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**TEGEMEO INSTITUTE OF AGRICULTURAL
POLICY AND DEVELOPMENT**

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**A FARM GATE-TO-CONSUMER VALUE CHAIN
ANALYSIS OF KENYA'S MAIZE MARKETING
SYSTEM**

**Lilian Kirimi, Nicholas Sitko, T.S. Jayne, Francis Karin,
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By

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Tegemeo Institute

Tegemeo Institute of Agricultural Policy and Development is a Policy Research Institute under Egerton University with a mandate to undertake empirical research and analysis on contemporary economic and agricultural policy issues in Kenya. The institute is widely recognized as a centre of excellence in policy analysis on the topical agricultural issues of the day, and in its wide dissemination of findings to government and other key stakeholders with a view to influencing policy direction and the decision making process. Tegemeo's empirically based analytical work, and its objective stance in reporting and disseminating findings has over the past decade won the acceptance of government, the private sector, civil society, academia, and others interested in the performance of Kenya's agricultural sector.

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Executive Summary

A. Background

Maize is the most important staple food in Kenyans' diets, providing roughly a third of the caloric intake for Kenya's population. Maize is also the central crop in Kenyan agriculture, being grown by 98% of Kenya's 3.5 million smallholder farmers.

Maize marketing and trade policy in Kenya has been dominated by two major challenges. The first challenge concerns the classic food price dilemma: how to keep farm prices high enough to provide production incentives for farmers while at the same time keeping them low enough to ensure poor consumers' access to food. The second major challenge has been how to effectively deal with food price instability, which is frequently identified as a major impediment to smallholder productivity growth and food security. In attempting to cope with these interrelated challenges, policymakers have grappled with issues of the appropriate role of the state in marketing and pricing, and the extent to which variable import tariffs and trade controls can promote the achievement of national policy objectives.

A third and as yet inadequately appreciated maize policy challenge, one that is facing the agricultural sector more generally, is the growing problem of access to land and the shrinking size of smallholder farms. Partly as a result of declining landholding sizes in Kenya, most rural farm households have become net buyers of maize. The potential for transforming smallholder farmers from maize buyers into surplus producers is becoming increasingly difficult as population growth and land pressures continue unabated. Over half of the smallholder farms in Kenya are less than 1.5 hectares. In this context, a major, yet underappreciated, agricultural policy issue is how to achieve broad-based smallholder-led agricultural growth under conditions of increasingly acute land pressures. Identifying the appropriate role and potential of maize intensification in densely populated rural areas is needed to address this important policy question.

B. Objectives

Developing appropriate maize marketing and trade policies in the context of a growing structural deficit in maize and ever shrinking smallholder farm sizes requires a detailed understanding of the structure and performance of Kenya's maize value chain. Understanding how the value chain has developed in turn requires an understanding of the market liberalization process in

Kenya, as this has been the major policy thrust affecting the industry over the past 20 years. This study is a follow-up to the Tegemeo study of Kenya's maize value chain carried out in the late 1990s by Nyoro, Kiiru, and Jayne (1999). This study, conducted in 2009, describes the operation of Kenya's maize value chain two decades after the liberalization process began. A broader objective of the study is to provide a full picture of Kenya's maize value chain from the farm gate to the retailing of maize meal to consumers; to assess the competitiveness of maize markets in Kenya; to identify major trends in maize prices, maize meal prices, and marketing margins charged at various stages of the system; and to identify actions by the public sector to overcome production and marketing problems and support the Kenyan government's national policy objectives of food security and smallholder-led development.

C. Main Findings at the Farm Level of the Value Chain

1. *Land fragmentation and decreasing land-size holdings:* One of the major findings of the study concerns farm structure. Most of Kenya's smallholder farmers reside in increasingly densely populated rural areas facing major land pressures. Balanced panel data from four survey years (1997, 2000, 2004, and 2007) show that farm sizes in Kenya declined by 15% over the 10-year panel period. About one-third of the smallholder farms nationwide are less than 1.0 hectares in size. There is very little scope for increasing farm production based on increasing the amount of land in smallholder farming areas. Even with major improvements in the performance of the maize value chain, a large percentage of smallholders will continue to be unable to produce a maize surplus that would enable them to link to markets. As rural populations continue to grow (albeit at a slower rate than in earlier decades), access to quality farm land is going to increasingly be a problem that will preclude many rural households from participating as sellers in grain markets, unless there is tremendous growth in food crop yields.

2. *A relative decline in the importance of maize as a share of gross farm revenue:* Balanced panel data show that households produced roughly the same quantity of maize in each of the four survey years (1997, 2000, 2004, and 2007). Because the inflation-adjusted value per unit of maize declined over this 10-year period, the real value of production declined. The proportion of households selling maize increased from 35% of households in 1996/97 to 49% in 2006/07. The increased proportion of households selling maize may be partially due to a major rise in the use

of fertilizer on maize over the 1997-2007 period, which has contributed to maize productivity gains; 54% of households used fertilizer on maize in 1997 compared to 70% in 2007. Yet the total quantity of maize sales declined by 12% over the same period. This suggests that though a larger fraction of households is selling maize the mean quantities sold per selling household is declining.

3. *High degree of differentiation and market concentration within the smallholder sector:* Smallholder households included in the nationwide survey can be divided into three groups: (i) the largest smallholder sellers of maize who accounted for 50% of the total marketed maize output; (ii) the remaining households that sold maize during the year who accounted for the other 50% of the marketed output; and (iii) those households that sold no maize during the 12-month marketing season. Data show that 2% of the farms account for 50% of the overall marketed maize surplus from the smallholder sector. These farm households appear to enjoy substantially higher welfare levels, in terms of asset holdings, crop income, and non-farm income, than the rest of the rural population. The relatively *elite* smallholder farmers had roughly 2 to 6 times as much land and productive assets as the non-selling households, 6 to 9 times more gross revenue from the sale of all crops, and 5 to 7 times as much total household income. This concentration of surplus production and marketing by a relatively few farmers is one of the most important points to be borne in mind when thinking about the effects of policy instruments designed to alter the mean level of food prices. At least in the short run, policies that put upward pressure on maize prices benefit only a small minority of producers, while directly hurting the majority.

4. *Evidence of the importance of marketing training on farm income:* The prices received by farmers selling maize in the same month and in the same village show a high degree of variability. This variation suggests that *marketing savvy* – the ability of farmers to negotiate prices and identify buyers – plays a significant role in their ability to obtain remunerative prices for their maize. Marketing savvy is shown to be enhanced through market skills training. Based on price data collected from participants in ACDI/VOCA's Kenya Maize Development Program (KMDP) and from nearby villages where training was not administered we find that KMDP recipients received 9.9% higher prices on average (22.1 shillings vs. 20.1 shillings per kg). To examine the training effect more precisely, we regressed these prices on a training dummy variable, distance of the household to the nearest market town and a village dummy to capture spatial price differences. OLS results indicate that the KMDP recipients received, on average, 1.8

shillings per kg more than non-recipients did (a 9.2% price difference), significant at the 5% level.

D. Main Findings at the Middle Levels of the Value Chain

1. *Kenya's introduction into the East African Community has resulted in an improvement in the regional trade policy environment.* Since January 2005, regional maize trade between Uganda, Tanzania, and Kenya has not been subjected to any taxation by the Kenyan government with the exception of a 2.75% inspection fee. A reduction in regional trade barriers is very much in Kenya's interests because the country is a food importer and it can generally procure maize more cheaply from its regional neighbors than it can from the world market.

2. *With the exception of the 2008-09 crisis period, grain-marketing policies in Kenya have become more stable over time.* The NCPB's role in the market has become more clear and truncated especially since the National Rainbow Coalition (NARC) government took power in 2002. A major source of uncertainty continues to revolve around the timing of changes in import tariff rates, which remain highly unpredictable.

3. *The structure of Kenya's maize market and the relative importance of its various actors change significantly depending on national production levels:* In a normal or good year, domestic production from small- and large-scale farmers forms the major source of domestic supply. Smallholder maize sales go largely to small-scale assemblers or brokers, who collect and bulk for onward sale to large wholesalers. Large-scale millers are the next major link in the chain, buying grain primarily from the large wholesalers, the NCPB, and from smaller traders. The large millers sell mainly to a decentralized system of informal retailers (street kiosks, *dukas*, multipurpose retail shops, and traditional retail markets) and to a lesser extent to the more high-end consumers who shop at supermarkets. *Posho* millers who operate in retail markets are important players in some areas. Consumers buy grain and pay a fee to custom-mill their grain into posho meal. This option provides the means to produce maize meal relatively inexpensively and is preferred by the urban poor and most rural households, especially in the western parts of the country.

In a year when the main harvest in the major growing areas is poor, the country is more reliant on imports. If supplies can be imported from Uganda and Tanzania, this tends to be the first

option pursued by wholesalers and millers because (since January 2005) there are no import restrictions or barriers except for the 2.75% import inspection fee and transport costs, which are relatively low. However, if the required quantities cannot be obtained from the region, Kenya then becomes dependent on the world market. It is at this point that Kenyan wholesalers and millers lobby for a waiver of the 50% duty on maize imported through Mombasa port. In years when imports constitute a major share of the marketed supplies, the structure of the maize value chain changes considerably. The most significant change is that the marketing channels become more concentrated and less competitive. Import contracts through Mombasa tend to be large volume orders placed by large millers, wholesalers, and the NCPB. Small-scale assemblers, itinerant traders, and small millers in the informal marketing channels are less active in drought years because they depend almost totally on small-scale farmers for their supplies, most of whom have little to sell during drought years. With grain being scarce in local informal markets during such years, consumers are increasingly dependent on the large-scale millers (who obtain their supplies from world markets or from the NCPB) for their maize meal. Without competition from the informal milling and retailing sector, large-scale millers and retailers are able to raise their margins, which is economically damaging for poor consumers.

4. *Evidence of growing investment in private sector grain assembly and improvements in grain marketing conditions for farmers:* Farmer focus group discussions (33) and individual interviews with surplus producing farmers (450) indicate that small-scale farmers have a variety of potential markets through which to sell maize. Of the available options, small-scale assemblers operating at the village level are shown to be the most important market channel utilized by small-scale farmers. One of the most important findings is that in virtually all villages chosen for farmer focus group discussions, including both accessible and inaccessible areas, the response to the question "how many traders came into this village to purchase maize from farmers in this village" was almost always more than 10. Overall, the most commonly cited number of traders was 100, with about 27% of the responses indicating a number between 15 and 30 and 42% quoting a figure of 50-100. With these many traders purchasing maize in each village, the assembly traders are apparently pushing much deeper into rural areas than the conventional wisdom would indicate. It shows the extent to which the first stage in the system (farmer-assembly trader/first buyer) has developed and become competitive over the years. The growing density of maize assemblers also reflects an increase in the participation of the private sector in

the maize trade following liberalization.

Data on the mean distance from the farmers' farms to the point of sale of maize also suggests an expansion of private sector maize assembly. Among those farmers interviewed, the mean distance travelled to their initial point of sale was 1.85 km, with 73.1% of the farmers selling their maize at the farm-gate. Therefore, the majority of the traders transact with farmers for grain right in the villages. These results closely mirror the findings based on the 10-year Tegemeo panel data on 1,267 smallholder households to monitor changes in their access to markets and services. Their results showed that between 1997 and 2007, the mean distance from the farm to point of sale of maize declined from 0.9km to 0.5km. This represents a 43% reduction in distance, and reflects an increased density of grain traders in rural areas. Their study also shows that while in 1997, 90% of the households traveled 3.5km or less to the point of maize sale, by 2007, 90% of the households traveled 2 km or less. This reduction in distance to the point of maize sale again suggests that over time maize assembly traders are penetrating deeper into the rural areas and buying maize directly in the villages, and may reflect a growing density of maize traders.

Overall, these results suggest that over the years, there has been greater investment in private grain trading, particularly at the assembly level. Additionally, given the high number of traders operating in the village, these findings imply that access to markets may no longer be defined in terms of distance to point of sale, but rather in terms of the ability of farmers to obtain and negotiate for a remunerative price.

5. *As a result of the expansion of private sector marketing options, farmers generally feel that the maize marketing system has improved.* Farmers in the 33 focus groups were asked to indicate how the current maize marketing conditions compare to those existing 10 years ago. Nearly 70% of the responses from the FGDs indicated that the marketing conditions had improved, with little variation in terms of responses across the districts.

6. *Decreasing importance of NCPB as a market option for farmers:* The study found that the National Cereals and Produce Board purchases a relatively small proportion of maize produced by smallholder farmers. Roughly 3% of the 1,275 farm households contained in the Tegemeo Rural Surveys sold maize to NCPB. Nevertheless, NCPB appears to play an important role in the market by purchasing large volumes from large-scale farmers and from smallholders in a few

major surplus zones such as Trans Nzoia and Uasin Gishu. NCPB tends to increase its purchases in a good production season and reduce its purchases in a poor season to stabilize maize prices (Jayne, Myers, and Nyoro 2008).

7. The performance of the assembly sector of the value chain is highly dependent on the functioning of downstream actors in the value chain, particularly the wholesale sector: The primary market for maize assemblers in Kenya is the wholesaling sector. Fifty-nine percent of the assembler traders interviewed for this report do not store any of the grain they purchase from farmers. The majority of the assembler traders sell quickly to wholesalers bulking up grain in the towns. They do this mainly due to liquidity constraints: after exhausting their limited working capital buying maize, they cannot buy more until they sell their grain to obtain more working capital. Wholesalers are therefore instrumental for the viability of these assembly traders, because they provide the means for assemblers to quickly sell and obtain fresh working capital to go back into the hinterland and buy more maize from farmers. Without the wholesalers, assembly traders could spend weeks or months with their working capital tied up while waiting for the marketing board or another buyer to pay them.

8. Medium-scale wholesalers play a vital role in Kenya's maize market by exploiting spatial arbitrage opportunities: In Kenya, where harvest periods vary by region and many major consumption centers are far removed from production areas, spatial arbitrage is critical for mitigating grain price volatility. Wholesalers in Kenya perform this function by acquiring maize from primary assemblers in surplus areas and quickly transporting it to deficit regions or to large-scale grain processors. Wholesalers also play a critical role during major deficit years, by acquiring informally imported maize from Uganda and Tanzania, as well as formally imported maize in Mombasa, and bringing it to retail markets in deficit regions.

9. Limited transportation capacity in the country limits the efficiency of maize markets during major import periods: One of the primary bottlenecks to maize imports during high import periods like that experienced in 2009 is transport access from the warehouses in Mombasa to Nairobi. When imports are concentrated within a short period when the import tariff on maize is waived, the demand for transport can outstrip supply, contributing to maize shortages in inland areas and maize prices rising well over the cost of importation. If imported maize requirements could be spaced over a longer period by waiving the import tariff earlier, this would relieve

transport capacity constraints and reduce the likelihood of shortages in upland markets.

10. *Contrary to the perceived wisdom that a lack of adequate storage facilities limits the ability of farmers, traders, and processors to store grain, we find that limited storage is not due to insufficient storage facilities but is primarily caused by disincentives for traders to store grain.*

The study found an apparent contradiction of very little seasonal storage occurring despite a great deal of storage space in the country available for rent. Interviews with traders indicate that the problem is not insufficient storage facilities but inadequate incentives to store due to very high risks, constraints on borrowing capital (again related to high risks as perceived by banks and other lenders), and the features of the East African grain market in which supplies from Uganda, Tanzania, and indeed parts of Kenya are coming on the market at various times of the year, which can put downward pressure on prices and hence affect the returns to storage. Certain behaviors by the government, most notably the sudden changes in the import tariff rates on maize imports through Mombasa as well as sudden changes in the NCPB's maize selling price, exacerbate the risks of storing grain. These disincentives to storage contribute to a circuitous flow of maize out of surplus areas during harvest periods, only to move back in once deficits set in. More generally, the disincentives for traders to store grain tends to depress prices right after harvest and (because relatively little is stored through the season) less is available for consumption later in the season, which raises prices more during these periods. In order to drive down the price of maize grain and meal to rural and urban consumers, there is need to address the disincentives to on-farm and trader storage.

E. Main Findings at the Consumer Level of the Value Chain

1. *Consumer data indicates the growing importance of wheat in consumers' diets, particularly among more affluent consumers.* The importance of maize in urban staple grain diet is shown to have declined by 22% from 58% share in staple food in 1995 to 45% in 2003. Maize accounted for 59% and 38% of the staple carbohydrate consumption among the 20% poorest and richest households, respectively. Therefore, maize still remained the dominant staple food among the urban poor. However, the richer urban households who are in the top 40% of the income distribution consumed more wheat than maize. Over time, the consumption of wheat products had grown, particularly among these higher income groups, with its share rising by 17% from 25% in 1995 to 31% in 2003. In addition, among the urban respondents, wheat consumption

accounted for 22% and 38% of the staple food consumption of the 20% poorest and richest households, respectively. By 2003, wheat was the dominant staple in terms of expenditure, accounting for 43.5% of total expenditures on the main staples compared to 32.4% of maize's contribution, which had declined from 41.8% in 1995. However, expenditures on maize products exceeded those on wheat only for households in the bottom two-income quintiles (40% of the poorest households in Nairobi), but wheat dominated expenditures for the top three income quintiles.

2. *Market channels for acquiring maize vary across income groups:* The consumption of posho meal has declined in Kenya, but remains very important for relatively poorer households. This was attributed to a decline in the price difference between sifted meal and posho meal perhaps resulting from greater competition in the milling sector due to the maize market liberalization. The liberalization of the maize market led to the development of many small-scale posho mills which provided great competition for the large-scale millers. In response to this, the large millers reduced the degree of flour refinement in order to cut down their costs. Consequently, the prices of maize meal have declined, thus reducing the price difference between the posho and sifted meal. This shift in maize meal consumption patterns may have led to a decline in the market share of the posho millers, which was high in the period immediately following liberalization.

The majority of the households (64%) in the poorest income quintile prefer duka/shops, spending Ksh105 million in a month on this channel. Open markets are the next most important means by which the poorest consumers obtain staple products, accounting for 14% of their expenditures. Among the second poorest income group, the most important retail outlets are dukas/shops, roadside kiosks, small supermarkets, and markets. Only among the top income quintile did national supermarkets account for more than 20% of total expenditures on the main staple food products. Among this relatively wealthy group, duka/shops accounted for 38% of expenditures on the top four staples, while the national supermarkets accounted for 37%.

F. Main Findings Regarding Maize Prices and Market Margins

1. *Price margins at multiple stages of the value chain are low and declining:* Low price margins signal that farmers are receiving a higher proportion of the final consumer price of maize meal over time. We also find that consumers are benefiting from lower retail maize meal prices. Between the early 1990s and 2008, the kilograms of maize grain and meal that was affordable with a daily wage has been rising steadily for the various employment sectors for which data is available. Low marketing margins at this stage in the value chain suggest competition among grain assembly traders in rural areas, a point corroborated through farmer focus group discussions.

2. *Spatial price margins between surplus and deficit regions are also low.* Wholesale prices in surplus areas are in the range of 90-95% of the prices in the main deficit market of Nairobi. The remaining 5-10% is the portion of the wholesale maize price extracted by traders and transporters between surplus areas and Nairobi.

3. *Finally, the price margins between wholesale grain and retail maize meal have declined significantly.* After adjusting for inflation, there has been a highly statistically significant decline in maize milling and retailing margins by Ksh 0.068 per kg per month between 1994 and 2008, or roughly Ksh 12,000 per ton (roughly US\$180) over this 15-year period. The reason for the decline in milling and retailing margins over time is associated with a substantial increase in competition at both the milling and retailing stages of the value chain in urban Kenya. An increase in the number of millers and retail outlets has forced price competition to maintain their market share. By putting downward pressure on marketing margins and retail maize meal prices, maize market liberalization has conferred important benefits for maize consumers in Kenya.

G. Main Findings Regarding Trade Policy

1. *Uncertainty over government behavior with respect to decisions on import tariff rates as well as the NCPB pricing and marketing operations continue to stifle private investment in maize markets:* Massive food price rises in 2008 were the direct result of a combination of factors, which can be linked to uncertainty over government intervention in maize markets, including the role of NCPB in maize imports, delays in the removal of maize tariffs, and transport bottlenecks between Mombasa and Nairobi. This price rise could have been avoided if rules governing

government intervention in the maize market were clearly spelled out.

H. Conclusions and Implications for Policy

Based on the findings of this study, the following actions are proposed for consideration by the Government of Kenya:

1. Raise public investment in maize seed breeding and agronomic research to make it possible for improvements in smallholder crop productivity. Based on research evaluating the returns to alternative investments in agriculture, public expenditures in maize seed breeding and agronomy may constitute the single most important investment to promote broad-based productivity growth and poverty reduction in Kenya.
2. Explore options for improving public and private extension programs to enable farmers to adopt improved farm technologies generated from point 1.
3. Examine options for bringing more land in Kenya under potential cultivation by smallholder farmers. Unless the land constraints in currently densely populated rural areas of Kenya are relieved, it is unlikely that a large portion of farmers in Kenya that own less than one hectare will be able to rise out of the semi-subsistence conditions that keep them trapped in poverty.
4. Support training programs to enable smallholders to develop more effective marketing strategies and to negotiate more effectively with traders, in order to raise the prices that they receive for their maize.
5. Raise public investment in road, rail, and port infrastructure to reduce marketing costs as well as the cost of modern inputs such as fertilizer to the farm gate. Rehabilitating the Kenyan railway system would be a key priority. If this were done prior to 2009, maize imports could have arrived in greater volumes much faster in early 2009 and pushed food prices down faster.
6. When early warning estimates predict a need for large import quantities, remove the import tariff soon enough to allow traders to import over a sufficiently long period to avoid transport capacity constraints and domestic stockouts.
7. Review the rationale for denying import licenses when applied for by traders.

8. Consider the costs and benefits from the standpoint of governments of transitioning from discretionary trade and marketing policy to adherence to more systematic rules-based policies. Nurturing credible commitment in regard to trade policy is likely to promote market predictability and therefore, lead to greater supplies and price stability in food markets during times of domestic production shortfalls.

9. Consider whether current proposals for international stockholding would be effective in the presence of domestic transport capacity constraints. International physical or financial reserves would not be able to relieve localized food production shortfalls unless local transport capacity is adequate to absorb sufficient imports within a concentrated period or unless import licenses are provided or the state carries out or contracts for the importation from the international stock source.

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Acronyms

ACDI-VOCA	Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance
AFRICOG	African Centre for Open Governance
CMA	The Cereal Millers Association
COMESA	Common Market for Eastern and Southern Africa
CPI	Consumer Price Index
CRF	Clean Report of Finding
EAC	East African Community
FGDs	farmer focus group discussions
GBHL	Grain Bulk Handlers Limited
GISAMA	Guiding Investments in Sustainable Agricultural Markets Initiative
GoK	Government of Kenya
KBS	Kenya Bureau of Standards
KMDP	Kenya Maize Development Program
Ksh	Kenyan Shilling
MOA	Ministry of Agriculture
MSU	Michigan State University
MT	Metric tons
NARC	National Rainbow Coalition
NCPB	National Cereals and Produce Board
NFMP	National Food and Nutrition Programme
OLS	Ordinary Least Squares
SED	Single Entry Document
US\$	U.S. Dollars

1. Introduction

Maize is the most important cereal crop in Kenya. It forms an important part of the food and feed system, and contributes significantly to income generation for rural households. It is the main staple food for the people of Kenya, providing more than a third of the caloric intake (FAO 2009). Maize is also the primary ingredient used in animal feeds in Kenya, accounting for over 80% of feed rations. In terms of land usage, maize accounts for about 56% of cultivated land in Kenya. About 98% of the 3.5 million small-scale farmers in Kenya are engaged in maize production. The small- and medium-scale sector produces about 75% of the nation's maize crop, while the large-scale sector (farms over 25 acres) produce the other 25%. On average, in the last five years, 1.8 million hectares are planted to maize annually, with annual production ranging between 26 and 36 million bags (2.3 and 3.3 million metric tons (MT)) depending on weather and market conditions. National maize consumption is about 37 million bags (2.9 million MT) annually. Shortfalls in production are met through imports from Uganda, Tanzania, and the world market. Yet, despite the centrality of maize to the Kenyan food system, the country has for the last several decades shown an increasing trend in the quantity of annual staple food imports, including maize. Effectively coping with recurrent maize deficits is critical for enhancing food security in Kenya and promoting economic growth in the smallholder farmer sector.

