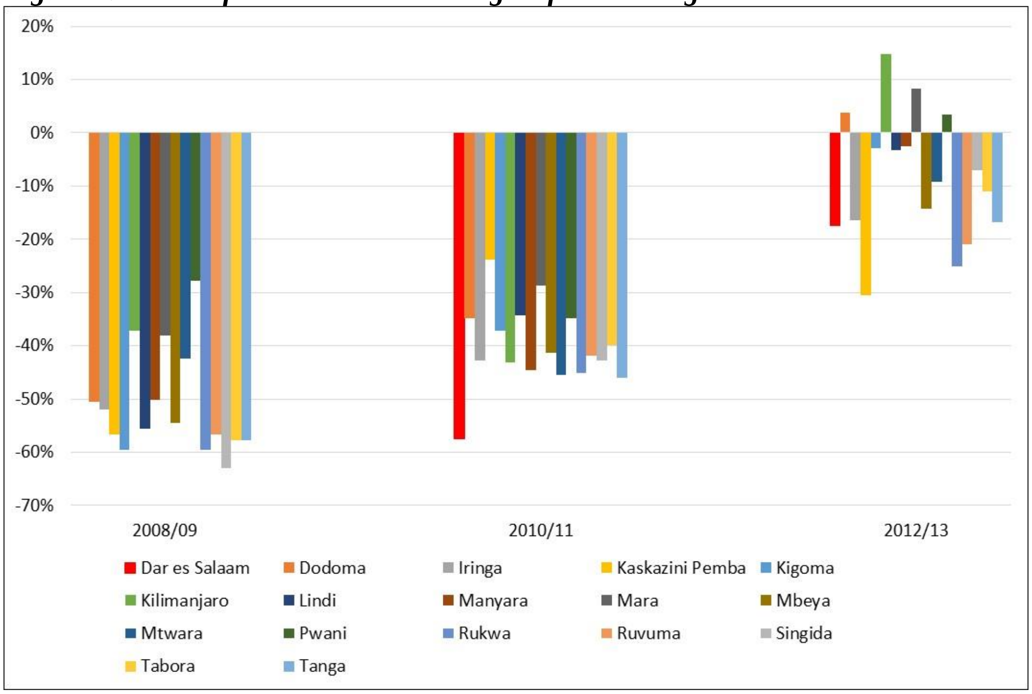
Figure 3.3 NRPs for Maize and Maize Flour at the Border



Source: Author's computations

Notes: NRPs are presented across crop marketing years for Tanzania.

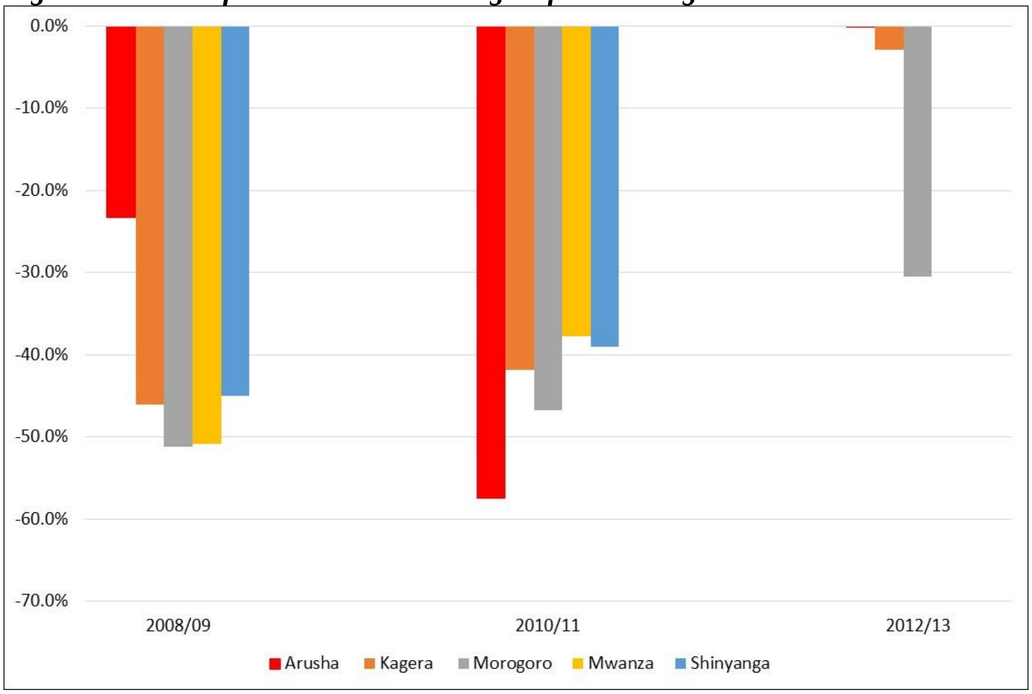
Figure 3.4 NRPs for Maize at the Farmgate for LRS Regions



Source: Authors' computations

Notes: NRPs are presented across crop marketing years for 2008-2009, 2010-2011, and 2012-2013 for regions provided by LSMS Survey data that are grouped by LRS pattern.

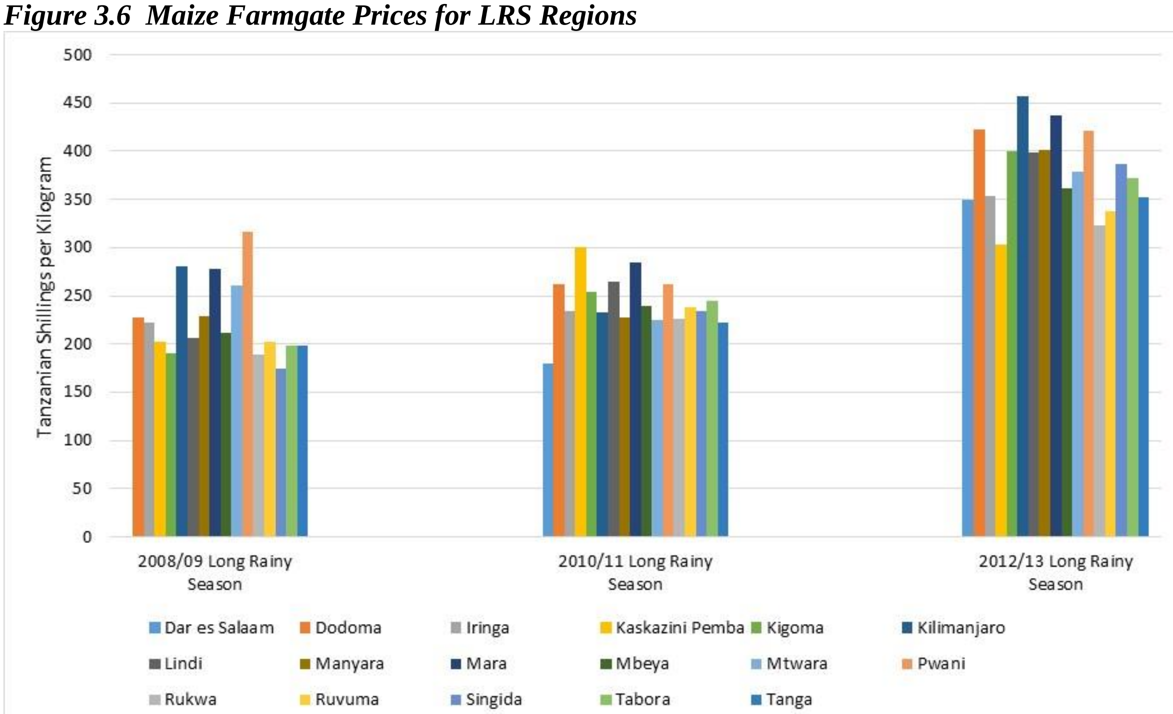
Figure 3.5 NRPs for Maize at the Farmgate for SRS Regions



Source: Authors' computations

Notes: NRPs are presented across crop marketing years for 2008-2009, 2010-2011, and 2012-2013 for regions provided by LSMS Survey data that are grouped by SRS pattern.

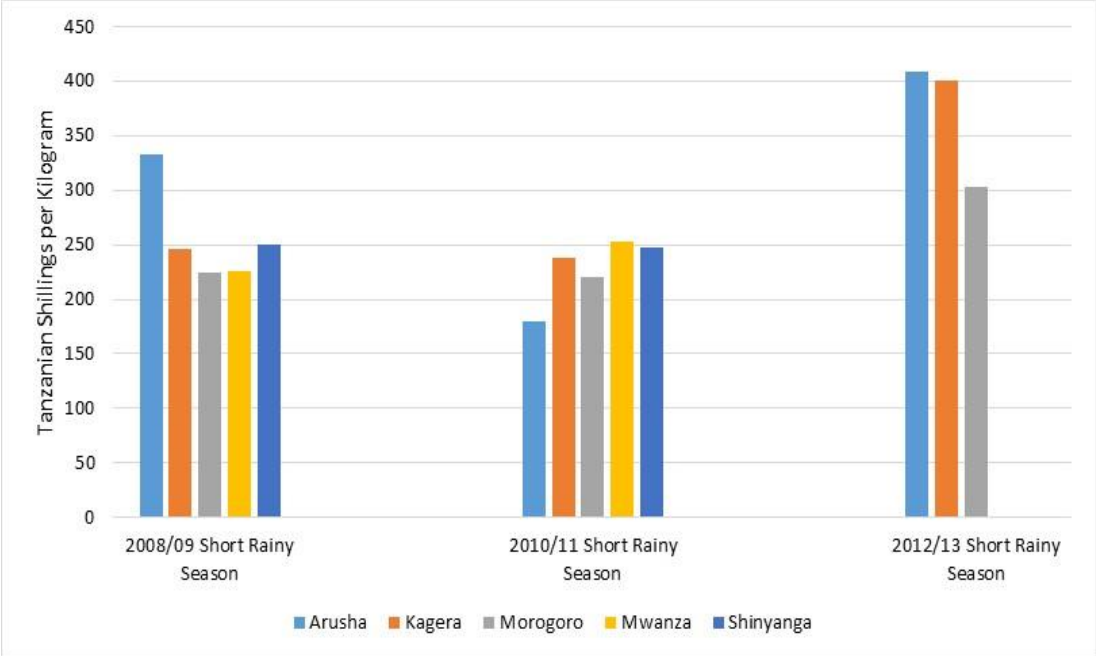
Figure 3.6 Maize Farmgate Prices for LRS Regions



Source: LSMS Survey data

Notes: Farmgate prices for each region are average of prices reported in the survey for each region.

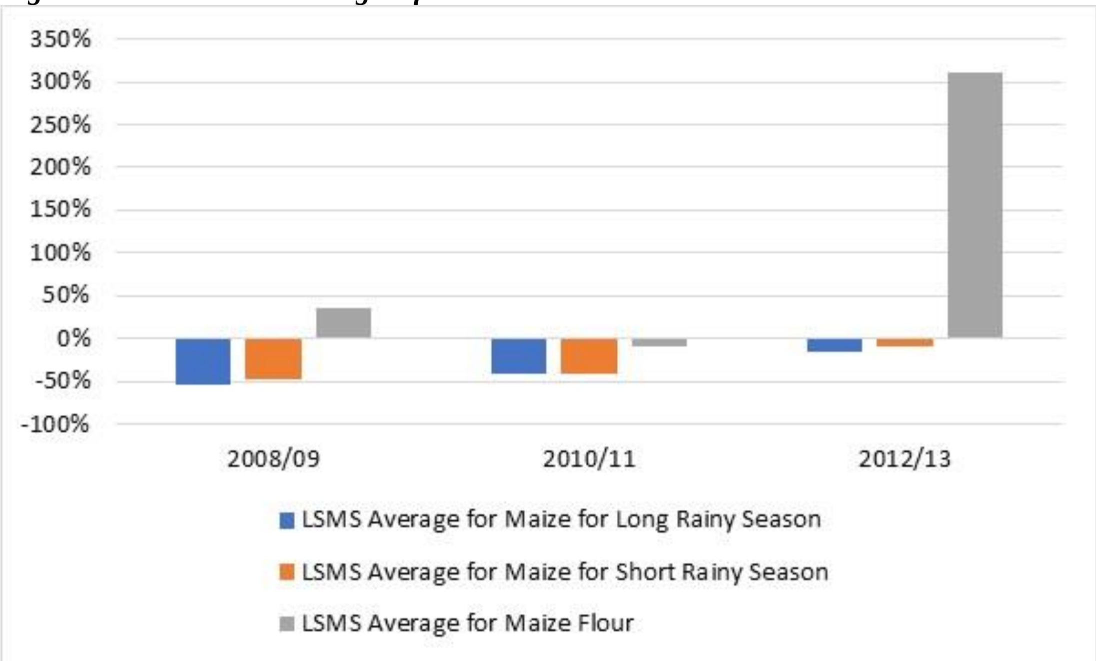
Figure 3.7 Maize Farmgate Prices for SRS Regions



Source: LSMS Survey data

Notes: Farmgate prices for each region are average of prices reported in the survey for each region.

Figure 3.8 NRPs at the Farmgate for Maize and Maize Flour



Source: Authors' computations

Notes: NRPs are presented across crop marketing years for 2008-2009, 2010-2011, and 2012-2013 for regions provided by LSMS Survey data. LSMS Average denotes average NRPs across all data points, not average of regional NRPs.

4. GROUNDNUT VALUE CHAIN OVERVIEW

Groundnuts constitute an important food and cash crop in Tanzania and play a significant role in supporting incomes and human health (ITC, 2015; Ronner and Giller, 2013; NBS, 2012). However, available studies and data on the stages of production, processing, distribution, and marketing and on the actors involved in each stage in Tanzania's groundnut value chain remain fragmented. Drawing on a wide variety of sources, this literature review provides an overview of the groundnut value chain in Tanzania.

Groundnuts grow in tropical and sub-tropical areas. Tanzania is the second largest groundnut producer in Africa (Bill and Melinda Gates Foundation, 2014b) and accounts for around 2 percent of the global production of groundnuts (ITC, 2015). Groundnuts also constitute the sixth highest crop contributor to Tanzania's GDP ($348.5 million) (Bill and Melinda Gates Foundation, 2014b). Together with sunflower, groundnuts dominate the production of edible oilseeds in the country, representing 35-40 percent of Tanzania's total production of oilseeds (FAO, 2012; Ugulumu, 2013; CEPA, 2016).

According to the Agricultural Census of 2007-2008 (the latest census to cover groundnut production in detail), an estimated 1.04 million smallholders engage in groundnut production in Tanzania (NBS, 2012). A number of studies note that most groundnuts in Tanzania are consumed domestically in unprocessed form, although multiple groundnut processors also operate in Tanzania; officially, only a small amount of groundnut products, both processed and unprocessed, are exported (FAO, 2012; ITC, 2015; Katundu et al. 2014). However, there are indications that significant amounts (up to 60 percent) of all groundnuts produced in Tanzania are informally exported to markets in neighboring countries (Bill and Melinda Gates Foundation, 2014b).

Previous studies have highlighted the role that groundnuts play in maintaining soil health by fixing nitrogen in the soil and aiding in soil management, which can support the resilience of crop production, especially in areas with minimal fertilizer use (ITC, 2015; Ronner, 2013). Furthermore, groundnuts have high nutritional value, providing a source of fats, proteins, carbohydrates, and minerals, including vitamin E, calcium, niacin, phosphorus, magnesium, zinc, iron, and potassium (Katundu, 2012).

Groundnuts have a wide array of uses for human consumption and are considered both a legume and an oilseed. They function as an important snack in Tanzania and many other parts of the world, as the seeds can be eaten raw, roasted, or boiled (ITC, 2015). Groundnuts can also be processed into an edible oil used for cooking and dressings or into a paste used in various foods, including the production of peanut butter (Settaluri et al., 2012). In some cases, groundnuts are added to flour production (Bill and Melinda Gates Foundation, 2012). The by-products of groundnut production and processing are also significant, as the vines, shells, and cake (meal) can be used as animal feed and fertilizer. Globally, around 50 percent of groundnuts are used to produce oil and 37 percent are used for direct human consumption (Taru et al., 2010).

Groundnut production in Tanzania faces significant challenges across the value chain, including susceptibility to drought, low productivity, poor access to markets, and low levels of in-country processing (ITC, 2015; TFDA, 2012). In addition, the domestic demand for groundnut products is expected to increase significantly in coming years; for instance, it is estimated that the demand for edible oils will increase by 3 percent per year in Tanzania, driven by large population increases and changing consumption habits (ITC, 2016).

