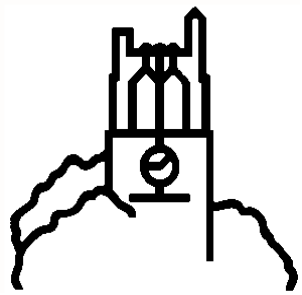
# MSU International Development Working Paper

**Food System Transformation and Market Evolutions: An Analysis of the Rise of Large-Scale Grain Trading in Sub-Saharan Africa**

**by**

**Nicholas J. Sitko, William J. Burke, and T.S. Jayne**



**MSU International Development Working Paper 153 March 2017**

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# FOOD SYSTEM TRANSFORMATION AND MARKET EVOLUTIONS: AN ANALYSIS OF THE RISE OF LARGE-SCALE GRAIN TRADING IN SUB-SAHARAN AFRICA

**by**

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**March 2017**

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**ISSN 0731-3483**



Published by the Department of Agricultural, Food, and Resource Economics and the Department of Economics, Michigan State University, East Lansing, Michigan 48824-1039, U.S.A.

## ACKNOWLEDGMENTS

The authors gratefully acknowledge financial support of the Bill and Melinda Gates Foundation under the Guiding Investments in Sustainable Agricultural Markets (GISAMA) Initiative and by the American people, via USAID's Innovation Lab for Food Security Policy. The authors would like to also thank Chalmers Mulwa, Brian Chisanga, and the Indaba Agricultural Policy Research Institute for their help during data collection and Patricia Johannes for editing and formatting assistance.

Any errors are our own.

## EXECUTIVE SUMMARY

Ongoing transformations of agri-food systems in Sub-Saharan Africa (SSA) are garnering considerable attention from policy-makers, researchers, and development partners. While a growing body of literature has examined transformations occurring within the farm production, processing and retail segments of the food systems, there has been surprisingly little attention to the so-called *middle* segments—trading and wholesaling. Beneficial changes in African grain markets hold considerable potential to improve livelihoods in the region, because grain-marketing costs typically account for 50-60% of the price paid for staple foods by African consumers (Jayne et al. 2010). This lack of empirical attention, particularly for staple cereals, is an important blind spot in our knowledge of recent transformations of these food systems.

The exceptional pace of transformation in the region's food systems suggests that the evidence generated about grain market performance ten or fifteen years ago is losing relevance for guiding beneficial investments and policies today. In particular, grain market policies and development interventions in the region typically presuppose a dysfunctional grain market structure, dominated by small, poorly capitalized, and often geographically isolated market actors, which limits market efficiency, imposes major transactions costs on market participants, and impedes supply chain coordination and risk management (Poulton, Kydd, and Dorward 2006; Fafchamps 2001; Barrett 2008). While this image of an incoherent and jumbled commodity aggregation market certainly still holds in many areas, recent survey data suggests major changes are underway that require fundamental reassessment of development policy and programmatic options.

Using data from nationwide farm surveys over time and from surveys of the population of large-scale traders operating in Zambia and Kenya, this article explores how grain markets in SSA are evolving by examining the rise of large-scale grain trading firms in smallholder grain markets. Nationally representative rural household survey data shows that in Zambia between 2012 and 2015 farmer maize sales to large-scale traders (LSTs) increased from 3% to 12% of total maize sales volume, or from approximately 40,000 metric tons (mt) to over 240,000 mt. In Kenya, we find virtually no sales to LSTs in 2004, increasing to 21% of all maize sales by volume in 2007, and expanding further to 37% in 2014.

### Key Findings

Drawing on survey data with large-scale traders in Kenya and Zambia and rural household survey date we show that LSTs are co-evolving with other important transformations occurring in the demand and production segments of regional agri-food systems, namely, the rapid growth in larger African farms and sustained regional grain demand caused by rapid population growth, dietary changes, and urbanization.

We show that the rise of LSTs is having important effects on market coordination and prices. Trader survey data shows that the majority of LSTs in Kenya and Zambia utilize upstream contracts with processors and downstream contracts with small-traders to coordinate supply chain activity, suggesting an important shift away from typical spot market arrangements in grain markets. As a consequence of improved supply chain coordination and scale economies, we find that, *ceteris paribus*, farmers that sell to LSTs receive 4.9 and 3.6% higher prices for maize, in Zambia and Kenya respectively, than farmers that sell to other commercial market channel.

We find that LSTs are particularly active in areas where medium-scale farms account for a relatively large share of area under cultivation. Medium-scale farms tend to have larger

surpluses to sell per farm and entail lower transaction costs per sale for traders, so no wonder that large traders tend to set up buying operations in areas with a large concentration of medium-scale farms. We show that farms of five hectares or more are 14.4 and 19.6 % more likely to sell to LSTs than small farms of 1 hectare or sell, all else equal. Once operating in these areas, large traders likely also provide additional access to markets for small-scale farmers—for inputs as well as for crops.

In addition to offering higher prices, LSTs are increasingly providing smallholders with services, including extension advice, price information, and input credit. We show that farmers that sell to large traders are statistically more likely to get price information (in Zambia) and more likely to receive seed credit (Zambia) and cash input credit (Kenya) than those selling to traditional small-scale traders.

**Conclusion and Recommendations**

The rise of LSTs in SSA grain markets suggests that important transformations are occurring in the middle segment of the agri-food system that challenges the dominant understanding of the constraints and opportunities in these markets. An important policy concern is how to effectively leverage the benefits of growing LST investment in grain markets, while managing downside risks associated with market power and limited market participation by poorer, more marginal segments of the rural population.

Policy tools and investments to help strike this difficult balance include: 1) Support competition from domestic traders through competitively priced and accessible commercial credit markets. The ability to leverage grain stocks through warehouse receipts or moveable collateral legislation may be particularly important; 2) support horizontal aggregation structures to help small farms with limited surpluses to sell to cost effectively link to LST market channels; 3) implement policies to improve grain price predictability, including clearly defined policies for triggering government action in cross border trade and marketing board activities; and 4) develop innovative financial tools to help defray risk and costs to LSTs of providing input credit and other services to smallholders in order to help expand the scope and scale of these activities to marginal regions, communities, and producers.

For African agriculture to contribute to a broader process of economic transformation, in the context of rapid population growth and increased climate uncertainty, marketing arrangement that create incentives and services to support smallholder intensification is critical. With effective policies and investment, the rise of large-scale grain trading offers new opportunities to support smallholder intensification.

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## ACRONYMS

| | |
|---|---|
| AEZ | Agro-Ecological Zones |
| CSO | Central Statistical Office |
| EAGC | East African Grain Council |
| FDI | foreign direct investment |
| FRA | Food Reserve Agency |
| GTAZ | Grain Traders Association of Zambia |
| IAPRI | Indaba Agricultural Policy Research Institute |
| IFPRI | International Food Policy Research Institute |
| KNBS | Kenya National Bureau of Statistics |
| LSTs | large-scale traders |
| MAL | Ministry of Agriculture and Livestock |
| mt | metric tons |
| MSU | Michigan State University |
| NCPB | National Cereals and Produce Board |
| NGOs | Non-Governmental Organizations |
| RALS | Rural Agricultural Livelihoods Survey |
| SSA | Sub-Saharan Africa |

# 1. INTRODUCTION

Ongoing transformations of agri-food systems in Sub-Saharan Africa (SSA) are garnering considerable attention from policy-makers, researchers, and development partners. A growing body of literature has examined transformations occurring within the production, processing, and retail segments of the food systems.[1] However, the so-called middle segments—trading and wholesaling—have received surprisingly little attention, particularly for staple cereals.[2] The lack of empirical attention is an important blind spot in our knowledge of recent transformations in African food systems.

Beneficial changes in grain markets in SSA hold considerable potential to improve food security and economic welfare in the region, as grain-marketing costs typically account for 50-60% of the price paid for staple foods by African consumers (Jayne et al. 2010). Yet the exceptional pace of transformation in the region's food systems suggests that the evidence generated about grain market performance just five to ten years ago is losing relevance for guiding investments and policies today.

Grain market policies and development interventions in the SSA typically presuppose a dysfunctional grain market structure, dominated by small, poorly capitalized, and often geographically isolated market actors, which impedes supply chain coordination and risk management, thus imposing major transactions costs on market participants (Poulton, Kydd, and Dorward 2006; Fafchamps 2003; Barrett 2008). While this image of an incoherent and jumbled commodity aggregation market certainly still holds in many areas, recent survey data suggests major changes are underway that require fundamental reassessment of development policy and programmatic options.

Using data from Zambia and Kenya, this article explores how grain markets in SSA are evolving by examining the rise of large-scale grain trading firms in smallholder grain markets. Nationally representative rural household survey data shows that in Zambia between 2012 and 2015 smallholder maize sales to large-scale traders (LSTs) increased from 3% to 12% of total maize sales volume, or from approximately 40,000 mt to over 240,000 mt. In Kenya, we find virtually no sales to LSTs in 2004, increasing to 21% of all maize sales by volume in 2007, and expanding further to 37% in 2014.