Maize marketing and trade policy in Kenya has been dominated by two major challenges. The first challenge concerns the classic food price dilemma: how to keep farm prices high enough to provide production incentives for farmers while at the same time keeping them low enough to ensure poor consumers' access to food. The second major challenge has been how to effectively deal with food price instability, which is frequently identified as a major impediment to smallholder productivity growth and food security. In attempting to cope with these interrelated challenges, policymakers frequently rely on the use of state-run maize marketing boards to procure and distribute maize, tariffs on maize imports and exports, and bans on cross border trading.

A third and not widely appreciated maize policy challenge, one that is facing the agricultural sector more generally, is the growing problem of access to land and the shrinking size of smallholder farms. Partly because of declining landholding sizes in Kenya, most rural farm households have become net buyers of maize. The potential for transforming smallholder

farmers from maize buyers into surplus producers is becoming increasingly difficult as population growth and land pressures continue unabated. Over half of the smallholder farms in Kenya are less than 1.5 hectares. In this context, a major, yet underappreciated, agricultural policy issue is how to achieve broad-based smallholder-led agricultural growth under conditions of increasingly acute land pressures. Identifying the appropriate role and potential of maize intensification in densely populated rural areas is needed to address this important policy question.

Developing appropriate marketing policies in the context of a growing structural deficit in maize and ever shrinking smallholder farm sizes requires a detailed understanding of the structure and performance of Kenya's maize value chain. Understanding how the value chain has developed in turn requires an understanding of the market liberalization process in Kenya, as this has been the major policy thrust affecting the industry over the past 20 years. Kenya's maize market liberalization process started in the late 1980s and intensified in the early 1990s, as a strategy to increase marketing efficiency and stimulate economic growth. Nearly two decades after the liberalization of maize marketing in Kenya, debate continues about the extent to which the private sector is meeting the needs of farmers and consumers and the appropriate role of government in the maize market. It was expected that liberalization would bid up maize producer prices, induce new entry by private traders, improve smallholders' access to markets, and so induce greater production and input intensification. The removal of maize movement controls during liberalization was expected to improve trade between surplus and deficit areas, reduce transaction costs, and make maize more available for purchase across the country with more intra- and inter-regional trade. Market liberalization was also anticipated to promote competition in trade and milling and hence reduce marketing margins between retail sifted flour and wholesale maize grain and between surplus and deficit areas. This study assesses the extent to which these intended changes have occurred.

This study is a follow-up to the Tegemeo study of the maize value chain in the late 1990s by Nyoro, Kiiru, and Jayne (1999). This study, conducted in 2009, is intended to provide an evidence-based description of the operation of the maize marketing system in Kenya two decades after the liberalization process began. Therefore, the study provides a useful comparison on the changes identified 10-years earlier by Nyoro, Kiiru, and Jayne (1999) and informs how

the maize marketing system has evolved since that time as the market has been progressively liberalized.

The broader objective of the study is to provide a full picture of Kenya's maize value chain from the farm gate to the retailing of maize meal to consumers, to assess the competitiveness of maize markets in Kenya, and to identify actions by the public sector to overcome production and marketing problems and support the Kenyan government's national policy objectives of food security and smallholder-led development. The specific objectives are to:

1. Undertake a detailed organizational mapping of the maize marketing system and document how it has changed over time;
2. Identify the structure, behavior, and other key characteristics of the players along the value chain;
3. Examine trends in maize grain (domestic and import parity) and meal prices in various markets/towns and marketing margins of chain players;
4. Identify main barriers to entry and expansion for players at various stages in the value chain;
5. Assess whether intended changes in the maize marketing system due to liberalization have occurred; and
6. Consider the policy and programmatic implications for the Government of Kenya.

The remainder of the paper is organized as follows. Section 2 describes the conceptual framework and data. Section 3 presents an overview of maize production and consumption trends in Kenya and describes the evolution of the maize marketing liberalization process in Kenya. Section 4 describes the organization of the maize marketing chain from the farm-gate to the consumer based on in-depth interviews of marketing participants and surveys on farmer and consumer behavior. Section 5 analyzes trends in maize prices, farm-gate to wholesale price spreads, and maize-meal marketing margins. Section 6 summarizes the main findings of the study and their implications for policy actions by government.

2. Analytical Framework, Methods, and Data

2.1. Value Chain Analysis

As a product moves from the producer to the consumer, a number of transformations and transactions take place along a chain of interrelated activities, and value is added successively at each stage of the chain. The term *value chain* is used to characterize the set of interconnected and coordinated links and linkages that take place as a product moves from the primary production unit to the final consumer. Kaplinsky and Morris (2001) define the chain as the full range of activities that are required to bring a product from conception, through the intermediary stages of transformation, delivery to final consumers, and final disposal after use.

Production, processing, and distribution of agricultural products are increasingly being organized into value chains, where flows of inputs, products, financial and information resources take place among farmers, processors, retailers and other economic actors. Value chains do not evolve in a deterministic process, but adapt and respond to local conditions, the policy and institutional environment, market power, and consumer preferences, among other things. Some of these factors shaping value chain evolution may not be optimal from a social welfare standpoint. The aim of value chain analysis, therefore, is to analyze the organization and behavior of all the participants in the value chain, to diagnose the constraints and problems that they face, and to identify public actions that may enhance the performance of the value chain and contribute to national policy objectives. It is recognized that the meaning of “performance” and “national policy objectives” may vary, sometimes greatly, among different groups and stakeholders in society. Strategies and policy changes broadly considered to promote value chain performance and national policy objectives may adversely affect some stakeholders. This report identifies particular strategies in the last section of this report after consideration of their broad effects on the following national policy objectives: consumers’ access to food, national food security, reduced and more stable consumer prices, increased and more stable farm-gate prices, improvements in smallholder-farm incomes, and a reduction in the costs incurred by the Government of Kenya in achieving these objectives.

Value chain analysis recognizes that different arrangements of actors may affect outcomes along the chain by influencing capabilities and levels of bargaining of the actors. Hence, the analysis focuses on institutional arrangements that link producers, processors, marketers, and distributors,

recognizing that power differentials among them may influence outcomes along the chain. The analysis can be useful in:

- creating a shared vision among chain participants with regard to challenges and opportunities, hence facilitating the development of collaborative relationships;
- promoting enterprise development;
- enhancing food quality and safety;
- determining the quantitative measurement of value addition and understanding of the distribution of returns amongst the various players;
- promotion of coordinated linkages among producers, processors and retailers; and
- improvement of an individual firm's competitive position in the market place.

The methodology specifically involves:

- Identifying the outline of the chain and the position of the various economic agents within it—all who contribute to production, transformation and marketing of a specific product;
- Identifying the roles and functions of these agents, including those who perform multiple roles;
- Grouping agents into categories which are homogeneous from the point of view of economic, technical and/or socio-economic analysis;
- Showing interactions among agents;
- Quantifying the flows corresponding to the activities of the actors both in physical and monetary terms;
- Mapping key policies and institutions along the value chain that influence the functioning of the chain; and
- Establishing key drivers, trends, and issues affecting the value chain and its actors.

Understanding how the maize sub-sector can become more competitive requires a systemic view of the markets, and the participants that comprise them. Improving the competitiveness of the sub-sector in a meaningful way requires a framework that examines the fabric of relationships between participants in the sub-sector to identify and prioritize the opportunities and constraints to improving industry competitiveness.

2.2. Data

This study used four kinds of data: (i) interviews of maize assemblers, wholesalers, retailers, and millers; (ii) farmer focus group discussions in four maize-surplus producing regions and two maize-deficit regions; (iii) panel data from the Tegemeo Institute/Michigan State University rural household surveys; and (iv) maize production, consumption, and price information from the Ministry of Agriculture and Food and Agricultural Organization of the United Nations.

Regarding data sources (i) and (ii), interviews were conducted in May, June, and September 2009 from a range of actors in the maize marketing system through farmer focus group discussions and key informant interviews. The data were collected by two separate research teams and included collaborators from Tegemeo Institute, Michigan State University, Moi University, and ACDI-VOCA. Research was primarily conducted in seven districts: Nakuru, Trans Nzoia, Kisii, Siaya, Bomet, Bungoma, and Machakos. These districts were selected due to the centrality of maize production as a livelihood strategy to farmers, while also including both maize surplus and deficit districts. Generally speaking, Machakos and Kisii are maize deficit regions, while Bomet, Nakuru, Trans Nzoia, and Bungoma tend to be surplus regions.

Structured survey instruments were prepared prior to this fieldwork, based on a previous value chain study conducted in Malawi in October 2008 (following Jayne *et al.* 2010b). Separate instruments were prepared for the various key actors in the maize value chain including farmers, primary assemblers, small- to medium-scale wholesalers, small-scale maize millers, retailers, and large-scale traders and millers. These survey instruments were designed to explore, in a rigorous way, the structure, conduct, and behavior of Kenya's maize market. Yet, structured survey instruments often fail to capture the diversity and market flexibility exhibited by many market actors. For example, many people who act as maize assemblers during the harvest period become maize retailers, providing maize directly to local consumers, as scarcities set in. Additionally, due to the agro-ecological variability in Kenya, many wholesalers and primary assemblers lack a central location from which they operate. Instead, they continuously move around the country, sourcing maize in surplus areas and transporting it to deficit areas. Thus, structured questions specific to their home area may not be relevant to their operations. Because of this diversity, we

combined the structured survey instruments with semi-structured interview questions, which seek to explore in detail the specificity of an individual's experiences and business operations.

For the purpose of this study, specific regions/districts within the country were identified purposively as sites for analysis as shown in Table 1. The criteria for the selection of districts were the following:

1. Maize is the primary crop grown in local farming systems. This selection criterion ensured that multiple actors in the value chain, including producers, assemblers, and wholesalers could be interviewed within a single region; and
2. The major maize surplus-producing districts were purposively selected as well as at least two deficit districts, to explore variations in the marketing behavior of actors operating within high surplus and low surplus/deficit regions.

Table 1: Description of rural districts and sample sizes of interviewed marketing agents

Districts covered: 7	Bomet, Bungoma, Kisii, Nakuru, Trans Nzoia, Siaya, Machakos
Farmer Focus Group Discussions:	
Isolated villages	15
Accessible villages	26
Total	41
Interviewee sample size	
Farmers	534
Primary assemblers	46
Wholesalers	36
Small-scale millers	7
Large grain trading / processing firms	8

Source: Tegemeo/Michigan State University Maize Value Chain Survey 2009.

Note: While 41 FGDs were carried out in nine districts among 534 small-scale farmers, for the majority of the subsequent analysis farm-level data collected in Siaya district were excluded because of late data entry and integration with the information from other districts. Therefore, most of the farmer analysis relies on data collected from 33 villages in six districts with 450 farmers.

In addition to the research conducted in rural districts, interviews were conducted with key informants, such as owners of large-scale milling companies, grain trading firms, or government officials.

2.2.1. Sampling of Farmers and Data Collection Methods

Within each region of analysis, villages were identified and focus group discussions conducted with farmers using a semi-structured survey instrument. Farmer surveys were conducted in a focus group format in order to better understand maize marketing issues within a given region, rather than the experiences of only a few individuals. We hypothesize that relative isolation from urban markets plays a critical role in farmers' ability to participate in the maize market. To test this hypothesis, we conducted focus group discussions in villages considered isolated from markets and villages considered accessible to markets. Obviously, this distinction is open to subjective interpretation. For example, a village located a long distance (more than 30 km) from a tarmac road may not in fact be isolated if it is still in close proximity to a rural market that is regularly serviced by transportation services. Villages were categorized as isolated or accessible based on several criteria: proximity to a rural market center, distance from tarmac roads, conditions of the roads, the opinion of farmers interviewed, and the opinion of the district agricultural officer. To assist us in locating villages that met our sampling criteria, we sought the advice of district agricultural officers. Additionally, we identified villages with the help of Tegemeo Institute, which has collected baseline data in several villages within our sample districts since 1997, as well as villages that are currently enrolled in ACDI-VOCA's Kenya Maize Development Program (KMDP).

While purposively sampling villages that have been enrolled in programs designed to improve farmers' knowledge of and performance in maize markets – such as those involved in the KMDP – makes the data non-random, it does perform an important comparative function. By sampling villages that have been exposed to marketing programs and nearby villages with similar characteristics that have not, we are able to measure the impact of these programs on prices received by farmers for maize. This has implications on possible recommendations for future interventions. The data contains 17 villages that received training and 16 nearby villages that did not receive training.

Several sampling criteria informed the villages selected for focus group discussions:

1. villages had to contain a relatively high number of surplus maize producers, in order to ensure that focus group participants could provide insights into local maize marketing issues; and
2. villages were then stratified based on their relative isolation and accessibility from regional maize markets. This was done in order to provide empirical data on the differences in marketing behavior and structure between villages with varying degree of market accessibility.

Within each village, 10-15 farmers were selected to participate in the focus group discussion. These farmers were selected because they were self-identified as maize farmers who sold maize. Farmer surveys were conducted in two parts. The first section involved focus group discussions. This section sought to explore the conduct and behavior of maize farmers in that village. In the second section of the farmer survey, focus group participants were surveyed individually in order to collect specific maize marketing data from farmers. In this case, data were collected about individual farmer's maize sales, timing of these sales, buyer type, distance traveled to the sales point, and the mode of transport used where applicable.

2.2.2. Sampling Strategies for Primary Assemblers and Data Collection Methods

Primary assemblers represent the next link in the regional maize value chain. By our definition, primary assemblers are private sector maize buyers who buy the majority of their stocks directly from farmers. The primary assemblers interviewed for this research were identified in two ways. First, during the course of the farmer focus group discussions farmers were asked to identify by name 5-6 primary assemblers who regularly service their village. Often times, these assemblers were local residents, while in other cases the assemblers lived outside of the community. Second, assemblers were sampled randomly at rural and peri-urban market areas or along the side of the road where they were buying maize.

A semi-structured survey instrument was used to collect marketing data from primary assemblers. This instrument explores the buying and selling practices of primary assemblers, their relationships with other actors in the value chain, the constraints they face in developing

and expanding their business, and the risks they perceive in the marketing system. In total, 46 primary assemblers were interviewed for this research.

2.2.3. Sampling Strategies for Maize Wholesalers and Data Collection Methods

By our definition, maize wholesalers are private sector maize buyers who buy the majority of their stocks from primary assemblers. We generally found two different kinds of wholesalers in the markets, differentiated by their scale: district-level wholesalers vs. large multi-district and multi-country traders that are discussed in Section 4.5. District-level maize wholesalers interviewed for this report were identified in several ways. First, several wholesalers were identified during the course of interviews with large-scale processing and trading firms. These wholesalers generally source maize in a limited number of districts (they may primarily operate in one district where they live and have built up close connections with farmers in this district) and supply maize for the larger trading and processing firms through formal or informal contracts. Second, district-level wholesalers were identified and interviewed during regional market days, where truckloads of maize are brought to the market by wholesalers to be sold to local maize retailers. Third, in some regions wholesalers own retail shops, from which they conduct their maize trading business. These wholesalers were identified with the assistance of local community members, such as primary assemblers, agricultural extension officers, and farmers.

Data from district-level wholesalers were collected through semi-structured interviews. These interviews sought to explore the buying and selling practices of wholesalers, their relationships with other actors in the marketing chain, the constraints they face in expanding and maintaining their businesses and the risks they perceive in the maize marketing system.

2.2.4. Sampling Strategies for Small-Scale Maize Mills (Hammer Mills) and Data Collection Methods

Generally, small-scale hammer mills are local grain processing businesses that provide rural communities and the urban poor with a means for grinding their own maize stocks. The small-scale mills interviewed for this report were identified in several ways. First, when possible mill owners were interviewed following farmer focus group discussions. Second, mill owners in rural

and peri-urban market areas were interviewed. Third, millers in urban areas, who provide maize milling services to urban consumers, were interviewed where possible.

Data from hammer mill owners were collected through semi-structured interviews. These interviews sought to understand the maize acquisition strategies of mill owners, the daily utilization of milling equipment, the mill's storage strategies, the constraints to entering into and expanding the milling business and the risks associated with owning and operating a mill. In total, seven small-scale mills were interviewed for this study.

2.2.5. Sampling Strategies for Large-Scale Grain Processing and Trading Firms and Data Collection Methods

Large-scale market actors were identified based on our knowledge of the national maize markets and by other actors in the value chain. Data were collected from eight large-scale trading companies using semi-structured interview strategies. Interviews were conducted with either the CEO or CFO of the company. These interviews sought to explore seasonal variation in the buying and selling practices of these firms, the relative importance of various market actors to their maize acquisition strategies, risks associated with the maize milling and trading industry, the potential for warehouse receipt systems, and the role of the government in structuring their business strategies.

This data is supplemented by data from the 10-year panel rural household survey and monthly price information from the Market Information Research Bureau of the Ministry of Agriculture and the Ministry of Trade and Industry.

3. An Overview of Maize Marketing in Kenya

3.1. Main Staples Production and Consumption Patterns and Trends

According to FAO (2009), Kenyans consume 2,155 kilocalories of food per day on average. Of this, 1,183 kilocalories (55%) are in the form of the main staples: maize, wheat, beans, potatoes, cooking bananas, and rice. Over the last 40 years, caloric intake per person appears to have been roughly constant over time in Kenya, dipping in the early 1990s but rising gradually since then.²

Maize is the main staple food in Kenya, accounting for 65% of total staple food caloric intake and 36% of total food caloric intake (FAO 2009, Table 2).³ The average person consumes 88 kgs of maize products per year. Wheat is the second most important staple nationally, accounting for 17% of staple food consumption in Kenya. However, urban consumption surveys indicate that wheat products have overtaken maize in terms of expenditures in urban areas, and the share of rice in urban food consumption is also rising (Muyanga et al. 2005). A more recent study shows that households in the first and second quintiles spend the greatest proportion of ‘staple budget’⁴ on maize and maize products i.e. 37% and 29%, respectively. On the other hand, the fourth and fifth quintiles spend the greatest proportion of ‘staple budget’ on wheat products (35% and 38%, respectively) followed by rice (23% and 19%, respectively) (Kamau et al 2011).

Maize has inferior good characteristics in the sense that its share in staple food expenditures is highest among the poor. Maize accounts for nearly 20% of total food expenditures among the poorest 20% of urban households, declining to 1% of total food expenditures among the wealthiest 20% (Muyanga et al. 2005). A similar result was found by Kamau et al (2001).

Beans are the third most important staple food nationally, accounting for 9% of staple food calories and 5% of total food calories in the national diet (Table 3).

Individually, cooking bananas, potatoes, and rice constitute less than 5% of staple food calories and 3% or less of total food calories.

² The temporary drop in caloric intake per person during the early 1990s was associated with a period of negative per capita national income growth and negative per capita agricultural growth.

³ According to the FAOSTAT website, 2003 was the most recent year for which data is available, so these figures may be slightly outdated.

⁴ Staple budget refers to expenditures on maize, wheat, and cassava products, rice, cooking bananas, Irish/sweet potatoes, sorghums and millets.

Table 2: Importance of staple foods in diet in Kenya

Commodity	Quantity consumed (kg/person/year)	Daily caloric intake (kcal/person/day)	Share of caloric intake (percent)
Maize	88	768	65
Wheat	26	196	17
Plantains	23	56	5
Potatoes	31	60	5
Beans	11	103	9
Total	180	1183	100

Source: FAO 2009

Table 3: Production and trade of food staples in Kenya, 2005-2007

Commodity	Production	Imports	Exports	Imports as a % of apparent	Exports as a % of
	('000 tons)	('000 tons)	('000 tons)	(%)	(%)
Maize	3,027	108	25	3.5	0.8
Wheat	360	612	2	63.1	0.5
Potatoes	855	0	0	0	0
Plantains	602	0	0	0	0
Beans	447	40	3	8.2	0.6
Rice	39	248	1	86.6	1.9
Total	5330	1009	31		

Source: FAOSTat 2009. Figures are based on the mean of 2005, 2006 and 2007 production levels.

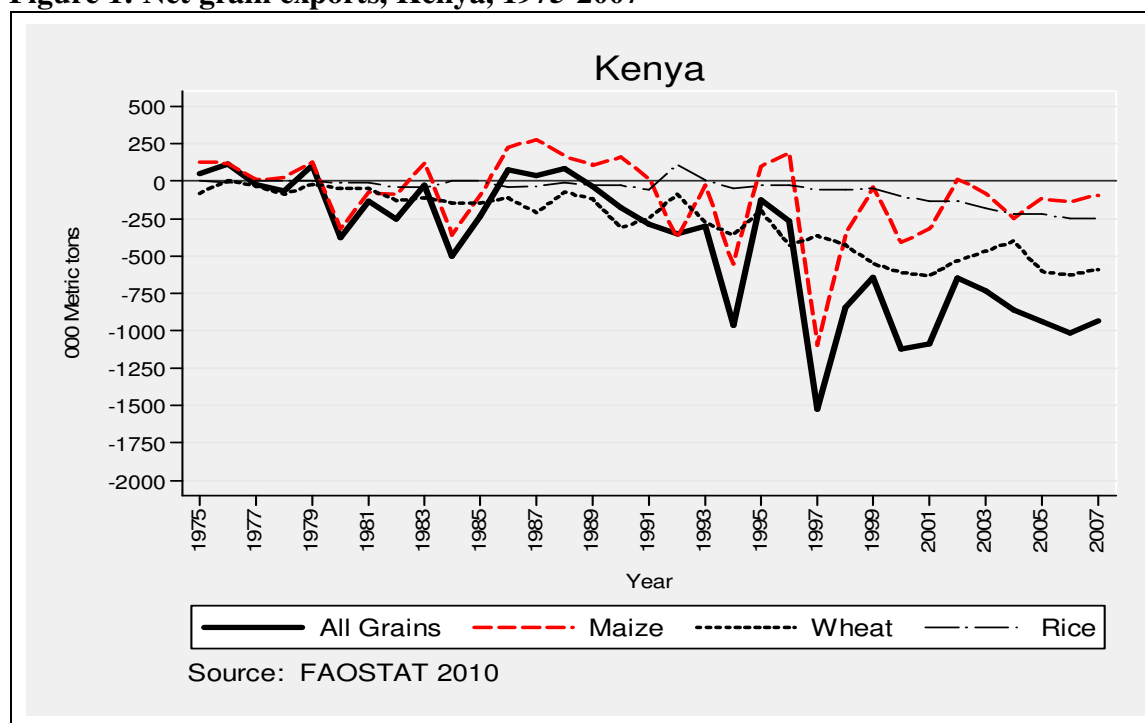
Note: Apparent consumption is production plus imports minus exports and non-food uses.