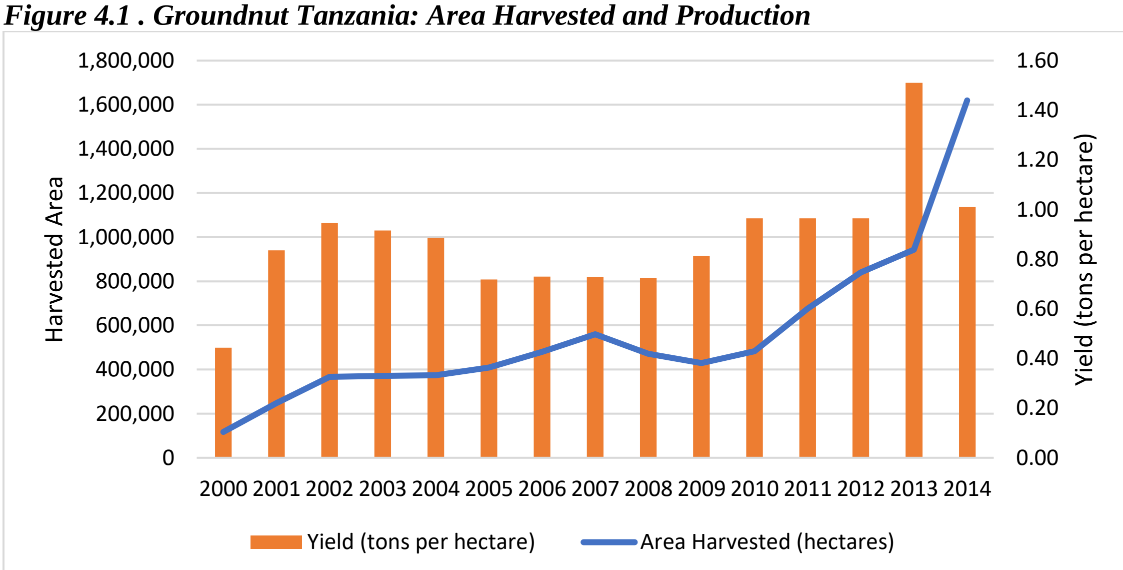
In this context, an analysis of the Tanzanian groundnut value chains can improve our understanding of the movement of groundnuts along the value chain, from production to consumption, as well as the roles of the different actors involved at each stage of the value chain. This understanding can aid in designing and improving interventions that enhance linkages along the value chain and support productivity and value addition along the chain.

Historical Overview

Groundnuts were introduced to Tanzania in 1946 by the British colonial government as part of the Tanganyika Groundnut Scheme. The scheme aimed to develop large-scale groundnut plantations on 1.2 million hectares in Tanzania but failed due to high costs and climatic difficulties; the scheme was abandoned in 1951 (Rizzo, 2006).

According to the FAO, between 1961 and 1999, groundnut production in Tanzania increased moderately, from 40,000 to 70,000 tons per year, despite experiencing a decline in production in the 1980s due to a protracted economic crisis (ITC, 2015; Monyo et al. 2009). During the period before the crisis, a groundnut marketing board controlled groundnut prices and marketing, but after liberalization, groundnut production has increased. In particular, since the early 2000s, annual groundnut production has increased significantly, to over 1 million tons annually in the period 2010-2014 (FAOSTAT, 2017c). These increases have been driven largely by expansions in the area under cultivation rather than by a rise in productivity (see Figure 4.1). Based on FAO data, groundnut yields have fluctuated; yields averaged around 1 ton per hectare in the early and mid-1960s, declined and remained stagnant until the late 1990s, and have averaged around 0.9 tons per hectare over the past 10 years despite a marginal increase. By contrast, the area harvested has steadily increased from 40,000 hectares in the 1960s to over 1 million hectares in recent years (FAOSTAT, 2017c). The main constraint to groundnut yields, highlighted by various authors, are low-yielding seeds introduced in the 1960s (such as the mamboleo variety), as well as the extremely low use of other agricultural inputs by groundnut farmers (Bill and Melinda Gates Foundation, 2012; Kidane et al., 2013; Bucheyeki et al., 2010).

Figure 4.1 . Groundnut Tanzania: Area Harvested and Production

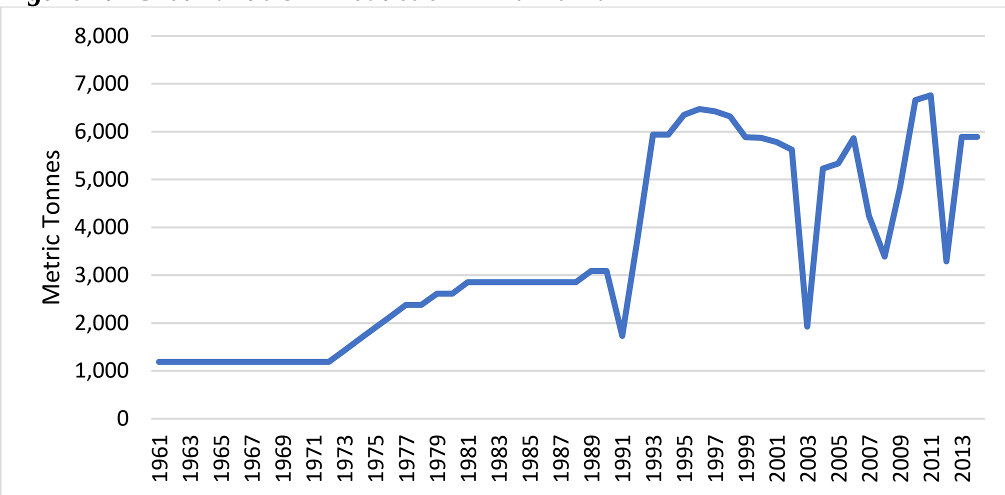


Source: FAOSTAT (2017c)
Notes: Data is in calendar year.

Historically, the rate of groundnut processing has been relatively low in Tanzania, and the annual production of groundnut oil has remained relatively stable since the mid-1990s (see Figure 4.2)

(FAOSTAT, 2017c). Similarly, the export of groundnut oil has started to increase in recent years but remains at a very low level, averaging less than 100 tons annually (see Figure 4.6); the export of shelled groundnuts has increased in recent years, reaching 17,209 tons in 2013 (see Figure 4.5).

Figure 4.2 Groundnut Oil Production in Tanzania



Source: FAOSTAT (2017c)
Notes: Data is in calendar year.

Groundnut Value Chain Characteristics

The groundnut value chain includes multiple stages and a variety of actors. Groundnuts form an important crop for many farmers in Tanzania, with production mainly conducted by smallholders. According to the 2007-2008 Agricultural Census, the clear majority of production occurs in the LRS (unimodal rainfall) and relatively little production occurs in the SRS (bimodal rainfall) (NBS, 2012). Groundnuts are grown in all regions of Tanzania (Monyo et al., 2009). However, the main growing regions (Shinyanga, Dodoma, Singida, Tabora and Mtwara) are located in the East and South of the country (NBS, 2012). Groundnuts are often intercropped with maize, cassava, and sorghum, making them an important part of Tanzania's crop rotation systems (Monyo et al., 2009). Most smallholder groundnut farmers do not use machinery and depend on household labor, while larger scale farmers use hired labor (Monyo et al., 2009).

The 2007-2008 Agricultural Census provides a significant amount of useful information on the yield, area under cultivation, use of irrigation, and inputs used by groundnut farmers. The Census shows that the average yield of groundnuts in Tanzania is around 0.73 tons per hectare during the LRS and 0.64

during the SRS (NBS, 2012). These numbers support the findings of the 2014-2015 Agricultural Survey, which finds an average yield of 0.8 tons per hectare during the LRS and 0.63 during the SRS (NBS, 2016), as well as the findings of other studies (Monyo et al., 2009). Importantly, Tanzania's average groundnut yields compare unfavorably with the world average (estimated at 1.56 tons per hectare in 2010 (CGIAR, 2011) but remain in line with yields achieved in Malawi and Uganda (FAOSTAT, 2017c).

The 2007-2008 Agricultural Census also shows that the land area devoted to groundnut production per household is highest in Dodoma (0.64 hectares), followed by Manyara (0.59 hectares), Shinyangana (0.56 hectares), Rukwa (0.55 hectares), and Tabora (0.54 hectares) (NBS, 2012). The Census also shows that the use of inputs in groundnut production remains especially low. For instance, farmers cultivate only 5.8 percent of the land planted to groundnuts using improved seeds, around 2 percent using fertilizers, 0.1 percent using herbicide, 0.4 percent using fungicide, and 0.3 percent using insecticide; farmers only irrigate 0.6 percent of the total groundnut area (NBS, 2012).

Similarly, a recent study by the Bill and Melinda Gates Foundation (2014b) highlights that 95 percent of farmers use recycled groundnut seeds. This study also finds that the average annual cost per hectare of growing groundnuts (including the opportunity costs) is $289. The major expenses break down as follows: $55 dollars for the use of recycled seeds (based on the opportunity cost of selling these seeds), $47 for harvesting, $47 for shelling, $39 for ploughing, and $36 for weeding (based on labor costs). The study finds that based on these costs, farmers make an average profit of $226 per hectare. The study also claims that if farmers purchased certified seeds, the total cost would increase significantly to $398; however, increased yields due to improved seeds would also allow for greater profit (Bill and Melinda Gates Foundation, 2014b).

Regarding post-harvest storage at the smallholder level, the Agricultural Census finds that around 54 percent of households stored groundnuts in sacks, 32 percent in locally made structures, 2 percent in improved local structures, less than 0.7 percent in airtight drums, 0.3 percent in modern storage facilities, and 0.5 percent in an unprotected pile; around 10 percent of farmers do not store their groundnuts (NBS, 2012). Similarly, Katundu et al. (2014) find that in Tabora, most farmers store their produce in either a shed or a room; the study argues that these storage facilities are inadequate and cause significant post-harvest losses at the farm level, equivalent to 8-12 percent of the harvest, with pests accounting for 72.2 percent and moisture accounting for 22 percent of these losses.

Katundu et al. (2014) explore the socio-economic factors that influence groundnut production in the Tabora region. They find a positive correlation between the amount of groundnuts produced at the household level and the previous year's price of groundnuts, a negative correlation between the cost of groundnut seeds and pesticides and groundnut yields, and a positive correlation between the time invested by the farmer and that farmer's yield. Significantly, the study did not find any correlation between groundnut production and factors including gender, household size, level of education of the household head, and non-farm income. The sale of groundnuts was found to be the third major source of income, accounting for 6 percent of total household income; the first two major sources of income were tobacco production and petty trading (Katundu et al., 2014).

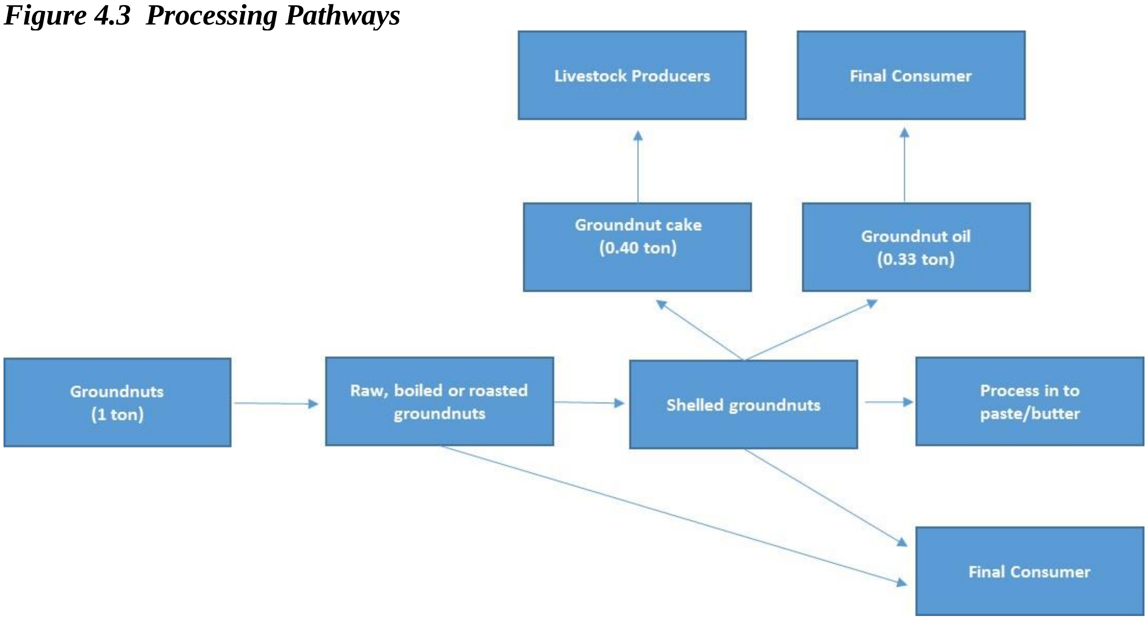
Previous studies have identified drought, pests, and lack of inputs and institutional support, as well as low price incentives, as major challenges to groundnut production in Tanzania (Monyo et al., 2009; Bucheyeki et al., 2010; Katundu et al., 2014; Bill and Melinda Gates Foundation, 2014b). In particular, numerous studies highlight that the lack of improved seeds and the dominance of old varieties, such as the Mamboleo variety dating back to the 1960s, pose a major barrier to improving groundnut yields. However, over the past decade, numerous actors, including Tanzania's National Agricultural Research Institute (NARI), ICRISAT, and private sector actors, have been active in developing and releasing new groundnut varieties for use in Tanzania. Since 2009, NARI, with support from the McKnight Foundation and ICRISAT, has released at least nine new promising groundnut varieties (Bill and Melinda Gates Foundation, 2012; McKnight Foundation, 2011). In addition, a recent partnership has been established between ICRISAT and the Agricultural Seed Agency with the goal of making improved varieties accessible across Tanzania (ICRISAT, 2017). Recent evidence suggests that new varieties improve yields significantly; for instance, a recent ICRISAT article highlights that the Pendo variety provides farmers with an average yield of 1.6 tons per hectare, almost doubling the yield of traditional varieties (ICRISAT, 2016). Similarly, Bucheyeki et al. (2010) investigate the potential of promising groundnut varieties in Tabora. The study finds that new varieties, notably Pendo and Johari, increase yields by 45 and 44 percent, respectively, compared to the older Mamboleo variety.

Aflatoxin contamination poses another major constraint to groundnut production and international trade for Tanzanian groundnuts (ITC, 2015). Produced by certain fungi, aflatoxins contaminate groundnuts during planting and can spread during harvesting, storage, transportation, and processing. It remains unclear to what extent aflatoxins exist throughout Tanzania; however, groundnut samples have shown significant aflatoxin contamination (TFDA, 2012; Mbega et al., 2016). Aflatoxins pose a major barrier to trade, as the main groundnut importing countries have set strict aflatoxin standards for groundnut imports (ITC, 2015). Aflatoxin contamination constitutes a significant reason for the failure of some past initiatives to export groundnuts (Monyo et al., 2009).

Processing and Storage

Groundnuts can undergo various processing pathways after production, as shown in Figure 4.3.

Figure 4.3 Processing Pathways



Source: Authors' representation.

The simplest channel involves no processing or minimal processing; in this channel, groundnuts reach end consumers as an edible snack. This pathway involves two separate value chains; groundnuts are either consumed raw (or roasted) immediately after production, or they are packaged and traded (ITC, 2015). A more complex value chain involves processing groundnuts into peanut paste or butter. This process involves multiple stages; first, groundnuts are shelled, cleaned, and roasted. Second, the groundnut kernels are ground by a hand mill or electronic grinder, producing a peanut paste. Peanut paste is used in multiple dishes and can also be mixed with other ingredients (vegetable oil, sugar, and salt) and stabilizers to produce peanut butter (Mchomvu, 2002). A third pathway involves processing groundnuts into groundnut oil, which also generates groundnut meal that can be used as an animal feedstock. This process also involves de-shelling, roasting, and grinding and pressing groundnuts to separate the oil from the presscake (meal) (ITC, 2015).

Relatively little research exists regarding the extent of groundnut processing in Tanzania; available research suggests that groundnut processing in Tanzania remains limited but does occur in both rural and urban areas. For instance, a recent study by the Bill and Melinda Gates Foundation (2014b) states that only around 44,000 tons of groundnuts are processed (defined by the study as roasted or processed into groundnut oil or peanut butter) in Tanzania domestically. In rural areas, processing is mainly done on a small scale, by either farmers or small businesses. Katundu et al. (2014) conduct a survey on groundnut processing by farmers in the Tabora region of Tanzania and find that only around 13 percent of farmers process their crop. Of those who do process their groundnuts, 46 percent shell their produce, 32 percent grade their produce, and 23 percent winnow their produce. The survey also reports on the reasons behind farmers' decision not to process their crop; 15 percent cite inadequate knowledge of shelling machines, 31 percent highlight limited access to technology, 11 percent report customers' preference for unprocessed groundnuts, 29 percent report a lack of capital, and 15 percent highlight that the processed price did not cover the costs of production (Katundu, et al. 2014).

Twenty-two major oilseed factories produce groundnut oil in major urban areas: Dar es Salaam, Morogoro, Arusha, and Mwanza. These factories process groundnuts, sunflower, sesame, and other seeds (CEPA, 2016) and purchase oilseeds from traders or cooperatives or directly from smallholders (ITC, 2016). A report on edible oil value chain development estimates that edible oil processors in Tanzania operate significantly below capacity, with smaller oil processors operating only at 20 percent of installed capacity and larger processors operating between 25 and 40 percent of capacity (ITC, 2016). Although no comprehensive data exists regarding the amount of processing that occurs at these factories, according to FAOSTAT (2017c), annual production of groundnut oil in Tanzania has averaged around 5,108 tons per year. Domestic production of edible oils is estimated to only fulfill 40 percent of local demand, with the rest sourced from imports (CEPA, 2016; ITC, 2016).