The rise of LSTs in SSA grain markets suggests important transformations are occurring in the middle segment of the food system that challenges the dominant understanding of constraints and opportunities in these markets. This article seeks to expand our understanding of these changes and their implications for grain market and agricultural development policy. In particular, this article has three interrelated objectives to: 1) identify the alternative functions and comparative advantages of large- and small-scale traders in grain markets; 2) identify factors driving the rapidly growing role of LSTs in Kenya and Zambia, and consider the extent to which these trends may reflect similar trends more broadly in SSA; and 3) assess what the rise of LSTs tells us about the on-going process of food system transformation in SSA and the implications for the future of small-scale farming.

The organization of this article is as follows. Section 2 discusses a detailed conceptual framework for understanding the rise of LSTs. Section 3 discusses data sources. Section 4

[1] This includes evidence of rapid land accumulation by medium-scale farms in many countries (Jayne et al. 2016; Sitko and Jayne 2014) and growth in food processing and retail market formalization in response to changes in urban food preferences (Tschirley et al. 2015).

[2] While a few studies have examined horticulture and dairy (e.g., Neven et al. 2009), virtually no attention has been given to potential structural change at the aggregation and wholesaling stages of the main staple commodities in Africa.

uses trader survey data to examine the evolution of LSTs in the region and how they engage in smallholder grain markets. Section 5 draws on household survey and other data sources to explore important drivers of the rise of LST. Section 6 uses survey data to assess the implications of the rise of LST on grain prices and access to farm credit and services. Section 7 offers concluding remarks and policy recommendations.

## 2. HOW AND WHY MARKETS EVOLVE: A CONCEPTUAL FRAMEWORK

Our thinking on the cause and consequences of the rise of LST in SSA is informed by two interrelated strands of literature: the economic structural transformation literature and the literature on food system transformation and modernization. The structural transformation literature highlights several stylized facts about how economies shift from being predominately agrarian to relatively more industry and service oriented (Johnston and Mellor 1961; Johnston and Kilby 1975; Mellor 1976). In countries where the primary source of employment is agriculture, agricultural productivity growth typically initiates the process of transformation. Farms selling the greatest surpluses lead this process and their earnings generated from the expansion of production creates demand for goods and services in the local rural economy. This, in turn, generates employment opportunities in the non-farm economy, thereby inducing rural to urban migration, labor force shifts from farm to non-farm, gradual farm consolidation by those that remain in agriculture, and ultimately a declining agricultural share to the Gross Domestic Product. An important outcome of this process is that *all* labor productivity increases through a combination of inter-sector gains—i.e., the movement of lower productivity labor from agriculture to manufacturing and services—and agricultural productivity growth achieved through technology adoption, scale economies, shifts in the mix of agricultural products, and improved market access (Jayne et al. 2016; Haggblade, Hazell, and Reardon 2010).

Initiating and sustaining a process of transformation, therefore, requires modes of exchange that trigger and sustain agricultural productivity growth among a broad segment of the rural population. This often boils down lowering transactions costs in ways that increase farm gate prices relative to input costs, combined with supply chain exchange mechanisms that overcome the idiosyncratic market failures that limit participation of small farms in agricultural supply chains (Poulton, Kydd, and Dorward 2006; Reardon and Timmer 2012; Barrett 2008).

Traditional market arrangements in SSA are often ill equipped to spur broad-based productivity growth. This is because myriad individuals and very small firms, with limited capital and asset bases, typically dominate traditional grain markets in SSA (Fafchamps 2003). In this context, farm products often undergo numerous discreet, small volume, spot market transactions before reaching consumers (Poulton, Kydd, and Dorward 2006). As a consequence, while these markets may be reasonably competitive (Sitko and Jayne 2014), they are also high-cost, due to a lack of scale economies and the accumulation of transactions costs (Poulton, Kydd, and Dorward 2006). Moreover, prices in these markets are typically volatile, due to market segmentation (Gabre-Madhin, Barrett, and Dorosch 2003; Barrett 2008), and limited financial capacity to store grain and withstand production fluctuations (Poulton, Kydd, and Dorward 2006). Finally, due to high risk of contract default, transactions are often on a cash and carry basis, with limited capacity for supply chain coordination through forward contracts (Fafchamps 2001). Taken together, these market attributes tend to inflate marketing margins, and consequently push down producer prices, which undermines incentives for intensification.

Transformation of traditional market arrangements is therefore critical for triggering broader processes of economic transformation. The literature on food system transformation suggests that as traditional market arrangements give way to more modern forms, four changes typically occur in their structure and conduct. First, there is consolidation of food system functions at both the farm level (Neven et al. 2009) and beyond (Reardon et al. 2009). Second, there is entry of global agri-business firms into some segments of the food system (Reardon and Barrett 2000). Third, there is an institutional shift away from spot market

transactions toward greater vertical and horizontal integration in supply chains facilitated through supply chain contracts (Reardon and Timmer 2012). Finally, private grades and standards become commonplace in governing supply chain relationships (Reardon et al. 1999). Virtually none of these shifts have been documented or commonly observed in staple food supply chains involving African smallholders.

These elements of food system transformations produce several potentially important effects that are relevant to our analysis. Farm and first-buyer consolidation exploit scale economies in production, transport, and market information, and can lead to lower transactions costs and, often, greater capacity to absorb investment risks (Poulton, Kydd, and Dorward 2006). Multi-nationalization brings with it global and regional supply chain expertise, experience in a range of risk management strategies, and considerable financial capabilities.

Consolidated agri-business firms gain footholds in traditional markets by driving down costs. Porter (1985) argued that to drive down costs, firms typically deploy supply chain governance strategies, including vertical coordination mechanisms such as contracts (Reardon and Timmer 2012). Vertical coordination and contracting serve two important functions. On the production side, resource supply contracts, such as input credit systems, help to address the idiosyncratic market failures that typically inhibit smallholder technology adoption and can increase and smoothen the surpluses available for firms to purchase (Reardon 2015). Further down the supply chain, contracts enable supply chain actors to coordinate activities and investments. In some cases, contracts can be collateralized, thus leading to improved liquidity conditions within supply chains (Reardon 2015). These contracts typically emerge in conjuncture with standards, which can lower the costs associated with ensuring production consistency, and can lay the foundation for the emergence of more sophisticated forward contracting arrangements (Coulter and Onumah 2002).

The literature identifies three fundamental factors that drive transformations in food system arrangement: 1) policy interventions: including public investments in markets, market liberalization, and foreign direct investment (FDI) liberalization; (2) demand pull, caused by population growth, urbanization, rising incomes, and dietary changes; and (3) supply side pushes caused by FDI and investments from domestic food system actors aimed at achieving economies of scale, scope, and specialization (Reardon et al. 2009). In the context of grain markets in SSA, two factors are likely of particular importance. First, rapid population growth in the region drives aggregate food supply demand and puts upward pressure on food prices. Second, rapid changes in production systems, namely the growth of medium-scale farms in SSA, creates a segment of the rural population that is better capitalized and can produce on considerably higher scale than most African farms (Jayne et al. 2016).

Food system transformation can affect broader processes of income differentiation, productivity growth, and economic transformation in several ways. At a production level, Reardon and Timmer (2012) find that there is convergence in the literature that the impact of participation by farmers in modern versus traditional supply chains on incomes is moderately to substantially beneficial. This is achieved through some combination of lower transactions costs within modern supply chains, as well as contract premiums. *A priori*, we anticipate the rise of LSTs to positively affect farmers that sell to them, through some combination of access to contracts and supply chain services (e.g. input credit, market information, etc...) and higher farm-gate prices. The possibility exists, however, that the rise of LSTs will squeeze out local supply chain actors,—a process referred to as “disintermediation”—leading to less competitive market condition and opportunities for LSTs to push down farm-gate prices due to their market power (Reardon 2015).

This framework leads us to a four-step analysis. First, we use nationwide survey data to document changes in the importance of LSTs in staple maize markets in Kenya and Zambia. Second, we use LST trader survey data to examine the role of the rise of LSTs in transforming and modernizing grain markets. Third, we examine why LSTs are expanding in smallholder markets, focusing on changing supply and demand conditions. Fourth, we use survey data and, controlling for a range of household-level and market access variables, examine the effects of selling to LSTs on access to input credit and services, and farm gate prices.

## 3. DATA SOURCES

The data in this paper comes from two primary sources: structured surveys with LSTs in Kenya and Zambia, and farm household survey data.

LST trader surveys were carried out in September and October of 2016. In Kenya, LSTs were identified using the membership roster of the East African Grain Council (EAGC). EAGC is a membership organization that lobbies for grain market integration in east Africa. Its membership roster is considered representative of grain market actors in the region. In total, 26 firms registered with EAGC from Kenya list *trader* as their primary business. Of these, trader surveys were carried out with 18, including all the multinational traders involved in domestic grain sourcing in Kenya. The remaining eight firms were either not available or refused to be interviewed for this study. Thus, while not a full census of LSTs in Kenya, our survey captures data from the majority of large-scale firms involved in grain trading.

In Zambia, LSTs were identified through Grain Traders Association of Zambia (GTAZ), the primary lobbying organization for grain traders in Zambia. In total interviews were conducted with 24 managing directors or owners of LST firms in Zambia. This included all domestic and multinational firms categorized as *large-scale* in the GTAZ membership roster. Because membership in GTAZ is required to access a trading license in Zambia, we consider this membership roster to include all LSTs in Zambia.