Production data: <http://faostat.fao.org/site/567/default.aspx#anchor>

Trade data: <http://faostat.fao.org/site/535/default.aspx#anchor>

Because national maize production is not keeping pace with the growth in national demand, imported wheat and rice are increasingly filling the residual food needs gap. For this reason, the shares of wheat and rice in staple food expenditures are rising, leading to more diversified basket of staples over time. Figure 1 shows trends in maize, wheat, and rice net exports overtime (exports minus imports). Figure 1 shows an increasing staple food deficit in Kenya over time. Wheat products are filling most of the deficit.

Figure 1: Net grain exports, Kenya, 1975-2007



In most years, the country imports maize informally from Uganda and Tanzania. In years of poor maize production, imports of wheat and maize from international sources typically make up the shortfall not met by informal regional imports.⁵ Maize imports as a percentage of national consumption is only 3.5%. However, of the 3,027,000 tons of maize produced annually (on average over the 2005, 2006, and 2007 seasons), at most 1,000,000 tons hit the market, thus recorded official imports account for over 10% of supplies circulating in Kenyan markets. If informal regional imports were recorded, the share of imports would be even higher.

Maize production and marketed sales in Kenya are highly concentrated. While almost all farmers in Kenya grow maize, it is estimated that 2% of farmers in the smallholder sector account for over 50% of the national marketed supply (Jayne, Myers, and Nyoro 2008). If the large-scale sector were included, the concentration of marketed supply would be even greater.

⁵ Wheat imports have risen at an annual rate of 26,000 tons per year since the early 1990s and have exceeded 600,000 MT since 2005. Using an OLS regression of Kenya's national wheat imports on national maize and wheat production and a time trend over the period 1990-2007 indicates that a decline in maize production of one ton is associated with a 160kg increase in wheat imports, other factors constant. This effect is imprecisely measured however, with a significance level of 0.13.

3.1.1. Wheat and Rice

Wheat is produced by smallholder and large-scale producers, but the latter account for the lion's share of national production. Production is unable to keep pace with consumption requirements and the country imports over 60% of national wheat consumption. Wheat imports appear to be growing rapidly as the country becomes increasingly food deficit due to urbanization and population growth.

Rice plays a similar role as wheat, in that importation is growing rapidly in response to the rising gap between national staple food production and consumption requirements. Very little rice is produced in the country, but it is becoming a major staple in urban areas.

3.1.2. Potatoes and Cooking Bananas

These crops play a role in Kenya that is similar to cassava in some countries of central and southern Africa, in the sense that the crops provide a consumption *shock-absorber* to annual variations in production of the main staple, maize (Haggblade, Longabaugh, and Tschirley 2009). In years of national maize shortfalls, potatoes can be pulled out of the ground and plantains can be harvested to substitute for maize in the diets. In years when maize is bountiful, potatoes can continue to be stored in the ground for at least some period of time.

Neither potatoes nor plantains are traded across national boundaries to any significant degree. Yet their role in reducing the magnitude of food imports in major deficit years is likely to be significant.

3.2. The Evolution of the Maize Marketing Liberalization Process in Kenya

Food security in Kenya has generally been viewed as synonymous with maize security. This is because maize is not only the main staple food but also the most common crop grown by the rural poor for food (Nyoro, Kiiru, and Jayne 1999). The importance attached to maize by policy-makers in Kenya can be inferred from the emphasis laid on maize in current and past national food policies.

Attempts to reform Kenya's maize marketing and pricing system began in the late 1980s. Up until that time, the Government set producer and into-mill prices for maize grain and prices for maize meal sold by millers and retailers to consumers. These prices were pan-territorial and pan-seasonal, adjusted once per year at the beginning of the marketing season. The government marketing board, known as the National Cereals and Produce Board (NCPB), had a longstanding monopoly on internal and external trade. Informal private trade across district boundaries was illegal, as was cross-border trade. Traders were required to apply for movement permits to allow them to transport grain across district boundaries. Despite government attempts at suppression, some private maize trade existed in Kenya even during the control periods before the liberalization process began in the late 1980s.

The Cereal Sector Reform Program began in 1987/88. The European Union supported the program as part of the country's overarching structural adjustment policies. At first, the Government of Kenya (GoK) and donors agreed to legalize inter-district maize trade, with the maximum volume of maize trade to be progressively raised over time. The reform agreement also called for the NCPB to reduce its market share (i.e., maize purchased as a proportion of total maize traded) over time, by widening the margin between its maize purchases and selling price, which would have provided greater scope for the private sector to operate. In fact, the NCPB's trading margin declined in the early 1990s, which had the opposite effect of making it unprofitable for the private sector to engage or invest in many types of marketing activities, especially long-distance trade.

The reform process intensified in late 1993, when, under pressure from international lenders, the government eliminated movement and price controls on maize trading, deregulated maize and maize meal prices, and eliminated direct subsidies on maize sold to registered millers (Jayne and Kodhek 1997). By 1995, private traders were allowed to transport maize across districts without any hindrance.

The reform process was expected to raise competition by encouraging more private sector participation in the market and thereby reduce costs in the marketing system. In practice, the implementation of the reforms has most likely exacerbated the risks and costs of private sector investment. This is because the reforms have been marked by frequent and usually unanticipated changes in trade tariffs, quantity restrictions, and regulatory changes facing private traders. The

discretionary policy tools used by the government to influence market prices and supplies, and which raised market uncertainty for traders include: (i) frequent and unannounced changes in maize import tariff rates; (ii) export bans; (iii) the behavior of the NCPB, in particular the prices it sets for maize purchase and sale, and the funds allocated for this purpose by the Treasury, which then determine the extent to which the NCPB can defend its official pricing structure and influence market prices; and (iv) regulatory changes regarding the amount of freedom the private sector was permitted in maize marketing.

In addition to these sources of uncertainty, the liberalization process in Kenya has created additional risks for private investment associated with the uncertainty over the eventual dispensation of NCPB assets. Private investment in dedicated capital outlays, such as storage facilities, has been impeded by the high degree of uncertainty over the disposition of the NCPB's storage facilities and other assets. New private investment in storage facilities could be vulnerable to huge losses if the NCPB continued to be a major player in the market, offered prices to farmers and millers that did not rise through the marketing season (pan-seasonal prices), or set a narrow margin between its buying and selling prices that could be underwritten by the treasury – all of which happened during much of the 1990s. For these and other reasons to be explored below, private investment in grain marketing facilities did not proceed as rapidly as anticipated. Table 5 provides a detailed chronology of these interventions.

Prior to market liberalization in the late 1980s, the NCPB purchased between 5-8 million bags of maize per year. Even during the early years of liberalization, the NCPB received enough public funds to purchase between 3-6 million bags per year, which was more than half of domestically marketed maize output. Thus, the NCPB remained the dominant player in the maize market even 6-7 years into the liberalization process. This is not surprising considering that the NCPB set its maize purchase prices considerably higher than prevailing market prices. In the maize breadbasket areas of Kenya, the incomes and living standards of many farmers, especially large-scale farmers, depended on the NCPB continuing to offer support prices for maize. By offering above-market support prices, the NCPB used its market power and access to treasury subventions to discourage private sector competition and investment in maize wholesaling and storage.

Starting in the 1995/96 marketing year, and under pressure from external donors, the government dramatically reduced the NCPB's operating budget. This forced the NCPB to scale back its purchases substantially to about 1 million bags per year between 1995 and 2000 (Table 4). The reduction in NCPB maize purchases from 3-8 million to 1 million bags led to intensive lobbying by commercial maize farmers for increased purchases. A year before the national elections, the government increased the NCPB's budget for the 2000/01 year. Since 2000, the NCPB's maize purchases have been trending upward. In drought years, when market prices are already relatively high, the NCPB tends to purchase relatively small volumes. In normal or good years, the NCPB's purchases from farmers have exceeded three million bags. This is believed to be roughly 25-35% of the total maize sold by the small and large farm sector in Kenya, and is approaching the scale of operations played by the NCPB during the pre-reform era.

Most of the maize purchased by the NCPB now appears to be directly from large-scale farmers in the maize surplus parts of the country, where unit procurement costs are low due to scale economies. The Tegemeo/MSU household surveys have tracked maize selling and buying behavior of 1,313 small farm households in 1996/97, 1999/00, and 2003/04. Since the major withdrawal of the NCPB in 1995, the survey data show that smallholder farmers in the aggregate sell 96% of their maize to one of two types of buyers: private traders/brokers or consuming households. The NCPB accounts for 4% or less of household maize sales, although it is likely that some traders buying maize from farmers sell it to NCPB. About 28.6% of the households in the Tegemeo panel sample are located in the prime maize-surplus districts of Trans Nzoia, Uasin Gishu, upper Kakamega, Nakuru, upper Narok, and Bomet. In this High-Potential Maize Zone, we find that 9% of the maize selling households sold maize to the NCPB. The other 91% of the households selling maize in the High-Potential Maize Zone sold to private buyers. Over the entire nationwide sample, only 2% of the households sold to the NCPB, while 34% sold to private buyers. The remainder of the sample did not sell maize. Yet, as will be shown later, the NCPB indirectly influences millions of small farmers and urban consumers through the upward pressure that its operations exert on maize market prices.

The 2007 National Food and Nutrition Programme (NFNP) is a draft government document that attempts to address the shortcomings in earlier policy documents. In particular, the NFNP shifts the focus away from maize self-sufficiency to a more comprehensive policy of food access,

diversity, and nutritional status (Republic of Kenya 2007). It acknowledges that high staple food prices, while favorable to farmers who can produce a surplus, directly hurt not only urban consumers but also a large portion of rural small-scale farmers who are net buyers of staple food. The NFNP emphasizes increased availability and accessibility to diverse foods to meet the basic minimum food nutritional requirements. It proposes a gradual removal of import duties on maize, wheat, and rice, promotion of cross-border trade in food items, controlled importation of subsidized foods, and educating local authorities and administrators on importance of free movement of food items. By proposing appropriate reforms in domestic and external trade policy, the NFNP brings into perspective the importance of perceiving food security in the broader context of regional market integration and globalization rather than just as a localized issue.

Table 4: NCPB maize trading volumes and price setting, 1988/89 to 2009/10

Year	Total output (000 mt)	NCPB maize purchase and sale price (Kenyan shilling (Ksh) per 90kg bag)				NCPB maize purchases (000 mt)	NCPB maize sales (000 mt)	Official exports (000 mt)	Official imports (000 mt)
		----- Nominal -----		----- Inflation-adjusted ----- (2005=100)					
		Purchase price	Sale price	Purchase price	Sale price				
		(A)	(B)	(C)	(D)				
1988/89	2761	201	326	1725	2703	643.8		167	0
1989/90	2631	221	337	1680	2561	551.3		110	0
1990/91	2290	250	337	1645	2215	235.3	669.6	160	0
1991/92	2340	300	358	1649	1961	318.9	735.2	19	75
1992/93	2430	420	646	1679	2582	493.4	257.4	0	0
1993/94	2089	950	1280	2549	3434	467.6	512.8	0	89
1994/95	3060	920	1280	1960	2728	540	67.7	2	121
1995/96	2699	600	887	1235	1825	100.8	111.3	154	0
1996/97	2160	1127	1100	2232	2176	62.8	54.3	221	0
1997/98	2214	1162	1318	2172	2463	151.5	14.6	9	565
1998/99	2400	1009	1209	1764	2113	34.9	123.3	13	0
1999/00	2322	1200	1436	1923	2301	177.2	145.1	37	52
2000/01	2160	1250	1300	1812	1884	311.5	74.1	7	498
2001/02	2776	1000	1250	1414	1768	257.7	23.7	6	472
2002/03	2441	1052	1265	1408	1693	89.1	196.4	0	24
2003/04	2714	1358	1680	1670	2066	162	136.7	48	109
2004/05	2459	1400	1950*	1566	2181	314.1	144	14	273
2005/06	2918	1250	1770*	1250	1770	135.3	375.6	4	40
2006/07	3248	1300	1500*	1161	1339	407.2	97.6	18	60
2007/08	2931	1300	1335	1111	1148	32	219.6	22	48
2008/09	2367	1950	1435-1835 [#]	1615	1189-1520	78.3	308.6	14	149
2009/10	2443	2300	1750-1910				0	1.5	1410
		1500							

Note: * NCPB maize selling price changed from pan-territorial to province-specific in 2004. Prices shown are for Nairobi and Central Provinces. [#] revised four times during 2008/09 starting at the 1435 Ksh/bag and ending at 1835 Ksh/bag.

Source: NCPB data files, except for maize production statistics, which come from the Ministry of Agriculture. Official imports include both NCPB and recorded private sector imports. Further disaggregation of import data is contained in Appendix 1.

Table 5: Evolution of maize market policy reforms, 1988-2010

State Marketing Agency	Maize Market Policy
1988: NCPB faces deficits and is financially restructured. Phased closure of NCPB depots. NCPB debts written-off; crop purchase fund established but not replenished.	1988: Cereal Sector Reform Program envisages widening of NCPB price margin. In fact, margin narrows. Proportion of grain that millers are obliged to buy from NCPB declines. Limited unlicensed maize trade allowed. State sets all prices for grain and flour.
Early 1990s NCPB narrows its margins. Private trade finds it unprofitable to reach remote areas.	1991: Local and international pressure for reforms builds up. Further relaxation of inter-district trade.
	1992: Kenya moves from one party politics to a multi-party state. Restrictions on maize trade across districts re-imposed. NCPB unable to defend ceiling prices. In 1993 maize and maize meal prices deregulated. Import tariff abolished. No subsidies to registered millers.
1995: Donor pressure leads to NCPB being restricted to limited buyer and seller of last resort role. NCPB market share declines to 10-20% of marketed maize trade. NCPB operations confined mainly to high-maize potential areas of Kenya.	1995: Full liberalization of internal maize and maize meal trade. Maize import tariff re-imposed to 30%. In, 1996 export ban imposed after poor harvest. In 1997 import tariff imposed after poor harvest.
2000 –onward: NCPB provided with funds to purchase a greater volume of maize. NCPB's share of total maize trade rises to 25-35% of total marketed maize.	1997 –2005: External trade and tariff rate levels change frequently and become difficult to predict. NCPB producer prices normally set above import parity levels
	2005-onward: The government withdraws the maize import tariff from maize entering Kenya from East African Community (EAC) member countries. An official 2.75% duty is still assessed. Variable import duty still assessed on maize entering through Mombasa port.
2008: High world food prices. NCPB mandated to sell subsidized grain to millers who then could lower prices to consumers. Difficult for state to enforce and monitor at millers' end due to unknown milling costs. Allegations of corruption emerge.	2008: Post election violence. African Centre for Open Governance (AFRICOG) estimated 3.5 million bags destroyed. NCPB imports began late 2008 from US and South Africa. Estimated 5 million bags arrive (AFRICOG).
2009: New trading firms and NCPB employees took advantage of crisis and subsidy arrangements to favor some firms for kickbacks. NCPB top management and some Ministry of Agriculture (MOA) officials suspended due to corruption charges during the crisis. The Cereal Millers Association (CMA) claims that only 40,000 bags of the 144,000 bags of maize imported aside by the NCPB had reached its members and queries the destination of the other 100,000 bags.	2009: Imports continue but maize production better than expected. Claims of monopoly at port (grain handling: one large grain handler—Grain Bulk Handlers Limited (GBHL)) and milling but not substantiated (AFRICOG). The Ministry of Public Health issues a public alert over the circulation of contaminated maize reported missing from the Grain Bulk Handlers Ltd store in Mombasa.
2010: NCPB allocated funds to buy maize from short rains in eastern Kenya.	2010: Short rains season does very well but farmers claim poor prices from private traders.

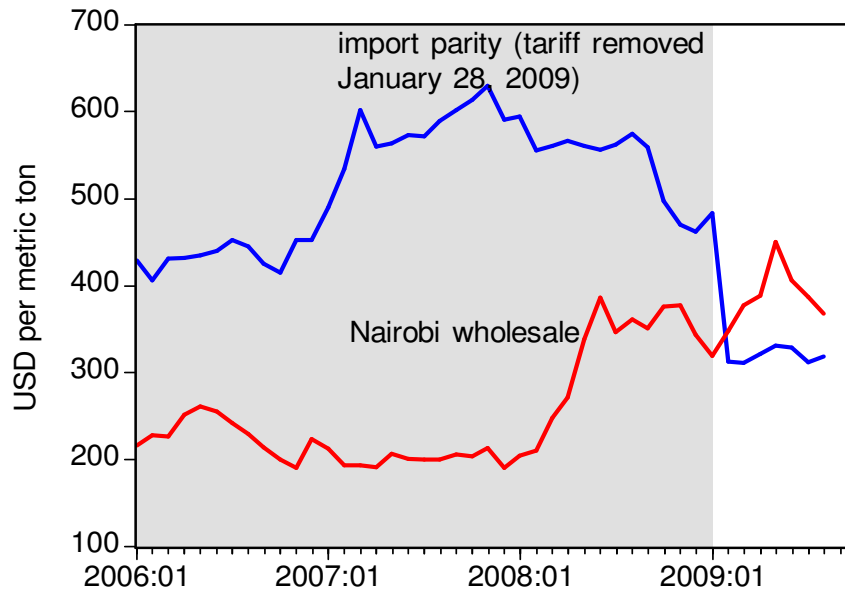
Source: Adapted from Ariga and Jayne 2009 and updated for this report.

3.2.1. The 2008/09 Food Price Crisis

In response to a poor 2008 main harvest, civil disruption following the December 2007 national elections, rising world food prices, and the continuation of a 50% tariff on maize imports through the port of Mombasa, local food prices rose sharply in 2008. Figure 2 presents Nairobi wholesale maize price trends denominated in U.S. dollars. Note that 2007 price levels were relatively average despite the surge in world food prices that had already begun. High world prices in 2007 and early 2008 no doubt exerted upward pressure on Kenyan maize prices by mid-2008, when the market adjusted to an import parity price surface in anticipation of the need for imports. However, because of delays in government importation and government's decision to maintain the 50% tariff on imports through Mombasa throughout 2008, maize prices stayed at levels almost 50% above world prices by late 2008 despite the tumbling world prices starting in September 2008. Maize prices usually decline by November or December in Kenya as the main season harvest hits the market. The fact that prices continued to exceed \$300 per ton at this time could have been an indicator of a food crisis to come.

In January 2009, Kenya's food crisis took a new turn as allegations of corruption emerged over the issuing of import licenses, reported diversion of over 100,000 tons of imported maize to Sudan, and a lack of transparency over the sale of subsidized NCPB grain (AFRICOG 2009). On January 16, 2009, President Mwai Kibaki declared a state of emergency and launched an international appeal for US\$ 463 million to feed roughly six million people who were estimated to be food insecure. In the same January, the World Food Programme pledged to feed 3.2 million people following the government's declaration of a food crisis in the country. The import duty on maize was finally lifted on January 28, 2009, allowing importers to buy maize from the international market and bring it into the country duty free.

Figure 2: Nairobi local and import parity prices of maize, January 2006-August 2009



Source: Ministry of Agriculture Market Information Bureau for Nairobi wholesale prices; Kenya Bureau of Statistics for exchange rates; SAFEX and Tegemeo Institute for import parity prices.

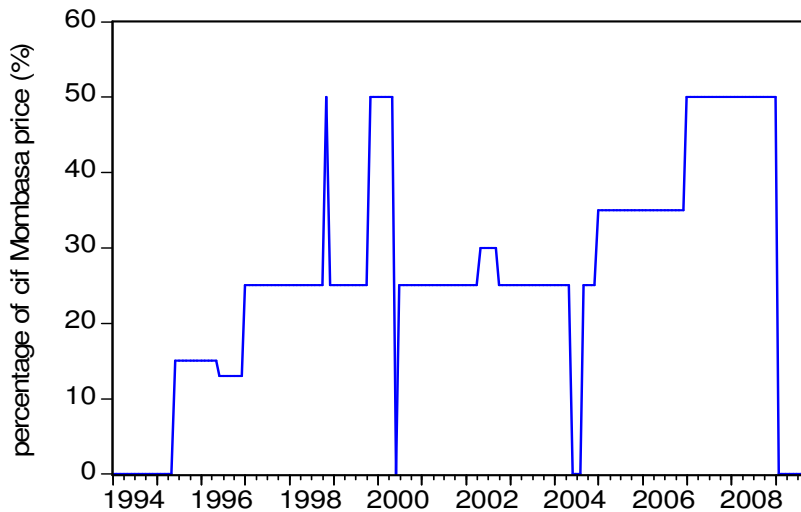
3.2.2. Cross-Border Maize Trade and Regional Trade Policy

Evidence indicates that the costs of maize production in eastern Uganda are typically lower than in most areas of Kenya (Nyoro, Kiriimi, and Jayne 2004), and import tariffs were deemed necessary to stem the inflow of imported maize from Uganda. However, since the border is relatively porous, illegal cross border trade was common, estimated at 100,000 to 250,000 metric tons per year (Ackello-Ogutu and Echessseh 1997). It is alleged that relatively high NCPB support prices encouraged maize imports from Uganda at the same time that official trade policy attempted to suppress it. Illegal cross-border trade appears to have been impeded somewhat by transaction costs, including bribery payments to police, extra handling charges associated with offloading maize at the border, smuggling it across the border, and on-loading maize onto trucks on the Kenya side of the border. This confusion was compounded by the fact that these export bans, import bans, and major changes in import tariff rates as shown in Figure 3 were not anticipated by market participants as the government in most cases never consulted with them or provided prior announcement of trade policy changes.

Imposing an import ban or high tariff rates benefits the large maize producers (a relatively small group) who are generally able to market their surplus at relatively higher prices compared to the situation that could have existed without bans. Conversely, a much larger

group of net-maize buying rural households and urban consumers were adversely affected to the extent that import tariffs raised domestic maize prices. However, the distributional effects were likely to be relatively small. A recent VAR analysis indicates that maize import tariffs over the 1995-2004 period raised mean domestic prices by roughly 4%, although in several particular years, the import tariff raised domestic price levels by well over 10% (Jayne, Myers, and Nyoro 2008).

Figure 3: Maize import tariff rate through Mombasa port, Kenya, 1994-2009



Source: Ministry of Trade and Industry 2010.

However, since 2005, Kenya's maize trade policy has stabilized considerably. It has complied with regional initiatives under the Common Market for Eastern and Southern Africa (COMESA) and the East African Community (EAC) to eliminate tariffs within the region and harmonize regional and international trade policies. Since January 2005, the tariff on maize imported into Kenya from Tanzania and Uganda has been limited to a 2.75% government levy. Imports of maize grain through Mombasa continue to attract a 50% tariff but have been occasionally waived for some months when the country has needed to import maize.⁶

While formal maize import tariff rates are being harmonized in the region, numerous non-tariff barriers to regional trade remain. Though a Single Entry Document (SED) is required

⁶ One other area that is being addressed by COMESA is the harmonization of food safety standards and SPS requirements. Each country has its own standards that may be different from the others and this will impose additional costs for traders who have to meet varied quality standards. The harmonization of the various standards will reduce costs for traders and raise the volume of trade. The setting of regionally harmonized quality and product standards is in progress.

for custom clearance for COMESA countries, Kenya has additional requests for other information that makes it difficult for traders to fill these forms, which delays custom clearance. Before being cleared through customs, one might need a combination of the following forms: (i) original invoice; (ii) Import Declaration Form; (iii) Pre-Shipment Inspection (Clean Report of Finding-CRF); (iv) Certificate of Origin; (v) Phytosanitary Certificate; (vi) Quality Standards Certificate (issued by Kenya Bureau of Standards (KBS)); and (vii) Safety Standards Certificate, among others. The issuance of most of the import documents is centralized at the capitals or at major towns, which means that maize traders have to travel long distances to obtain the documents. Non-tariff barriers in the form of cumbersome trade regulations have constrained official regional trade and increased informal unregistered cross-border trade. However, unregistered or unrecorded cross-border trade incurs additional transaction costs, bribe payments, and handling costs that are most likely paid for by producers and consumers in the form of lower producer prices and higher consumer prices. This is one area that further research can provide useful information in estimating the costs of these non-tariff barriers and how they compare with official tariff rates.