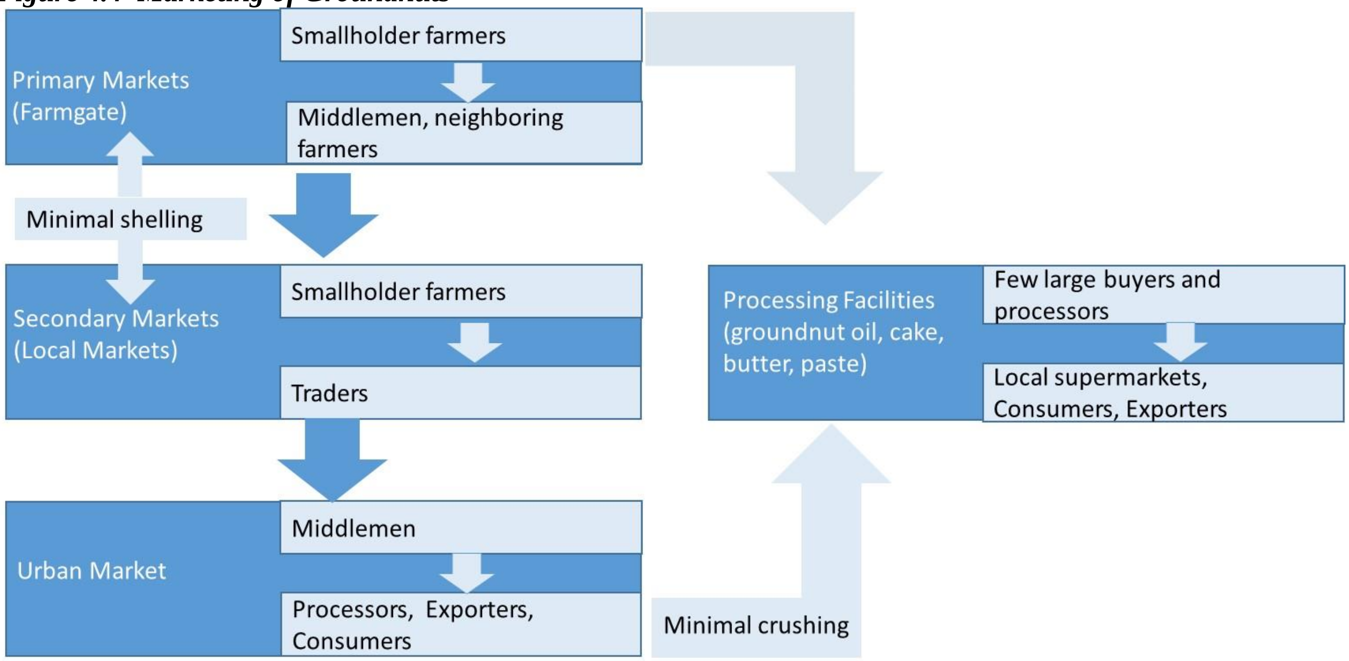
Due to the lack of accurate information on groundnut processing in Tanzania, sources from other countries with similar contexts can be useful in broadening our understanding of the processing pathways in groundnut value chains. A 2014 ICRISAT discussion paper provides a value chain map and analysis of groundnuts in Uganda (Mugisha et al., 2014); the study shows that the majority of value-added to groundnuts in Uganda occurs via manual shelling done by smallholders or small traders. The larger processors, meanwhile, generally mill groundnuts into flour, paste or oil. The study also finds that 18 percent of the total amount of groundnuts purchased by processors were bought directly from small holders, 25 percent from small traders, 44 percent from large traders, and 13 percent from brokers (Mugisha et al., 2014).

Groundnuts are also used as an ingredient in a variety of products in Tanzania. For instance, a small company (Afri-Youth Pride) purchases groundnuts, along with other products, to produce corn/soy flour (Bill and Melinda Gates Foundation, 2012); in recent years, another Tanzanian processor, Power Foods, has partnered with a French company, Nutriset, to produce Plumpy'Nut, a peanut-based paste used to treat malnutrition (Nutriset, 2013). Sources also report that other companies, as well as cooperatives, have become involved in peanut butter production and have built an extensive network with smallholders (van der Ven, 2012; Heilbron, 2013).

Marketing and Trade

Different actors engage in the various stages of marketing and trading of groundnuts in Tanzania; however, relatively little literature exists regarding the types, scale, and organization of the actors involved. Figure 4.4 presents an overview of the sector, describing the groundnut value chain and listing the main economic agents involved in each node of the value chain.

Figure 4.4 Marketing of Groundnuts



Source: Authors' representation.

Similar to the majority of other crops produced in Tanzania, no organized structure or commodity board supervises the marketing of groundnuts, and farmers have remained generally unaware of the quantity and quality standards necessary to produce groundnuts for urban and international markets (Monyo et al., 2009). Potential buyers also may not be aware of the quantities and varieties available in groundnut-producing areas, making it difficult for producers to develop marketing strategies (Monyo et al., 2009). These challenges illustrate that increased government intervention in the groundnut sector in particular, and in the oilseed sector in general, can help develop these value chains, for instance through creating an enabling environment for private sector groundnut production. This enabling environment could include government interventions in developing transport, processing, and export infrastructure, as well as in expanding extension services and input support and developing quality control mechanisms (Dalberg, 2017).

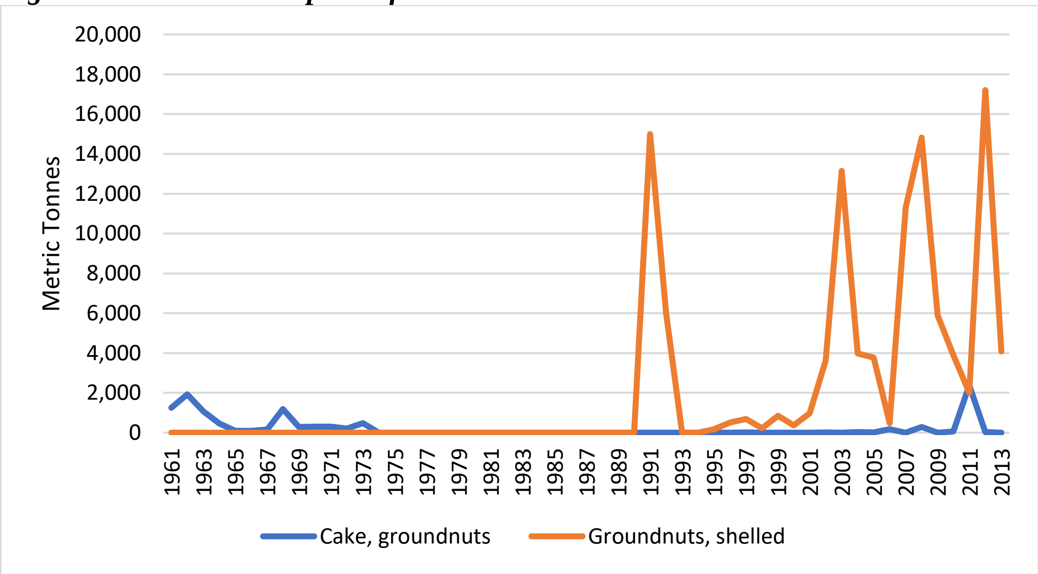
Literature on the actors and processes involved in marketing groundnuts in Tanzania remains fragmented. Evidence from the BMGF (2012) suggests that groundnut smallholders who sell their produce do so either to traders at the local market, to middlemen at the farmgate, or to other farmers directly; another study highlights that edible oilseed processors purchase oilseeds directly from smallholders or from agents acting on behalf of processors. After processing, these edible oil products are generally sold in the main urban centers or exported (ITC, 2016). Another study conducted by the Bill and Melinda Gates Foundation (2014b) highlights various marketing channels for groundnuts. According to this study, 20 percent of groundnuts are consumed at the farm level, 40 percent of groundnuts are traded semi-formally (5 percent of which are processed and a small percentage of which are exported and most sold to domestic households), and 40 percent of groundnuts are traded informally (most of which are exported). Factors such as membership of a farmer group or cooperative, distance to markets, and local prices are also likely to influence farmers' choice of marketing path (*Ibid*.).

Despite an increase in groundnut exports in recent years (see Figure 4.5 and Figure 4.6), official exports of groundnut products remain low. However, up to 60 percent of groundnuts produced in Tanzania are exported informally and undeclared to regional markets in Kenya, Uganda, the Democratic Republic of the Congo, and Rwanda (Bill and Melinda Gates Foundation, 2014b). This suggests that Tanzania constitutes a major exporter of groundnuts and that only around 40 percent of groundnuts produced in Tanzania are consumed domestically; the study also illustrates that the current understanding of the Tanzanian groundnut value chain contains gaps, especially regarding informal trade, and requires further research. As domestic and international demand for groundnuts is expected to increase in coming years and as groundnut value chains in Tanzania will continue develop, many authors predict that the marketing of groundnuts produced in Tanzania will increase both locally and internationally (CEPA, 2016; ITC, 2015; Bill and Melinda Gates Foundation, 2014b).

The 2007-2008 Agricultural Census provides data regarding challenges to groundnut marketing in Tanzania. The most common reason, expressed by 379,560 households, was that the open market price was too low; 16,057 households had no accessible means of transport, 24,421 found transport costs to be too high, 29,118 reported that the crop market was too far. In addition, 1,518 households reported problems with farmers' association, 4,655 reported problems with cooperatives, and 1,202 reported problems with trade unions; 2,225 reported government regulatory problems, 5,520 reported having no buyer, and 9,994 lacked information on the market. Finally, 178,807 households reported having no problems with marketing, and 408,007 labeled the question as not applicable (NBS, 2012). Groundnut farmers in Tabora reported travelling an average of 11 km in order to reach their selling points. Forty-three percent of the households reported that men were responsible for selling groundnuts and controlled the proceeds from the sale, 29 percent reported that women were responsible for selling groundnuts and controlled the proceeds, and 27 percent reported joint ownership and control (Katundu, et al. 2014).

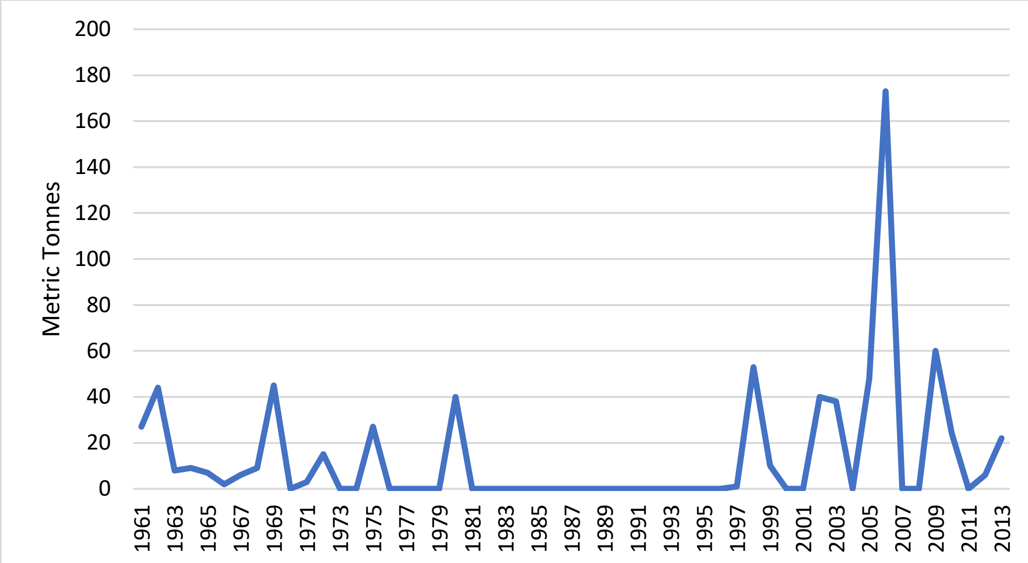
Data regarding the prices that smallholders receive for their groundnut products and the incentives they receive for processing conflict. Katundu et al. (2014) find average market prices of 7,323 Tanzanian Shillings per bag (24 kg) for shelled groundnuts and 6,326 Tanzanian Shillings per bag for unshelled groundnuts; the study argues that this difference (16.5 percent) is not enough to incentivize smallholders to shell their groundnuts. However, a study conducted by the Bill and Melinda Gates Foundation in Mbeya district finds that farmers make an 8 percent profit margin from selling unshelled groundnuts and a 218 percent profit from selling shelled groundnuts; the study highlights that problems obtaining shelling machines and the time required to shell by hand pose significant barriers to selling shelled groundnuts (Bill and Melinda Gates Foundation, 2012).

Figure 4.5 Tanzanian Exports of Shelled Groundnuts and Groundnut Cake



Source: FAOSTAT (2017c)
Notes: Data is in calendar year.

Figure 4.6 Tanzanian Exports of Groundnut Oil



Source: FAOSTAT (2017c)
Notes: Data is in calendar year.

Policies Impacting the Groundnut Value Chain

Tanzania's National Development Mission 2025, which guides economic policy in the country, aims to transform Tanzania from an agricultural economy to a semi-industrialized economy supported by a productive agricultural sector. Key objectives relevant to the oilseeds sector are to achieve an annual grinding rate of 2 million tons of oilseeds, to produce 450,000 tons of oil annually in order to achieve domestic self-sufficiency in the production of edible oils, and to become a major exporter of edible oils (United Republic of Tanzania, 2014).

Tanzania's latest five-year plan for the period of 2016-2017 to 2020-2021 focuses on industrialization; one of its key goals is to develop Tanzania's agro-processing sector, specifically increasing annual edible oil production from 100,000 in 2015 to 250,000 by 2020. The plan also makes numerous references to planned investments from both the private and the public sector in the oilseed processing sector, including the development of an edible oil processing plant in Singida, continued financing for oilseed research, and the establishment of food processing training centers in Morogoro and Dar es Salaam. The plan also states that an export processing zone that includes a modern trade hub will be created In Kurasini, near the port of Dar Es Salaam (United Republic of Tanzania, 2016). This zone, in tandem with other investments in the port of Dar es Salaam, will help facilitate the export of agricultural products (Morisset, 2013).

Tanzania's Agriculture Sector Development Strategy aims to achieve an annual agriculture growth rate of 5 percent (United Republic of Tanzania 2014), and the National Agriculture Policy (United Republic of Tanzania 2013) make numerous reference to developing agricultural value chains and supporting the transition from subsistence to commercial agriculture (United Republic of Tanzania, 2013). In particular, these policies promote public expenditure to support farmers' access to inputs, finance, technology, and markets. However, Tanzania's annual budget remains limited and as a result, research, agricultural extension, and quality control services remain limited as well (FAO, 2012).

Although Tanzania has no specific groundnut development strategy, the government's increasing interest in developing the edible oil sector is illustrated by a recently released Sunflower Sector Development Strategy 2016-2020, jointly produced by the Tanzanian Ministry of Industry, Trade, and Investment. This is significant for this study because sunflower and groundnuts constitute Tanzania's two largest oilseed crops, representing 35 percent and 25 percent of total production, respectively, and have overlapping value chains (ITC, 2016).

Since 2003, Tanzania has implemented limited fertilizer subsidies (which had been previously eliminated in the 1980s) (Cagley, 2009). Although there is limited data available, it is clear that while fertilizer use in Tanzania has increased significantly in recent years, it favors a few crops, notably maize and rice (Minot, 2009). For instance, in 2008, Tanzania implemented the NAIVS, which provides a 50 percent fertilizer subsidy to maize and rice farmers (Huang et al., 2017). According to the World Bank, the NAIVS between 2008 and 2013 has been responsible for the production of an additional 2.5 million tons of rice and maize (World Bank, 2014). If expanded to cover the production of groundnut crops, NAIVS is likely to influence groundnut yields positively as well.

ITC (2016) highlights that the complex and multi-layered taxation system for Tanzania's oilseed sector has held back growth in the sector (ITC, 2016). For instance, cess, an agricultural tax, is currently levied at 3 percent for all cash crops (KPMG, 2017). In addition, another study highlights that a range of other taxes increase costs significantly (especially for small and medium-sized agro-processors), including: a 2.5 percent production tax imposed by district governments every time produce crosses district borders, a 1 percent tax on all invoices, a fee to obtain a business license, and a 40 percent increase in tariffs on electricity usage (van der Ven, 2012). Despite a relatively high VAT rate of 20 percent, unprocessed agriculture, including unprocessed groundnuts, remains exempt from VAT; in addition, there is currently a VAT waiver in place on domestically processed oils (ITC, 2015). Very little information exists on local district and municipality taxes, but a 2009 report based on farmer surveys finds that local taxes generally do not place a significant financial burden on farmers (World Bank, 2009b). Regarding trade policy, Table B. 11 and Table B. 12 present import tariffs for groundnuts and groundnut oil for most-favored-nation status countries and for East African Community countries. According to BMGF (2014b), there are currently minimum taxes on groundnut exports. In our study period, Tanzania is a net importer of groundnuts in 2013-2014 and 2014-2015 and net exporter in prior years. Tanzania is a net importer of groundnut oil 2007-2008 and a net exporter in all other years.