Household survey data from Kenya comes from panel data collected by researchers at the Tegemeo Institute of Agricultural Development and Policy of Egerton University, in partnership with Michigan State University (MSU). The sampling frame was originally prepared in consultation with the Kenya National Bureau of Statistics (KNBS) in 1997. KNBS used census data to identify all non-urban divisions in the country, and these were allocated to Agro-Ecological Zones (AEZ). Divisions were selected from each AEZ proportional to the size of population. Beginning in 2004, questions on marketing channel were added to the survey instrument to allow us to distinguish between small- and large-scale traders. Since 2004 three waves of the survey have been conducted (2004, 2007, 2010), consisting of a balanced panel of 1,200 maize-growing farm families living in 120 villages across 24 countries and eight AEZ.

Household survey data in Zambia comes from the Rural Agricultural Livelihoods Survey (RALS) carried out by the Indaba Agricultural Policy Research Institute (IAPRI) in partnership with MSU and the Central Statistical Office (CSO). This is a nationally representative longitudinal survey of smallholder households in Zambia carried out in 2012 and 2015. In total, 7,254 households in 442 standard enumeration areas were interviewed in both panel waves. Like the Kenya survey, these surveys capture data on farm households' crop sales behavior, including the characteristics of buyers for each crop sold, in addition to a range of other household level information.

An important challenge in collecting smallholder market channel data is ensuring that the distinction between large- and small-scale trader is consistent across households in both countries. To address this challenge, enumerators in both countries asked three clarifying questions when respondents indicated that they sold grain to a trader. First, to their knowledge, does the trader purchase more grain than the average trader in the area? Second, how does the trader typically buy grain? Do they personally come to villages to buy or do they operate buying points and hire agents to buy on their behalf? Third, does the trader have a business name or are they an individual? If the respondent answers yes to the first question and yes to either question 2 or 3, the market channel was classified as *large-scale trader*.

## 4. THE RISE OF LARGE-SCALE TRADING AND SHIFTING MARKET ARRANGEMENTS IN ZAMBIA AND KENYA

Table 1 documents how smallholder marketing behavior has changed over time in Kenya and Zambia. Two important observations come out of this table. First, of market channels captured in survey data, LST is the fastest growing in terms of the share of total maize sales in both countries. Second, the rise of LST appears to coincide with a decline in the share of total maize surplus purchased by national marketing boards, the Food Reserve Agency (FRA) in Zambia and the National Cereals and Produce Board (NCPB) in Kenya. This suggest that not only are LSTs the most dynamic market channel in the region, but that they are highly responsive to changes in government marketing policies.

### 4.1. Market Entry and Structure

As shown in Table 2, the establishment of large-scale grain trading firms in Kenya and Zambia has mostly occurred since the turn of the century. On average respondents indicate that their firms began buying grain in Kenya in 2002, while in Zambia the average start date is 2008. In Zambia, the rise of large-scale grain trading coincides with the global food price spike of 2007/08, which gave rise to a range of food system investments across Africa, most notably in commercial farm land acquisitions (Deininger and Byerlee 2011; German, Schoneveld, and Mwangi 2013).

Between the two countries, we see variations in the relative role of multinational versus domestic ownership. In Kenya, only two major multinational firms are involved in grain trading, Cargill and Export Trading Group (ETG). By contrast, Zambia has seven multinational firms involved in grain trading. These include ETG and Cargill, as well as NWK Agri-Services, AFGRI, DomZam, Inter-Africa Grain, and Quality Commodities.

The higher concentration of multinational firms in Zambia relative to Kenya reflects several important underlying differences in the structure of the two markets. According to interviews, including one respondent who at different times managed grain-buying activities in both countries, the higher level of multinational activity in Zambia is due to three primary factors. First, grain-trading profit margins in Kenya are narrower and come mostly from spatial rather than temporal arbitrage due to the two-season nature of production in the country and a staggered surplus production season with neighboring Uganda and Tanzania.

**Table 1. Share in Total Smallholder Maize Sales by Volume, Kenya and Zambia, Various Years**

| | | Small-scale trader | Large-scale trader | NCPB/ FRA | Processor/ miller | Retailer/ consumer | Other | Total |
|---|---|---|---|---|---|---|---|---|
| | | % of total kg sold to…. | | | | | | |
| Kenya | 2007 | 38 | 21 | 29 | 5 | 7 | 0 | 100 |
| | 2014 | 39 | 37 | 8 | 4 | 9 | 3 | 100 |
| Zambia | 2012 | 10 | 3 | 81 | 3 | 2 | 1 | 100 |
| | 2015 | 17 | 12 | 60 | 8 | 2 | 1 | 100 |

Source: CSO/MAL/IAPRI 2012-2015; Tegemeo HH survey 2004, 2007, and 2014; we draw on our conceptual framework and data from the trader survey to explore the rise of LSTs, and its implications for smallholder grain supply chains.

**Table 2. Summary Statistics of Large-Scale Trader Survey**

| Variable | Kenya | Zambia |
|---|---|---|
| Mean year firms began buying grain | 2002 | 2008 |
| Median year firms began buying grain | 2005 | 2008 |
| Share of firms that are multinational | 11.1 | 29.2 |
| Domestic *Maize* Purchases 2015/16 marketing season (MT) | | |
| Mean | 9,103 | 21,603 |
| Sum | 163,850 | 518,461 |
| Domestic *All Grain* Purchases 2015/16 marketing season (MT) | | |
| Mean | 20,334 | 38,215 |
| Sum | 366,020 | 917,171 |
| Purchase channels (% of MT purchased) 2015/16 | | |
| Small-scale farms (<5 ha) | 3.06 | 34.0 |
| Medium-scale farms (5-20 ha) | 22.22 | 40.83 |
| Commercial farms (>20 ha) | 3.33 | 3.67 |
| Other traders | 52.5 | 21.5 |
| Imports | 18.89 | 0 |
| Sales channel (% of MT sold) 2015/16 | | |
| Large-scale mills | 56.94 | 41.71 |
| Small-scale mills | 8.61 | 4.58 |
| Animal Feed Processor | 5.83 | 9.58 |
| Oilseed crusher | 1.67 | 2.71 |
| Other trader | 16.67 | 14.17 |
| Export market | 2.22 | 13.54 |
| NGOs | 8.06 | 13.71 |
| Contract Utilization (% yes) | | |
| w/ small-scale traders | 61 | 54 |
| from processors/retailers | 78 | 54 |
| forward delivery contracts with farmers | 17 | 58 |
| Financing | | |
| % that borrow to fund grain trade | 89 | 46 |
| Source of trade finance (% of those that acquired) | | |
| Domestic commercial bank | 75 | 8 |
| Overseas commercial bank | 6 | 13 |
| Internal borrowing within firm/family | 13 | 67 |
| Informal credit | 6 | 4 |
| Other | 0 | 8 |

Source: Large Scale Trader Survey 2016.

This favors nimble local traders that can leverage local market knowledge and social capital in order link seasonally varying production zones to consumption markets.

Moreover, given relatively lower margins, firms have to handle significantly larger volumes of grain to remain profitable than they would in Zambia. Relatively low and spatially varying domestic surplus production, coupled with a lack of bulk handling facilities place limits on

the total available surplus and the pace that grain is off-loaded to the market, and thus limit the attractiveness of the Kenyan market to multinational firms.

Second, domestic commercial lending rates in Kenya are lower than in Zambia and banks are more willing to lend to local grain traders. In Zambia, benchmark interest rates set by the Bank of Zambia held at 15.5% throughout 2016, compared to rates between 8.5% and 11.5% in Kenya. As shown in Table 2, amongst financed traders, 75% of the respondents in Kenya indicated that domestic commercial lending was their primary source of grain trade financing, compared to just 8% in Zambia. Moreover, a larger share of trading firms in Kenya borrowed money (89%) than in Zambia (46%). So, amongst all traders interviewed, two out of three in Kenya were financed domestically, compared to less than one in twenty in Zambia. Finally, Zambia's position as a consistent grain surplus producer, and associated export opportunities to the region's deficit countries is considered an important driver of the multi-nationalization of grain trading in Zambia.

### 4.2. Scale and Supply Chain Structure

As shown in Table 2, in Kenya our sample of large traders accounted for over 163,000 mt of domestic maize purchases (excluding imports) in 2015/16 (Table 2). On average, respondents purchased over 9,000 mt of maize in that year from domestic suppliers. In Zambia, large-traders accounted for well over 500,000 mt of domestic maize purchases. This amounts to 37% of the total forecasted maize sales in the country for 2016 (GoZ 2016).[3] Respondents purchased, on average, over 21,000 mt each in 2015/16. LSTs in Zambia therefore exercise significant market power and have significantly larger capital outlays than in Kenya.

While maize is the most widely traded crop for large-scale traders in both countries, LSTs typically buy and sell a range of other grains and export crops. In Kenya, traders purchase a wide range of pulses, such as green gram, pigeon pea, and groundnuts, for both domestic retail markets and export to deep-sea markets. Wheat is also an important commodity for some traders. In Zambia, traders focus primarily on wheat and soybeans, but are increasingly adding groundnuts, pigeon peas, and to a lesser extent sunflower to their crop portfolio. When the full range of grains is included, respondents purchased a total of 366,000 mt and 917,000 mt of grains in Kenya and Zambia respectively in 2015/16. This amounts to an average annual purchase volume of over 20,000 mt of grain per firm in Kenya and over 38,000 mt in Zambia.