3.2.3. Summary

The salient features of Kenya's maize marketing system from the start of liberalization in the late 1980s until 2009 are:

1. Private trade has been progressively liberalized from the late 1980s until 1995 when the liberalization process was complete. However, government has continued to intervene heavily in maize and maize meal markets, both through the operations of the National Cereals and Produce Board, and through ad hoc changes in trade policies, tariff rates, bans, and quotas. These highly discretionary government actions cause substantial uncertainty for private firms and hence the anticipated rate of rapid investment and upgrading of marketing facilities immediately after liberalization did not occur.
2. Kenya's introduction into the East African Community has resulted in an improvement in the regional trade policy environment. Since January 2005, regional maize trade between Uganda, Tanzania, and Kenya has not been subjected to any taxation by the Kenyan government with the exception of a 2.75% inspection fee. A reduction in regional trade barriers is very much in Kenya's interests because the

country is a food importer and it can generally procure maize more cheaply from its regional neighbors than it can from the world market.

With the exception of the 2008-09 crisis period, grain marketing policies in Kenya have become more stable over time. The NCPB's role in the market has become clearer and truncated especially since the National Rainbow Coalition (NARC) government assumed office in 2002. A major source of uncertainty continues to revolve around the timing of changes in import tariff rates, which remain highly unpredictable

4. Organization of the Maize Value Chain

4.1. Overview of Kenya's Maize Value Chain

This section examines the organization and behavior of the maize value chain from the farm-gate to the consumer's table, and documents how it has evolved in the post-reform era.

The movement of maize grain from the farm-gate to the consumer involves a series of stages. Fieldwork from this study and that of Nyoro, Kiiru, and Jayne (1999) indicates that there are seven major categories of actors in the maize value chain: farmers, primary assemblers (also known as "brokers" in Kenya), wholesalers, the NCPB, posho millers, large-scale millers, and retailers. The current overall structure of the maize market is similar to what it was a few years after liberalization. However, the numbers of players at each node has increased substantially, particularly at the assembly stage. Each group of players is diverse and interactions /transactions among players at different chain nodes lead to a complex system with many marketing channels.

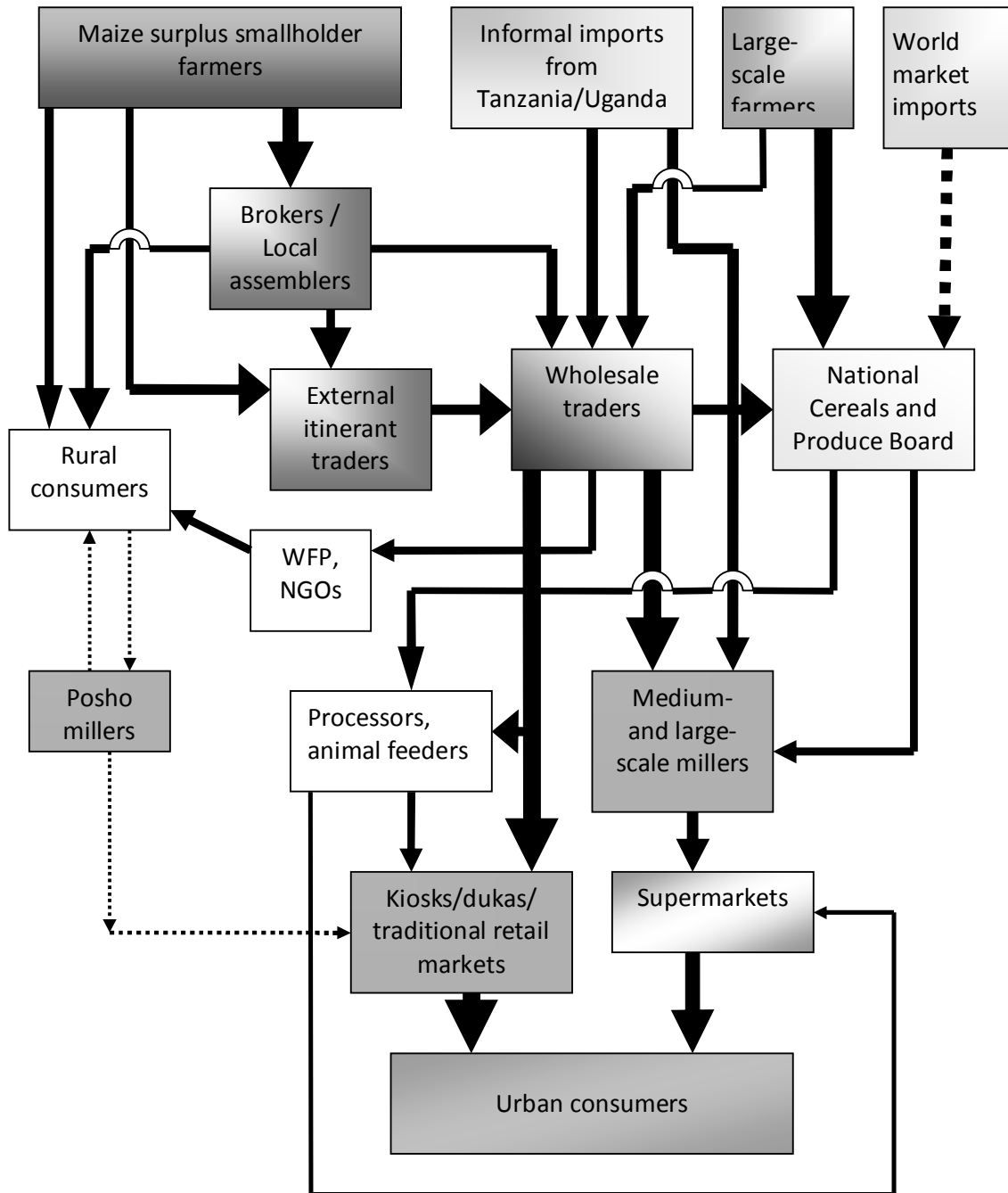
A description of the chain follows. The relative importance of actors and marketing channels varies depending on the quality of the harvest. Figure 4a presents a market channel diagram representative of a normal or good harvest year, while Figure 4b shows a poor harvest situation when imports form a large share of total supply. The depth of shading and thickness of the arrows denote volume of flow.

In a normal or good year, domestic production from small- and large-scale farmers forms the major source of domestic supply. According to wholesalers, imports from neighboring countries account for 25-30% of total domestic supply in an average harvest year, while the world market supplies relatively little, especially when import tariff rates are high. Smallholder maize sales go largely to small-scale assemblers or brokers, who collect and bulk

for onward sale to large wholesalers with buying depots in the towns of major production areas. Large-scale farmers sell both to wholesale traders and to the NCPB. Large-scale millers are the next major link in the chain, buying grain primarily from the large wholesalers, the NCPB, and from smaller traders. The large millers sell mainly to a decentralized system of informal retailers (street kiosks, dukas, multipurpose retail shops, and traditional retail markets) and to a lesser extent to the more high-end consumers who shop at supermarkets. Posho millers who operate in retail markets are important players in some areas. Consumers buy grain and pay a fee to custom-mill their grain into posho meal. This option provides the means to produce maize meal relatively inexpensively and is preferred by the urban poor and most rural households, especially in the western parts of the country.

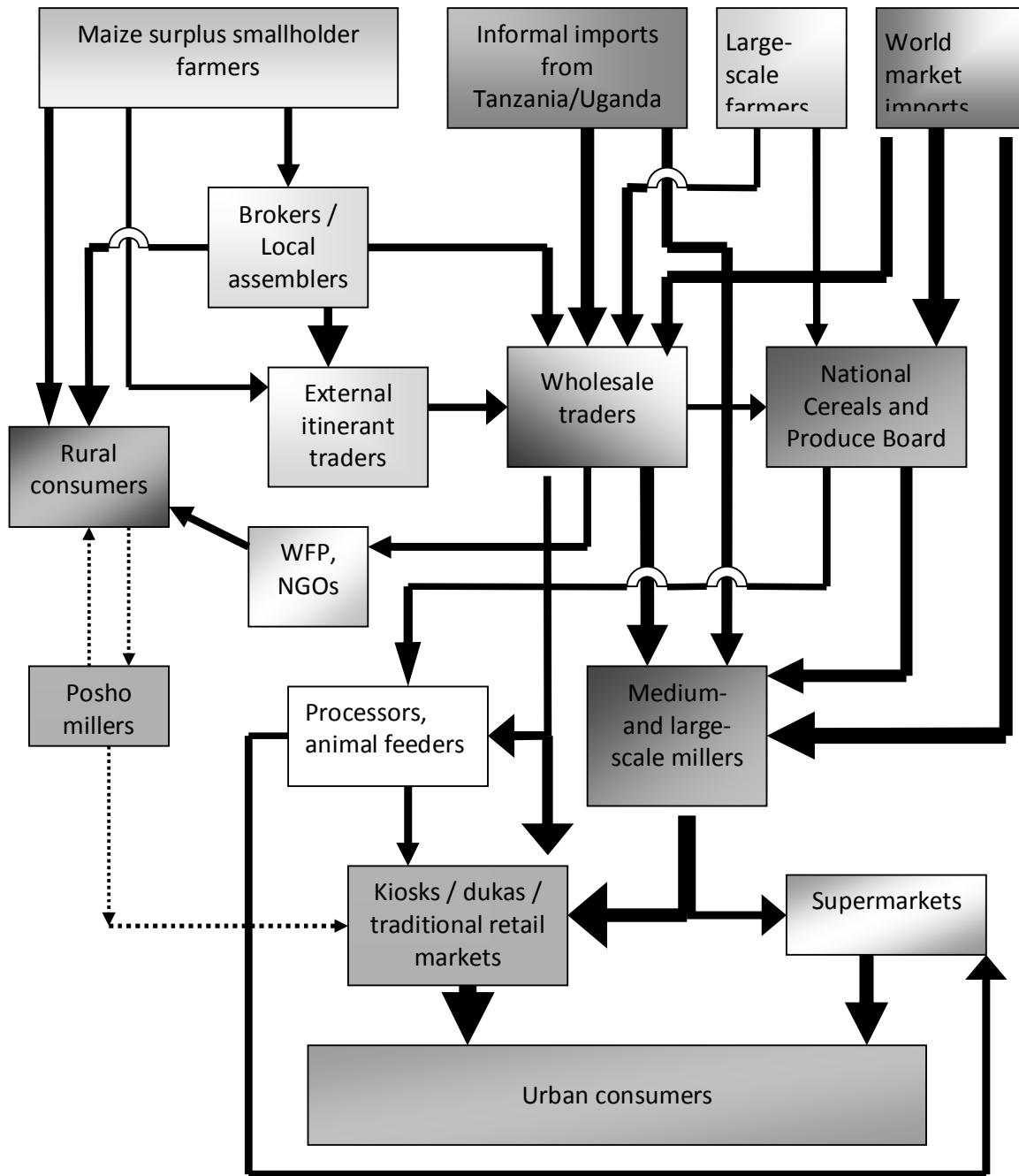
In a year when the main harvest in Western Kenya is poor, the country is more reliant on imports. If supplies can be imported from Uganda and Tanzania, this tends to be the first option pursued by wholesalers and millers because (since January 2005) there are no import restrictions or barriers except for the 2.75% import inspection fee and transport costs, which are relatively low. However, if the required quantities cannot be obtained from the region, Kenya then becomes dependent on the world market. It is at this point that Kenyan wholesalers and millers lobby for a waiver of the 50% duty on maize imported through Mombasa port. In years when imports constitute a major share of the marketed supplies, the structure of the maize value chain changes considerably as shown in Figure 4b. The most significant change is that the marketing channels become more concentrated and less competitive. Import contracts through Mombasa tend to be large volume orders placed by large millers, wholesalers, and the NCPB. Small-scale assemblers, itinerant traders, and small millers in the informal marketing channels are less active in drought years because they depend almost totally on small-scale farmers for their supplies, most of whom have little to sell during drought years. With grain being scarce in local informal markets during such years, consumers are increasingly dependent on the large-scale millers (who obtain their supplies from world markets or from the NCPB) for their maize meal. Without competition from the informal milling and retailing sector, large-scale millers and retailers are able to raise their margins somewhat, as is documented in Section 5.3.

Figure 4a: Maize marketing channel diagram: typical year of small national maize deficits



Note: the shaded boxes signify the main channels in terms of volume during this phase of the marketing season. The thickness of the arrow signifies the volume of flow. Dashed lines represent minor flows.

Figure4b: Maize marketing channel diagram: major national deficits - less typical



Note: the shaded boxes signify the main channels in terms of volume during this phase of the marketing season. The thickness of the arrow signifies the volume of flow. Dashed lines represent minor flows.

4.2. Farmers

4.2.1. Characteristics of Maize-Producing Households

Using the 10-year balanced panel of 1,275 rural farm households surveyed by the Tegemeo Institute in 24 districts in 1997, 2000, 2004, and 2007 we provide a description of the economic and cropping characteristics of small-scale farmers in Kenya. This will provide a foundation for understanding the role of farmers in the maize market.

Table 5 indicates that maize accounts for a declining share of total crop income in Kenya. The share of maize in total income declined from 15.6% in 1996/97 to 11.4% in 2006/07, while fresh fruits and vegetables have taken up an increasing share. Other than this small shift in income shares from maize to horticultural crops, there are no other discernible trends in rural farm income shares.

Table 6 presents data on farm production and marketing patterns. Over 96% of all farm households cultivate maize. The balanced panel of households produced roughly the same quantity of maize in each of the four survey years even though mean farm sizes declined by 15% over the 10-year panel period. Because the inflation-adjusted value per unit of maize declined over this 10-year period, the real value of production declined. The proportion of households selling maize increased from 35% of households in 1996/97 to 49% in 2006/07. The increased proportion of households selling maize may be partially due to a major rise in the use of fertilizer on maize over the 1997-2007 period; 54% of households used fertilizer on maize in 1997 compared to 70% in 2007. Yet the total quantity of maize sales declined by 12% over the same period. This suggests that though a larger fraction of households are selling maize, the mean quantity sold per selling household is declining. Analysis of subsequent years will be needed to determine whether these are robust trends or not.

Table 6: Production income shares in the small- and medium-scale farming sector, Kenya, 1,275 households

	1996/1997 marketing year	1999/2000 marketing year	2003/2004 marketing year	2006/2007 marketing year
	% of total income			
Crop production (of	41.1	49.9	37.9	41.1
<i>Maize</i>	15.6	14.0	13.4	11.4
<i>Other cereals, roots,</i>	5.1	5.5	4.8	3.1
<i>Beans and oilseeds</i>	3.9	4.0	3.0	2.4
<i>Industrial cash crops</i>	8.3	11.9	7.4	9.5
<i>Horticulture</i>	8.0	13.0	7.4	12.5
<i>Other crops</i>	0.2	1.4	1.8	2.3
Animal products	22.8	16.6	32.9	22.3
Off-farm activities	36.1	33.5	29.2	36.6

Source: Tegemeo Rural Household surveys

The percentage of marketed maize production is relatively high when compared to other countries in the region. In Malawi, for example, roughly 15% of the maize produced by the smallholder sector is sold (Jayne et al. 2010b). By contrast, the Tegemeo data indicate that the mean household sales as a proportion of production is roughly 45%.

Despite the relatively commercialized nature of maize production in Kenya, maize accounts for a declining share of households' gross farm sales revenue, being as high as 30.1% in 1996/97 and as low as 16.2% in 2006/07. This points to a trend towards increasing diversification in farmers' crop marketing behavior.

Table 7 presents data on various crops' contribution to total gross farm sales revenue by region. It is apparent that maize is the dominant source of crop sales income in only one region, the High-Potential Maize Zone. Across all 24 districts surveyed, maize accounts for only 11% of total household farm sales revenue. Table 7 shows a fairly diversified crop commercialization pattern, in which industrial cash crops such as tea, coffee, and sugarcane are the dominant source of crop sales revenue in two or three regions (Western Transitional, including Bungoma and parts of Kakamega Districts; and the Central Highlands zone), while fresh fruits and vegetables and animal products (mainly dairy) are the greatest source of crop revenue in several other zones. Over time and at the national level, there appears to be no major shifts in the importance of certain crops in overall commercialization patterns.

Table 7: Farm production patterns of small- and medium-scale agricultural households in Kenya – Shillings reflatd to 06/07 real value

		% producing	Total production (MT)	Gross Value of Production (000 KSH) - real value	% selling	Total sales (MT)	Gross Value of Sales (000 KSH) - real value	Sales as % of production - mean across households	Sales as % of production - national	% of total gross farm sales revenue - national	Consumed on farm (MT)
Maize + other grains	1996/1997	96.9	2,477	65,028	35.3	1,535	41,495	48.5	63.8	30.1	942
	1999/2000	96.4	2,663	59,518	43.1	1,414	31,497	42.6	52.9	19.4	1,248
	2003/2004	98.4	2,500	44,370	49.8	1,390	24,671	45.9	55.6	21.2	1,110
	2006/2007	98	2,476	31,394	49.1	1,315	16,747	47	53.3	16.2	1,161
Roots and Tubers	1996/1997	56.5	693	8,586	20.1	284	3,811	48.2	44.4	2.8	409
	1999/2000	77.1	1,052	10,838	29.8	428	4,251	44.5	39.2	2.6	625
	2003/2004	82.4	1,006	8,301	33.6	428	3,684	46	44.4	3.2	578
	2006/2007	69.8	663	4,634	30.3	290	2,103	52.5	45.4	2	373
Oilseeds, beans, legumes	1996/1997	87.3	226	9,017	24.3	83	3,141	49.3	34.8	2.3	143
	1999/2000	93	275	10,560	31.5	88	3,337	42.6	31.6	2.1	187
	2003/2004	94.7	280	8,851	38.1	95	2,994	44.2	33.8	2.6	185
	2006/2007	93.4	243	6,953	34.2	80	2,081	43.5	29.9	2	164
Horticulture	1996/1997	66	1,960	23,632	47.5	1,293	16,035	60.5	67.9	11.6	667
	1999/2000	97.3	4,209	40,169	75.6	2,236	22,601	43.5	56.3	13.9	1,973
	2003/2004	99.1	3,884	32,809	81.6	2,092	17,877	40.4	54.5	15.3	1,792
	2006/2007	99.3	3,265	24,072	80.8	1,791	13,734	42.8	57.1	13.3	1,474
Tea	1996/1997	12.1	648	18,344	12	635	17,929	99.4	97.7	13	14
	1999/2000	13.2	717	25,953	13.2	713	25,799	98.6	99.4	15.9	4
	2003/2004	14.5	739	17,755	14.4	734	17,661	99	99.5	15.1	5
	2006/2007	15.1	797	19,062	15.1	797	19,062	100	100	18.5	0
Sugar cane	1996/1997	5.5	2,917	9,257	5.5	2,906	9,226	96.5	99.7	6.7	12
	1999/2000	9.8	6,707	20,289	9.8	6,707	20,289	100	100	12.5	0
	2003/2004	6.1	3,788	9,040	5.9	3,749	8,947	98.8	99	7.7	39
	2006/2007	6	3,699	7,726	6	3,674	7,673	99.7	99.3	7.4	25
Coffee	1996/1997	18.1	170	4,329	16.5	155	3,912	97.8	90.4	2.8	15
	1999/2000	21.7	255	12,451	21.2	250	12,218	97.5	98.1	7.5	5

		% producing	Total production (MT)	Gross Value of Production (000 KSH) - real value	% selling	Total sales (MT)	Gross Value of Sales (000 KSH) - real value	Sales as % of production - mean across households	Sales as % of production - national	% of total gross farm sales revenue - national	Consumed on farm (MT)
	2003/2004	19.1	167	2,538	18.4	160	2,420	98.2	95.4	2.1	7
	2006/2007	18.5	125	2,532	17.7	125	2,520	99.7	99.5	2.4	0
Dairy	1996/1997	63.1	1,811	44,197	63.1	996	24,308	55	55	17.7	815-b
	1999/2000	69	1,793	53,602	50.8	960	28,231	54.6	52.7	17.4	832
	2003/2004	68.9	2,151	47,384	52.3	1,137	24,687	49.7	52.1	21.2	1,011
	2006/2007	68.5	2,006	33,588	54.7	1,229	20,299	57.4	60.4	19.7	777
Other animal products	1996/1997	82	a	21,888	35.8	a	15,895	85.1	72.6	11.5	a
	1999/2000	60	a	844	57.4	a	15,566	182.3	1843.2	9.4	a
	2003/2004	57.8	a	9,019	51	a	12,403	-155.9	137.5	10.6	a
	2006/2007	59.2	a	5,201	68.6	a	18,100	-14.7	348	17.5	a
Other crops	1996/1997	5	51	2,437	3.9	30	1,913	92.1	78.5	1.4	21
	1999/2000	39.8	2,162	5,653	7.6	142	1,145	66.5	20.3	0.7	2,019
	2003/2004	48.5	5,173	6,322	9.1	519	1,303	68.2	20.6	1.1	4,653
	2006/2007	53.9	3,086	5,765	8.3	207	955	68	16.6	0.9	2,879
Total	1996/1997	49.2	10,954	206,715	26.4	7,916	137,665	64.3	70.5	100	3,038
	1999/2000	57.7	20,345	239,877	34	13,043	164,935	76.1	239.4	100	7,302
	2003/2004	59	20,443	186,390	35.4	10,560	116,647	22.4	69.2	100	9,884
	2006/2007	58.2	16,941	140,927	36.5	9,944	103,276	42.5	91	100	6,997

Source: Tegemeo Rural Household surveys. See documentation for crops included in the categories.

Notes: a - not applicable to this category.

b – estimated sales based on ratio of sales to production for the other years of the panel.