Data Sources for Groundnut Value Chain NRPs

To analyze the impact of policy space on Tanzanian groundnut farmers, we utilize the NRP methodology. To compute NRPs, we use price data from various sources (both international prices and Tanzanian prices) for the multiple nodes of the groundnut value chain, including groundnut oil.

We collect price data for different value chain locations in Tanzania, such as the border and the farmgate. All farmgate prices are at the regional level and all border prices are at the national level. We include 13 regions in our analysis and focus on regions with LRS only. Crop (marketing) years differ between LRS and SRS, as seen in Figure A.1. The majority of groundnut production occurs in the LRS (unimodal rainfall). The main growing regions — Shinyanga, Dodoma, Singida, Tabora, and Mtwara — are located in the East and South of the country. Thus, we choose LRS' crop calendar for groundnut for our marketing year definition: May-April. For conversion of data in calendar year and rest of the analysis, we define the marketing year as May to April.

We compute the net trade status of agricultural commodities using UNCOMTrade database

(2017) (net trade = exports – imports) for groundnuts and groundnut oil. Groundnuts includes all groundnuts, whether shelled, broken or whole. Groundnut oil includes all types and fractions, both refined and unrefined (but not chemically modified). Tanzania switches between net exporter and net importer for both commodities in our period of analysis.

We chose the international price for groundnuts as the best representative price of that commodity in global markets. International price comes from World Bank GEM database (World Bank, 2017b) and is Rotterdam CIF price but U.S. origin. We convert these prices to Tanzanian Shillings per metric tonne. The exchange rate of Tanzanian Shillings per US$ comes from IHS MARKIT. For groundnut oil, we use World Bank GEM database (World Bank, 2017b) as a source, which publishes Rotterdam CIF price (of any origin).

For years during which Tanzania is a groundnut or groundnut oil importer, we adjust international price to CIF price in Tanzania by adding transportation costs. For years during which Tanzania is a net exporter, we do not adjust international price and use it as international price. Border (import and export depending on net trade status) prices for Tanzania for both commodities come from UNCOMTrade (2017) data, from which we calculate import price based on estimated import quantity and import value and export price based on estimated export quantity and export value.

Farmgate (harvest) prices for groundnut for LRS regions come from Living Standards Measurement Study (LSMS) survey data provided by World Bank at regional level for 2008-2009, 2010-2011, and 2012-2013 (NBS (2016a, 2016b, 2016c)). Margins along the value chain from farm to wholesalers range between 50 percent and 100 percent (BMGF 2014b); this analysis assumes a 50 percent margin.

For marketing costs, we are limited by data availability. Since we did not have sources with which to measure marketing costs between border and point of competition and between point of competition and farmgate separately, we apply this data only once between point of competition (retail or wholesale) and farmgate. Appendix C provides detailed data documentation.

Groundnut Value Chain NRP Results

We compute the NRPs for two nodes along the groundnut value chain: border and farmgate for groundnut and groundnut oil. Figure 4.7 shows NRPs at the border for Tanzania for both commodities, while Table B. 8 and Table B. 9 present detailed numbers along with trade status. Tanzania's trade status changes between net importer and net exporter in our analysis period for both commodities.

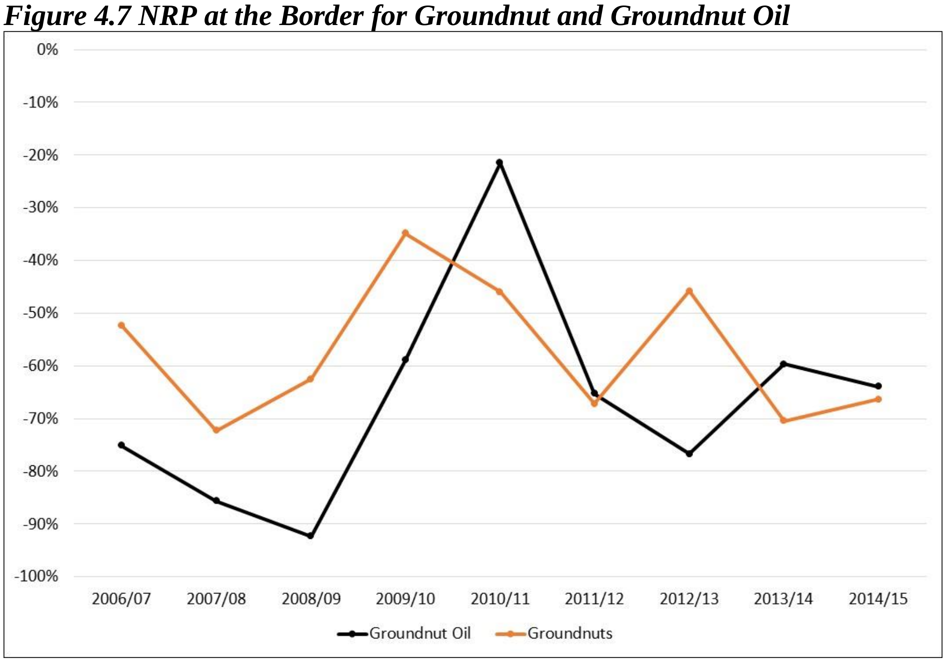
For groundnuts, NRPs are negative at the border for all years, regardless of whether Tanzania is a net importer or net exporter. When Tanzania is a net exporter from 2006-2007 through 2012-2013, the NRPs range between -35 percent and -72 percent. When Tanzania is a net importer in 2013-2014 and 2014-2015, the NRPs are -70 percent and -66 percent, respectively. The negative NRPs during net exporting years show disincentives in the groundnut export market, despite the existence of minimal to no export taxes for groundnuts. Tanzanian exporters receive lower than world market prices for their groundnuts, as seen in Figure B. 3. The negative NRPs in net importer years show that Tanzania also paid less than world market prices for groundnut imports. Import tariffs, shown in Table B. 11, show preferential tariffs for EAC countries with which Tanzania trades with. Thus, negative NRPs in net importer years are as expected. As with maize, it appears that Tanzania groundnut NRPs imply some anti-trade bias for exports.

For groundnut oil, Tanzania was a net importer for the 2007-2008 marketing year and a net exporter for the rest of the analysis period. All NRPs in our period of analysis are negative. For years during which Tanzania is a net exporter, the NRPs are as expected and in line with the situation in the groundnut oil markets. Tanzania has not yet developed the processing and marketing stages of the groundnut value chain, and inefficiencies in the value chain create disincentives in export markets. Figure B. 4 presents international prices for groundnut oil and Tanzanian border prices for groundnut oil, showing that when Tanzania exports groundnut oil, it does so at prices below international prices. When Tanzania imports, it imports from neighboring countries and thus pays a lower price than international market prices. This is in line with preferential tariffs for East African Community (EAC) countries, as shown in Table B. 12.

In this paper, we focus on how policies affect farmers in Tanzania. We compute NRPs at the farmgate for the main producing regions in Tanzania using the regional farmgate price data from the LSMS survey (NBS, 2016a, 2016b, 2016c). Figure 4.8 shows average NRP for average of LRS regions along with NRP at the border for groundnuts.[3] Figure 4.9 shows these NRPs for groundnuts in all LRS regions for three years (2008-09, 2010-11, 2012-13). Table B. 10 presents these NRPs for each region. For the three years for which we compute NRPs at farmgate, Tanzania is a net exporter of groundnuts. For all regions and years, the NRPs are negative, showing that disincentives in the groundnut export market reverberate through the domestic market and affect farmers negatively.

Figure 4.10 presents the average farmgate prices for each region, showing the variation in prices received by farmers across regions. NRPs vary across regions even though we include market access costs between farmgate and wholesale markets for each region individually. Therefore, the different NRPs across regions may show the impact of regional/state-level policy framework or other market inefficiencies leading to variation in prices that farmers receive.

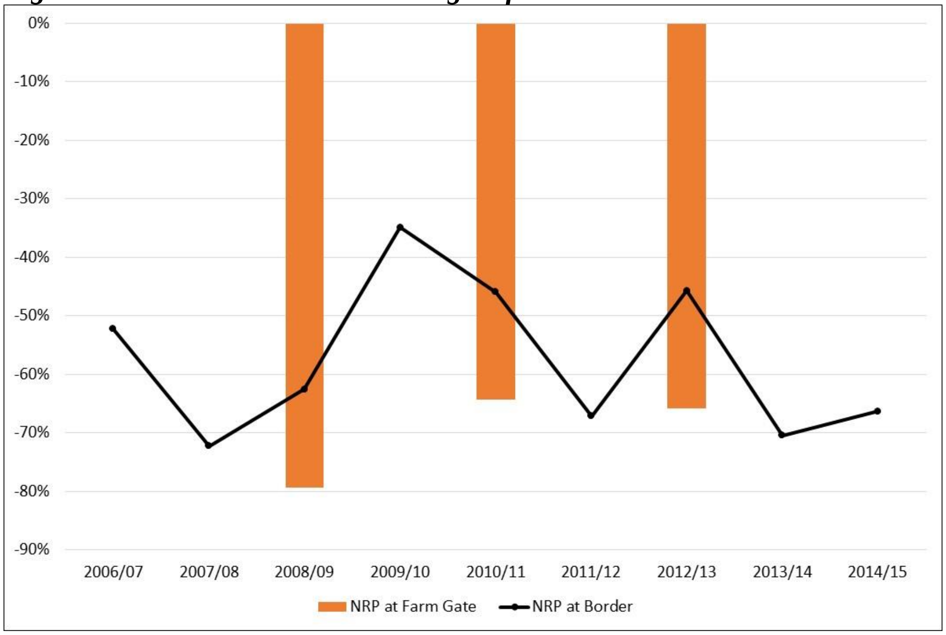
Figure 4.7 NRP at the Border for Groundnut and Groundnut Oil



Source: Authors' computations
Notes: NRPs are presented across crop marketing years for 2008-2009, 2010-2011, and 2012-2013.

[3] We do not present NRPs for SRS regions since the majority of groundnut production occurs in the LRS and relatively little production occurs in the SRS.

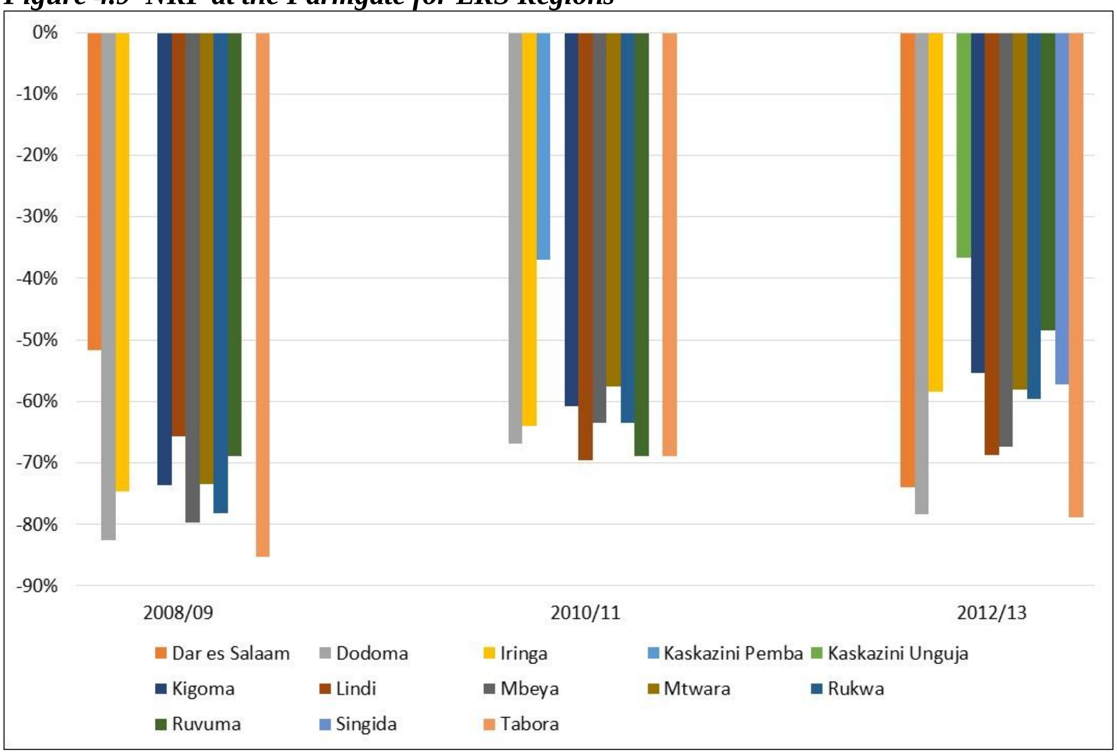
Figure 4.8 NRP at Border and Farmgate for Groundnuts



Source: Authors' computations

Notes: NRPs are presented across crop marketing years for 2008-2009, 2010-2011, and 2012-2013. NRP at Farmgate represents LSMS average for LRS regions.

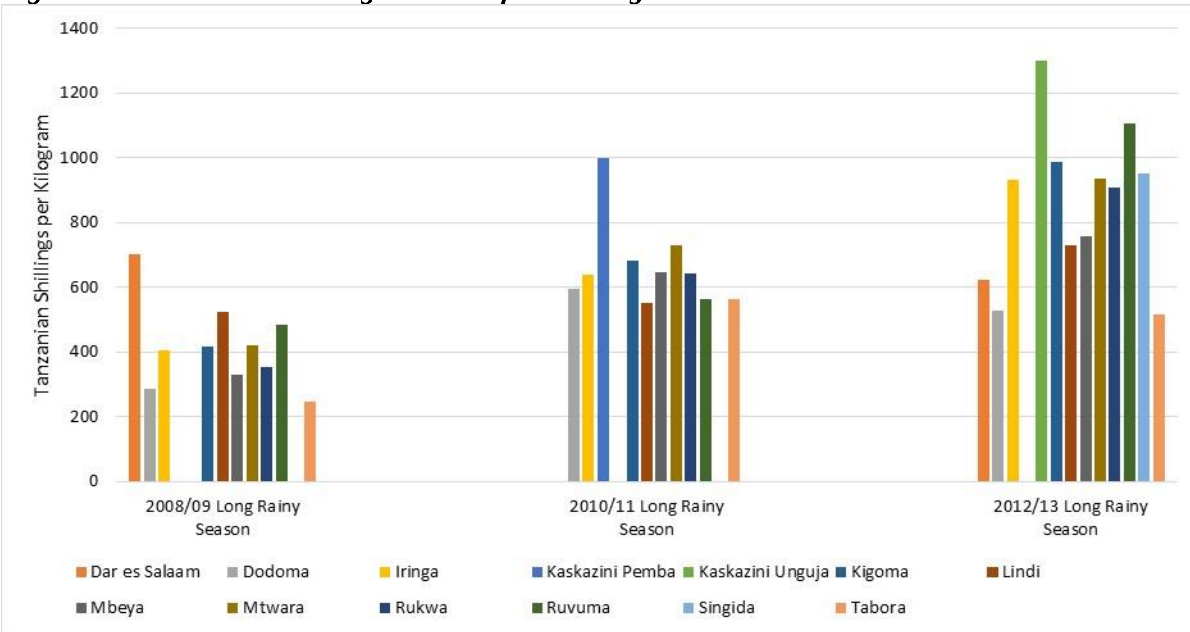
Figure 4.9 NRP at the Farmgate for LRS Regions



Source: Authors' computations

Notes: NRPs are presented across crop marketing years for 2008-2009, 2010-2011, and 2012-2013 for regions provided by LSMS Survey data that are grouped by LRS pattern.

Figure 4.10 Groundnut Farmgate Prices for LRS regions



Source: LSMS Survey data

Notes: Farmgate prices for each region are average of prices reported in the survey for each region.

5. CONCLUSIONS

Tanzania's National Development Mission 2025, which guides economic policy in the country, aims to transform Tanzania from an agricultural economy to a semi-industrialized economy supported by a productive agricultural sector. Tanzania's agricultural policies, such as the Agriculture Sector Development Strategy (United Republic of Tanzania 2014) and the National Agriculture Policy (United Republic of Tanzania 2013), focus on developing agricultural value chains and supporting the transition from subsistence to commercial agriculture (United Republic of Tanzania, 2013). In this context, this study analyzes two important agricultural value chains in Tanzania (maize and groundnut) that have the potential to add to agricultural development, create value for the Tanzanian economy, and increase rural incomes and employment.