The ways in which LSTs purchase maize in Zambia and Kenya vary. When we disaggregate the share of total purchases, including imports, by supply channel we find that large-scale traders in Kenya acquire stocks primarily through intermediaries and imports, while those in Zambia purchase the majority of their grain directly from small- and medium-scale farms. In both cases, commercial farms play only a minor role in total grain purchases.

As mentioned earlier, because of the staggered seasonal nature of maize production in Kenya, large traders rely on smaller traders with local market knowledge and social capital to acquire grain. Large-traders in Kenya only maintain established grain buying points in a handful of locations in the breadbasket regions of the Rift Valley.

By contrast, Zambia produces grain according to a uni-modal rainfall pattern. Consequently, large-traders in Zambia frequently have established buying points in major production regions, which they operate during the main marketing season. These established buying

[3] Kenya does not collect comparable data on forecasted maize sales.

points allow Zambian traders to buy a larger share of their total grain purchases directly from small- and medium-scale farmers.

This suggests that processes of disintermediation that are common markers of food system transformation (Reardon 2015) are more pronounced in Zambia than Kenya. As a result, we anticipate that the pace of decline in the prominence of traditional market channels in Zambia is likely to be faster than in Kenya. An important area for future research is to understand the implication of this on the competitiveness of the assembly markets on which most very small producers currently depend (Sitko and Jayne 2014).

In both Zambia and Kenya, direct purchases from farmers are concentrated in the medium-scale farm sector. This is a farm sector that has exhibited significant dynamism in recent years, particularly in Zambia (Jayne et al. 2016; Sitko and Jayne 2014). We will return to the role of land size dynamics in driving large-scale trader growth below.

Grain sales patterns by large-scale traders are similar between countries. In both countries, large-scale mills that process maize meal and wheat flour are the primary markets for traders. Export markets are particularly important for Zambia traders, who export to deficit countries in the region. In both countries, Non Governmental Organizations (NGOs), particularly the World Food Programme's Purchase for Progress program, accounts for a non-trivial share of total sales. Edible oil crushers and animal feed processors are particularly important market channels in Zambia, where local soybean production is well established.

### 4.3. Supply Chain Contracts and Coordination

The shift from predominantly spot market transactions to more coordinated contractual relationships along supply chains is an important element of supply chain transformation (Reardon and Timmer 2012). Large-scale trader surveys show that downstream and upstream market relationships are increasingly characterized by formal and informal contracts.

Table 2 shows that the majority of large-scale traders in Kenya and Zambia utilize contracts with other, often smaller scale traders to purchase grain on their behalf. Due to a lack of formal contract enforcement mechanisms, these contracts are typically carried out with local traders that have an established business record with the firm. At a minimum, the contracts specify the price, quantity, and delivery point. In some cases, quality requirements, particularly moisture content and color are included in the contracts. These contracts are used to enhance supply chain predictability, increase total traded volumes and to defray supply and price risk.

These contracts often include financing for the smaller-scale trader. Of the respondents that contract traders to buy grain on their behalf, 60% in Kenya and 71% in Zambia provide financing to the traders. In addition, supply contracts from large traders to small traders in Kenya are used to access short-term commercial bank loans. This is important, as it helps to address typical capital constraints that imped small-scale trader activities in SSA.

Downstream contracts are also an important feature of large-scale traders' business model. Like trader contracts, these processor contracts specify quantity, quality, price, and delivery location. As shown in Table 2, 78% of all LST respondents in Kenya indicated that they receive processor contracts, compared to 54% in Zambia. These contracts serve two important supply chain functions. First, they help to defray some price risk for traders. This is important, given the high level of price variability in the two countries. Prices in these markets frequently move dramatically as a result of policy changes, such as tariff waivers, export bans, or marketing board activities, limited supply and demand information, and

global price movements (Kirimi et al. 2011; Jayne et al. 2010). Second, in some cases processors provide traders with financing to purchase grain. Of the respondents that receive processor contracts, 22% in Kenya and 46% in Zambia are provided with financing as part of the contract. More often, traders use the processor contracts to borrow from local commercial banks. Again, this is more prevalent in Kenya than in Zambia.

Taken together, the rise of large-scale trading is helping to drive a fledgling transition from predominantly spot market transactions to more formal marketing arrangements. In the absence of market concentration and market power, these arrangements could improve the capacity of the food system to lower and spread risk along supply chains, enable greater transparency, and serve to address some of the traditional liquidity constraints that imped African grain market performance (Poulton, Kydd, and Dorward 2006).

### 4.4. Supply Chain Evolution

The growth of large-scale trading is driving important processes of supply chain integration. As shown in Table 3, LSTs in both Kenya and Zambia are carrying out an increasingly wide range of supply chain activities. This is particularly evident when looking at changes between when the firms began trading grain and now in the share of firms with investments in processing, storage, and input supply. In each of these functional areas, LSTs have made substantial investment over time. Respondents indicate that several factors are driving this process of firm development and supply chain integration.

First, LSTs indicate that processors are increasingly unwilling or unable to assume the costs and risks of grain storage. Through contractual relationships, processors are devolving the risks and costs of financing grain procurement and storage and ensuring minimum quality standards to LSTs. While 10 or 15 years ago most large-scale processors would physically store roughly three months of grain stocks, processors are now increasingly replacing physical stock holdings with supply contract with large-traders. These arrangements allow processors to forecast supply and specialize in their market niche of processing and retailing, traders to forecast demand, and allow both to hedge price risks.

According to interviews, processors often lack skill and experience in price risk hedging that LSTs possess. In addition, respondents indicated that access to financing, from overseas credit markets or from within their own firms, enable LSTs to borrow at lower rates than many domestic processors. The combination of these factors gives LSTs a comparative advantage in storage over many processing firms.

Second, in order to manage supply chain risks and declining margins, a growing number of large-scale traders are investing in grain processing. This is more widespread in Kenya, where investment in pulse processing and medium-scale *posho* milling is common. In Zambia, processing investments have been concentrated in oil expelling and peanut butter processing.

**Table 3. Evolution of Supply Chain Responsibilities/Activities**

| | Zambia | | | Kenya | | |
|---|---|---|---|---|---|---|
| Supply chain activity | % that engaged in ….when the company began (n=?) | % that engage in …. Currently (n=?) | Diff | % that engaged in ….when the company began (n=?) | % that engage in …. Currently (n=?) | Diff |
| Purchase grain from commercial farmers | 50.0% | 50.0% | 0.0% | 44.4% | 72.2% | 27.8% |
| Purchase grain from small-scale farmers | 87.5% | 100.0% | 12.5% | 88.9% | 88.9% | 0.0% |
| Import or export grain | 41.7% | 33.3% | -8.3% | 16.7% | 83.3% | 66.7% |
| Process grain | 12.5% | 29.2% | 16.7% | 11.1% | 55.6% | 44.4% |
| Store grain | 75.0% | 91.7% | 16.7% | 38.9% | 94.4% | 55.6% |
| Supply inputs | 50.0% | 62.5% | 12.5% | 22.2% | 38.9% | 16.7% |
| Own grain transport | 20.8% | 12.5% | -8.3% | 27.8% | 88.9% | 61.1% |

Source: Large-scale trader Survey 2016.

Finally, an increasing share of large-scale traders are making investments in input supply, this includes through credit arrangements with farmers, licensing agreements with global suppliers, or investments in agro-dealer retail outlets. These investments are partially driven by an interest in stimulating production growth in supply regions and to increase profits through scale economies in purchasing, diversification, and supply chain integration.

## 5. CHANGING GRAIN SUPPLY AND DEMAND CONDITIONS AND THE RISE OF LSTS

Table 4 summarizes survey responses to the question "what factors explain the growth of large-scale trading?" It shows that traders attribute growth in large-scale trading to two fundamental dynamics. The first is rapid and sustained demand growth, both in domestic and regional export markets. The second is changing supply conditions, particularly increased production coming from the medium-scale farm sector. We examine these factors in detail below.

### 5.1. Evolving Demand Conditions

Large-scale traders say expanding demand in local and regional markets has been the fundamental growth engine for their businesses. This increased demand has come from a combination of structural, quantitative, and qualitative changes in grain markets. The key structural change has been the shifting of supply chain responsibilities from processors to traders, which opens space in the market for more trading and wholesaling activity. This transfer of responsibility has likely co-evolved with the growth of large-scale traders, where the existence of large-scale traders makes a dispersion of supply chain responsibilities possible, which in turn creates greater opportunities for growth for large-scale traders.