Table 8: Contribution to total gross farm sales revenue of selected enterprises, by zone for different marketing years

Zones	Marketing year	Number of households	Median (mean) land holding size								Gross farm revenue	
				Maize	Roots/tubers	Beans/oilseeds	Industrial cash crops	Other crops	Fruits and vegetables	Animal products	000' US	US\$ per household
Coastal Lowlands	1996/1997	75	3.9 (4.8)	1.3	0.7	0.3	0	0	31.7	66	13.5	179.8
	1999/2000		2.8 (5.3)	6.8	5.7	2.1	0	0	55.2	30.1	17.3	230.2
	2003/2004		4.0 (6.0)	3.8	27.9	0.4	0	0.1	33.5	34.3	33.7	449.2
	2006/2007		3.8 (5.0)	4.5	5.1	3.4	0	0	53.3	33.7	20.9	278.2
Eastern Lowlands	1996/1997	145	4.5 (5.9)	3.5	1.6	3.7	2.2	3.4	49.2	36.4	62.5	431.3
	1999/2000		5.3 (6.3)	8.8	3.5	6.3	2.1	1.6	46.9	30.9	68.2	470.5
	2003/2004		5.4 (6.8)	9.6	1.6	6.2	0.2	5	43.3	34.1	56.6	390.5
	2006/2007		4.8 (6.8)	7	0.9	4.7	0.7	2	43.5	41.2	95.9	661.6
Western Lowlands	1996/1997	153	2.6 (3.2)	13.3	1.4	4.4	29.7	1.5	3.3	46.5	29.2	191.2
	1999/2000		2.9 (3.4)	16.9	2.5	2.6	42.8	0.5	13.6	21.2	39.1	255.4
	2003/2004		3.1 (4.0)	8.1	2	4.4	32.4	0.9	26.9	25.3	53.1	347.2
	2006/2007		2.4 (3.0)	17.6	1.1	2.4	36.7	1	16	25.2	51.6	337.4
Western Transitional	1996/1997	14	4.5 (5.2)	4.5	2.8	2.2	59.4	0	10.1	21	110	743
	1999/2000		4.6 (5.5)	4.6	1.1	2	72.1	0.4	7.4	12.4	192.9	1,303.30
	2003/2004		3.9 (5.0)	11.4	2.2	2.5	54.1	0.1	10.5	19.2	126.9	857.2
	2006/2007		4.1 (4.9)	8.9	1.7	2.6	56.6	0.1	6.8	23.3	158.2	1,069.00
High Potential Maize Zone	1996/1997	346	4.0 (6.9)	56.7	0.5	3	6.3	2.1	4.2	27.2	554.7	1,603.30
	1999/2000		4.2 (7.3)	42.7	0.8	2.3	10.9	0.8	6.8	35.7	489.3	1,414.20
	2003/2004		3.9 (5.4)	39.2	1	2.9	10.8	1.2	8.8	36	613.5	1,466.10
	2006/2007		3.8 (5.5)	31.4	0.6	2.3	11.2	1.2	5.2	48	613.5	1,773.00
Western Highlands	1996/1997	129	2.8 (3.2)	6.3	0	2.1	20.1	0	28.9	42.5	44.5	344.9
	1999/2000		2.5 (3.2)	6.9	0.2	4	29.4	1.2	31.5	26.8	72.7	563.3
	2003/2004		2.4 (3.0)	10.4	0.7	3.2	21.6	2.8	27.8	33.5	66.9	518.7
	2006/2007		2.8 (3.0)	7	0.2	2.5	37.2	1.5	20.6	31	95.9	743.3
Central	1996/1997	242	2.8 (3.5)	1.4	8.3	0.4	47.3	0.4	14.1	28.2	274.3	1,133.00

Zones	Marketing year	Number of households	Median (mean) land holding size	Maize	Roots/tubers	Beans/oilseeds	Industrial cash crops	Other crops	Fruits and vegetables	Animal products	Gross farm revenue	
											000' US	US\$ per household
Highlands	1999/2000		2.4 (3.3)	1.4	6	0.5	58.5	0.5	13.6	19.5	368.4	1,522.10
	2003/2004		2.5 (3.2)	1.6	5.9	0.6	48.7	0.3	14.7	28.2	253.1	1,045.70
	2006/2007		2.3 (2.7)	1.4	5.2	0.5	51.4	0.6	14.4	26.6	389.4	1,608.90
Marginal Rain Shadow	1996/1997		3.0 (3.5)	0.9	1.6	1.2	0	0	48.5	47.8	14	378.4
	1999/2000		2.8 (2.9)	0	1.3	0.5	0	0.2	34.3	63.8	17.5	473.7
	2003/2004		3.0 (3.3)	5.3	2.7	4.5	0	0.7	36.2	50.6	20.5	552.8
	2006/2007	37	3.0 (3.1)	2.9	2	1.3	0	0	41.1	52.7	35.2	952.5
Total	1996/1997		3.7 (5.0)	11	2.1	2.2	20.6	0.9	23.7	39.4	1,102.80	625.6
	1999/2000		3.4 (5.1)	11	2.6	2.5	27	0.7	26.2	30.1	1,265.30	779.1
	2003/2004		3.5 (4.7)	11.2	5.5	3.1	21	1.4	25.2	32.7	1,118.00	703.4
	2006/2007	1,275	3.2 (4.4)	10.1	2.1	2.5	24.2	0.8	25.1	35.2	1,460.60	928

Source: Tegemeo Rural Household surveys

*Categories are derived from Table 2 data. Roots/Tubers and Beans / oilseeds are the same, Industrial cash crops= Tea, Sugarcane and Coffee, Animal products = Dairy and Other animal products, Fruits and vegetables = Horticulture, Other crops = all other crops.

Table 9: Attributes of different categories of smallholder farmers according to maize sales status, for various marketing years (constant 2007 Kenyan shillings)

		Biggest maize sellers accounting for 50 % of total maize sales (n= 20 in 1996/97) (n= 24 in 1999/2000) (n=26 in 2003/04) (n=27 in 2006/07)	Other maize sellers accounting for the other 50% of total maize sales (n= 383 in 1996/97) (n= 457 in 1999/2000) (n=538 in 2003/04) (n=544 in 2006/07)	Farm households growing but not selling maize (n= 822 in 1996/97) (n= 738 in 1999/2000) (n=678 in 2003/04) (n=675 in 2006/07)	Farm households not growing maize (n= 50 in 1996/97) (n= 56 in 1999/2000) (n=33 in 2003/04) (n=29 in 2006/07)	Total (n= 1275 for all years)
Attribute	Marketing year	----- Mean Values -----				
Total household income (Ksh)	1996/1997	1,418,230	369,311	231,356	177,597	289,306
	1999/2000	1,349,117	350,958	236,265	257,355	299,248
	2003/2004	753,742	330,011	180,193	251,508	256,952
	2006/2007	584,046	230,256	166,732	201,650	203,467
Gross value of crop sales (Ksh)	1996/1997	837,870	104,647	48,024	22,976	76,441
	1999/2000	685,747	115,244	65,871	60,668	95,007
	2003/2004	310,561	84,143	36,337	47,810	62,398
	2006/2007	213,749	57,720	39,974	24,984	50,884
Gross value of maize sales (Ksh)	1996/1997	500,904	26,620	-	-	16,501
	1999/2000	483,692	22,877	-	-	17,304
	2003/2004	244,245	19,693	-	-	13,643
	2006/2007	166,417	14,381	-	-	9,885
Value of productive assets (Ksh)	1996/1997	2,261,097	280,981	111,849	104,264	196,071
	1999/2000	1,063,858	174,726	87,793	127,572	139,072
	2003/2004	806,654	166,205	72,451	91,462	127,475
	2006/2007	198,585	65,671	49,365	32,926	59,108
Value of income from livestock products (Ksh)	1996/1997	160,445	81,193	37,169	24,512	51,831
	1999/2000	238,066	50,957	32,243	29,479	42,703
	2003/2004	206,665	60,427	25,972	28,654	44,238
	2006/2007	115,376	35,568	23,271	21,287	30,423
Area under crops (acres)	1996/1997	26.6	5.4	3.5	3.0	4.4
	1999/2000	27.4	6.5	3.7	3.0	5.1
	2003/2004	15.1	5.6	3.4	5.6	4.7
	2006/2007	15.4	5.2	3.3	1.8	4.4

Table 8 disaggregates smallholder households included in the nationwide survey into three groups: (i) the largest smallholder sellers of maize who accounted for 50% of the total marketed maize output; (ii) the remaining households that sold maize during the year who accounted for the other 50% of the marketed output; and (iii) those households that sold no maize during the 12-month marketing season. The data in Table 8 demonstrate that 2% of the farms account for 50% of the overall marketed maize surplus from the smallholder sector. These farm households appear to enjoy substantially higher welfare levels, in terms of asset holdings, crop income, and non-farm income, than the rest of the rural population. The relatively *elite* smallholder farmers had roughly 2 – 6 times as much land and productive assets as the non-selling households, 6 – 9 times more gross revenue from the sale of all crops, and 5-7 times as much total household income.

When a broader set of staples are aggregated together (maize, cassava, sweet potato, millet and sorghum) more than 55% of the sales of staples are still accounted for by 10% of the farmers with the largest sales. This concentration of surplus production and marketing by a relatively few farmers is one of the most important points to be borne in mind when thinking about the effects of policy instruments designed to alter the mean level of food prices. At least in the short run, policies that put upward pressure on maize prices benefit only a small minority of producers, while directly hurting the majority.

A second implication of the substantial differentiation within the smallholder farm sector is that the benefits of food price support policies that raise mean prices are likely to be extremely concentrated. This was a major outcome of the price support and stabilization policies pursued during the pre-liberalization period, which contributed to peasant differentiation and the subsequent stratification among smallholders in terms of their ability to participate in markets during the post-liberalization era. The benefits of state resources aimed at supporting food prices are directly proportional to how much a farmer can sell. In light of the extreme concentration of land and other productive assets in the agricultural sector, coupled with the fact that the majority of relatively asset-poor smallholders sell no grain at all, it is clear that state-led efforts to support maize producer prices in Kenya represent a regressive redistribution of income from the urban and rural poor to a small set of relatively wealthy farmers.

4.2.2. Net Buyer/Net Seller Status of Smallholder Farmers

Maize producers can be classified into six categories depending on their grain selling and purchase behavior. Table 10 is based on the Tegemeo rural household panel data collected in 1997, 2000, and 2004, and shows the percentage of farming households in the sample that fall into different categories according to their market position. The positions are described as follows: (i) sell only—households that sold but did not buy maize; (ii) buy only—households that bought maize and did not sell any; (iii) net sellers—households that bought and sold maize but maize sales exceeded purchases; (iv) net buyers—households that bought and sold maize but purchases were greater than sales; (v) neither buys nor sells—households that did not participate in the market (autarkic); and (vi) net equal—the quantity of maize sold and bought were equal.

As shown in Table 9, the majority of rural farm households in Kenya are only buyers of maize, who tend to have relatively smaller farms, are poorer, and are mainly female-headed households. By contrast, roughly 20% of farms (*sell only*, who are generally larger farms) account for the majority of the maize marketed nationwide. In addition, about 18% of the total households in the sample both buy and sell maize within the same year (net seller, net buyer and net equal categories), with nearly two thirds of them being net-sellers.

In the net-seller category (*sell only* and *net seller* categories), a majority of these households sold maize out of their marketable surplus and did not buy any maize. Results based on the 2007 Tegemeo rural household survey indicate that these households are highly concentrated in the High Potential Maize Zone (Table 11). The other households in this category are those who bought and sold maize but sales exceeded purchases. The largest proportion of such households is also found in the High Potential Maize Zone.

Table 10: Household characteristics according to position in the maize market, nationwide sample of small-scale households in Kenya, pooled data, 1997, 2000, and 2004

Characteristic	Household market position (% of households)						
	Sell Only (n=781)	Buy only (n=2052)	Net seller (n=467)	Net buyer (n=242)	Net equal (n=18)	Neither buys nor sells (n=412)	Total (n=3972)
% of total sample	19.7	51.7	11.8	6.1	0.5	10.4	100
Household Income (2004 Ksh per hh)	334,188	175,409	275,006	184,375	243,950	213,775	223,176
Crop Income (2004 Ksh per hh)	182,093	86,702	153,616	90,908	157,080	102,893	115,580
Household Wealth (2004 Ksh per hh)	273,390	58,662	118,840	61,862	31,590	110,435	113,401
Land Cultivated (acres)	7.5	2.6	4.8	3.0	2.4	3.6	4.0
Household Size (adult equivalents)	6.2	6.2	6.2	6.3	6.9	5.8	6.2
Female-headed households (%)	12%	49%	7%	16%	5%	11%	100%

Source: Adapted from Ariga and Jayne (2009).

Table 11: Household maize market position for the 2006/2007 production season by agro-ecological zone

	Eastern and Western Lowlands	Western Transitional and Western Highlands	High-potential maize zone	Central Highlands	Coast	Full sample Total
Selling maize only (%)	12.4	30.7	52.5	14.9	4.2	27.3
Buying maize only (%)	51.7	35.8	19.7	47.6	72.2	39.9
Buying and selling maize (net maize seller)	13.6	13.7	16.6	22.6	11.1	15.9
Buying and selling maize (net maize buyer)	3.7	3.4	1.4	2.8	4.2	2.9
Autarkic (no maize sales or purchases)	18.6	16.4	9.8	12.1	8.3	14.0

Source: Tegemeo Rural Household Survey, 2007.

A study by Kimenju and Tschirley (2008) provides perspective on the conditions of the relatively small proportion of households that sell and buy maize in the same year. Results from their study show that the contribution of off-farm business income to total household

income has increased in all zones, signifying that rural households are diversifying their income sources by engaging in off-farm activities. Businesses that are increasingly contributing more to household income include trading (retail shops and selling clothes), food and beverage (hotel, butchery, fish trading), artisan activities (masonry, carpentry, weaving) and services (tailoring, hairdressing, and barbershops, car washing). These businesses offer opportunities for households to earn additional income and avoid distress sales. It turns out that a relatively large share of farm households that buy and sell maize in the same year are engaged in maize trading, perhaps as assemblers. By far the majority of maize buying households are those that only buy maize, not buy and sell in the same year.

The proportion of households producing maize has remained high between 1997 and 2007, averaging 99%. This indicates the importance attached to maize by most rural households. Indeed, nearly all households attempt to produce maize for their own consumption, but many are unable to do so and are buyers or net buyers. The majority of smallholders lack access to sufficient land and productive assets to produce a meaningful surplus. Even if they could achieve major maize productivity gains, they would remain unable to produce a meaningful surplus that would generate levels of income that would be substantially above the poverty line. A critical component of making maize markets work for small-scale farmers is thus to address the needs of the majority of farmers who are net buyers of maize. Reliable access to maize at tolerable prices is a necessary precondition for these farmers to successfully diversify away from maize production and into the production of higher value crops.

4.2.3. Maize Marketing Channels for Farmers

This section highlights the various outlets through which farmers sell their maize. The figures presented are based on the responses obtained from 33 farmer focus group discussions (farmer FGDs) carried out in 33 villages in the districts of Bomet, Kisii, Bungoma, Nakuru, Machakos, and Trans-Nzoia during May-June 2009. We separately obtained specific information from the 450 maize-selling farmers who participated in the FGDs. Out of the total number of villages, 57.6% were identified as accessible while 42.4% were defined as inaccessible. Accessibility was mainly defined in terms of two indicators of market access, namely mean village-level data on distance to the nearest motorable road and the condition of the road.

We also stratified villages according to whether they participated in farmer marketing training under the KMDP to compare marketing behaviors between farmers receiving

marketing training and control groups without formal marketing training. Out of the total number of villages surveyed, 48.5% were identified as receiving KMDP marketing training.

In the villages where the fieldwork was carried out, farmers have a wide range of marketing options or outlets. There is a range of types of buyers who purchase maize from farmers, including assemblers or small traders, large traders or wholesalers, cooperatives, NCPB, other farmers, households in the village, schools, commercial and posho millers, and brewers. Of these available options, the most prevalent kinds of buyers are the small and large traders. The distribution of these types of buyers by village accessibility is as shown in Table 11. Assemblers are the dominant maize buyers in both accessible and inaccessible villages, followed by the large traders. These results indicate that maize assembly traders have penetrated even the remote rural areas in Kenya, which may reflect an increase in private sector investment in maize trade. There is also evidence of a declining role of NCPB, particularly in the accessible areas.

According to focus group respondents, private buyers operating at the village level provide farmers with particular advantages relative to other marketing options. First, they pay cash immediately upon acquiring maize. Second, they purchase maize directly from farmers' doorstep. Third, they will occasionally offer farmers cash loans prior to harvest, which allows farmers to deal with immediate financial demands when the need arises. Assembly traders are also willing to purchase maize in small quantities, which is critical in a country where many farms generate small surpluses. Finally, small-scale assemblers are not very concerned with quality and moisture standards, which many farmers view as a barrier preventing them from selling maize directly to large-scale mills or the NCPB. In fact, the current structure of Kenya's maize market provides little incentive for farmers to produce high quality maize, because quality rarely translates into greater returns when selling through the small-scale assembler marketing channel.

Table 12: Frequency of the type of buyers purchasing maize from farmers interviewed in the focus group discussions (N=450), stratified by accessible vs. remote villages

	Accessible villages*		Inaccessible villages**	
	Number	%	Number	%
Assembler/small trader	139	54.3	110	56.7
Large trader/wholesaler	56	21.9	47	24.2
Cooperative	0	0	2	1.0
NCPB	1	0.4	5	2.6
Other farmer/trader	2	0.8	2	1.0
Household in village	27	10.5	14	7.2
School	29	11.3	5	2.6
Miller	0	0	7	3.6
Posho mill	1	0.4	2	1.0
Brewer	1	0.4	0	0
Total	256	100	194	100

Source: Tegemeo/Michigan State University Maize Value Chain Survey 2009.

Note: * ** Accessibility was defined in terms of several indicators of market access as outlined on page 8, but the main ones are mean village-level data on distance to the nearest motorable road and the condition of the road.

However, despite the stated advantages of selling maize to private assemblers, farmers complain that these buyers frequently use inaccurate measurements when buying maize and collude to fix prices and minimize competition between them. These complaints may be well founded. Throughout Kenya, private assemblers use plastic tins, known as *gorogoro*, to buy and sell maize. *Gorogoro* are assumed to hold 2.25 kg of maize. Thus, 40 *gorogoro* is the standard measure for a 90 kg bag of maize. Yet these plastic tins are far from standardized. In fact, variations in size serve as one of the primary ways in which assemblers, wholesalers, and retailers extract additional profits from maize transactions. Based on measurements of *gorogoro* in Salgaa, Nakuru District, and Kapkwen, Bomet District, three different sizes of *gorogoro* were identified, with sizes changing as maize moves up and down the value chain. The tins used to buy maize from farmers held 3 kg of maize, the tins used by wholesalers to sell maize to retailers held 2.25 kg, and the tins used by retailers to sell to consumers held 2 kg. Obviously these weights will change based on the moisture content of maize, but the relative difference will hold constant. The consequence of this variegated form of measurement is that, for example, if a farmer claims to have sold three 90kg bags of maize, but the assembler measured 40 *gorogoro* per bag, in all likelihood the farmer sold four 90kg bags of maize, while only being compensated for three. This is a significant loss of profit and is one of the central complaints farmers have about the private trading system. As a result, a great deal of distrust of the private maize marketing system exists within the smallholder sector.

One of the most important findings is that in virtually all villages chosen for farmer focus group discussions, including both accessible and inaccessible areas, the response to the question "how many traders purchased maize from farmers in this village" was almost always more than 10. Overall, the most commonly cited number of traders was 100, with about 27% of the responses indicating a number between 15–30 and 42% quoting a figure of 50–100. Figure 5 shows the distribution of traders operating in accessible and inaccessible villages across the districts. With this many traders purchasing maize in each village, the assembly traders are apparently pushing much deeper into rural areas than the conventional wisdom would indicate. It shows the extent to which the first stage in the system (farmer-assembly trader/first buyer) has developed and become competitive over the years. The growing density of maize assemblers also reflects an increase in the participation of the private sector in the maize trade following liberalization.

The mean distance from the farmers' farms to the point of sale of maize was 1.85 km, with 73.1% of the farmers selling their maize at the farm-gate. Therefore, the majority of the traders transact with farmers for grain right in the villages. Most of the maize sold beyond the farm gate was purchased by assemblers/small traders, schools, and wholesalers/large traders in order of decreasing volumes, and was mainly transported by donkey carts and trucks/cars. These results closely mirror the findings by Chamberlin and Jayne (2009). They used the 10-year Tegemeo panel data on 1,267 smallholder households to monitor changes in their access to markets and services. One of their access indicators was the distance (km) to point of maize sale with private trader. Results showed that between 1997 and 2007, the mean distance from the farm to point of sale of maize declined from 0.9km to 0.5km. This represents a 43% reduction in distance, and reflects an increased density of grain traders in rural areas. In addition, by 2007, over 75% of smallholder households selling maize stated that the private trader to which they sold came to their farm or village to buy their maize.

Figure 5: Farmer focus group respondents' estimates of the number of traders buying maize within their village in the 2008/09 marketing season



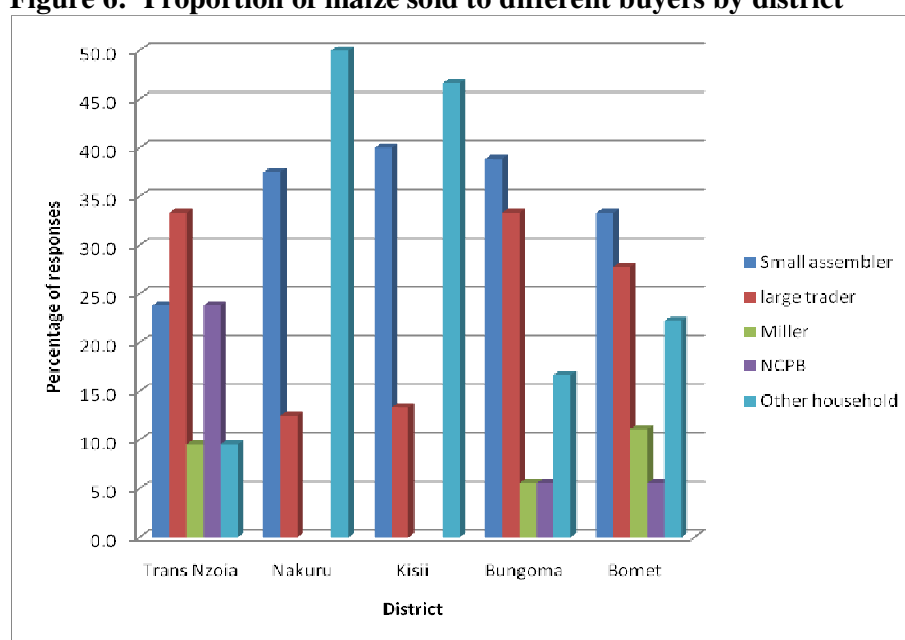
Source: Tegemeo/Michigan State University Maize Value Chain Survey 2009.

Private traders accounted for 73% of the sales transactions in 2007, while neighboring households and the NCPB accounted for the remaining 22% and 5% of transactions, respectively. The study also shows that while in 1997, 90% of the households traveled 3.5km or less to the point of maize sale, by 2007, 90% of the households traveled 2 km or less. This reduction in distance to the point of maize sale again suggests that over time maize assembly traders are penetrating deeper into the rural areas and buying maize directly in the villages, and may reflect a growing density of maize traders.

Overall, these results suggest that over the years, there has been greater investment in private grain trading, particularly at the assembler level. This trend perhaps reflects a positive result of liberalization; there is now more private sector participation in the maize market as evidenced by the improved proximity of households to maize buyers as well as the growing density and geographical coverage of maize assembly traders in response to the removal of controls on maize movement and price. Additionally, given the high number of traders operating in the village, these findings imply that access to markets may no longer be defined in terms of distance to point of sale, but rather in terms of the ability of farmers to obtain and negotiate for a remunerative price.

Results in Figure 6 show that the importance of the marketing channels varies by district. While farmers in Nakuru and Kisii did not sell maize to millers, a significant proportion of them sold maize to other households. On the other hand, in Trans Nzoia district, the proportion of sales to NCPB and small traders were equal. Therefore, although NCPB is generally playing an increasingly smaller role as an outlet for maize from farmers, it remains an important channel in the larger Trans Nzoia and Bomet districts, which are maize surplus zones and there is a deliberate move by NCPB to operate in such areas. It is important to note that these interviews took place after the 2008 harvest, when private sector prices were high and the NCPB therefore played a diminished role in the market.

Figure 6: Proportion of maize sold to different buyers by district



Source: Tegemeo/Michigan State University Maize Value Chain Survey 2009.