These value chains comprise an important share of the agricultural sector in Tanzania, affecting a considerable number of smallholder farmers. We present the policy framework affecting these value chains to try to understand the implications for economic agents along the value chains. We utilize the nominal rate of protection (NRP) methodology from Krueger, Schiff, and Valdes (1988) and apply it to different nodes of these two value chains in order to provide estimates of distortions to agricultural incentives along the complete value chain.

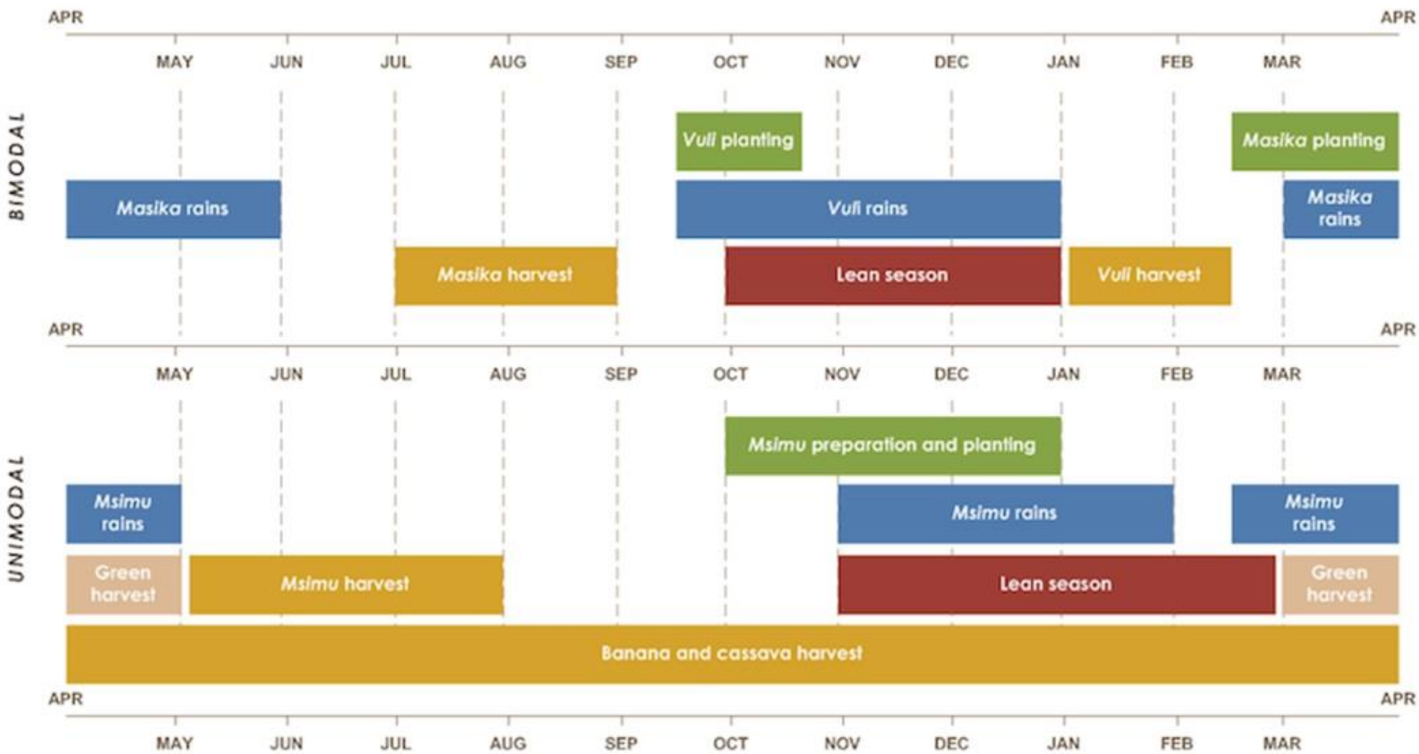
The maize value chain analysis includes maize and maize flour, and Tanzania's trade status varies between net importer and net exporter for both commodities. The border NRPs for maize vary between negative and positive, and results imply an anti-trade bias; when maize is imported, those imports face a tariff (hence the positive NRPs in most years it is imported) and when it is exported, it is often taxed (hence the negative NRPs in most years during which maize is exported). For maize flour, Tanzania is a net importer for three years and a net exporter for the rest of the period. All border NRPs in our period of analysis are negative. For years during which Tanzania is a net exporter, these negative NRPs are expected and in line with the situation in the maize value chain. However, the negative NRPs for years during which Tanzania is a net importer are not expected. The average NRPs at the farmgate for maize flour are also negative.

Groundnut NRPs are negative at the border for all years, regardless of whether Tanzania is a net importer or net exporter for groundnuts and groundnut oil. The negative NRPs for groundnuts during net exporting years show that Tanzanian exporters receive less than world market prices. Despite imposing minimal to no export taxes, Tanzania receives border prices that are lower than world market prices, showing structural problems in the groundnut export market that prevent Tanzania from fully realizing its export revenue potential. The negative groundnut border NRPs in net importing years show that Tanzania pays less than world market prices for groundnut imports; these NRPs are expected because of preferential groundnut import tariffs for EAC countries with which Tanzania trades. For the three years for which we compute groundnut NRPs at farmgate, Tanzania is a net exporter of groundnuts, with negative border NRPs. For all regions and years, the farmgate NRPs are negative for groundnuts, suggesting that disincentives in the export market reverberate through the domestic market and negatively impact farmers. For years during which Tanzania is a net exporter of groundnut oil, the observed negative border NRP is expected and in line with the situation in the groundnut oil value chain. Tanzania has not yet developed the processing and marketing stages of the groundnut value chain, and inefficiencies in the value chain create disincentives in export markets for the processed good of groundnut oil.

For both maize and groundnut value chains, farmgate prices and NRPs for each region show significant variation; this indicates the impact of regional/state-level policy framework or other market inefficiencies leading to variation in farmgate prices. Furthermore, both value chains remain underdeveloped in terms of processing of raw commodities and trade of the processed outputs. Further research on the value chain participants and processing channels of Tanzania's main commodities is needed to provide more insight and identify the best mechanisms for increasing efficiencies in processing and value addition across the value chain.

APPENDIX A

Figure A.1 Crop Calendar for Tanzania



Source: FEWS NET (2017)

APPENDIX B

Maize Value Chain Results

Table B. 1 NRPs and Trade Status

Commodity	Year	Commodity Trade Status	NRP at Border
Maize (White)	2006/07	Importer	-26%
Maize (White)	2007/08	Exporter	-57%
Maize (White)	2008/09	Importer	107%
Maize (White)	2009/10	Importer	258%
Maize (White)	2010/11	Importer	235%
Maize (White)	2011/12	Exporter	47%
Maize (White)	2012/13	Exporter	-31%

Source: Authors' computations and FAOSTAT database (2017c).

Table B. 2 NRPs and Trade Status

Commodity	Year	Commodity Trade Status	NRP at Border	NRP at Farmgate
Maize Flour	2006/07	Import	-50%	
Maize Flour	2007/08	Import	-39%	
Maize Flour	2008/09	Import	-17%	36%
Maize Flour	2009/10	Export	-65%	
Maize Flour	2010/11	Export	-58%	-10%
Maize Flour	2011/12	Export	-63%	
Maize Flour	2012/13	Export	-70%	311%

Source: Authors' computations and FAOSTAT database (2017c).
Notes: NRPs are presented across crop marketing years for 2008-2009, 2010-2011, and 2012-2013. NRP at farmgate is based on LSMS Average and denotes average NRP across all data points, not average of regional NRPs.

Table B. 3 NRPs for Maize at Farmgate

Commodity	Year	Trade Status	LSMS Average for LRS	LSMS Average for SRS
Maize (White)	2008/09	Importer	-54%	-46%
Maize (White)	2010/11	Importer	-42%	-41%
Maize (White)	2012/13	Exporter	-14%	-8%

Source: Authors' computations and FAOSTAT database (2017c).
Notes: NRPs are presented across crop marketing years for 2008-2009, 2010-2011, and 2012-2013 for regions provided by LSMS Survey data. LSMS Average denotes average NRP across all data points, not average of regional NRPs.

Table B. 4 NRPs for Maize at Farmgate for LRS Regions

Commodity	Year	Dar es Salaam	Dodoma	Iringa	Kaskazini Pemba	Kigoma	Kilimanjaro
Maize (White)	2008/09		-51%	-52%	-57%	-60%	-37%
Maize (White)	2010/11	-57%	-35%	-43%	-24%	-37%	-43%
Maize (White)	2012/13	-17%	4%	-16%	-30%	-3%	15%
		Lindi	**Manyara**	**Mara**	**Mbeya**	**Mtwara**	**Pwani**
Maize (White)	2008/09	-56%	-50%	-38%	-54%	-42%	-28%
Maize (White)	2010/11	-34%	-45%	-29%	-41%	-46%	-35%
Maize (White)	2012/13	-3%	-3%	8%	-14%	-9%	3%
		Rukwa	**Ruvuma**	**Singida**	**Tabora**	**Tanga**	
Maize (White)	2008/09	-60%	-57%	-63%	-58%	-58%	
Maize (White)	2010/11	-45%	-42%	-43%	-40%	-46%	
Maize (White)	2012/13	-25%	-21%	-7%	-11%	-17%	

Source: Authors' computations.
Notes: $NRPs$ are presented across crop marketing years for 2008-2009, 2010-2011, and 2012-2013 for regions provided by LSMS Survey data.

Table B. 5 NRPs for Maize at Farmgate for SRS

Commodity	Year	Arusha	Kagera	Morogoro	Mwanza	Shinyanga
Maize (White)	2008/09	-23.4%	-46%	-51%	-51%	-45%
Maize (White)	2010/11	-57.4%	-42%	-47%	-38%	-39%
Maize (White)	2012/13	-0.2%	-3%	-31%		

Source: Authors' computations.
Notes: $NRPs$ are presented across crop marketing years for 2008-2009, 2010-2011, and 2012-2013 for regions provided by LSMS Survey data.

Table B. 6. Tanzania Maize Import Tariffs

Year	Tariff	Partner
2005	50	Most Favored Nation duty rate treatment
2005	0	Preferential tariff for Kenya under (EAC) East African Community
2005	0	Preferential tariff for Uganda under (EAC) East African Community
2006	50	Most Favored Nation duty rate treatment
2006	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2007	50	Most Favored Nation duty rate treatment
2007	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2008	50	Most Favored Nation duty rate treatment
2008	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2009	50	Most Favored Nation duty rate treatment
2009	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2010	50	Most Favored Nation duty rate treatment
2010	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2011	50	Most Favored Nation duty rate treatment
2011	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2012	50	Most Favored Nation duty rate treatment
2012	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2013	50	Most Favored Nation duty rate treatment
2013	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2014	50	Most Favored Nation duty rate treatment
2014	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2015	50	Most Favored Nation duty rate treatment
2015	0	Preferential tariff for South Africa
2015	0	Regional Preferential tariff for SADC countries
2015	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)

Source: WITS (2018)

Table B. 7 Tanzania Maize Flour Import Tariffs

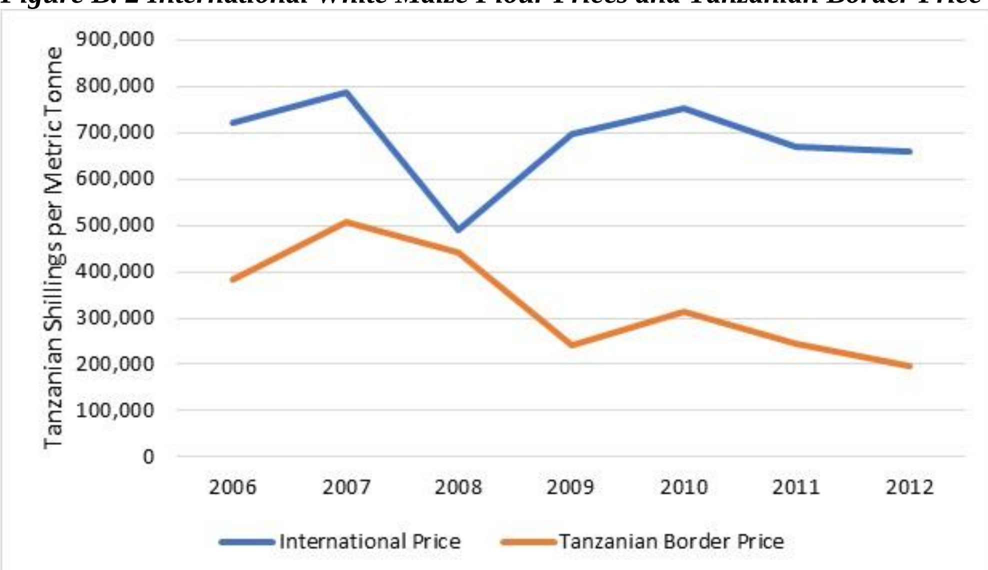
Year	Tariff	Partner
2005	25	Most Favored Nation duty rate treatment
2005	0	Preferential tariff for Kenya under (EAC) East African Community
2005	0	Preferential tariff for Uganda under (EAC) East African Community
2006	25	Most Favored Nation duty rate treatment
2006	0	Preferential tariff for Kenya under (EAC) East African Community
2006	0	Preferential tariff for Uganda under (EAC) East African Community
2007	25	Most Favored Nation duty rate treatment
2007	0	Preferential tariff for Kenya under (EAC) East African Community
2007	0	Preferential tariff for Uganda under (EAC) East African Community
2008	50	Most Favored Nation duty rate treatment
2008	0	Preferential tariff for Kenya under (EAC) East African Community
2008	0	Preferential tariff for Uganda under (EAC) East African Community
2009	50	Most Favored Nation duty rate treatment
2009	0	Preferential tariff for Kenya under (EAC) East African Community
2009	0	Preferential tariff for Uganda under (EAC) East African Community
2009	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2010	50	Most Favored Nation duty rate treatment
2010	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2011	50	Most Favored Nation duty rate treatment
2011	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2012	50	Most Favored Nation duty rate treatment
2012	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2013	50	Most Favored Nation duty rate treatment
2013	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2014	50	Most Favored Nation duty rate treatment
2014	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2015	50	Most Favored Nation duty rate treatment
2015	0	Preferential tariff for South Africa
2015	0	Regional Preferential tariff for SADC countries
2015	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)

Source: WITS (2018)

Figure B. 1 International White Maize Prices and Tanzanian Border Price

Source: UNCOMTrade (2017) for South Africa White Maize Export Price and Tanzania Import and Export Price.

Figure B. 2 International White Maize Flour Prices and Tanzanian Border Price



Source: UNCOMTrade (2017) for South Africa White Maize Export Price and Tanzania Import and Export Price.

Groundnut Value Chain Results

Table B. 8 NRPs and Trade Status

Commodity	Year	Commodity Trade Status	NRP at Border
Groundnuts	2006/07	Exporter	-52%
Groundnuts	2007/08	Exporter	-72%
Groundnuts	2008/09	Exporter	-63%
Groundnuts	2009/10	Exporter	-35%
Groundnuts	2010/11	Exporter	-46%
Groundnuts	2011/12	Exporter	-67%
Groundnuts	2012/13	Exporter	-46%
Groundnuts	2013/14	Importer	-70%
Groundnuts	2014/15	Importer	-66%

Source: Authors' computations and UNComtrade database (2017),

Table B. 9 NRPs and Trade Status

Commodity	Year	Commodity Trade Status	NRP at Border
Groundnut Oil	2006/07	Exporter	-75%
Groundnut Oil	2007/08	Importer	-86%
Groundnut Oil	2008/09	Exporter	-92%
Groundnut Oil	2009/10	Exporter	-59%
Groundnut Oil	2010/11	Exporter	-21%
Groundnut Oil	2011/12	Exporter	-65%
Groundnut Oil	2012/13	Exporter	-77%
Groundnut Oil	2013/14	Exporter	-60%
Groundnut Oil	2014/15	Exporter	-64%

Source: Authors' computations and UNComtrade database (2017),

Table B. 10 NRPs for Groundnut at Farmgate for LRS Regions

Year	Commodity Trade Status	Dar es Salaam	Dodoma	Iringa	Kaskazini Pemba	Kaskazini Unguja	Kigoma	
2008/09	Exporter	-52%	-83%	-75%			-74%	
2010/11	Exporter		-67%	-64%	-37%		-61%	
2012/13	Exporter	-74%	-78%	-58%		-37%	-55%	
		Lindi	**Mbeya**	**Mtwara**	**Rukwa**	**Ruvuma**	**Singida**	**Tabora**
2008/09	Exporter	-66%	-80%	-73%	-78%	-69%		-85%
2010/11	Exporter	-70%	-63%	-58%	-64%	-69%		-69%
2012/13	Exporter	-69%	-67%	-58%	-60%	-48%	-57%	-79%

Source: Authors' computations.

Notes: NRPs are presented across crop marketing years for 200-20/09, 2010-2011, and 2012-2013 for regions provided by LSMS Survey data.