The quantitative expansion of demand is largely due to rapid population growth and urbanization. Within both Zambia and Kenya, total populations have doubled between 1990 and 2015. Regionally as well, large and growing populations create tremendous demand growth for staple foods. As of 2014, the Food and Agricultural Organization estimates total net maize demand in eastern and southern Africa is approaching 40 million tons, with no sign of diminishing. This creates opportunities for food processors and wholesalers. However, the nature of the opportunity is somewhat different in the two countries. Nearly 14% of Kenya's maize consumption over 2009-2013 was imported from world markets, while Zambia was a net exporter over this same period. Kenya's increasing dependence on imported grains is raising opportunities to link demand in burgeoning cities with supplies from global markets. Processing is thriving regardless of the source of the raw maize. In Kenya, for example, large-sale processors have increased total grain processing capacity by over 30% between 2005 and 2015 (EPZA 2005; Global Agriculture Information Network 2015). As domestic large-scale processing capacity increases, total formal market demand for grain increases,

**Table 4. Drivers of the Rise of LSTs**

| | Kenya | | Zambia | |
|---|---|---|---|---|
| Rank | Driver of growth | % respondents | Driver of growth | % respondents |
| 1st | Increased demand from processors and retailers | 33 | Increased cross border trade opportunities | 21 |
| 2nd | Increased production from medium-scale farms | 14 | Increased production from medium-scale farms | 17 |
| 3rd | Improved infrastructure | 14 | Increased demand from processors and retailers | 15 |

Source: Large-scale trader survey 2016.

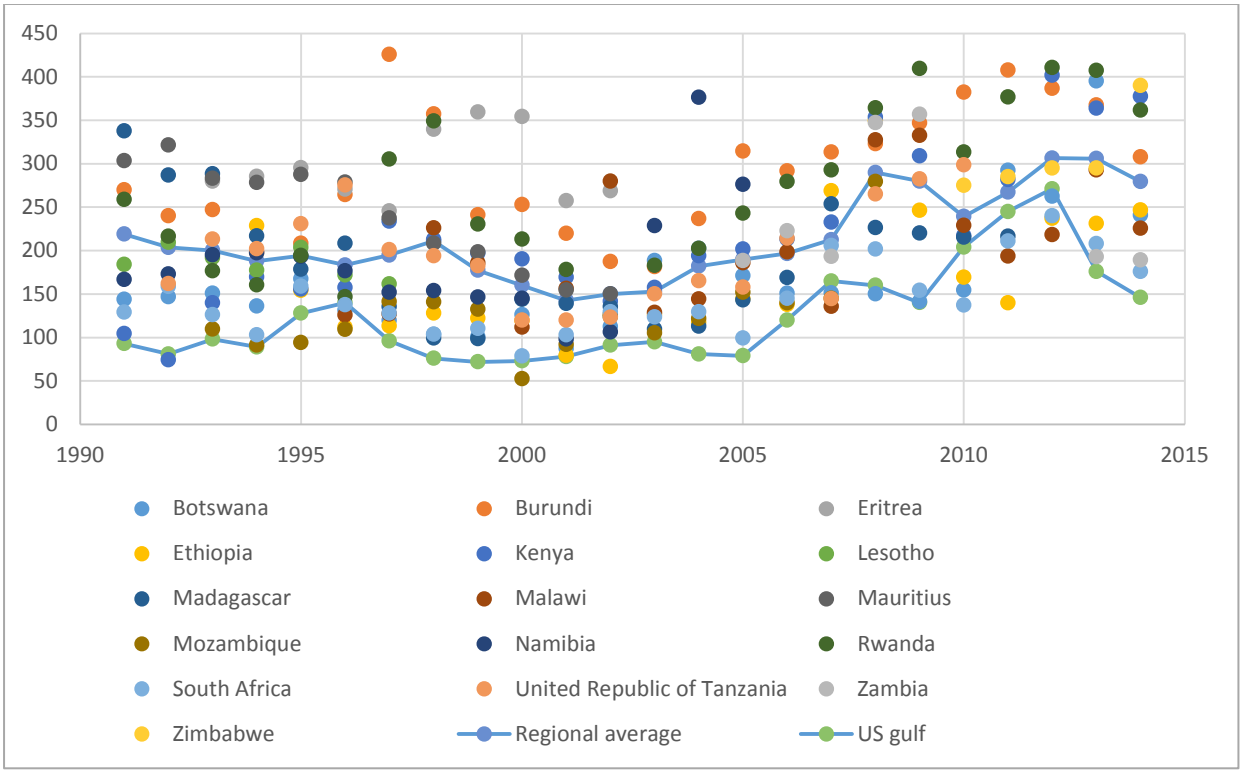
which creates considerable opportunities for large-scale traders from local, regional, and global sources. In Zambia, by contrast, essentially all of the urban demand for maize since 2010 has been sourced from domestic production. This provides greater investment and employment growth in the development of local supply chains dedicated to pulling surplus production off the farm and into cities, from local aggregation, wholesaling, processing, and retailing. In Kenya, LST investment is responding to opportunities from both local and import supply chains.

In many countries, demand growth is outpacing domestic supply growth, pushing prices toward import parity (ReNAPRI 2015). Figure 1 presents national annual nominal maize prices (in dots) against regional price averages and US gulf maize prices. It shows that prices in the region have trended upward since 1990, yet with significant inter-annual fluctuation at a country level and high levels of price heterogeneity between countries. This creates both regional arbitrage opportunities in grain trading and investment opportunities for processors and traders.

Finally, urbanization and income growth are creating qualitative changes in demand, particularly increased consumption of oils and animal proteins (Byerlee et al. 2013; Tschirley et al. 2015; Masters et al. 2013). This drives demand for primary products, including both oilseeds and maize. In Zambia, for example, animal feed processing capacity has increased from less than 10,000 mt per year in 2000 to over 320,000 mt in 2015 (AgriProFocus Zambia 2015).

The combination of these demand side factors create tremendous growth and profit opportunities for domestic and multinational firms willing to assume the risk of operating in these uncertain markets and capable of accessing the requisite capital to do so.

**Figure 1. Average Annual Maize Producers Prices for Countries in Eastern and Southern Africa, Regional Averages, and U.S. Gulf Prices 1990-2014**




Source: FAOSTAT.

### 5.2. The Co-Evolution of Medium-Scale Farms and Large-Scale Traders

Alongside the demand growth in the region, and partially as a response to it, SSA is witnessing a rapid expansion of medium-scale farms (Jayne et al. 2016; Sitko and Jayne 2014). Medium-scale farms (defined here as farms between 5 and 100 hectares) have increased over the last decade to control roughly 20% of total farmland in Kenya, 32% in Ghana, 39% in Tanzania, and over 50% in Zambia (Jayne et al. 2016). Investment in medium-scale farms in the region has been driven in large measure by increased interest in land by urban-based professionals and influential rural people. This investment followed many projections that the rise in world food prices represented a long-term structural change in global food conditions driven by US biofuels policy and rising long-term demand for grain in large middle-income countries (e.g., see von Braun 2007). It remains to be seen whether domestic investment in medium-scale farms continues in the current period of moderate global food prices, but in any event, the rapidly rising urban population growth and demand for food in Africa still presents strong incentives for local farm investment.

*A priori,* we anticipate that the growth in larger, better-capitalized farms, with larger surpluses to sell would require better-capitalized market actors than traditional small-scale traders. This is particularly the case as government marketing boards in the region are increasingly unable to compete with the private sector on price or timing of payment (Kirmi et al. 2011; Chapoto et al. 2015).

We progressively build a probit model to estimate the relationship between land size and market channel choice for Kenya and Zambia in Table 5. Amongst the population of farmers selling maize, the dependent variable is whether or not the farm sold maize to a large-scale trader. The first model is an unconditional correlation between two farm size category variables, farms with two to five hectares and farms of five hectares or more, and the dependent variable. The coefficients estimate the difference in the probability of selling to a LST between farms in these categories relative to farms less than two hectares, which make up roughly 70% of the total smallholder population in both countries. In subsequent columns, we progressively add variables. In the second column, we add district fixed effects and month of sale variables. In the third column, we remove the fixed effects and add household characteristics. In the fourth column, we add grain transport costs, the number of traders operating in the village, and prices. In the full model, we reintroduce district and year dummies to the model.

Table 5 shows that in Zambia, across the five models, the correlations between farm sizes and selling to LSTs remain stable and significant. In the full model, we find that the likelihood of farms of 5 or more hectares selling to LSTs is 14.4 percentage points higher than farms of less than two hectares, all else equal. In Kenya, we find a similar relationship between farm size and selling to LSTs. However, in models 2 and 5 the relationship is not statistically significant for farms with 5 hectares or more. This is due to collinearity in the relationships between district fixed effects, farm size, and selling to LSTs.[4] Despite this limitation, these data provide compelling evidence that the rise of LSTs, and the structural changes it creates in grain markets, is likely co-evolving with rapid growth in relatively larger producers.

[4] In the Kenya data more than half (54%) of the farmers selling to large traders, and 40% of the farms over five hectares are in just two districts—Uasin Gishu and Kakamega.