Table 13: Average price per kilogram of maize through different market channels

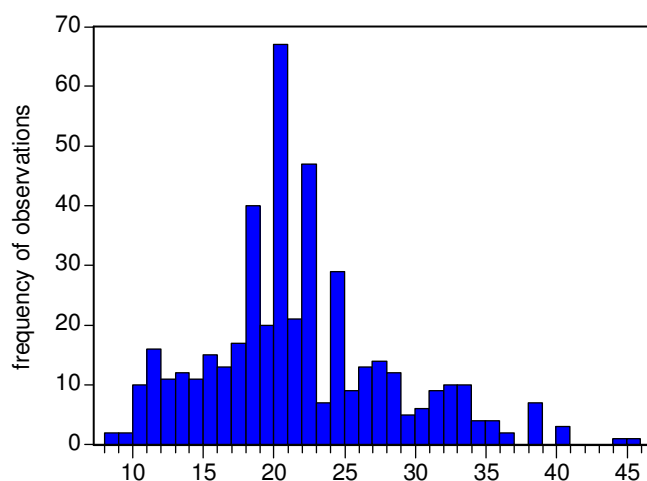
Marketing channel	Price per kg
Assembler/small trader	21.00
Large trader/wholesaler	20.50
Cooperative	20.00
NCPB	19.80
Other farmer/trader	17.80
Household in village	26.20
School	22.35
Miller	25.10
Posho mill	19.30

Source: Tegemeo/Michigan State University Maize Value Chain Survey 2009.

The average price that farmers received for the 2008/09 maize sales was Ksh 21.50. However, results in Table 13 show that the price per kilogram varied widely across the marketing channels, ranging from a low of Ksh 17.80 for sales to other farmer/trader to a high of Ksh 26.20.

The average price per kg also varied by district, with Bomet having the lowest mean price of Ksh 19.45 and Bungoma the highest mean price of Ksh 24.03. In addition, there was wide intra-district variation in price, with the difference between the lowest and highest prices being as large as Ksh 47/kg in Bungoma district. Within Bungoma district, prices obtained from individual farmers within the FGDs show that the most commonly received price was Ksh 18/kg, but the lowest price of Ksh 9/kg was paid by a small trader/wholesaler for a sale made in the month of November.

Figure 7: Frequency of maize prices received by farmers in Trans Nzoia district in May 2009



Source: Tegemeo/Michigan State University Maize Value Chain Survey 2009.

Note: Horizontal axis: maize price received in Ksh per kg

Table 14: Mean maize selling price for farmers receiving vs. not receiving marketing training, Kenya, May/June 2009

Category of farmers	Mean price (Ksh per kg)	Standard deviation
All farmers (n=450)	21.5	7.1
Received training (n=279)	22.1	7.2
Have not received training (n=171)	20.1	6.0

Source: Tegemeo/Michigan State University Maize Value Chain Survey 2009.

Even within the same areas, farmers received different prices, perhaps depending on their ability to negotiate for a good price, and to hold onto some of their grain and sell it later in

the season. For instance, Figure 7 shows that farmers within the same location obtained widely varying prices for their maize in the same month.

Prices also varied by whether farmers had received training or not. Table 14 presents the prices received by farmers in May and June 2009 for KMDP training recipients vs. non-recipients. KMDP recipients received 9.9% higher prices on average (22.1 shillings vs. 20.1 shillings per kg). To examine the training effect more precisely, we regressed these prices on a training dummy variable, distance of the household to the nearest market town and a village dummy to capture spatial price differences. Ordinary Least Squares (OLS) results indicate that the KMDP recipients received, on average, 1.8 shillings per kg more than non-recipients (a 9.2% price difference), significant at the 5% level.

For a farmer selling five bags of maize, the difference of Ksh 2 per kg is equivalent to Ksh 900 of additional profit. Although market training has not yet transformed farmers' groups into effective cooperative marketing enterprises, it has had a measurable effect on farmers' understanding of the maize market and their ability to profitably and confidently participate in it. Developing greater understanding and comfort within these dynamic and intimidating markets is critical both for smallholder welfare and for the future development of the region's maize market.

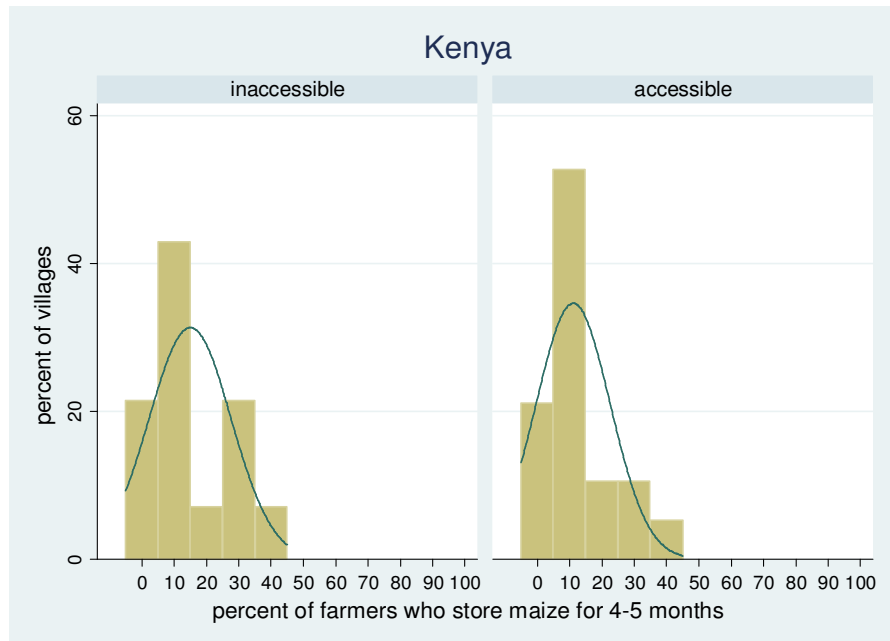
4.2.4. On-farm Storage Issues

On-farm storage of grain plays a vital function in ensuring household food security. However, only 13% of the maize surplus-producing households surveyed in the focus group discussions (n=450) stored maize for at least 4-5 months after harvest with an intention to sell it later. In accessible villages, the mean percentage of households storing grain for more than 4-5 months was 11.4%, whereas in the villages defined as remote it was 14.9%. Figure 8 shows the frequency of households storing grain at least 4-5 months.

Those that stored maize for 4-5 months after harvest generally produced larger surpluses of maize than their neighbors produce and had access to alternative income sources. These findings indicate that most of the smallholder sector's surplus maize production is sold and in the hands of traders and other downstream marketing actors within 5 months after the main harvest. The implications of this are very different in areas benefiting from two harvest seasons per year – in such areas, seasonal price rises are not as pronounced as in regions with

only one crop season, and therefore storage for many months may offer limited temporal arbitrage opportunities.

Figure 8: Percentage of farmers storing maize for at least 4-5 months after harvest in accessible and inaccessible villages, 2009



Source: Tegemeo/Michigan State University Maize Value Chain Survey 2009.

The depletion of maize grain supplies in the local markets very early in the season has implications for food security, particularly in the period just before the next harvest. If there is grain in the local markets, consumers can buy grain and utilize local posho mills to obtain relatively inexpensive meal. However, later in the season, scarce maize supplies in the market preclude rural households from utilizing this option. Therefore, consumers have to rely on the relatively expensive meal from the commercial millers, which drives up the demand and prices for this meal.

Farmers in the FGDs indicated that the primary reasons that households with surplus maize to sell do not store maize for more than 4-5 months after harvest are as follows. First, grain sales are a means of coming up with needed cash for school fees, land preparation expenses, the repayment of debts, and other cash needs. The harvest provides a means for households to meet these pent up needs for cash. Second, on-farm storage involves costs and it is not clear that the seasonal increases in the price of maize are large enough to compensate for the storage costs and losses that farmers incur. A third factor limiting seasonal storage has traditionally been the pan-seasonal pricing of the NCPB. In the surplus-producing areas of western Kenya, it made little sense for surplus-producing farmers to invest in storage (beyond

home consumption requirements) because the NCPB's pan-seasonal price offered no incentives to store. The best strategy was to sell as soon as possible. While NCPB's direct presence in the market has declined over the past 15 years, its prices still exert a major influence on market prices (Jayne, Myers, Nyoro 2008). NCPB's operations appear to be aimed, with some degree of success, in mitigating seasonal price rises especially in high-priced years. All of these factors also induce maize wholesalers to cease their buying operations during the lean season period in each region because there is very little surplus left to buy at this time. Hence, the assembly traders who depend on quick resale to wholesalers after buying from farmers also disappear from the market later in the season. Thus, farmers' options for selling maize dry up considerably after 5-6 months after harvest.

The limited storage of surplus maize by farmers therefore represents a wide range of factors including farmers' needs for cash, cultural factors, discretionary government operations in the market, and traders' responses to these various factors. We feel it is misleading to conclude that limited storage incentives for farmers indicates that there is something wrong with the market or with private traders' response to liberalization. We do agree that if it were possible to provide the incentives and wherewithal for farmers to store grain on the farm further into the marketing season, this could reduce marketing costs, and therefore, drive down the cost of food for food-deficit rural households. Because of limited local storage in many areas, grain surpluses tend to be sold and quickly distributed to urban areas for milling by large-scale firms instead of stored for later sale locally. The lack of storage therefore increases the outflow of grain from deficit rural areas and subsequent backflow, which leads to redundant transport costs and higher food costs for consumers. However, recommendations to support local grain storage through the establishment of village grain banks and warehouse receipt systems have often failed because they did not identify the fundamental causes of limited grain storage. Alternative options for overcoming the constraints on grain storage are addressed in the discussion on policy options in Section 6.

4.2.5. Farmers' Perceptions of the Major Problems with Selling Maize

Farmers in the FGDs were asked to enumerate three or four main problems that they face when selling their maize. They overwhelmingly identified cost of fertilizer as the primary problem, while lack of credit, poor road conditions, and access to fertilizer featured highly as the important secondary problems. Other problems include storage losses and lack of buyers. The high cost of fertilizer relative to the prices received for maize discourages the use of fertilizer among small-scale maize growers, leading to low yields and small marketable

surpluses. Additionally, the lack of credit options forces farmers to rely on local loans from other farmers and maize traders, and to sell their maize soon after harvest in order to repay debts incurred and purchase inputs for the coming farming season. Of the 33 focus group discussions carried out for this research, and the hundreds of farmers represented by these groups, none had obtained a loan for their agricultural activities through the Agricultural Finance Cooperation. Thus, a lack of financing remains a major obstacle to expanding smallholder maize production. While farmers do not cite lack of a market as a critical problem, they are highly constrained in their ability to produce a marketable surplus due to lack of credit and high fertilizer costs. Opportunities to deal with these constraints will help improve production and productivity of maize.

4.2.6. Farmers' Perceptions of Maize Marketing Conditions and Welfare

Farmers were asked to indicate on a scale of 1 to 3 (1=better, 2=worse, and 3=same) how the current maize marketing conditions compare to those existing 10 years ago. Nearly 70% of the responses from the FGDs indicated that the marketing conditions had improved, with little variation in terms of responses across the districts. However, the highest proportion of those who felt that marketing conditions were worse is within Trans Nzoia district.

In answer to the question on whether most households were better off, worse off, or the same in terms of their standards of living at the time of the survey as compared to 10-15 years ago, responses showed an almost split in the middle, with about a half indicating that they were better off, while the other half pointed out that they were worse off.

In addition, nearly 76% of the responses showed that farmers in the interviewed villages were shifting their land and labor over time to other crops or farming activities. However, the scope of this study did not allow for further enquiry into what crops and farming activities to which the farmers were shifting.

4.2.7. Access to Market Information

Farmers were asked questions that sought to determine whether the uptake of mobile phones in rural areas improved their access to market information. They were asked to indicate on a scale of 1 to 5 (1=no difference, 2=small improvement, 3=moderate improvement, 4=large improvement, and 5=the most important development in the past 20 years), to indicate how much owning a phone improved their price and their ability to locate a suitable buyer for their maize. Nearly 67% and 50% of the responses revealed that owning a cell phone had little or

no improvement on the price they received for maize, or on their ability to find a buyer, respectively. While the majority of farmers own mobile phones, few of them are successfully exploiting this technology to look for buyers, to negotiate a price, or even to search for price differences among buyers. This passive approach to marketing is perhaps the result of a common belief among farmers that private buyers collude to set prices, making price negotiation futile. Therefore, there is need for training programs to provide farmers with knowledge and strategies for marketing their crops.

4.3. Assembly Traders

The assembly or small traders are the first commercial purchasers of maize in the value chain and the most important marketing output for maize-selling households in most areas. There has been substantial recent new entry into grain assembly. The year in which they started operating the trader business ranges from 1985 to 2008, with nearly 57% of the 46 traders interviewed having started operations since 2002. Nearly 76% of these traders buy maize directly from farmers in one district only; another 13% purchase in two districts. This indicates that the small traders hardly source for maize outside the districts where they live and operate, and further that many of these traders are themselves farmers who bulk up surpluses of neighboring farmers. These small traders are only able to purchase low volumes of stock due to working capital constraints.

A response to the question, “How many other traders purchase directly from farmers in this village” showed great variation with a minimum of one, a maximum of 200 and a mean of 25. The results showed that 55% of the traders indicated that there are 10-50 small traders buying maize grain directly from farmers in a village. Again, this clearly indicates that the assembly traders are apparently pushing much deeper into rural areas and that the first stage in the maize marketing system has become increasingly competitive over the years.

A majority (96%) of traders bought maize grain independently for themselves rather than as agents for another trader. They purchased maize directly from farmers or farmer groups and sold it mainly to wholesalers (67%) and consuming households in the area (20%).

Fifty-nine percent of the assembler traders do not store any of the grain they purchase from farmers. The majority of the assembly traders sell quickly to wholesalers bulking up grain in the district towns. They do this mainly due to liquidity constraints; after exhausting their limited working capital buying maize, they cannot buy more until they sell their grain to obtain more working capital. Concerns about uncertain future price movements were another

reason for limited storage as expressed by traders. Therefore, the majority of assembly traders engage in quick-turnover operations. Quick-turnover operations make heavy demands on transportation. It is noteworthy that the vast majority of assembly traders interviewed indicated that it was not a problem to secure truck transportation services quickly.

Wholesalers are instrumental for the viability of these assembly traders because they provide the means for assemblers to quickly sell and obtain fresh working capital to go back into the hinterland and buy more maize from farmers. Without the wholesalers, assembly traders could spend weeks or months with their working capital tied up while waiting for the marketing board or another buyer to pay them.

Of the 41% of assemblers who do store maize, most of them store for less than a month to avoid having their working capital tied up in inventory. However, a significant minority of assembly traders, 26.3%, do store at least 40% of the grain they buy from farmers for at least four months. These traders who store for at least 4 months were predominantly from Kisii and Bomet districts, areas where a sizeable portion of the nearby population become maize buyers later in the season after their production is depleted. Therefore, the strategy of these few assembly traders appears to be to buy grain shortly after harvest from maize surplus households in order to meet the expected maize demand later in the season from maize deficit households in these same areas.

Because most assemblers do not store maize for any significant amount of time and sell quickly to wholesalers, they tend to not be concerned with issues of storage, maize quality, and moisture content. Indeed, from a small-scale farmer's perspective this is considered one of their advantages. Wholesalers also appear to take only limited account of maize quality and moisture content when paying assemblers. Because assemblers pay no attention to maize quality, there is little incentive for farmers to bother either. These problems create many downstream problems for millers and raise marketing costs as will be discussed later.

Those assemblers who did store maize indicated that if they were to store a 100kg bag of maize for 6 months, its weight after 6 months would be 97kgs. If the difference in weight is used as a rough measure of storage losses, then this indicates that few storage losses are expected.

Most assemblers are content to make incremental profits on every bag of maize they sell and as such are not willing to assume the risks associated with changing their business model, such as storing maize and exploring alternative marketing options. The profits they get are in

the range of Ksh100 to Ksh400 per bag of maize (US\$12 to US\$48 per metric ton). Additional profits are made by using relatively large tin sizes when buying maize and small tin sizes when selling as indicated earlier (which would then inflate actual assembler margins to the range of Ksh130 to Ksh520, or US\$16 to US\$62 per metric ton).

In addition to the proceeding general discussion, the small-scale assembler group can be broken into three sub-categories: brokers, local assemblers, and external/itinerant assemblers.

4.3.1. Brokers

Brokers work to connect external, large-scale buyers/wholesalers to local farmers. They utilize knowledge of their local region to locate maize, negotiate prices with farmers, and assemble sufficient quantities of maize for the principal buyer. Once they have assembled enough maize they will notify the external buyer, who will send a lorry to collect it. Because they simply act to connect farmers with buyers, they do not need or use any type of storage facility. Aside from a mobile phone, there are no start-up costs to enter into this business. What a broker needs is local knowledge and external connections. By using brokers, large-scale buyers lower the transaction costs associated with purchasing maize from small-scale farmers. Because large-scale buyers tend to concentrate their buying efforts in a particular region only through the main harvesting period, brokers tend to be seasonal market actors. According to interviews with both large-buyers and brokers, brokers charge Ksh 5-10 per 2 kg tin of maize they assemble. In Kenya, 40 tins are assumed to be equivalent to a 90kg bag. Thus, the use of a broker adds Ksh 200-400 to the price of a bag of maize.

4.3.2. Local Assemblers

Local assemblers are generally farmers who utilize the income generated from their agricultural activities to finance maize purchases and to rent or build small temporary storage facilities. These facilities are either concrete or wooden structures with tin roofs. In general, local assemblers change their buying and selling practices in response to the seasonal agricultural cycle. During the harvest period, local buyers are busy assembling maize from small-scale farmers. Because of serious capital constraints, the maize they acquire is sold as quickly as possible to a wholesaler. This quick sale allows them to continue to make purchases throughout the harvest period. In general, local assemblers expect Ksh 100-200 profit per bag of maize they sell to wholesalers. The profits they make from each sale allow them to expand their purchases or to compensate for price rises. When selling, larger local

buyers can generally acquire enough maize to fill a lorry, at which time they will notify a wholesaler, who will come to purchase it. However, the majority of local assemblers do not have sufficient capital to purchase the 150 bags needed to fill a lorry. Those without the resources to purchase larger quantities of maize depend on mobile wholesalers, who bring lorries into rural areas during the harvest period to acquire maize. Local assemblers often have informal relationships with wholesalers in regional urban centers. Through these relationships, assemblers can determine prices and inform wholesalers of locally available surpluses.

Near the end of the harvest period, local assemblers frequently change their business practices. With the profit made from earlier sales, local buyers will begin to accumulate maize that they will store and then sell back to local consumers as local scarcities set in. Of the three types of primary assembler, local buyers are the only ones who will store maize for a significant amount of time. Thus, they perform a valuable function within their communities, as many maize farmers will become maize buyers before the next harvest. Additionally, unlike brokers or external buyers, local buyers will continue to buy maize throughout the year. This is another valuable function they perform, because when farmers need to generate cash, they frequently rely on these buyers to sell small quantities of maize to later in the year.

4.3.3. External/Itinerant Buyers

These buyers often use donkeys or bicycles to cover larger geographic areas than the other categories of primary assemblers. Additionally, they can access regions where it is difficult for trucks to enter. Some, such as the donkey carts that are common around Bomet and Transmara, normally cover huge geographic areas. They frequently purchase maize directly from farmers and then transport it, sometimes for days, to urban markets or the tea plantations around Kericho. Others, like the bicycle traders in Trans Nzoia and Bungoma, purchase maize directly from farmers and transport it to urban markets within the district. Like the other primary assemblers, capital constraints and the risks associated with storing maize mean that these buyers never store maize longer than it takes to find a buyer. Like other assemblers, they expect a Ksh 200-400 profit per bag of maize they acquire.

4.4. National Cereals and Produce Board (NCPB)

With its substantial storage facilities and government-backed purchasing power, NCPB continues to play a major role in Kenya's maize markets. The NCPB's role in the market appears to be correlated with expected production. NCPB tends to be more active after a good harvest when market price levels are expected to be low. NCPB takes a less active role in a poor production season, as during the 2008/09 marketing season in which our interviews were conducted. Interviews with NCPB managers in Bomet, Kisii, and Trans Nzoia indicate that only the depot in Trans Nzoia bought maize during the 2008/09 harvest period. The reasons for this diminished role include uncompetitive pricing relative to private marketing channels, which made it difficult to attract maize from farmers and traders, and low production throughout the major maize growing regions. This low production is attributed to a combination of residual effects from the post-election violence of 2008 and a subsequent drought. According to data collected for this report, only six of the 450 maize transactions recorded from small-scale farmers went through NCPB. Additionally, only 7% of the total maize marketed through the wholesale sector went to NCPB (Table 16 in Section 4.5

During the period of fieldwork for this report, NCPB depots acknowledged that they were holding stocks of imported maize. However, all NCPB depots had been instructed by the government to stop selling maize to either consumers or mills, despite escalating maize prices throughout the region. None of the depot managers interviewed could explain the reason behind this sales ban. Under normal conditions, NCPB depots sell maize to individuals at their warehouses. These individuals are primarily retailers, who will then divide the bags for

onward sale to consumers. Additionally, when mandated by the government, NCPB will sell maize to milling companies.

In addition to being a major maize buyer, NCPB owns the majority of high-tech grain storage in Kenya. The private sector and individual farmers can rent this storage for Ksh 10 per month per bag. In addition to storage services, NCPB offers fumigation, drying, and bagging service. NCPB fumigates maize brought to their silos but can also go to an individual's storage area to spray. These services, however, are not widely utilized. Of the 36 wholesalers interviewed for this report, only Lesiolo Grain Handlers, a large-scale grain trading and storage firm located in Nakuru, rented storage from NCPB. The vast majority of wholesalers were either unaware of rental opportunities with NCPB, felt it was too costly and risky to store maize with NCPB, or simply did not store maize. Thus, while high-tech maize storage is available through NCPB in most rural district capitals, these facilities are not being put to use. Obstacles preventing the use of these facilities include the perceived risks associated with storing maize, particularly price volatility and storage losses. Therefore, an expansion of private storage facilities may not be the answer to Kenya's erratic maize market if available storage is not being utilized.

4.5. Wholesalers

Wholesalers are traders operating in the district towns who purchase maize from the assemblers. They serve as a critical link in the maize value chain. Wholesalers acquire most of their maize from primary assemblers, but also buy directly from farmers and maize importers.

Thirty-six of these traders were interviewed, most of whom were found in Bomet and Trans-Nzoia districts. The year in which their operations started spans the period 1984-2009, with a majority of the wholesalers starting up between 1997 and 2002. These traders have been in operation longer compared to the small traders. Perhaps this reflects the tendency of the latter to graduate into wholesale firms as their businesses expand, and also because wholesale traders appear to have entered into the grain trading system more quickly after liberalization than most assemblers, who require the presence of a nearby wholesaler to perform their main operations, i.e., the quick turnaround sales from farmers to wholesalers.

Nearly 33% of these traders bought maize from three districts, while 19% bought from four districts in the previous year. Therefore, unlike the assemblers, their purchases cover a wider geographical area, clearly indicating the role of liberalization in enabling private traders to

transport maize across districts after the government eliminated movement and price controls on maize trading in the early 1990s. Although wholesalers are not geographically bounded and are extremely flexible in their buying and selling operations, most wholesalers maintain a permanent presence in major surplus areas, including Trans Nzoia, Molo, Uasin Gishu, and Nakuru, while having only a seasonal presence in places like Bomet and Kisii. Additionally, wholesalers maintain a permanent presence in major urban areas such as Mombasa, Kisumu, and Nairobi. Wholesalers tend to purchase maize in surplus areas during harvest periods and sell maize directly to milling companies or to consumers in deficit regions through local retailers.