Table B. 11. Tanzania Groundnut Import Tariffs

Year	Tariff	Partner
2005	10	Most Favored Nation duty rate treatment
2005	0	Preferential tariff for Kenya under (EAC) East African Community
2005	0	Preferential tariff for Uganda under (EAC) East African Community
2006	10	Most Favored Nation duty rate treatment
2006	0	Preferential tariff for Kenya under (EAC) East African Community
2006	0	Preferential tariff for Uganda under (EAC) East African Community
2007	10	Most Favored Nation duty rate treatment
2007	0	Preferential tariff for Kenya under (EAC) East African Community
2007	5	Preferential tariff for South Africa
2007	0	Preferential tariff for Uganda under (EAC) East African Community
2007	5	Regional Preferential tariff for SADC countries
2008	10	Most Favored Nation duty rate treatment
2008	0	Preferential tariff for Kenya under (EAC) East African Community
2009	10	Most Favored Nation duty rate treatment
2009	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2010	10	Most Favored Nation duty rate treatment
2010	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2011	10	Most Favored Nation duty rate treatment
2011	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2012	10	Most Favored Nation duty rate treatment
2012	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2013	10	Most Favored Nation duty rate treatment
2013	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2014	10	Most Favored Nation duty rate treatment
2014	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2015	10	Most Favored Nation duty rate treatment
2015	0	Preferential tariff for South Africa
2015	0	Regional Preferential tariff for SADC countries
2015	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)

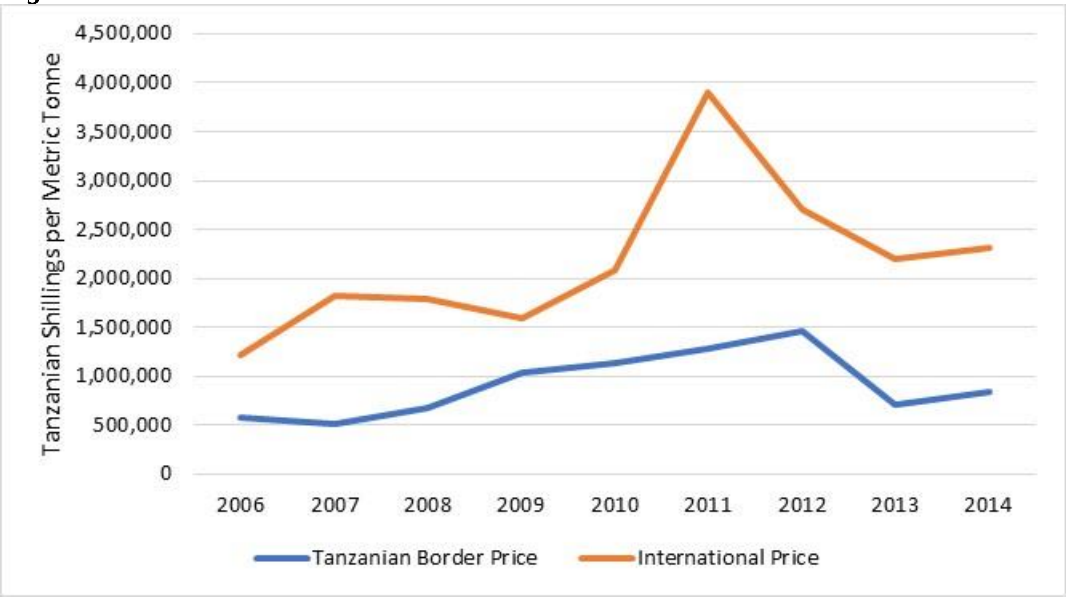
Source: WITS (2018)

Table B. 12. Tanzania Groundnut Oil Import Tariffs

Year	Tariff	Partner
2005	25	Most Favored Nation duty rate treatment
2005	20	Preferential tariff for South Africa
2005	0	Preferential tariff for Uganda under (EAC) East African Community
2005	15	Regional Preferential tariff for SADC countries
2006	25	Most Favored Nation duty rate treatment
2006	20	Preferential tariff for Kenya under (EAC) East African Community
2006	15	Preferential tariff for South Africa
2006	0	Preferential tariff for Uganda under (EAC) East African Community
2006	10	Regional Preferential tariff for SADC countries
2007	25	Most Favored Nation duty rate treatment
2007	15	Preferential tariff for Kenya under (EAC) East African Community
2007	5	Preferential tariff for South Africa
2007	0	Preferential tariff for Uganda under (EAC) East African Community
2007	5	Regional Preferential tariff for SADC countries
2008	25	Most Favored Nation duty rate treatment
2008	10	Preferential tariff for Kenya under (EAC) East African Community
2008	0	Preferential tariff for Uganda under (EAC) East African Community
2009	25	Most Favored Nation duty rate treatment
2009	5	Preferential tariff for Kenya under (EAC) East African Community
2009	0	Preferential tariff for Uganda under (EAC) East African Community
2009	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2010	25	Most Favored Nation duty rate treatment
2010	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2011	25	Most Favored Nation duty rate treatment
2011	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2012	25	Most Favored Nation duty rate treatment
2012	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2013	25	Most Favored Nation duty rate treatment
2013	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2014	25	Most Favored Nation duty rate treatment
2014	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)
2015	25	Most Favored Nation duty rate treatment
2015	0	Preferential tariff for South Africa
2015	0	Regional Preferential tariff for SADC countries
2015	0	Preferential tariff for East African Community (EAC) (Kenya, Tanzania, Uganda, Rwanda, Burundi)

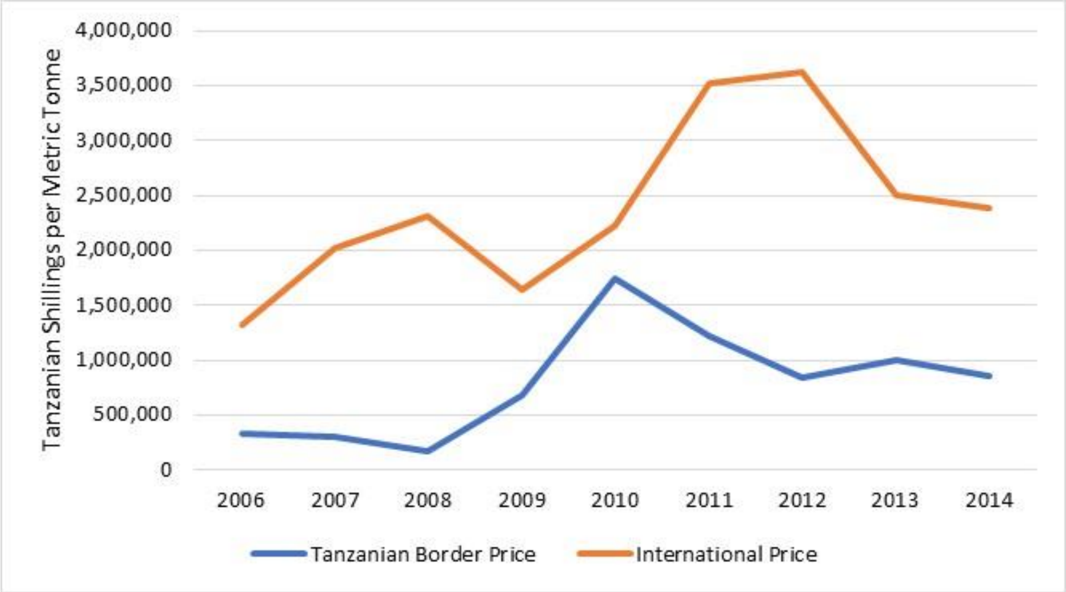
Source: WITS (2018)

Figure B. 3 International and Tanzanian Groundnut Price



Source: World Bank (2017b) and UNComtrade (2017)

Figure B. 4 International and Tanzanian Groundnut Oil Price



Source: World Bank (2017b) and UNComtrade (2017)

APPENDIX C

Data Sources for Maize Value Chain

We conduct analysis in marketing years in which the crop calendar from FEWS NET (2017) is used. The crop calendar for Tanzania provided by FEWS NET (2017) is consistent with the crop calendar provided by World Food Programme (WFP, 2015). We include 26 regions in our analysis and divide them into two groups: regions with LRS and regions with SRS. Crop (marketing) years differ between LRS and SRS, as seen in Figure A1. For conversion of data in calendar year and rest of the analysis, we define the marketing year as July to June. If price data or trade data for Tanzania or international is in calendar year in original source, we convert these data series into marketing year by formula.

In Tanzania, most of maize produced is white maize; thus our data collection and analysis focuses on white maize only. We chose the international price for white maize as the best representative price of that commodity in global markets. International price comes from UNCOMTrade (2017) for South Africa export price to World for white maize and white maize flour. We convert these prices to Tanzanian Shillings per metric tonne. Exchange rate for Tanzanian Shillings per US$ comes from IHS MARKIT.

For years during which Tanzania is a net importer of maize or white maize, we adjust international price to CIF price in Tanzania by adding transportation costs. For years during which Tanzania is a net exporter, we do not adjust international price and rather use it as FOB price of South Africa. From 'World Freight Rates' online database, we have transport costs from various ports in South Africa to Dar es Salaam in Tanzania, ranging between $35 and $39. We add $35 per ton when to the international price when Tanzania is a net importer of maize and maize flour.

Border (import and export) prices for Tanzania for both commodities come from UNCOMTrade (2017) calendar year data, from which we calculate import price based on estimated import quantity and import value and export price based on estimated export quantity and export value. We convert the price series from US$ per kilogram to Tanzanian Shillings per metric tonne.

Farmgate (harvest) prices come from LSMS survey data provided by World Bank at the regional level for Tanzania for 2008-2009, 2010-2011, and 2012-2013 (NBS, 2016a, 2016b, 2016c). We report farmgate prices for maize flour as LSMS average and not at the regional level. Price data is provided in marketing year, so no conversion is made. Regions in LSMS survey include Dar es Salaam, Dodoma, Iringa, Kaskazini Pemba, Kigoma, Kilimanjaro, Lindi, Manyara, Mara, Mbeya, Mtwara, Pwani, Rukwa, Ruvuma, Singida, Tabora, and Tanga for LRS. We include Arusha, Kagera, Morogoro, Mwanza, Shinyanga for SRS. We compute farmgate prices for each household by using quantity sold and value of sale reported. For LSMS average and for regional averages for farmgate prices, we first conduct sensitivity analyses for price series to check data for negative prices or outliers. Price data for maize is in Tanzanian Shillings per kilogram. We convert the price data into Tanzanian Shillings per metric tonne for analysis. In this study, we chose to use LSMS survey data due to its transparency in collection and data documentation.

LSMS survey data is based on Tanzania National Panel Survey data for Tanzania for all years. The GHS-Panel sample on agriculture divides Tanzania into 26 regions and records agriculture data for commodities in the long rainy season and the short rainy season. Data is collected in three rounds: 2008-2009, 2010-2011, and 2012-2013. There were 3,265 households for 2008-2009, 3,924 for 2010-2011, and 5,010 for 2012-2013.

Data descriptions for entries used are:

a. 2008 - 2009

Section 5A (Long Rainy Season) and 5B (Short Rainy Season)

Zaocode	CROP ID
S5aq1, S5bq1	Did you sell any of the [CROP] produced in 08?
S5aq2, S5bq2	Quantity sold: KGs
S5aq3, S5bq3	Total value of sales: T-SHILLINGS
S5aq9, S5bq9	Did you transport [CROP] for sale?
S5aq10, S5bq10	Average distance you transported [CROP] for sale
S5aq13, S5bq13	How much did you pay to transport [CROP]?

Section 9: For byproducts

zaocode	CODE
byproduct	By-product produced from this crop
s9q2name	Crop: name
s9q2_2	Crop: PROCESSED OR BY-PRODUCT
s9q5	Was any [BY-PRODUCT] sold?
s9q6_1	How much was sold: amount
s9q6_2	How much was sold: unit
s9q8	Total sales in shillings

b. 2010-2011

Section 5A (Long Rainy Season) and 5B (Short Rainy Season)

zaocode	CROP CODE
ag5a_01, ag5b_01	1.Did you sell any of the [CROP] produced in the long/short rainy season?
ag5a_02, ag5b_02	2.What was the quantity sold?
ag5a_03, ag5b_03	3.What was the total value of the sales?
ag5a_15, ag5b_15	15.Did you transport [CROP] for sale?
ag5a_16, ag5b_16	16. What is the average distance you transported [CROP] for
ag5a_19, ag5b_19	19.How much did you pay to transport [CROP]

Section 9: For byproducts

ag09_02_1	Crop Name
zaocode	Crop Code
ag09_02_3	Processed / By-Product AG09_02_3
ag09_05	Was any [BY-PRODUCT] sold?
ag09_06_1	How much was sold? AMOUNT
ag09_06_2	How much was sold? UNIT
ag09_08	What was total sales? TSH

c. 2012-2013

Section 5A (Long Rainy Season) and 5B (Short Rainy Season)

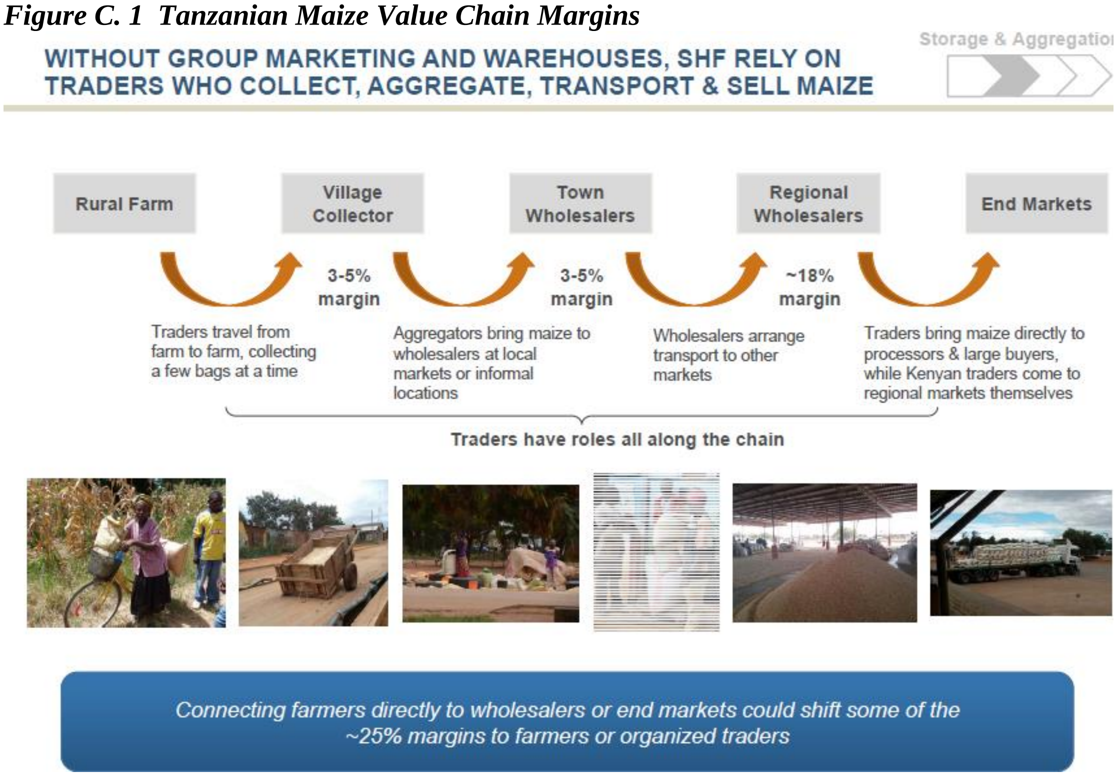
y3_hhid	Unique Household Identification NPS Y3
zaocode	CROP CODE
zaoname	CROP NAME
ag5a_01	Did you sell any of the [CROP] produced in the long rainy season 2012?
ag5a_02	What was the quantity sold?
ag5a_03	What was the total value of the sales?
ag5a_18	Generally, did you transport [CROP] for sale?
ag5a_19	What is the average distance you transported [CROP] for sale?
ag5a_22	How much did you pay to transport [CROP] during the long rainy season 2012?

Section 10: For byproducts

zaoname	Crop Name
zaocode	Crop Code
ag10_02_3	Processed / By-Product
ag10_06	Was any [BY-PRODUCT] sold?
ag10_07_1	How much was sold? AMOUNT
ag10_07_2	How much was sold? UNIT
ag10_11	What was total sales in shillings?

BMGF (2014a) gives detailed trade margin information for the maize value chain. Margins along the value chain from rural farm to regional wholesalers range between 24 percent and 28 percent in total. The study provides these margins, and we sum wholesale-farmgate margin as total percentage. We apply a 24 percent margin to each regional farmgate price to compute regional wholesale prices and later compute market access costs between wholesale and farmgate. This margin is total of margins from farm to village collector to town wholesalers to regional wholesalers.

Figure C. 1 Tanzanian Maize Value Chain Margins



Source: BMGF (2014a)

For the maize flour value chain, we use retail prices in Arusha reported by Ministry of Industry and Trade under the Department of Trade Promotion and Marketing. We compute marketing costs between retail and farmgate prices using the two price series.