**Table 5. Factors Associated with Selling to a Large-Scale Trader (amongst Those Selling to Traders) in Kenya and Zambia**

| *Explanatory variables* | *Variables added in each column (left-to-right)* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Simple<br>1 | | Month and district only<br>2 | | Household characteristics only<br>3 | | Price and TCs<br>4 | | Full model<br>5 | |
| | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya |
| Farm is 2-5 hectares (cultivated and fallow land) (1=yes) | 0.082*** | 0.151*** | 0.077*** | 0.090*** | 0.093*** | 0.134*** | 0.095*** | 0.140*** | 0.092*** | 0.086*** |
| | (0.02) | (0.03) | (0.02) | (0.03) | (0.02) | (0.03) | (0.02) | (0.03) | (0.02) | (0.02) |
| Farm is 5 or more hectares (cultivated and fallow land) (1=yes) | 0.145*** | 0.188*** | 0.147*** | 0.042 | 0.136*** | 0.182*** | 0.134*** | 0.196*** | 0.144*** | 0.074 |
| | (0.04) | (0.05) | (0.04) | (0.04) | (0.04) | (0.05) | (0.04) | (0.05) | (0.04) | (0.05) |
| Adult equivalents | | | | | 0.004 | 0.013*** | 0.005 | 0.011*** | 0.002 | 0.005* |
| | | | | | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Level of education household head in years | | | | | -0.007*** | 0.002 | -0.006** | 0.002 | -0.005* | 0.005*** |
| | | | | | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Female headed household | | | | | -0.034 | 0.024 | -0.034 | 0.025 | -0.024 | 0.064** |
| | | | | | (0.02) | (0.03) | (0.02) | (0.03) | (0.02) | (0.03) |

(Table cont. on next two pages.)

| *Explanatory variables* | *Variables added in each column (left-to-right)* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Simple<br>1 | | Month and district only<br>2 | | Household characteristics only<br>3 | | Price and TCs<br>4 | | Full model<br>5 | |
| | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya |
| Land is not formally owned (1=yes) | | | | | -0.023 | -0.001 | -0.017 | 0.002 | -0.036 | 0.022 |
| | | | | | (0.03) | (0.02) | (0.03) | (0.02) | (0.03) | (0.02) |
| All animal / equipment assets (1,000's K/Household, rebased) | | | | | 0.001*** | -0.000 | 0.001*** | -0.000 | 0.000** | -0.000 |
| | | | | | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Quantity of fertilizer applied (kgs/maize ha) | | | | | 0.025*** | -0.000 | 0.025*** | -0.000 | 0.019*** | 0.000* |
| | | | | | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Price for commercial sale (K/kg, rebased) | | | | | | | -0.002 | 0.003* | 0.035 | 0.004* |
| | | | | | | | (0.02) | (0.00) | (0.02) | (0.00) |
| Transportation cost for sale (K/kg, rebased | | | | | | | 0.050 | -0.006** | 0.060 | -0.007*** |
| | | | | | | | (0.05) | (0.00) | (0.04) | (0.00) |
| | | | | | | | | | | |

| *Explanatory variables* | *Variables added in each column (left-to-right)* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Simple<br>1 | | Month and district only<br>2 | | Household characteristics only<br>3 | | Price and TCs<br>4 | | Full model<br>5 | |
| | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya |
| One or two commercial traders came to village (1=yes) | | | | | | | -0.012 | | -0.005 | |
| | | | | | | | (0.03) | | (0.03) | |
| 3 or more commercial traders came to village (1=yes) | | - | | | | - | -0.010 | - | 0.017 | |
| | | | | | | | (0.03) | | (0.03) | |
| Year=2015 | | - | 0.023 | 0.109*** | | - | | - | 0.003 | 0.060** |
| | | | (0.02) | (0.02) | | | | | (0.02) | (0.03) |
| Monthly dummy variables for time of sale | - | | Yes | Yes | - | | - | | Yes | Yes |
| District dummy variables | - | | Yes | Yes | - | | - | | Yes | Yes |
| Observations | 2,794 | 1,411 | 2,555 | 1,373 | 2,794 | 1,411 | 2,720 | 1,410 | 2,496 | 1,372 |

Sources: Kenya: Tegemeo Institute survey data 2007, 2010. Note, 38 observations are in a district where no farmers sold to large-scale traders (and thus present an incidental parameter problem if included in the district fixed-effect regression), so they are omitted from columns 2 and 5. One observation is missing month of sale data, and so is omitted from columns 4 and 5. Zambia: CSO/MAL/IAPRI, 2012, 2015. Note – N changes because of missing data in columns 4. In Columns 2 and 5 there are several districts where no one sold to large traders, so the observations from these districts are dropped.

## 6. IMPLICATIONS OF THE RISE OF LSTS ON SERVICE PROVISION TO FARMERS AND FARM-GATE PRICE

The literature reviewed in the conceptual framework suggests that as traditional markets give way to more consolidated and integrated supply chains, the capacity to coordinate investments along the supply chain, including investments in input credit and other services, increases (Poulton, Kydd, and Dorward 2006). This is because larger firms can often better manage the sorts of risks, including default and price risk, which typically imped these investments in traditional market arrangements (ibid). Moreover, due to economies of scope and scale, coupled with other supply chain governance tools, such as price hedging and supply contracting, LSTs may be able to drive down transactions costs in ways that allow them to pay higher farm gate prices than traditional market actors (Reardon and Timmer 2012). Evidence of these outcomes would suggest that the rise of LSTs is contributing in important ways to broader processes of economic transformation.

### 6.1. African Farmers Improving Access to Markets and Services

According to interviews, input credit and extension services are provided by LSTs to farmers in order to increase available tradable surpluses and to help farmers meet quality standards, particularly for pulses and oilseeds. Table 4 summarizes data on the provision of input credit and extension services to farmers collected in the LST survey. It shows that credit and extension service provision are common attributes of LSTs businesses, though with important variations between Kenya and Zambia.

Table 6 shows that that while more than half of LSTs in Zambia offer input credit to some farmers, only a quarter of LSTs in Kenya do. Zambia's large commercial farm sector is an important recipient of input credit. While the mean number of farmers provided with input credit for grain by LSTs is over 3,400 in Zambia, the median is just 20. Many LSTs provide input credit to a small handful of large commercial farms, while a minority also extends credit to the smallholder sector.

**Table 6. Input Credit and Extension Service Provision by LSTs**

| Input credit | Kenya | Zambia |
|---|---|---|
| *% that provide to farmers* | 28 | 54 |
| # of recipients | | |
| *mean* | 256 | 3,423 |
| *median* | 100 | 20 |
| *sum* | 1,281 | 44,504 |
| *total value (US$)* | | |
| *mean* | 28,940 | 5,352,710 |
| *median* | 7,000 | 9,960 |
| *sum* | 144,700 | 69,585,224 |
| Extension | | |
| *% that provide to farmers* | 33 | 42 |
| *# of recipients* | | |
| *mean* | 1,378 | 5,675 |
| *median* | 125 | 200 |
| *sum* | 8<br>271 | 51,076 |

Source: Large-scale Trader Survey 2016.

These are mostly firms that also have an investment in smallholder cash crop production, and have assumed many of the screening costs of providing input credit to smallholders through this side of their business (Sitko and Chisanga 2016). Input credit is particularly important for driving productivity growth in Zambia, where domestic lending rates are higher than in Kenya and input markets are less dynamic (Ariga and Jayne 2009).

The total value of input credit in Zambia is astounding. In 2015, LSTs estimate that they provided over 44,000 commercial and smallholder farmers with a combined $US 70 million in input credit for maize, soy, and wheat production. In Kenya, the scale of input credit provision is much more modest. Respondents estimate they granted US$144,000 in grain input credit to 1,200 farmers.

Extension services area also an important element of LSTs business models. In Kenya, LSTs provide extension services, mostly for pulse production, to 8,200 farmers. In Zambia, extension advice was provided to 51,000 farmers by LSTs. Extension services were provided for smallholder pulses, oilseeds, and maize, as well as for commercial wheat and soy production. One might ask what kind of extension services a trader is providing, or even qualified to provide. Multi-national firms are likely to provide specialists and host field days educating farmers on a range of topics including plant spacing, fertilization, marketing and so on.

Supplemental discussions with our respondents suggest that many domestic large-scale traders are farmers themselves and often trained by either government or other extension agents. The primary focus of the advice from these actors seems to be on encouraging fertilizer and improved seed use.

Trader survey responses on input credit are supported by evidence from smallholder household survey data. Table 7 uses household survey data to estimate the share of producers that receive input credit in Kenya and Zambia, and market information in Zambia, by market channel.[5] It shows that, consistent with the trader interviews, farmers that sell to large traders are statistically more likely to get price information (in Zambia) and more likely to receive seed credit (Zambia) and cash input credit (Kenya) than those selling to traditional small-scale traders.

**Table 7. Smallholder Access to Farm Credit and Information by Market Channel**

| | Zambia | | Kenya | |
|---|---|---|---|---|
| Market channel for largest transaction | Did the HH receive price information from… (% yes) | Did the HH receive seed on loan from… (% yes) | Did the household receive cash credit for agriculture from … (% Yes) | Did the household receive in-kind credit for agriculture from … (% Yes) |
| Small trader | 13.3 | 1.1 | 9.5 | 21.5 |
| Large trader | 17.7 | 5.5 | 14.2 | 12.8 |
| FRA/NCPB | 15.3 | 0.9 | 17.2 | 13.8 |
| Miller | 18.3 | 0.7 | 9.1 | 9.1 |
| Other households | 14.9 | 1.2 | 8.8 | 26.9 |

Source: Zambia: CSO/MAL/IAPRI 2012-2015; Kenya: Tegemeo Institute survey data 2007 and 2010.

[5] In Kenya, information on price information is not collected, however input credit information is more thorough and disaggregates by cash and in-kind while in Zambia only data on seed credit is available.