Most wholesalers use their own trucks, while some will rent trucks, to acquire maize from primary assemblers in surplus regions. Maize is purchased either through brokers, local assemblers, or directly from farmers. In a few cases, wholesalers will forward money using M-Pesa to local buyers and brokers in surplus areas to ensure that they are able to acquire adequate stocks.

Table 15: Percent of maize sold by wholesalers within and outside the districts

District	Market to which trader primarily sells maize			
	July 2008 to June 2009		March-May 2009	
	Within district	Outside district	Within district	Outside district
Trans Nzoia	12.5	87.5	12.5	87.5
Nakuru	0.0	100.0	50	50
Kisii	66.7	33.3	100	0
Bungoma	60.0	40.0	80	20
Bomet	38.5	61.5	46.2	53.8
Machakos	66.7	33.3	66.7	33.3
Average	36.1	63.9	50	50

Source: Tegemeo/Michigan State University Maize Value Chain Survey 2009.

Their sales are also either within or outside the district, and the proportions sold to these two locations vary by district and time of the year. The peak maize marketing period is usually between December and March, while the months of March-May correspond to the low season. During the low season, there are very few seasonal maize traders since most of them have shifted to other business activities. Therefore, at this time, most of the grain in the rural areas is expected to be in the hands of medium-scale wholesalers and larger traders, who have the capacity to store maize for longer periods. Overall, about 64% of sales by medium-scale wholesalers in the 2008/09 year were primarily outside the district of their operations (Table

15). The proportion of wholesalers' sales within and outside the district of operation varies depending on the district.

For example, while the majority of the wholesalers in Trans Nzoia, Nakuru, and Bomet districts sold their maize primarily outside their districts, those in Kisii, Bungoma, and Machakos sold it mainly within the districts. This clearly reflects a flow of maize from the surplus regions of Trans Nzoia, Nakuru, and Bomet into other districts that are more likely to be maize deficit areas. In addition, during the low maize season when demand for grain is high in the rural areas, most wholesalers in the maize deficit zones tend to sell overwhelmingly within the district and those in the surplus areas sell relatively more outside the district.

Table 16 shows the percentage of maize sold by medium-scale wholesalers through various channels in the 2008/09 year and the March-May 2009 period.

Table 16: Percentage of maize sales by medium-scale wholesalers to different buyers by District

District	Millers	Traders	NCPB	Retailers	Other channels
Trans Nzoia	63	1	29	6	-
Nakuru	55	11	-	34	-
Kisii	-	33	-	40	27
Bungoma	38	-	-	44	18
Bomet	12	31	-	53	4
Machakos	-	42	-	57	2
Overall	30	19	7	39	6

Source: Tegemeo/Michigan State University Maize Value Chain Survey 2009.

In 2008-09, retailers served as the primary channel through which wholesalers marketed their maize. Retailers, who operate in central marketplaces, buy maize from wholesalers and then sell it in small quantities to local consumers. Wholesalers will often transport their maize to various marketplaces on particular market days and sell their maize from the back of their trucks to retailers. This is a low risk, high return marketing strategy. Prices in local markets are verified prior to transporting maize, though competition between wholesalers in the market can drive prices down, and retailers will buy even the lowest quality maize, though badly damaged maize will bring a lower price. All the wholesalers interviewed during market days indicated that they had no problem selling out their entire stocks in one day at a market.

Conversely, selling maize directly to milling companies can be a risky endeavor. During harvest periods, trucks can queue for more than a day waiting to sell maize to milling

companies. This is costly both in terms of opportunity costs, as the truck has to sit idle at the mill rather than be used to acquire maize, and in terms of lodging and food expenses. Once their trucks have passed through the gate there is no guarantee that their maize will meet the mill's quality demands, and therefore may not be purchased. Finally, several wholesalers recounted the experience of waiting in long queues at the mill only to find that the mill's buying price had dropped while they waited. To overcome these risks, several wholesalers indicated that they hired a *broker*, who, for around Ksh 1000, can move their truck up the queue at the mill and can ensure that maize meets quality standards. This illicit system serves as a major barrier to entry for wholesalers without brokers, and by extension small-scale farmers' maize, to reach the formal milling sector. As a result, many wholesalers avoid the commercial milling sector entirely, and instead focus on retail whole grain markets.

Other marketing channels include selling to other traders and selling through NCPB. Wholesalers who are located in rural market areas and do not own trucks will frequently sell maize to other traders, who will then transport that maize to deficit regions. These wholesalers will also frequently service their own regional markets by selling maize back to local retailers as maize scarcities set in. Few wholesalers sold maize to NCPB in 2008-09 because most NCPB depots in our sample areas were not buying maize, or if they were buying, they were offering prices below the prevailing market price. Only wholesalers located around Moi's Bridge sold maize to NCPB in 2008-09.

Despite the challenges of selling maize to the milling sector and the advantages of selling through retailers in local markets, wholesalers do adjust their buying and selling behavior based on seasonal supply and demand conditions. During major harvest periods more

Table 17: Percentage of maize sales by medium-scale wholesalers to different buyers from March-May 2009

Buyer	% of maize sales to buyer
Millers	15.5
Other traders	12.8
NCPB	4.7
Retailers	63.6
Other channels	3.4
Total	100.0

Source: Trader survey data collected for this study, 2009 and 2010. ?

wholesalers sell their maize to milling companies. However, as time passes from the harvest, and deficits begin to set in around the country, wholesalers turn their attention even more to

the retail market (Table 17). This change in practice is the result of several factors. First, as noted above, retail markets are easier to navigate and less risky. Second, because so little maize in Kenya is treated to prevent pest damage, the quality of the maize that wholesalers can acquire more than several months after the harvest is very low.

Finally, if the variable import tariff is low or waived, then mills may begin to import high quality, low-cost maize from abroad, which wholesalers find difficult to compete with. Under such conditions, during the months of March, April, and May an even greater percentage of the maize being handled by wholesalers goes through retail, whole grain markets.

Because the majority of wholesalers do not store maize after harvest to meet local demand during scarcity periods, they must acquire it from outside of their regions as scarcities set in. Wholesalers will purchase maize from importers in Mombasa as well as from Tanzania, where maize is smuggled across the border at the Sirare border crossing. As a result, even in major surplus regions like Nakuru, imported maize from South Africa was being sold in the wholesale market in June 2009. In Bomet, maize from Tanzania and South Africa was being sold in May. Thus, consumers in major maize supply regions pay the price for a system in which maize is transported out of their region after harvest and then must be transported back in only a few months later.

When buying, selling, or transporting maize within a particular district, a tax, called cess, is charged to wholesalers. In general, this fee equals about Ksh 20 per bag of maize. Because districts have recently been divided, the amount of cess a wholesaler must pay when moving from a buying to a selling point has risen dramatically. In addition to cess charges, wholesalers are invariably charged *fines* by police at checkpoints along the highway. Wholesalers complain that regardless of the condition of their truck, police will find a fault with it or they will accuse the wholesaler of transporting illegal goods and demand that the truck be unloaded. To avoid the time and cost of unloading the truck or hassle of contesting a formal fine, wholesalers simply bribe the police. The total additional transport costs associated with bribing police ranges between Ksh 1000-2000. This figure depends on the number of checkpoints encountered on a journey. All this has a significant effect on the consumer price of maize, as wholesalers incorporate these costs into their selling price.

4.5.1. Wholesalers' Storage Behavior

Nearly 53% of the wholesalers own storage facilities, while the remaining ones rent storage space. Wholesalers interviewed for this report indicated that a lack of financing, fear of

storage losses, and the potential for unanticipated seasonal price movements prevent them from storing maize. Instead of storing maize from the harvest to the lean season, most wholesalers buy and quickly sell maize for a marginal profit of Ksh 100-200 per bag. Majority of the wholesalers indicate that there are adequate storage facilities to rent. Because of the prevailing practice of minimizing storage time, adequate storage for most wholesalers is a room with a roof on it that is secure from theft. In this sense, adequate storage has nothing to do with managing maize stocks in a rigorous way to prevent pest damage and to ensure quality.

Many traders indicate that risks of government stock releases or a sudden waiver of import duties impedes incentives to store grain from the harvest to the lean season. Traders storing grain in anticipation of benefiting from seasonal price rises may find the value of their stock deteriorating after an announcement that import duties will be waived or if the NCPB releases stocks on the market at a steep discount. For these reasons, a lot of grain is purchased at harvest, contributing to low prices at this time, and less grain is stored for consumption later in the season, thus contributing to higher prices in the lean season. Because of traders' reticence to store for any significant period of time, seasonal price rises tend to be artificially high, except in years that the government takes steps to reduce prices in the market. Hence there is something of a vicious cycle in which traders are reluctant to store, which contributes to high seasonal price rises, which then invites government to intervene to push down prices, which then further depresses traders' incentives to store. Section 6 discusses possible means to address these strategic interaction problems.

4.6. Nyamakima Wholesale Market

Nyamakima is a wholesale market in Nairobi, which has many grain wholesalers and two larger posho mills. During the month of September 2009, most of the whole grain maize available in the market was coming from either Bomet or Sirare, Tanzania. This maize was being purchased from traders by retailers in the market at an average price of Ksh 2400-90 kg bag. It was then being disaggregated and sold to consumers at a price of Ksh 35-40/kg. Wholesalers in the market indicated that although they were able to access imported maize from Mombasa for a relatively cheaper price of Ksh 2300-90 kg bag, most declined to buy imported maize because they felt that consumers would reject it. The reason for this is tied to an incident that had occurred earlier in the year (2009), when imported maize was found to have high levels of a toxic chemical and was removed from the market. As a result,

consumers feared eating imported maize and were willing to pay a premium for locally produced maize.

Despite the rejection of imported maize by local consumers, the posho mills in the market were buying and milling imported maize. This maize, however, was disguised within their warehouses, where it was removed from its labeled bags and put in local bags. These posho mills were grinding maize and selling packaged products in 5, 10, 20, 45, and 90 kg bags. The price of a kg of milled maize from these posho mills ranged from Ksh 34-40 per kg, a price lower than that of the sifted maize from large-scale companies, which was selling for Ksh 44 per kg. The maize flour being sold by these posho mills was normally bought by schools and retailers in the slum areas, where it was disaggregated and sold to consumers in smaller quantities.

4.7. Large-scale Millers

This section reports on the discussions that were held with some large-scale maize millers during the time of the survey.

In Kenya, four major milling companies and their associates account for 80% of the total sifted maize production in the country (Kenya Maize Handbook 2009). These mills are located primarily in major urban, deficit areas, such as Nairobi, Kisumu, Thika, and Mombasa. In addition, milling is done in surplus areas, including Eldoret and Kitale. Throughout Kenya, large-scale milling companies form strategic business alliances, thus leading to a consolidation of the industry.

During normal production years, millers buy maize from Kenyan farmers and traders to meet their own consumption demands through April, after which time some of them turn to NCPB to meet their maize requirements. Some millers have tried to set up buying centers in rural areas to better facilitate maize acquisitions. However, these buying centers are difficult to manage and are open to corruption. As a result, most of the locally produced maize procured by millers is purchased at the mill gate. Farmers and traders indicate that a great deal of corruption exists at the gate of many mills, particularly at the level of gate security and quality testing.

During the time of the survey, millers were 100% reliant on maize imports to meet their milling requirements. Importing of maize in Kenya at that time was facilitated by the removal of import tariffs, which are normally 50%, which was to be in place until January 2010.

Depending on shipping traffic in South Africa and Mombasa, maize imports can take between 3-10 weeks to arrive in Kenya. One of the primary bottlenecks to maize imports during high import periods like that experienced in 2009 is transport access from the warehouses in Mombasa to Nairobi. High levels of competition for transport contribute to higher than normal transport cost for delivering maize to Nairobi. During high import periods, large-scale importers, including commodity traders and millers, are usually given preferential access to port berths and thus imported maize. As a result, much of the informal sector is denied access to imported maize, until the large companies have met their requirements, at which time imported maize becomes more available to smaller scale traders and the informal maize market. The smaller millers have devised marketing strategies to fight off competition from the large-scale millers. For instance, because of their relatively small size and limited capital, smaller millers join up and import maize collectively through one of the large traders. Despite having relatively easy access to imported maize, some of the mills were running at only 30% of their maize milling capacity during the time of the survey. They indicated that this dramatic drop could be the result of decreased consumption of maize meal, which in turn was a reflection of the high cost of maize and maize flour.

Some of the large millers own very little grain storage, with most of their warehouse and storage facilities being rented from either private owners or NCPB. Reliance on rented facilities adds additional costs to their operations. Additionally, limited storage, along with some capital constraints, prevent such millers from acquiring all of their annual maize requirements directly. Even in normal years, they depend on NCPB to make up for any shortfalls. However, some millers do have sufficient storage capacity to meet their annual milling requirements. Grain purchases are financed primarily by securing overdrafts from local banks. As such, capital is not considered a major constraint for their business. Instead, issues of power shortage and large demand fluctuations are seen as major constraints to their business.

Milling companies in Kenya buy maize at their mill gate from a handful of agents, large-scale farmers, and other direct purchases. They rarely develop buying networks in rural areas, though some will set up satellite depots in major surplus regions. Mill managers interviewed for this report indicate that several obstacles prevent them from purchasing maize beyond the mill gate. First, stringent quality and moisture controls, which can be carried out at the mill, cannot be maintained effectively in rural areas. Second, payments are done with checks, which can only be issued at the mill. Thus, payments can be severely delayed at buying centers, which discourages maize sellers. As a result, most mills purchase maize only at their

mill gate. The majority of this maize comes from large-scale farmers and larger wholesalers, who can easily meet the quality demands at the mill.

Wholesalers interviewed for this report indicated that quality demands and long queues at the mill prevented them from selling maize to large-scale mills. Others reported having to use brokers to help them quickly pass through the mill gate and to ensure that their maize meet quality standards. Mill managers agree that corruption at the mill gate is a problem and that it is difficult to regulate. When complaints are made these are followed up on, but otherwise the system operates outside of the direct control and supervision of the mill managers. This serves as a major obstacle to incorporating small-scale farmers into the formal maize market. If quality standards are indeed skirted by an ability to pay a brokerage fee rather than by objective measurements, then this gives an advantage to well-connected and less scrupulous traders and large-scale farmers over those unable or unwilling to pay such a fee. In addition, little incentive will exist for small-scale farmers to focus on producing high quality maize if it is not quality per se that determines whether a mill will accept maize from an individual.

Mills generally buy maize aggressively during the harvest period, using price incentives to attract sellers when their stocks are low. Mills interviewed for this report have silos that can store up to 5 months of reserve stocks. On average mills try to maintain at least 3 months of stock in their mills at all times. Once locally available maize stocks have been depleted, mills then begin to import maize or buy from NCPB, depending on the prevailing political climate. In June 2009, the Government of Kenya indicated that it would waive import duties on maize until December 2009. Mill managers welcomed this development and said that they would import maize aggressively until December. The result, as one mill manager pointed out, is that as the major maize producing regions in Kenya begin to harvest maize in October, mills would have large stocks of imported maize and would not buy local maize aggressively. Thus, it was anticipated that producer prices for maize in December 2009 and January 2010 could be quite low throughout Kenya. However, this was not the case; grain prices were high during this period.

Large-scale mills produce a variety of maize products, principally sifted maize flour. These products are then sold through regional wholesaling networks. Prices are determined by prevailing regional market prices and not by specific costs associated with transporting flour from the mill to a given location. Thus, if a number of mills are competing in a specific region the prices can be quite low and margins small, while in other regions, where competition is minimal, prices will be higher and margins larger. Because of this pricing

system, sifted maize prices may even be more expensive in the town where the mill is located than in Nairobi. While most large-mills traditionally focus on selling small retail packets of maize flour, an increasing number are expanding into wholesale operations by selling sifted flour in 50-90 kg bags. This change had previously been resisted because large wholesale bags of maize flour are divided up by retailers and sold to consumers in unmarked plastic bags. This makes branding and brand recognition impossible. However, rising maize prices and increasing competition from small-scale mills that produce wholesale maize flour has pushed large-scale milling companies into the wholesale market.

An emerging pattern is that wheat now dominates some of the millers' operations, which reflects broader trends in urban Kenya, where bread consumption is slowly surpassing that of maize. This issue is explored further in a subsequent section.

4.8. Small-scale Posho Millers

The small-scale posho milling sector in Kenya accounts for about 60% of the total maize meal processing in the country (Kenya Maize Handbook 2009). The posho milling sector is also one of the fastest growing sectors of the maize value chain. According to interviews conducted with small-scale mill owners (n=7), the number of small-scale mills has increased over the last five years in every region under investigation. While this competition, coupled with an expansion of more efficient, electric powered mills, has driven down the cost of milling to Ksh 5-10 per 2.5 kg tin, it has also led to an under-utilization of fixed costs, including machines and labor.

Small-scale millers indicate that their mills can process 30-40 bags of maize a day. However, most do not come close to this figure. On average, small-scale mills operate at about 10% capacity, processing 3-4 bags of maize per day. This under-utilization is the result of excessive local competition, for example, one small village may have three mills operating in close proximity to each other.

Most small-scale mills are not major buyers or sellers of maize, though many do keep some maize stocks on hand to sell to customers. Due to financial constraints, those millers that are active buyers of maize during the harvest period rarely do so in order to increase their own stocks. Instead, during the harvest period these mills act as assemblers of maize and sell their stocks to wholesalers. Thus, posho mills rarely have their own stocks of maize to mill. Instead, the majority of mill owners simply offer milling services to customers who provide their own maize. Those mills that do purchase maize do so through wholesalers and thus do

not offer competitively priced maize relative to other local options. Because of this business model, both mills and labor often sit idle until a customer arrives to grind maize.

Some mill owners have begun to challenge the predominant fee-paying business model by selling processed maize flour. Several of these mills have also invested in de-hullers and can therefore produce sifted maize flour, which can compete with the large-scale milling sector in terms of quality. A handful of mills, with the necessary financial resources and business savvy, have begun to purchase increasingly large quantities of maize during the harvest period, which they store until local scarcities drive up demand. By storing maize locally and selling it in the form of processed maize flour, these mills can provide a high quality product at a far lower cost than their large-scale competitors. Additionally, posho mills that process their own maize can sell maize flour in ½ kg packets, which large-scale mills do not offer. This is an important niche market, as many customers cannot afford to buy larger packets of maize flour.

Significant investment in expanding the business expertise, storage capacity, and purchasing power of small-scale mills presents a real opportunity to stabilize maize prices in maize production areas. By encouraging these mills to become more active buyers of maize, local demand for maize during times of scarcity can increasingly be met by these mills rather than by wholesalers, who transport maize out of production areas during the harvest and back into these same areas as scarcities increase. Additionally, by buying and processing their own maize, posho mills can increase their production capacity and maximize the fixed cost utilization of their equipment and labor, which could drive down the unit price of milling. Finally, by becoming more active buyers within their local market, posho mills can provide a new marketing channel for farmers who today are almost entirely dependent on small-scale assemblers.

4.9. Consumers

A study by Muyanga et al. (2005) examined the consumption patterns of the main staple carbohydrate products in Nairobi (maize, wheat, rice, and cooking bananas) with the aim of updating policy makers' knowledge of current urban food consumption patterns.

Their findings showed that maize was the primary staple food in Nairobi in terms of kilograms consumed per adult equivalent. Nearly 97% of the respondents reported to have purchased maize products (maize meal, grain or green maize), while 12% indicated that they obtained maize grain or green maize either from relatives or their own farms in the rural areas

during the month preceding the survey. A much smaller proportion (2%) of respondents obtained maize products from their urban gardens. However, findings indicated that households in the poorest income quintile consumed the most maize, with the consumption declining by 7% for households in the wealthiest income quintile. In addition, the importance of maize in urban staple grain diet was shown to have declined by 22% from 58% share in staple food in 1995 to 45% in 2003.

The study further showed that maize accounted for 59% and 38% of the staple carbohydrate consumption among the 20% poorest and richest households, respectively. Therefore, maize remained the dominant staple food among the urban poor. However, the richer urban households who are in the top 40% of the income distribution consumed more wheat than maize. Over time, the consumption of wheat products had grown, particularly among these higher income groups, with its share rising from 25% in 1995 to 31% in 2003. In addition, among the urban respondents, wheat consumption accounted for 22% and 38% of the staple food consumption of the 20% poorest and richest households, respectively.

The results also showed that on average, although maize products provided the greatest contribution to Nairobi staple food diets in terms of kilograms consumed, there was a shift in consumer expenditure patterns from maize to wheat. By 2003, wheat was the dominant staple in terms of expenditure, accounting for 43.5% of total expenditures on the main staples compared to 32.4% of maize's contribution, which had declined from 41.8% in 1995. However, expenditures on maize products exceeded those on wheat only for households in the bottom two-income quintiles (40% of the poorest households in Nairobi), but wheat dominated expenditures for the top three income quintiles.

Moreover, the results also revealed a significant shift in maize meal consumption patterns. There was a decline in the consumption of posho meal, although it remained very important among the relatively poorer households. This was attributed to a decline in the price difference between sifted meal and posho meal perhaps resulting from greater competition in the milling sector due to the maize market liberalization. The liberalization of the maize market led to the development of many small-scale posho mills that provided great competition for the large-scale millers. In response to this, the large millers reduced the degree of flour refinement in order to cut down their costs. Consequently, the prices of maize meal have declined, thus reducing the price difference between the posho and sifted meal. This shift in maize meal consumption patterns may have led to a decline in the market share of the posho millers, which was high in the period immediately following liberalization.

Overall, the changes in urban consumption of maize indicate that liberalization has helped to bring competition in the milling industry, thus putting a downward pressure on maize meal prices.

4.9.1. Consumers' Use of Alternative Marketing Channels for Primary Staple Products

Nairobi consumers use a range of alternative marketing channels for procuring their main staple food products. These include duka shops (small retail stores), large national supermarket chain stores, smaller supermarkets, open markets, kiosks (stalls), and posho millers. Table 18 presents the importance of various retail channels by which urban consumers procure their primary staple products. The table also shows the respective values of primary staples (maize products, rice, wheat products, and cooking bananas) purchased from each retail channel. Staples worth Ksh 473 million, representing 50% of the market share, are sold through duka/shop in a month. Large supermarkets follow, handling 17% of the market share valued at Ksh 160 millions in a month. Other important channels include small supermarkets (12%), markets (10%), and kiosks (9%).

The importance of these retail channels varies substantially by income. The majority of the households (64%) in the poorest income quintile prefer duka/shops, spending Ksh105 million in a month on this channel (Table 18). Open markets are the next most important means by which the poorest consumers obtain staple products, accounting for 14% of their expenditures. Among the second poorest income group, the most important retail outlets are dukas/shops, roadside kiosks, small supermarkets, and markets. Only among the top income quintile did national supermarkets account for more than 20% of total expenditures on the main staple food products. Among this relatively wealthy group, duka/shops accounted for 38% of expenditures on the top four staples, while the national supermarkets accounted for 37%.