For marketing costs, we are limited by data availability. Since we did not have sources with which to measure marketing costs between border and point of competition and between point of competition and farmgate separately, we apply this data only once between point of competition and farmgate.

We convert all price data from various units (e.g. per kg, or per 100 kg, per liter) to per metric tonne in Tanzanian Shillings. We convert all quantity data from various units (e.g. kg, 100 kg) to per metric tonne.

Table C. 1 . Market Access Costs between Wholesale and Farmgate Nodes

Regions/Year	2008/09	2010/11	2012/13
LSMS National Average LRS	51,033	57,100	86,639
LSMS National Average SRS	58,740	57,648	91,867
Dar es Salaam LRS		43,200	84,000
Dodoma LRS	54,570	63,009	101,333
Iringa LRS	53,174	56,248	84,955
Kaskazini Pemba LRS	48,600	72,000	72,680
Kigoma LRS	45,600	61,039	96,003
Kilimanjaro LRS	67,400	55,941	109,733
Lindi LRS	49,567	63,483	95,800
Manyara LRS	55,008	54,648	96,303
Mara LRS	66,585	68,160	104,843
Mbeya LRS	50,755	57,470	86,774
Mtwara LRS	62,591	53,891	90,950
Pwani LRS	76,000	63,000	101,067
Rukwa LRS	45,479	54,274	77,393
Ruvuma LRS	48,565	57,024	81,088
Singida LRS	41,944	56,338	92,665
Tabora LRS	47,456	58,821	89,354
Tanga LRS	47,475	53,415	84,570
Arusha SRS	80,000	43,200	98,190
Kagera SRS	59,000	57,048	96,000
Morogoro SRS	54,000	52,857	72,613
Mwanza SRS	54,329	60,544	
Shinyanga SRS	60,000	59,484	

Source: BMGF (2014a) and LSMS survey
Notes: Unit is Tanzanian Shillings per Metric Tonne.

Data Sources for Groundnut Value Chain

We conduct analysis in marketing years for which the crop calendar from FEWS NET (2017) is used. The crop calendar for Tanzania provided by FEWS NET (2017) is consistent with the crop calendar provided by World Food Programme (WFP, 2015). We include 13 regions in our analysis and focus on regions with LRS only. Crop (marketing) years differ between LRS and SRS, as seen in Figure A1. The majority of groundnut production occurs in the LRS (unimodal rainfall). Main growing regions, which include Shinyanga, Dodoma, Singida, Tabora, and Mtwara, are located in the East and South of the country. Thus, we choose LRS' crop calendar for our marketing year: May-April. For conversion of data in calendar year and rest of the analysis, we define marketing year as May to April. If price data or trade data for Tanzania or international is in calendar year in original source, we convert these data series into marketing year by formula.

We chose the international price for groundnuts as the best representative price of that commodity in global markets. International price comes from World Bank GEM database (World Bank, 2017b) which is Rotterdam CIF price but U.S. origin (Runners 40/50, shelled basis, c.i.f. Rotterdam, US$ per metric tonne). We convert these prices to Tanzanian Shillings per metric tonne. Exchange rate of Tanzanian Shillings per US$ comes from IHS MARKIT. For groundnut oil, we use World Bank GEM database (World Bank, 2017b), which publishes Rotterdam CIF price of any origin.

For years during which Tanzania is a groundnut or groundnut oil importer, we adjust international price to CIF price in Tanzania by adding transportation costs. For years during which Tanzania is a net exporter, we do not adjust international price and rather use it as international price. From 'World Freight Rates' online database, we have transport costs from Rotterdam to Dar es Salaam in Tanzania, ranging between $99 and $110. We add $110 per ton to the international price when Tanzania is a net importer of groundnut and groundnut oil.

Border (import and export, depending on net trade status) prices for Tanzania for both commodities come from UNCOMTrade (2017) data, from which we calculated import price based on estimated import quantity and import value and export price based on estimated export quantity and export value. We convert the price series from US$ per kilogram to Tanzanian Shillings per metric tonne.

Farmgate (harvest) prices for groundnut for LRS regions come from Living Standards Measurement Study (LSMS) survey data provided by World Bank at regional level for 2008-2009, 2010-2011, and 2012-2013 (NBS (2016a, 2016b, 2016c)). Price data is provided in marketing year, so no conversion is made. Regions in LSMS survey are Dar es Salaam, Dodoma, Iringa, Kaskazini Pemba, Kigoma, Kilimanjaro, Lindi, Manyara, Mara, Mbeya, Mtwara, Pwani, Rukwa, Ruvuma, Singida, Tabora, and Tanga for LRS. We compute farmgate prices for each household by using quantity sold and value of sale reported. For LSMS average and for regional averages for farmgate prices, we first conduct sensitivity analyses for price series to check data for negative prices or outliers. Price data for maize is in Tanzanian Shillings per kilogram. We convert the price data into Tanzanian Shillings per metric tonne for analysis. In this study, we chose to use LSMS survey data due to its transparency in collection and data documentation.

LSMS survey data is based on Tanzania National Panel Survey data for Tanzania for all years. The GHS-Panel sample on agriculture divides Tanzania into 26 regions and records agriculture data for commodities in the long rainy season and the short rainy season. Data is collected in three rounds: 2008-2009, 2010-2011, and 2012-2013. There were 3,265 households for 2008-2009, 3,924 for 2010-2011, and 5,010 for 2012-2013.

Data descriptions for entries used are:

a. 2008-2009

Section 5A (Long Rainy Season) and 5B (Short Rainy Season)

Zaocode	CROP ID
S5aq1, S5bq1	Did you sell any of the [CROP] produced in 08?
S5aq2, S5bq2	Quantity sold: KGs
S5aq3, S5bq3	Total value of sales: T-SHILLINGS
S5aq9, S5bq9	Did you transport [CROP] for sale?
S5aq10, S5bq10	Average distance you transported [CROP] for sale
S5aq13, S5bq13	How much did you pay to transport [CROP]?

Section 9: For byproducts

zaocode	CODE
byproduct	By-product produced from this crop
s9q2name	Crop: name
s9q2_2	Crop: PROCESSED OR BY-PRODUCT
s9q5	Was any [BY-PRODUCT] sold?
s9q6_1	How much was sold: amount
s9q6_2	How much was sold: unit
s9q8	Total sales in shillings

b. 2010-2011

Section 5A (Long Rainy Season) and 5B (Short Rainy Season)

zaocode	CROP CODE
ag5a_01, ag5b_01	1.Did you sell any of the [CROP] produced in the long/short rainy season?
ag5a_02, ag5b_02	2.What was the quantity sold?
ag5a_03, ag5b_03	3.What was the total value of the sales?
ag5a_15, ag5b_15	15.Did you transport [CROP] for sale?
ag5a_16, ag5b_16	16. What is the average distance you transported [CROP] for
ag5a_19, ag5b_19	19.How much did you pay to transport [CROP]

Section 9: For byproducts

ag09_02_1	Crop Name
zaocode	Crop Code
ag09_02_3	Processed / By-Product AG09_02_3
ag09_05	Was any [BY-PRODUCT] sold?
ag09_06_1	How much was sold? AMOUNT
ag09_06_2	How much was sold? UNIT
ag09_08	What was total sales? TSH

c. 2012-2013

Section 5A (Long Rainy Season) and 5B (Short Rainy Season)

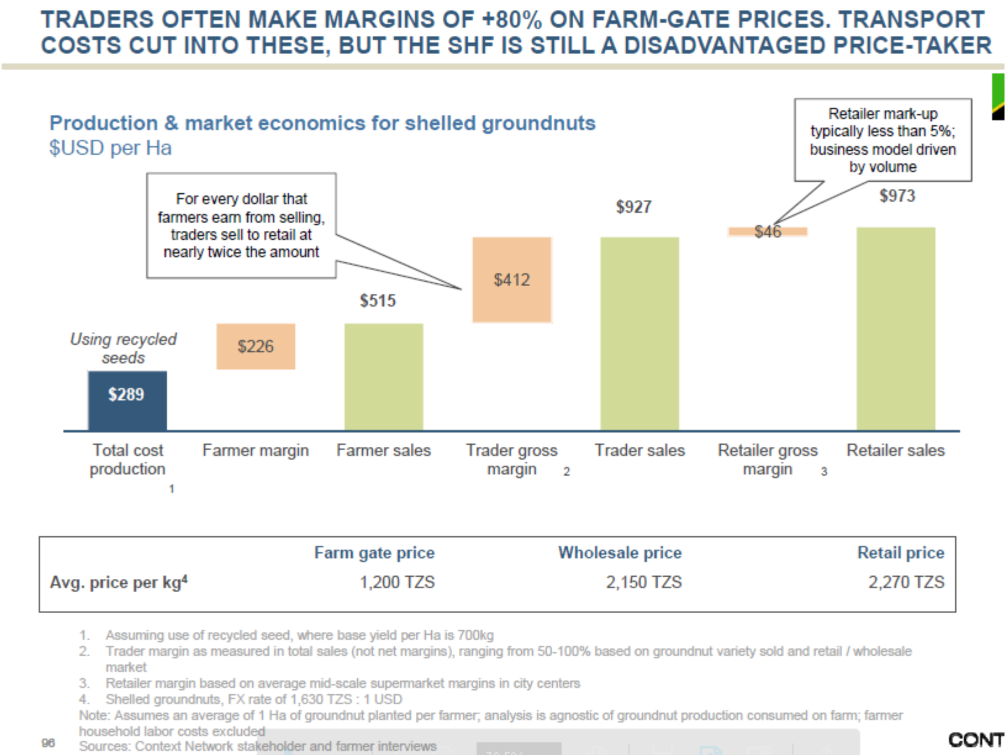
y3_hhid	Unique Household Identification NPS Y3
zaocode	CROP CODE
zaoname	CROP NAME
ag5a_01	Did you sell any of the [CROP] produced in the long rainy season 2012?
ag5a_02	What was the quantity sold?
ag5a_03	What was the total value of the sales?
ag5a_18	Generally, did you transport [CROP] for sale?
ag5a_19	What is the average distance you transported [CROP] for sale?
ag5a_22	How much did you pay to transport [CROP] during the long rainy season 2012?

Section 10: For byproducts

zaoname	Crop Name
zaocode	Crop Code
ag10_02_3	Processed / By-Product
ag10_06	Was any [BY-PRODUCT] sold?
ag10_07_1	How much was sold? AMOUNT
ag10_07_2	How much was sold? UNIT
ag10_11	What was total sales in shillings?

BMGF (2014b) gives detailed trade margin information for the groundnut (shelled) value chain. Margins along the value chain from farm to wholesalers range between 50 percent and 100 percent. We use the 50 percent margin for our analysis and apply the margin to each regional farmgate price to compute regional wholesale prices and to compute market access costs between wholesale and farmgate. This margin is the total of margins from farm to village collector to town wholesalers to regional wholesalers.

Figure C. 2 Tanzanian Groundnut Value Chain Margins



Source: BMGF (2014b)

For marketing costs, we are limited by data availability. Since we did not have sources with which to measure marketing costs between border and point of competition and between point of competition and farmgate separately, we apply this data only once between point of competition and farmgate.

We convert all price data from various units (e.g. per kg, or per 100 kg, per liter) to per metric tonne in Tanzanian Shillings. We convert all quantity data from various units (e.g. kg, 100 kg) to per metric tonne.

Table C. 2. Market Access Costs between Wholesale and Farmgate Nodes

Regions/Year	2008/09	2010/11	2012/13
National Average	167,872	315,857	393,259
Dar es Salaam	350,000		310,345
Dodoma	143,516	296,956	263,816
Iringa	202,500	318,673	465,000
Kaskazini Pemba		500,000	
Kaskazini Unguja			650,000
Kigoma	208,965	341,667	492,766
Lindi	262,500	276,000	
Mbeya	165,597	322,396	379,409
Mtwara	210,903	365,179	468,014
Rukwa	176,681	321,481	453,472
Ruvuma	241,667	281,000	553,676
Singida			475,000
Tabora	122,965	280,833	258,746
National Average	167,872	315,857	393,259
Dar es Salaam	350,000		310,345
Dodoma	143,516	296,956	263,816
Iringa	202,500	318,673	465,000

Source: BMGF (2014b) and LSMS survey
Notes: Unit is Tanzanian Shillings per Metric Tonne

REFERENCES

Abass, A. B., G. Ndunguru, P. Mamiro. B. Alenkhe. N. Mlingi, and M. Bekunda. 2014. "Post-Harvest Food Losses in a Maize Based Farming System of Semi-Arid Savannah Area of Tanzania." *Journal of Stored Products Research (57): 49-57.*

Agriculture and Rural Development Unit. 2009. "Eastern Africa: A Study of the Regional Maize Market and Marketing Costs." Washington, DC: World Bank.

Ahmed, S. A., N. S. Diffenbaugh, T. W. Hertel, and W. Martin. 2012. "Agriculture and Trade Opportunities for Tanzania: Past Volatility and Future Climate Change." *Review of Development Economics 16(3), 429–447.*

Anderson, K., Kurzweil, M., Martin, W., Sandri, D., and Valenzuela, E. 2008. "Measuring Distortions to Agricultural Incentives, Revisited", *World Trade Review 7(4): 675– 704*, October. Also circulated as World Bank Policy Research Working Paper 4612, Washington DC, April 2008.

Athumani, R. 2016. Tanzania: TFDA Tests Find Higher Aflatoxin Levels in Cereals, Maize Flour, allAfrica, August 2, 2016, accessed August 19, 2017. http://allafrica.com/stories/201608020728.html

Azaniapost. 2017. "Tanzania: 'There is no solution found to contain the viral disease in Maize'-Expert." Azaniapost, July 24, 2017, Accessed August 20, 2017. http://www.azaniapost.com/agenda/tanzania-there-is-no-solution-found-to-contain-the-viral-disease-in-h5250.html

Baffes, J., V. Kshirsagar, and D. Mitchell. 2015. "Domestic and External Drivers of Maize Prices in Tanzania." Washington, DC: World Bank.

Baha, M. R. 2013. "Sources of Technical Efficiency Among Smallholder Maize Farmers in Babati District, Tanzania." *International Journal of African and Asian Studies, 1.*

Barreiro-Hurle, J. 2012. Analysis of incentives and disincentives for maize in the United Republic of Tanzania. Technical notes series, MAFAP, FAO, Rome.

Bill and Melinda Gates Foundation (BMGF). 2012. Legume Market Analysis Tanzania. Presentation Tanzania.

Bill and Melinda Gates Foundation (BMGF). 2014a. Multi Crop Value Chain Phase II: Maize Tanzania. Presentation, Tanzania.

Bill and Melinda Gates Foundation (BMGF). 2014b. Multi Crop Value Chain Phase II: Burkina, Ghana, Tanzania Groundnut. Presentation, Tanzania.

Bucheyeki, T. L., M. E. Shenkalwa, T. Mapunda, and W.L. Matata. 2010. "The groundnut client oriented research in Tabora, Tanzania." *African Journal of Agricultural Research, 5(5), 356-362.*

Bymolt, R., and F. Zaal. 2015. "Moving to Mechanisation: Mechanisation in Maize Farming Systems in Kenya, Tanzania and Ethiopia." KIT (Royal Tropic Institute), Amsterdam.

Cagley, J. H., M. K. Gugerty, and R. Plotnick. 2009. Political Economy of Fertilizer Policy in Tanzania. Evans School Policy Analysis and Research.

CEPA. 2016. Agribusiness Country Diagnostic – Tanzania. International Finance Cooperation.

CGIAR Groundnut. 2011. Accessed July 19, 2017.

Chapoto, A., and T. S. Jayne. 2010. "Maize Price Instability in Eastern and Southern Africa:The Impact of Trade Barriers and Market Interventions," Paper presented at the COMESA Policy Seminar on Variation in Staple Food Process: Causes, Consequences, and Policy Options, Maputo, Mozambique, 25–26 January.

Chen, X., T. H. Choon, A. Koli, and E. J. Lee. 2013. Improving the Efficiency of the Supply Chain of Maize in Northern Tanzania. Marshall Economics Research Group, University of Cambridge.

CIMMYT. 2013. Maize lethal necrosis (MLN) disease in Kenya and Tanzania: Facts and actions. CIMMYT, Texcoco.

CIMMYT. 2014. Drought Tolerant Maize. A Quarterly Bulletin of the Drought Tolerant Maize for Africa Project 3(3).

Dalberg. 2017. Draft Agro-processing Strategy for the Government of Tanzania. Presentation. Michigan State University.

Daly, J., D. Hamrick, G. Gereffi, and A. Guinn. 2016. Maize Value Chains in East Africa. Center on Globalization, Governance & Competitiveness, Duke University.

Doyle, A. 2015. What is the evidence on the economic impact of Tanzania's National Food Reserve Agency (NFRA) on smallholder maize famers in Tanzania? Oxford Policy Management, Oxford.

Ellis, F. 1982. "Agricultural Price Policy in Tanzania." *World Development, 10(4): 263-283.*

ESRF. 2008. Agricultural Trade Policies Tanzania. Economic and Social Research Foundation, Tanzania.