While the share of smallholder households receiving input credit from LSTs remains small relative to the total population, the fact that input credit for grain production developing is encouraging. Given widespread capital constraints among smallholders, coupled with weather related production uncertainty, functional input credit systems are likely essential for achieving sustainable smallholder land productivity growth, particularly if these are linked to effective extensions services.

### 6.2. Price Effect of Selling to LSTs

To estimate the price effect of selling to LSTs relative to other commercial market channels (e.g., traditional small-scale traders and processors) we regress the log of the price the farmer reported receiving per kg of maize using ordinary least squares, on a dummy variable for whether or not the farm sold to a LST using transaction-level data from Zambia and Kenya. In Table 8, we then build on this model to control for an increasing number of factors. The first column shows the unconditional correlation between price and whether a farmer sold to a LST. We subsequently add transportation costs, farm size, year and month of sale *fixed* effects, and finally district dummies. It is important to note that in these models we are *not* attempting to control for selection bias, since we are not really looking for a causal relationship. Instead, we are trying to develop a nuanced understanding of the factors associated with commercial prices received and the role of market channel.

We find that in all five specifications in Zambia and four out of five specifications in Kenya, selling to an LST is associated with receiving a statistically significantly higher price than other commercial market channels. Looking at column 5, we find that, once the full range of seasonal, household, and geographic variables are included, selling to a LST is associated with a 4.9% higher price per kg of maize than other commercial market channels (compared to a 6% unconditional price difference) in Zambia and 3.6% higher price per kg in Kenya (compared to a 6.9% unconditional price difference).[6]

Thus, even controlling for factors that typically influence price, farmers selling to LSTs still receive a higher price on average than other commercial channels. This suggests that the supply chain attributes of LSTs described in Section IV enable LSTs to drive down marketing costs in ways that allow them to provide farmers with higher farm gate prices than can be obtained in other commercial market channels.

[6] It is worth noting that seasonal price variation is substantial and statistically significant with up to 25% higher prices during the lower-volume trading months. Also, the positive correlation between farm size and price diminishes after seasonal variation is modeled. Together, this suggests part of the reason larger farms get higher prices is that they are better positioned to wait for higher market prices (which is also when larger traders are more likely to remain active than small traders).

**Table 8. Factors Associated with Maize Commercial Spot Prices in Zambia and Kenya**

| | Explanatory variables added (left-to-right) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Large trader | | Transport cost | | Farm size | | Month and Year | | District | |
| ln(Price)= | 1 | | 2 | | 3 | | 4 | | 5 | |
| | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya |
| Sold to large scale trader (1=yes) | 0.060*** | 0.069*** | 0.058*** | 0.070*** | 0.047*** | 0.082*** | 0.028** | -0.009 | 0.049*** | 0.036** |
| | (0.02) | (0.02) | (0.02) | (0.02) | (0.01) | (0.02) | (0.01) | (0.02) | (0.01) | (0.02) |
| Transport cost (K/50kg/km, rebased) | | | 0.006 | 0.002 | 0.006 | 0.004 | 0.008 | 0.004** | 0.011** | 0.005*** |
| | | | (0.01) | (0.00) | (0.01) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Farm size-cultivated and fallow (ln(ha)) | | | | | 0.033*** | -0.025** | 0.002 | 0.008 | 0.017** | 0.019** |
| | | | | | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| *Time-effects* | | | | | | | | | | |
| Year=2015 | | | | | | | 0.240*** | 0.489*** | 0.242*** | 0.469*** |
| | | | | | | | (0.01) | (0.01) | (0.01) | (0.01) |
| February | | | | | | | -0.089 | -0.021 | -0.075 | -0.023 |
| | | | | | | | (0.10) | (0.02) | (0.09) | (0.02) |
| March | | | | | | | -0.023 | -0.022 | 0.019 | -0.020 |
| | | | | | | | (0.10) | (0.02) | (0.11) | (0.02) |

Continued on next two pages.

| | Explanatory variables added (left-to-right) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Large trader | | Transport cost | | Farm size | | Month and Year | | District | |
| ln(Price)= | 1 | | 2 | | 3 | | 4 | | 5 | |
| | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya |
| April | | | | | | | -0.044 | -0.016 | -0.117 | -0.011 |
| | | | | | | | (0.08) | (0.02) | (0.10) | (0.02) |
| May | | | | | | | -0.208*** | -0.067** | -0.240*** | -0.066** |
| | | | | | | | (0.08) | (0.03) | (0.06) | (0.03) |
| June | | | | | | | -0.228*** | -0.043 | -0.219*** | -0.009 |
| | | | | | | | (0.07) | (0.03) | (0.05) | (0.03) |
| July | | | | | | | -0.195*** | 0.027 | -0.193*** | -0.022 |
| | | | | | | | (0.07) | (0.05) | (0.05) | (0.04) |
| August | | | | | | | -0.158** | 0.042 | -0.145*** | -0.023 |
| | | | | | | | (0.06) | (0.03) | (0.05) | (0.03) |
| September | | | | | | | -0.133** | 0.073*** | -0.139*** | 0.024 |
| | | | | | | | (0.07) | (0.02) | (0.05) | (0.02) |
| October | | | | | | | -0.131* | 0.050* | -0.148*** | -0.001 |
| | | | | | | | (0.07) | (0.03) | (0.05) | (0.03) |

| | Explanatory variables added (left-to-right) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Large trader | | Transport cost | | Farm size | | Month and Year | | District | |
| ln(Price)= | 1 | | 2 | | 3 | | 4 | | 5 | |
| | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya | Zambia | Kenya |
| November | | | | | | | -0.062 | -0.010 | -0.094* | -0.041 |
| | | | | | | | (0.07) | (0.03) | (0.06) | (0.03) |
| December | | | | | | | -0.054 | -0.001 | -0.072 | -0.013 |
| | | | | | | | (0.07) | (0.02) | (0.06) | (0.02) |
| District fixed effects | - | - | - | - | - | - | - | - | *Yes* | *Yes* |
| Constant | -0.0439*** | 2.710*** | -0.0457*** | 2.707*** | -0.0510*** | 2.713*** | 0.0069 | 2.504*** | -0.0438 | 2.666*** |
| | (0.008) | (0.01) | (0.008) | (0.01) | (0.008) | (0.01) | (0.034) | (0.02) | (0.042) | (0.05) |
| Observations | 2,438 | 1,411 | 2,438 | 1,410 | 2,438 | 1,410 | 2,429 | 1,410 | 2,429 | 1,410 |
| R-squared | 0.01 | 0.006 | 0.01 | 0.006 | 0.01 | 0.010 | 0.24 | 0.561 | 0.35 | 0.627 |

Sources: Zambia CSO/MAL/IAPRI 2012 and 2015; Kenya Tegemeo Institute survey data 2007, 2010.

## 7. CONCLUSION

In this article, we have shed empirical light on rapid and on-going transformations occurring in the grain trading market segments of in Kenya and Zambia. We have shown that the prevailing image of grain markets in SSA dominated by small-scale, poorly capitalized actors with limited capacity to manage risks or coordinate supply chain investments is outdated. We have shown in our focus countries that large-scale, often multinational, trading firms are expanding their footprint in smallholder grain markets, with important implications for market conduct and performance.

We have shown that these LSTs are co-evolving with other important transformations occurring in the demand and production segments of regional agri-food systems, namely the rapid growth in larger African farms and sustained regional grain demand caused by rapid population growth, dietary changes, and urbanization. As these processes continue to unfold, we anticipate continued dynamism in grain trading and wholesaling.

Using available data, we have shown that the growth of LSTs in smallholder grain markets has important implications for producers. The rise of LSTs creates new opportunities for grain intensification through the provision of input credit, extension services, and higher farm gate prices. On balance, this transformation has the potential to bring significant social welfare benefits with it, but the process also carries societal risks. For example, the strong relationship between farm size and whether or not a farm sells to an LST suggests that, on the production end, the rise of LSTs is generating benefits that are disproportionately accruing to already relatively better-off producers. While 95% of Kenyan farms and 75% of Zambian farms cultivate less than five hectares, our results indicate that these farms are significantly less likely to sell to LSTs than medium- and large-scale farms. Therefore, while the rise of LSTs may bring beneficial spillover effects for small farms and small farmers, it may simultaneously contribute to agricultural growth without poverty reduction and widening rural wealth inequality in SSA.

An important policy concern is how to leverage the benefits growing LST investment in grain markets, while managing downside risks associated with market power and limited market participation by poorer, more marginal segments of the rural population. Broader welfare benefits from the rise of LSTs will depend on its effects on consumer prices. This will hinge on on a range of factors, including the degree of concentration in markets brought about by the rise of LST and levels of competitiveness in grain processing. Assessing the effects of the rise of LSTs on consumer prices and marketing margins is an important area for future research.

Policy tools and investments to help strike this difficult balance include:

- supporting competition from domestic traders through competitively priced and accessible commercial credit markets, where the ability to leverage grain stocks through warehouse receipts or moveable collateral legislation may be particularly important;
- support horizontal aggregation structures to help small farms with limited surpluses to cost effectively link to LST market channels;
- implement policies to improve access to grain price information and predictability, including clearly defined policies for triggering government action in cross border trade and marketing board activities; and
- develop innovative financial tools to help defray risk and costs to LSTs of providing input credit and other services to smallholders in order to help expand the scope and scale of these activities to marginal regions, communities, and producers.

For African agriculture to contribute to a broader process of economic transformation in the context of rapid population growth, urbanization, and changing diets marketing arrangements that create incentives and services to support smallholder productivity growth are critical. With effective policies and investment, the rise of large-scale grain trading offers new opportunities to support smallholder intensification.

## REFERENCES


AgriProFocus Zambia. 2015. Market Study-Poultry: Investment Opportunities in the Zambian Poultry Sector (and the Katanga Region of the DR Congo). Commissioned by the Kingdom of The Netherlands in Zimbabwe in Conjunction with AgriProFocus Zambia and Poultry Association of Zambia. Lusaka: AgriProFocus Zambia. Available online at: http://agriprofocus.com/upload/Final_Market_Study_of_Poultry_Sector_in_Zambia_(for_publication)1445864268.pdf

Ariga, J. and T.S. Jayne. 2009. *Private Sector Responses to Public Investments and Policy Reforms: The Case of Fertilizer and Maize Market Development in Kenya*. IFPRI Discussion Paper 00921. Washington, DC: International Food Policy Research Institute.

Barrett, C.B. 2008. Smallholder Market Participation: Concepts and Evidence from Eastern and Southern Africa. *Food Policy* 33.4: 299-317.

Byerlee, Derek, Andres F. Garcia, Asa Giertz, and Vincent Palmade. 2013. *Growing Africa: Unlocking the Potential of Agribusiness.* Report No. 75663. Washington, DC: World Bank. http://documents.worldbank.org/curated/en/327811467990084951/Main-report.

Central Statistical Office, Ministry of Agriculture and Livestock, and Indaba Agricultural Policy Research Institute (CSO/MAL/IAPRI). 2012-2015. Rural Agricultural Livelihoods Survey Data. Lusaka, Zambia: CSO/MAL/IAPRI.

Chapoto, A., B. Chisanga, A. Kuteya, and S. Kabwe. 2015. *Bumper Harvests a Curse or a Blessing for Zambia: Lessons from the 2014/15 Maize Marketing Season*. Indaba Agricultural Policy Research Institute Working Paper No. 93. Lusaka, Zambia: IAPRI.

Coulter, J.G. and Onumah. 2002. The Role of Warehouse Receipt Systems in Enhanced Commodity Marketing and Rural Livelihoods in Africa. *Food Policy* 27.4: 319-337.

Deininger, K.W. and D. Byerlee. 2011. *Rising Global Interest in Farmland: Can It Yield Sustainable and Equitable Benefits?* Washington, DC: World Bank Publications.

Export Processing Zone Authority (EPZA). 2005. Grain Production in Kenya 2005 Report. Online at: http://www.epzakenya.com/UserFiles/files/GrainReport.pdf.

Fafchamps, M. 2001. The Role of Business Networks in Market Development in Sub-Saharan Africa. *Community and Market in Economic Development* 1.9: 186-215.

Fafchamps, M. 2003. *Market Institutions in Sub-Saharan Africa: Theory and Evidence*. Cambridge, MA: MIT Press Books.

FAOSTAT. http://www.fao.org/economic/ess/en/.

Gabre-Madhin, E., C.B. Barrett, and P. Dorosch. 2003. *Technological Change and Price Effects in Agriculture: Conceptual and Comparative Perspectives*. IFPRI Markets, Trade and Institutions Division Discussion Paper No. 62. Washington, DC: International Food Policy Research Institute.

German, L., G. Schoneveld, and E. Mwangi. 2013. Contemporary Processes of Large-Scale Land Acquisition in Sub-Saharan Africa: Legal Deficiency or Elite Capture of the Rule of Law? *World Development* 48.August: 1-18.

Global Agriculture Information Network 2015 Kenya Grain and Feed Annual Report 2014. Washington, DC: United States Department of Agriculture. Accessed online at: https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Grain%20and%20Feed%20Annual_Nairobi_Kenya_4-8-2014.pdf.

Haggblade, S., P. Hazell, and T. Reardon. 2010. The Rural Non-Farm Economy: Prospects for Growth and Poverty Reduction. *World Development* 38.10: 1429-1441.

Jayne, T.S., J. Chamberlin, L. Traub, N. Sitko, M. Muyanga, F. Yeboah, C. Nkonde, W. Anseeuw, A. Chapoto, and R. Kachule. 2016. Africa's Changing Farmland Ownership: The Rise of the Emergent Investor Farmer. Plenary paper presented at the 29th Triennial International Conference of Agricultural Economists, 13 August, 2015. Milan, Italy.

Jayne, T.S., N.M. Mason, R.J. Myers, J.N. Ferris, D. Mather, M. Beaver, ... and D. Boughton. 2010. *Patterns and Trends in Food Staples Markets in Eastern and Southern Africa: Toward the Identification of Priority Investments and Strategies for Developing Markets and Promoting Smallholder Productivity Growth.* MSU International Development Working Paper No. 104. E. Lansing, MI: Michigan State University.

Johnston, B.F. and P. Kilby. 1975. *Agriculture and Structural Transformation: Economic Strategies in Late-Developing Countries.* New York, NY: Oxford University Press.

Johnston, B.F. and J.W. Mellor. 1961. The Role of Agriculture in Economic Development. *The American Economic Review* 51.4: 566-593.

Kirimi, L., N. Sitko. T.S. Jayne, F. Karin, M. Muyanga, M. Sheahan, ... and G. Bor. 2011. *A Farm Gate-to-Consumer Value Chain Analysis of Kenya's Maize Marketing System*. Tegemeo Institute Working Paper No. 44/2011. Nairobi, Kenya: Egerton University, Tegemeo Institute of Agricultural Policy and Development.

Masters, W.A., A.A. Djurfeldt, C. De Haan, P. Hazell, T. Jayne, M. Jirström, and T. Reardon. 2013. Urbanization and Farm Size in Asia and Africa: Implications for Food Security and Agricultural Research. *Global Food Security* 2.3: 156-165.

Mellor, J.W. 1976. *New Economics of Growth*. Ithaca, NY: Cornell University Press.

Neven, D., M.M. Odera, T. Reardon, and H. Wang. 2009. Kenyan Supermarkets, Emerging Middle-Class Horticultural Farmers, and Employment Impacts on the Rural Poor. *World Development* 37.11: 1802-1811.

Porter, M.E. 1985. Technology and Competitive Advantage. *Journal of Business Strategy* 5.3: 60-78.

Poulton, C., J. Kydd, and A. Dorward. 2006. Overcoming Market Constraints on Pro-Poor Agricultural Growth in Sub-Saharan Africa. *Development Policy Review* 24.3: 243-277.

Reardon, T. 2015. The Hidden Middle: The Quiet Revolution in the Midstream of Agrifood Value Chains in Developing Countries. *Oxford Review of Economic Policy* 31.1: 45-63.

Reardon, T. and C.B. Barrett. 2000. Agroindustrialization, Globalization, and International Development: An Overview of Issues, Patterns, and Determinants. *Agricultural Economics* 23.3: 195-205.

Reardon, T., C.B. Barrett, J.A. Berdegué, and J.F. Swinnen. 2009. Agrifood Industry Transformation and Small Farmers in Developing Countries. *World Development* 37.11: 1717-1727.

Reardon, T., J.M. Codron, L. Busch, J. Bingen, and C. Harris. 1999. Strategic Roles of Food and Agricultural Standards for Agrifood Industries. Contributed paper selected for presentation at the IAMA World Food and Agribusiness Forum, 1999. Firenze, Italy.

Reardon, T. and C.P. Timmer. 2012. The Economics of the Food System Revolution. *Annual Review of Resource Economics* 4.1: 225-264.

ReNAPRI. 2015. Anticipating the Future of Agriculture in the Region: Outlook for Maize, Wheat, Sugar, and Rice. Lusaka, Zambia: ReNAPRI.

Sitko, N.J. and B. Chisanga. 2016. *How Is Multinational Investment in Grain and Oilseed Trading Reshaping the Smallholder Markets in Zambia?* IAPRI Working Paper No. 104. Lusaka, Zambia: IAPRI.

Sitko, N.J. and T.S. Jayne. 2014. Structural Transformation or Elite Land Capture? The Growth of "Emergent" Farmers in Zambia. *Food Policy* 48: 194-202.

Tegemeo Institute. 2004, 2007, and 2014. Household (HH) Survey. Nairobi, Kenya: Egerton University, Tegemeo Institute of Agricultural Policy and Development.

Tegemeo Institute. 2016. Large-Scale Trader Survey Data. 2016. East Lansing: Michigan State University.

Tschirley, D., T. Reardon, M. Dolislager, and J. Snyder. 2015. The Rise of a Middle Class in East and Southern Africa: Implications for Food System Transformation. *Journal of International Development 27*.5: 628-646.

Von Braun, Joachim. 2007. The World Food Situation: New Driving Forces and Required Actions. IFPRI's Biannual Overview of the World Food Situation presented to the CGIAR Annual General Meeting, December 4, 2007. Beijing China. http://www.fanrpan.org/documents/d00467/World_food_situation_vonBraun_Dec2007.pdf.