FAO. 1992. Maize in Human Nutrition. FAO, Rome.

FAO. 2010. Agricultural Value Chain Development: Threat or Opportunity for Women's Employment? Gender and Rural Employment Policy Brief No. 4. FAO, Rome.

FAO. 2012. An Analysis of the Edible Oils Value Chain. Southern Highlands Food Systems Project. FAO, Rome.

FAO. 2014. Tanzania Country Programming Framework January 2014-June 2016. Food and Agricultural Organization of the United Nations.

FAO. 2017a. GIEWS Country Brief the United Republic of Tanzania. FAO, Rome.

FAO. 2017b. MAFAP to advise on fertilizer policy reforms in Tanzania. Accessed September 8, 2017. http://www.fao.org/in-action/mafap/highlights/highlights-archive/detail/en/c/469199/

FAOSTAT. 2017c. FAOSTAT Database, FAO Rome, Accessed September 11, 2017. <http://www.fao.org/faostat/en/#home>

FEWS NET. 2017. “Tanzania Crop Calendar.” Accessed November 17, 2016. <*http://www.fews.net/east-africa/tanzania*>

Frenken, A. 2013. Maize Lethal Necrosis Disease (MLND): A Snapshot. Food Security and Nutrition Working Group, FAO, Rome.

FSNWG. 2016. East Africa Crossborder Trade Bulletin. MAS Market Analysis Subgroup, Volume 15.

Gilbert, C. L., L. Christiaensen, and J. Kaminski. 2017. “Food Price Seasonality in Africa: Measurement and Extent.” *Food Policy, 67: 119-132.*

Heilbron, M. 2013. Fundraising: Arusha Women Entrepreneur, Producers of Tanzania’s Premier Natural “Mr Peanut Butter” Brand. VC4A, August 16, 2013, accessed July 21, 2017.

Huang, J., A. Gulati, and I. Gregory. 2017. “Fertilizer Subsidies. Which Way Forward?”, IFDC/FAI Report. February.

ICRISAT. 2016. “Small Farmers Don’t Give up on Pendo Groundut in Tanzania.” ICRISAT, June 6, 2016, Accessed July 2, 2017. http://www.icrisat.org/small-farmers-dont-give-up-on-pendo-groundnut-in-tanzania/

ICRISAT. 2017. “Partnering for Sustainable Groundnut Seed Systems in Tanzania.” ICRISAT, April 7, 2017, Accessed July 2, 2017. http://www.icrisat.org/partnering-for-sustainable-groundnut-seed-systems-in-tanzania/

IHS MARKIT. 2017. Exchange Rates Database. Accessed September 14, 2017. https://ihsmarkit.com/.

Isinika, A. C., G. C. Ashimogo, and J. E. D. Mlwanga. 2005. “From Ujamaa to Structural Adjustment-Agricultural Intensification in Tanzania.” In The African Food Crisis: Lessons from the Asian Green Revolution, ed. Djurfeldt, G. et al. (Lund: University of Lund, 2005).

ITC. 2015. Edible Nuts – Groundnuts. International Trade Center.

ITC. 2016. United Republic of Tanzania: Sunflower Sector Development Strategy 2016-2020. International Trade Center.

Katundu A. M., M. L. Mhina, A. G. Mbeiyererwa, and N. P. Kumburu. 2012. Agronomic Factors Limiting Groundnut Production: A Case of Smallholder Farming in Tabora Region. Paper presented at REPOA's 17th Annual Research Workshop.

Katundu A. M., M. L. Mhina, A. G. Mbeiyererwa, and N. P. Kumburu. 2014. “Socio-Economic Factors Limiting Smallholder Groundnut Production in Tabora Region.” Research Report 14, Dar es Salaam, REPOA.

Kidane, A., A. Hepelwa, E. T. Ngeh, and T. Hu. 2013. “Agricultural Inputs and Efficiency in Tanzania Small Scale Agriculture: A Comparative Analysis of Tobacco and Selected Food Crops.” *Tanzania Economic Review, 3(1): 1-16.*

KPMG. 2017. Budget Brief Tanzania 2017. Dar es Salaam, KPMG.

Krueger A. O., M. Schiff, and A. Valdes. 1988. Agricultural Incentives in Developing Countries: Measuring the Effect of Sectoral and Economywide Policies. *The World Bank Economic Review*, 2(3), 255–271.

Makombe, W. and J. D. Kropp. 2016. “The Effects of Tanzanian Maize Export Bans on Producers’ Welfare and Food Security”. Paper presented at the Agricultural & Applied Economics Association’s, Boston.

Magembe, K. S., M. W. Mwatawala, and D. P. Mamiro. 2016. “Mycotoxin Contamination in Stored Maize and Groundnuts Based on Storage Practices and Conditions in Subhumid Tropical Africa: The Case of Kilosa District, Tanzania.” *Journal of Food Protection, 79(12): 2160-2166.*

Match Maker Associates Ltd. 2010. Value chain analysis of rice and maize in selected districts in Tanzania. Volume I: Introduction, context analysis and recommended way forward. Study commissioned by ACT –Tanzania Agricultural Partnership.

Maziku, P., J. Hella, and J. Makindara. 2015. “Effects of non tariff barriers on market participation for maize smallholder farmers in Tanzania.” *Journal of Development and Agricultural Economics, 7(11): 373-385.*

Mbega, E. R., C. R. Massawe, and A. M. Mbwaga. 2016. Alectra vogelii, a Threat to Bambara Groundnut Production in Singida and Dodoma Regions, Tanzania. *Advances in Research 7(5): 1-8.*

Mchomvu, H. 2002. “Small-scale peanut butter processing in Tanzania — The experience of women processors.” ITDG Food Chain 30 (2002): 3–5.

McKnight Foundation. 2011. Enhancing Child Nutrition and Livelihoods of Rural Households in Malawi and Tanzania through Post-Harvest Value-Chain Technology Improvements in Groundnuts. McKnight Foundation.

Mhlanga, N., P. Anaadumba and R. Ngaiza. 2014. Institutional Procurement of Staples From Smallholders: The Case of Purchase for Progress in Tanzania. Food and Agriculture Organization of the United Nations, Rome.

Minot, N. 2009. "Fertilizer policy and use in Tanzania." Fertilizer Policy Symposium of the COMESA African Agricultural Markets Programme (AAMP), Zambia 15 June 2009. Livingstone, Zambia, 06 15, 2009.

Minot, N. 2010. “Staple Food Prices in Tanzania.” Paper presented at Comesa policy seminar on “Variation in staple food prices: Causes, consequence, and policy options”, Maputo, Mozambique, 25-26 January. <https://ageconsearch.umn.edu/bitstream/58555/2/AAMP_Maputo_24_Tanzania_ppr.pdf>

Mmbando, F. E., L. J. Baiyegunhi. 2016. “Socio-economic and Institutional Factors Influencing Adoption of Improved Maize Varieties in Hai District, Tanzania.” *Journal of Human Ecology 53(1): 49-56.*

Monitoring and Analysing Food and Agricultural Policies (MAFAP). 2017. FAO, Rome. http://www.fao.org/in-action/mafap/home/en/>

Monyo, E. 2007. Developing Short and Medium Term Duration Groundnut Varieties with Improved Yield Performance, Acceptable Market Traits and Resistance to Foliar Diseases. Lillongwe. ICRISAT.

Monyo E.S., M.O. Osiru, D. Kadyampakeni, O. Mponda, and B. Chinyamunyamu (eds.). 2009. Improving Food Security and Nutrition in Malawi and Tanzania through Research on Edible Legumes. Proceedings of Stakeholder Workshops on Groundnut Production in Malawi and Tanzania held 1-2 March and 13 April 2007, Lilongwe (Malawi) and Mtwara (Tanzania). Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics. 96 pp. ISBN: 978-92-9066-515-1

Morisset, J. 2013. Opening the Gates How the port of Dar es Salaam can transform Tanzania. Washington, DC: World Bank http://documents.worldbank.org/curated/en/881091468311086610/Tanzania-economic-update-opening-the-gates-how-the-port-of-Dar-es-Salaam-can-transform-Tanzania

Msuya, E. E., S. Hisano, and T. Nariu. 2008. Explaining Productivity Variation among Smallholder Maize Farmers in Tanzania. XII World Congress of Rural Sociology of the International Rural Sociology Association, Goyang.

Mtaki, B. 2017. Grain and Feed Annual 2017 Tanzania Corn, Wheat and Rice Report. Washington, DC: USDA.

Mugisha, J., S. Lwasa, and K. Mausch. 2014. Value Chain Analysis and Mapping for Groundnuts in Uganda. ICRISAT Discussion Paper Series: Series Paper Number 14.

Mutabazi, K., S. Wiggins, and N. Mdoe. 2013. Commercialisation of African Smallholder Farming. The Case of Smallholder Farmers in Central Tanzania. Working Paper, Future Agricultures.

NBS. 2012. National Census of Agriculture Small Holder Agriculture Volume II: Crop Sector – National Report. National Bureau of Statistics, United Republic of Tanzania.

NBS. 2016. 2014/2015 Annual Agricultural Sample Survey Report. United Republic of Tanzania.

National Bureau of Statistics (NBS), Republic of Tanzania. 2016a. National Panel Survey 2008-2009, Wave 1. TZA_2008_NPS-R1_v01_M. Accessed November 23, 2016. http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTLSMS/0,,contentMDK:23635561~pagePK:64168445~piPK:64168309~theSitePK:3358997,00.html] on [October 18, 2016.

National Bureau of Statistics (NBS), Republic of Tanzania. 2016b. National Panel Survey 2010-2011, Wave 2. TZA_2010_NPS-R2_v01_M. Accessed November 23, 2016. http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTLSMS/0,,contentMDK:23635561~pagePK:64168445~piPK:64168309~theSitePK:3358997,00.html] on [October 18, 2016.

National Bureau of Statistics (NBS), Republic of Tanzania. 2016c. National Panel Survey 2012-2013, Wave 3. TZA_2012_NPS-R3_v01_M. Accessed November 23, 2016. http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTLSMS/0,,contentMDK:23635561~pagePK:64168445~piPK:64168309~theSitePK:3358997,00.html] on [October 18, 2016.

Nutriset. Powever Foods Industries Ltd. Tanzania. Nutriset, accessed July 20, 2017. http://www.groupenutriset.fr/en/partnerships/our-countries-of-intervention/powerfoods-tanzania/ OECD. 2013. "Overview of progress and policy challenges in Tanzania", in OECD Investment Policy Reviews: Tanzania 2013.

OECD (Organization for Economic Co-operation and Development). 2013. "Overview of progress and policy challenges in Tanzania", in OECD Investment Policy Reviews: Tanzania 2013.

OECD (Organization for Economic Co-operation and Development). 2017. Agricultural Policy Monitoring and Evaluation 2017. Paris, France: OECD Publishing. Retrieved from OECD website: http://dx.doi.org/10.1787/22217371

Petro, M. 2015. "Market Access for Maize Smallholder Farmers in Tanzania." Paper presented at Proceedings of the Second European Academic Research Conference on Global Business, Economics, Finance and Banking, Zurich.

Reddy, A. A., and C. S. Bantilan. 2012. Competitiveness and technical efficiency: Determinants in the groundnut oil sector of India. Food Policy 37: 255-263.

Rizzo, M. 2006. "What Was Left of the Groundnut Scheme? Development Disaster and Labour Market in Southern Tanganyika 1946–1952." *Journal of Agrarian Change 6(2): 205-238.*

Ronner E., and K. E. Giller. 2013. Background Information on Agronomy, Farming Systems, and Ongoing Projects on Grain Legumes in Tanzania. N2Africa.

SeaFreight. 2017. Database. Accessed January 29, 2018. http://www.seafreightcalculator.com/

Seetha, A., W. Munthali, H. W. Msere, E. Swai, Y. Muzanila, E. Sichone, T. Tsusaka, A. Rathore, and P. Okor. 2017. "Occurrence of aflatoxins and its management in diverse cropping systems of central Tanzania." *Mycotoxin Research.*

Settaluri V. S., C. V. K. Kandala, N. Puppala, and J. Sundaram. 2012 "Peanuts and their nutritional aspects—A review." Food and Nutrition Sciences 3: 1644-1650.

Shabani, I., M. E. Kimanya, P. N. Gichuhu, C. Bonsi, and A. C. Bovell-Benjamin. 2015. "Maize Storage and Consumption Practices of Farmers in Handeni District, Tanzania: Corollaries for Mycotoxin Contamination." *Open Journal of Preventive Medicine, 5: 330-339.*

Sitko, N. J., A. N. Kuteya and B. Chisanga. 2014. Analysis of the Effects of Maize Trade Restrictions in the COMESA Region on Food Prices and Market Development. Indaba Agricultural Policy Research Institute, Lusaka.

Suzuki, Y., and A. Bernard. 1987. "Effects of Panterritorial Pricing Policy for Maize in Tanzania." IFPRI. Washington, DC: International Food Policy Research Institute.

Taru, V. B., I. Z. Kyagya, and S. I. Mshelia. 2010. Profitability of groundnut production in Michika Local Government Area of Adamawa State, Nigeria. *Journal of Agricultural Science, 1(1): 25-29.*

TFDA. 2012. Aflatoxin Contamination and Potential Solutions for Its Control in Tanzania. Tanzania Food and Drugs Authority. Dar es Salaam.

Ugulumu, E. S., and E. L. Inanga. 2013. "Tanzania's Small-Scale Sunflower Farmers: Upgrading the Value Chain." *International Journal of Sciences: Basic and Applied Research 10(1): 126-145.*

UNComtrade. 2017. United Nations Department of Economic and Social Affairs Statistics Division Database. Accessed November 2, 2017. https://comtrade.un.org/.

United Republic of Tanzania. 2010. *Livestock Sector Development Strategy*. Dar es Salaam.

United Republic of Tanzania. 2011. The Tanzania Food, Drugs and Cosmetics (Food Fortification) Regulations, 2011. Dar es Salaam.

United Republic of Tanzania. 2012. *National Census of Agriculture 2007/2008; Regional Report – Morogoro Region.* Dar es Salaam.

United Republic of Tanzania. 2013. *National Agriculture Policy*. Dar es Salaam. Ministry of Agriculture Food Security and Cooperatives

United Republic of Tanzania. 2014. *Agricultural Sector Development Strategy – II 2015/2016-2024-2025.* Dar es Salaam.

United Republic of Tanzania. 2015. *Ministry of Agriculture, Food Security and Cooperatives: Annual Report 2014/15.* Dar es Salaam.

United Republic of Tanzania. 2016. *National Five Year Development Plan 2016/17 – 2020/21. Nurturing Industrialization for Economic Transformation and Human Development.* Dar es Salaam.

USAID. 2010. Staple foods value chain analysis. Country report Tanzania. Washington, DC: USAID.

USAID. 2012. Study of Policy Options for Increasing Tanzanian Exports of Maize and Rice in East Africa While Improving Its Food Security to the Year 2025. USAID, Washington, DC: USAID.

van der Ven, C. 2012. From Peanuts to Peanut Butter: Unleashing Tanzania's potential to move up the value chain. Harvard Law and International Development Society.

Westengen, O. T., K. H. Ring, P. R. Berg, and A. K. Brysting. 2014. "Modern Maize Varieties Going Local in the Semi-Arid Zone in Tanzania." *BMC Evolutionary Biology*, *14(1).*

WFP. 2013. Comprehensive Food Security and Vulnerability Analysis (CFSVA), Tanzania, 2012. World Food Programme, Rome.

WFP. 2015. Farm-Gate Price Monitoring in Selected Impact Countries: Tanzania. World Food Programme, Rome.

Wilson, R. T., and J. Lewis. 2015. The Maize Value Chain in Tanzania: A report from the Southern Highlands Food Systems Programme. FAO, Rome.

WITS. 2018. World Bank World Integrated Trade Solution. UNCTAD TRAINS database. Accessed January 17, 2018. https://wits.worldbank.org/.

World Bank. 2009a. Eastern Africa: A study of the regional maize market and marketing costs. Agriculture and Rural Development Unit, Report 49831-AFR, Washington, DC: World Bank

World Bank. 2009b. Tanzania – A study of the Burden of Local Taxes on the Agricultural Sector. Washington, DC: World Bank.

World Bank. 2014. Tanzania Public Expenditure Review: National Agricultural Input Voucher Scheme (NAIVS). Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/18247

World Bank. 2017a. World Development Indicators. Accessed July 3, 2017. http://data.worldbank.org/

World Bank. 2017b. Global Economic Monitor GEM Database. Accessed July 3, 2017. https://data.worldbank.org/data-catalog/global-economic-monitor.

ALL IFPRI DISCUSSION PAPERS

All discussion papers are available **here**

They can be downloaded free of charge

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
www.ifpri.org

IFPRI HEADQUARTERS
1201 Eye Street, NW
Washington, DC 20005 USA
Tel.: +1-202-862-5600
Fax: +1-202-862-5606
Email: ifpri@cgiar.org