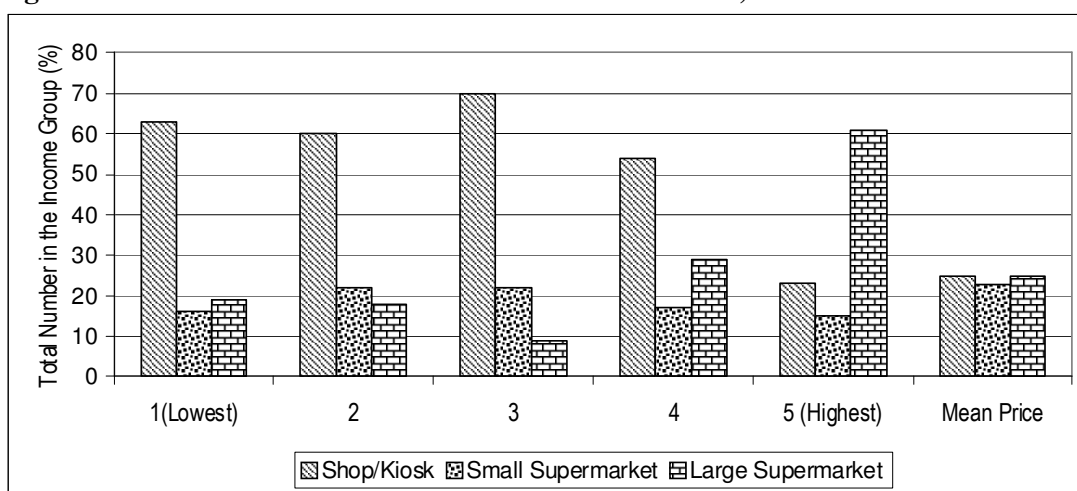
Table 18: Consumer expenditures (Ksh millions) and market share (%) of alternative retail channels for primary staple products (maize, wheat, rice, and cooking banana products), by income group, 2003

Retail Channel	Income Quintiles										Total	
	1(Lowest)		2		3		4		5 (Highest)			
	Ksh	%	Ksh	%	Ksh	%	Ksh	%	Ksh	%	Ksh	%
Duka/shop	105	64	81	49	94	57	105	47	88	38	473	50
Large supermarket	7	4	11	7	17	10	40	18	85	37	160	17
Small supermarket	14	8	22	13	28	17	20	9	26	11	111	12
Market	23	14	17	10	15	9	30	13	10	4	94	10
Kiosk/kibanda	10	6	29	18	7	4	24	11	18	8	88	9
Posho mill	6	4	4	2	3	2	2	1	0	0	16	2
Other ⁷	1	1	2	1	1	1	0	0	4	2	8	1
Total	165	100	165	100	166	100	222	100	231	100	950	100

Source: 1995 and 2003 Tegemeo Institute/Michigan State University Urban Household Surveys

Considering the different retail channels specifically for sifted maize meal, we find that about 60% of the 20% poorest and the wealthiest obtain their supplies from duka/kiosk and large supermarkets, respectively, even though there does not seem to be a marked difference in the retail price (Figure 9).

Figure 9: Alternative retail channels for sifted maize meal, 2003



Source: Tegemeo Institute/Michigan State University Urban Household Survey 2003.

⁷ Hawker, manufacturer, factory, green grocer, neighbor, bakery, place of work, and colleagues.

Small supermarkets are offering a slightly lower price, yet only about 18% of Nairobi consumers are using them as their main source of staple food products. The majority of the households (70%) consuming the highly refined brand (Hostess) procure it from large supermarkets while 15% buy from small supermarkets.

5. Maize Prices and Marketing Margins

This section explores the evolution over time of vertical maize marketing margins. Vertical margins are defined as the difference between prices at different stages of the supply chain and represent the portion of the final price absorbed by traders, assemblers, millers, transporters, etc. Margins between the farm-gate and rural wholesale prices represent the margin accounted for by traders and assemblers in rural areas. Margins between rural wholesale markets and urban wholesale markets represent the portion of the final price paid to assemblers and transporters. Finally, the difference between wholesale maize grain and retail processed maize prices provides the margins to millers and retailers in urban areas.

An assessment of competition, or lack thereof, can be obtained by comparing the margins with the costs involved at each stage. However, estimating the full range of costs at each stage can be difficult, and is beyond the scope of this study. Nevertheless, some conclusions can be derived by examining the evolution of marketing margins over time.

In general, we find that margins at all three of these levels appear to be relatively small and are diminishing with time. These observations signal that farmers are receiving a higher proportion of the final consumer price of maize meal over time. We also find that consumers are benefiting from lower retail maize meal prices. Between the early 1990s and 2008, the kilograms of maize grain and meal that was affordable with a daily wage has been rising steadily for the various employment sectors for which data is available. As a caveat to the general story, however, farmers in remote villages receive lower prices for their grain compared to farmers in more accessible areas and within-village price variation is substantial. A number of potential reasons for these two observations are explained below.

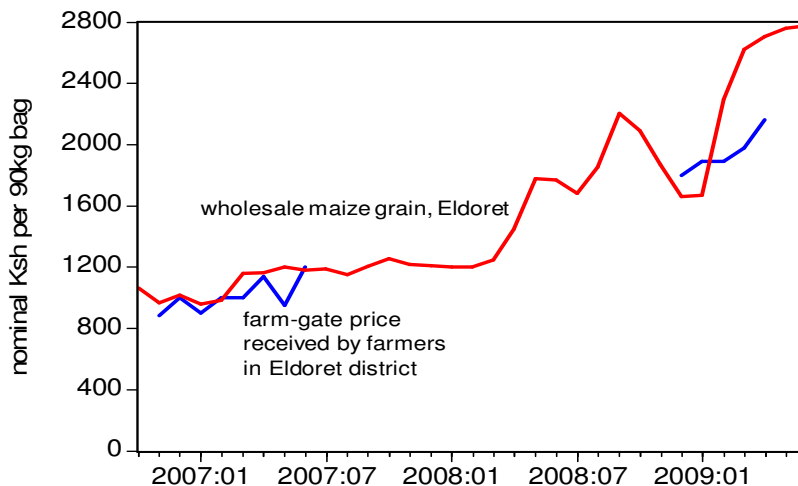
A reduction in margins can occur for two reasons: (1) reductions in the cost of doing business and (2) increased competition among intermediaries. Marketing margins should reflect the cost of moving a good from surplus to deficit areas as well as the costs of storage and processing from one stage to the next in the value chain. When a reduction in margins is observed, this could naturally follow from a reduction in the cost of transportation or

transformation. For example, efficiency gains in milling technology should result in lower milling margins assuming that the milling industry is competitive. However, if a particular stage of the supply chain is highly concentrated, then reductions in marketing costs may not result in reductions in marketing margins.

5.1. Margins between Farm-gate and Wholesale Maize Grain Prices

Very few studies have been carried out on maize marketing margins between farm-gate prices and wholesale prices because of the paucity of farm-gate prices in the region. Market information systems in the region routinely collect wholesale or retail prices only. To overcome this problem, this study interviewed 450 farmers who sold maize in the 2008/09 crop season from 33 villages. These villages were then matched up with the wholesale markets that they feed into to compute farm-gate to wholesale margins.

Figure 10: Farm-gate and wholesale maize grain prices in Eldoret, Uasin Gishu District



Source: Tegemeo/Michigan State University Maize Value Chain Survey 2009; Tegemeo Rural Household Survey 2007.

The evidence points to generally declining margins between farm-gate and wholesale maize grain prices. Figure 10 shows the relationship between these prices in Eldoret between early 2007 and mid 2009. The 2007 farm-gate observations come from the Tegemeo rural survey while the 2009 observations come from the farmer focus group discussions. At these two points in time, farmers were receiving between 80-85% of the wholesale price in the same district.

Low margins at this level suggest competition between buyers and assemblers in rural areas, a point corroborated by the farmer focus group discussions in the six districts studied. When

asked about the number of traders operating in villages, farmers reported an average of 83 in remote areas and 93 in more accessible areas (see section 4.1), signaling a high level of competition among buyers at the village level.

Another reason for low and declining margins is that the cost of transportation between the farm-gate and wholesale markets could also be declining relative to the cost of the product. While we do not have information on the cost of transport faced by buyers, we do observe a decline in the distance farmers are traveling to the point of sale (Chamberlin and Jayne 2009). Based on both the farmer interviews during 2009 as well as the Tegemeo rural surveys in 2004 and 2007, the median distance to the point of maize sale was zero, while the mean distance to the point of sale was about 6 kilometers. These differences are due to the fact that about 10% of the farmers who tend to have larger quantities to sell appear to prefer to arrange transport for selling their maize directly to a wholesaler or miller in the towns, thereby bypassing the assembly traders. The low distances involved in selling maize for most farmers indicate that assembly buyers are willing to operate deep in the rural areas, perhaps due to the competition previously mentioned.

5.1.1 Differences in Farm-Gate Prices Reported by Farmers

The farm-gate price series used in the previous section represent averages across farmers in the same geographic area. Another interesting dimension is the variation in farm-gate prices received by farmers in the same area in the same month. While it appears that the average farmer obtains a price not very far below the local wholesale price in the same month, farmers within the same area report receiving sometimes vastly different prices in the same month.

The graphs below show prices received by individual farmers in the same village versus the nearest wholesale market maize grain price. Figures 11 and 12 show prices received by farmers in accessible and remote villages, respectively, in the Nakuru district. Figures 13 and 14 show the same for accessible and remote villages in Trans Nzoia.

Figure 11: Farm-gate prices in accessible villages in Nakuru district vs. wholesale Nakuru

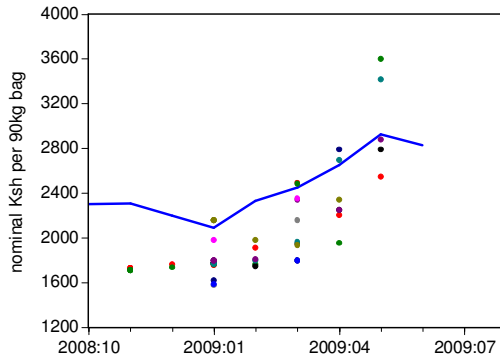


Figure 12: Farm-gate prices in remote villages in Nakuru district vs. wholesale Nakuru

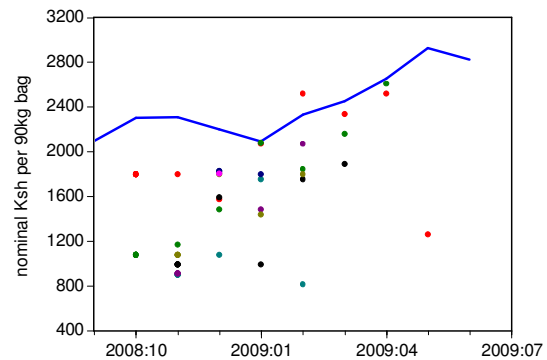


Figure 13 Farm-gate prices in accessible villages in Trans Nzoia vs. wholesale Eldoret

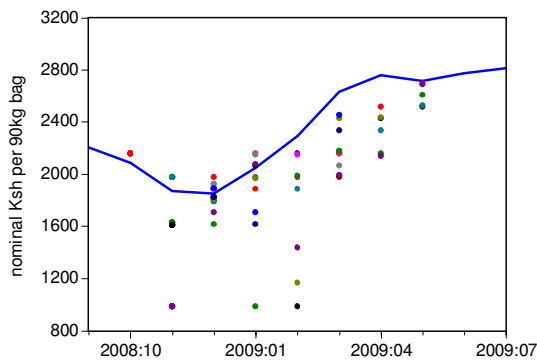
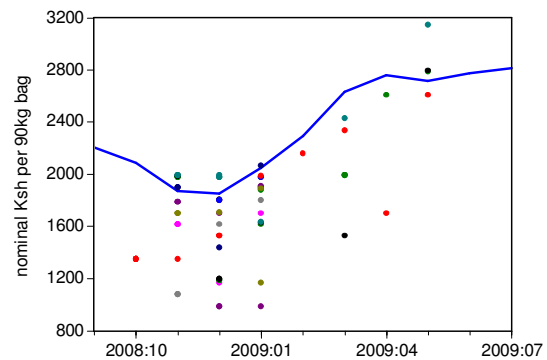


Figure 14 Farm-gate prices in remote Villages in Trans Nzoia vs. wholesale Eldoret



Source: Tegemeo/Michigan State University Maize Value Chain Survey 2009.

The first major observation is the variation in prices received by farmers in a given area and month. Some farmers are able to obtain prices very near the local wholesale price (similar to the average farm-gate prices from the last section) while others receive less than 50% of the wholesale price. This suggests that farmers within the same village might have very different access to price information, negotiating skills, or relationships with buyers. One recommendation for helping disadvantaged farmers is to improve their access to information via cell phones. In theory, through text messaging or calling various potential buyers, farmers should be able to raise the prices they receive for their crops. Through farmer focus group discussions, we learned that cell phone ownership is ubiquitous in maize growing areas of Kenya. Over 85% of farmers in accessible villages and 75% in remote villages own a cell

phone. However, despite widespread ownership, when asked to what extent owning a cell phone allowed them to negotiate a better price or find a buyer, a majority of farmers said the cell phone was either not helpful or not used for these purposes. One possible area for intervention, then, is to design development programs aimed at increasing farmers' ability to use available communications technology and price information to their advantage in negotiations with potential buyers.

A second observation is that farmers in accessible villages reported receiving slightly higher price than those in remote areas. There is also a greater spread of price observations in a given month in the remote villages. One reason for this might be more competition amongst buyers in accessible villages than remote villages. While there are slightly fewer buyers operating in remote villages, still there is an average of about 80, casting some doubts on claims that buyers in remote areas might be using market power to offer lower prices. Another reason might be that transportation costs are lower between the accessible village and the wholesale market, meaning traders must offer lower prices in the more remote villages.

A final observation is that some farmers in both villages reported receiving prices greater than the wholesale market value. This may be because there is variation in grain transaction prices in the wholesale markets as well as between farmers and assemblers. Although the Ministry of Agriculture wholesale maize price reporting system reports only one price per day, it is of course likely that there is some variation in the transaction prices around this reported mean price. For this reason, some farmers may be receiving prices above the mean wholesale price, although this is very infrequent.

5.2. Margins between Rural Surplus Wholesale and Urban Deficit Wholesale Maize Prices

The next level of margins is found between wholesale markets in surplus production areas and deficit consumption areas. For example in the wholesale markets of Eldoret and Nakuru, two surplus maize-producing districts, maize grain is assembled for both local millers and for transport to wholesale markets in Nairobi where there is a greater concentration of consumers. Figures 15 and 16 show how average farm-gate and wholesale prices in these two districts compare with Nairobi wholesale market prices. .

Figure 15: Wholesale/farm-gate prices in Eldoret compared to Nairobi

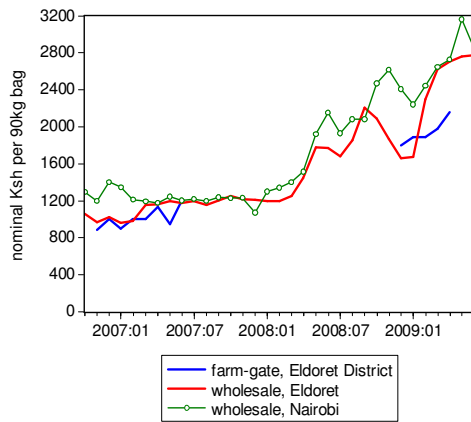
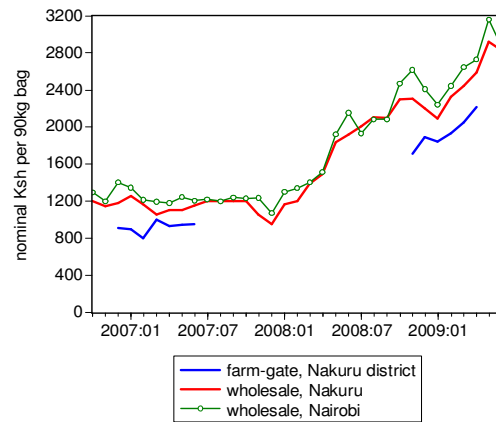


Figure 16: Wholesale/farm-gate prices in Nakuru compared to Nairobi



Source: Tegemeo/Michigan State University Maize Value Chain Survey 2009; Tegemeo Rural Household Survey 2007.

In both Eldoret and Nakuru markets, there is evidence of low spatial price differences between local wholesale maize prices and wholesale prices in Nairobi, with the margins relatively smaller in Eldoret than Nakuru. Wholesale prices in surplus areas are in the range of 90-95% of the prices in the main deficit market of Nairobi. The remaining 5-10% is the portion of the final maize price extracted by traders and transporters between surplus areas and Nairobi. This portion is relatively low signaling either low costs of transport between the markets or a high degree of competition among transporters and assemblers.

Note the anomaly in late 2008 where spatial wholesale price differences were larger than average. In both Eldoret and Nakuru, the wholesale prices decreased much more significantly than wholesale prices in Nairobi.

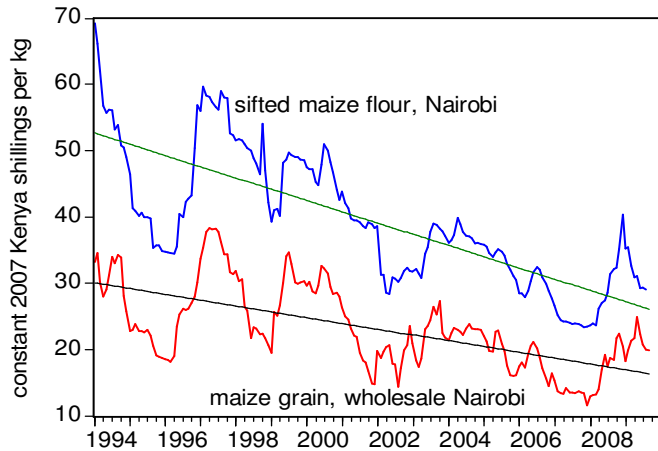
5.3. Margins between Maize Grain and Processed Maize Meal

Another type of margin to explore is that at the milling and retailing stages of the value chain. The spread in prices observed between wholesale maize grain and retail maize meal represents the margin charged by millers and retailers.

Figure 17 shows price trends for retail maize meal and wholesale maize grain in Nairobi between the early 1990s and the present. In the mid-1990s, sifted maize meal prices were considerably higher than wholesale maize grain prices. More recently, these prices have become much closer and appear to move more synchronously. Not only are the prices closer, representing smaller margins to millers and retailers, but also both have dropped considerably

over time. Despite a 370% rise in the consumer price index (CPI) between 1996 and 2009, the difference in nominal wholesale price of maize and the retail price of sifted flour has

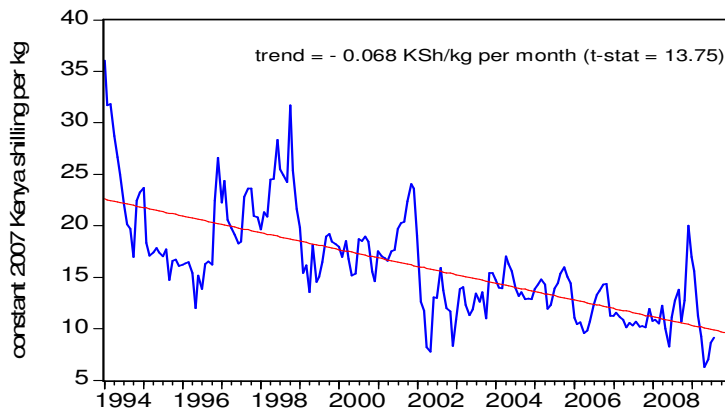
Figure 17: Price trends for retail sifted maize meal and wholesale maize grain in Nairobi, Kenya



Source: Ministry of Industry and Commerce for data on retail maize meal prices; Market Information Bureau, Ministry of Agriculture for data on maize grain wholesale prices.

increased only by 25% or so. After adjusting for inflation, there has been a highly statistically significant decline in maize milling and retailing margins by Ksh 0.068 per kg per month between 1994 and 2008, or roughly Ksh 12,000 per ton over this 15 year period (Figure 18). General prices in the economy have increased 15 times as much as this milling/retailing marketing margin. Maize market liberalization has benefited maize consumers in urban Kenya by reducing the price of and increasing access to maize products (Jayne and Kodhek 1997).

Figure 18: Trend in the difference between maize wholesale prices and sifted flour retail prices in Nairobi, 1994 to 2008



Source: Ministry of Industry and Commerce for data on retail maize meal prices; Market Information Bureau, Ministry of Agriculture for data on maize grain wholesale prices.

The reason for the decline in milling and retailing margins over time is associated with a substantial increase in competition at both the milling and retailing stages of the value chain in urban Kenya. An increase in the number of millers and retail outlets has forced price competition in order to continuously attract buyers. Muyanga et al. (2005) outline the competitive nature of the milling industry with large millers operating with economies of scale and small-scale posho millers struggling to compete.

Interestingly, a decline in margins relates to other findings by Muyanga et al. (2005). They find that urban consumers are shifting their consumption towards sifted maize meal and away from posho meal. In their study, the main reason given by households for the shift in consumption was the ease of procurement and preparation. Moreover, another possible reason might be the declining prices of processed maize products relative to less processed posho given the reduction of margins.

The temporary surge in the margins in late 2008/early 2009 reflects a shortage of grain during this period. Millers and retailers increased their margins greatly during this period to compensate for the loss in volume of maize. Attempts by the government in late 2008 to push down the price of maize meal to consumers were largely unsuccessful. Government offered millers a subsidy in return for passing along lower prices of sifted maize flour to consumers, yet this did not happen, largely because millers continued to require purchasing maize from the market at relatively high prices to operate at levels to meet consumer demand.

In fact, while nominal milling/retailing margins for sifted flour were at an all time high in late 2008, the inflation-adjusted price of sifted flour was actually below average levels in the late 1990s as shown in Figure 17.

5.3.1. Summary

Margins for traders, assemblers, millers, transporters and retailers appear to be declining in Kenya. Using farm-gate prices reported by farmers through the Tegemeo rural household survey and farmer focus group discussions, we find that these prices are not considerably different from rural wholesale prices. Similarly, prices in rural wholesale markets and Nairobi markets move together and with relatively small margins. Finally, in urban Nairobi, differences between wholesale maize grain and retail maize flour prices have been declining

with time. All three of these observations signal narrowing margins and rents extracted by middlemen throughout the maize supply chain in Kenya, allowing a higher proportion of the final price of maize to be captured by farmers and generally lower prices to consumers overall.

6. Conclusion and Policy Implications

This study was conducted in 2009 to provide an up-to-date description of the operation of Kenya's maize value chain. The study is conceived as a follow-up to the Tegemeo study of the maize value chain in the late 1990s by Nyoro, Kiiru, and Jayne (1999). The study thus provides a useful comparison of changes identified 10-years earlier by Nyoro, Kiiru, and Jayne (1999) and informs how the maize marketing system has evolved since that time as the market has been progressively liberalized. The study also aims to assess the competitiveness of maize markets in Kenya and to identify actions by the public sector to overcome major production and marketing problems and support the achievement of national policy objectives related to food security and smallholder-led agricultural development

6.1. Summary of Main Findings

Promoting the performance of the maize value chain so that it effectively meets the needs of smallholder farmers and consumers will require actions from many different kinds of actors within the maize market value chain, both in the private and public sectors. Kenya's maize marketing system is complex, with many players carrying out different and sometimes overlapping functions, and so is characterized by many alternative and competing channels, through which maize can flow from farmers to final consumers.

One of the major findings of the study concerns farm structure. Most of Kenya's smallholder farmers reside in increasingly densely populated rural areas facing major land pressures. About one-third of the smallholder farms nationwide are less than 1.0 hectare in size. Moreover, there is very little scope for increasing farm production based on increasing the amount of land in smallholder farming areas. While proximity to demand centers and access to markets are important determinants of smallholder farmers' ability to participate in food markets, survey data reveal that limited land and capital are perhaps the primary constraints preventing the majority of smallholder farmers to enter into commercialized staple food production. Even with major improvements in the performance of the maize value chain, a

large percentage of smallholders will continue to be unable to produce a maize surplus that would enable them to link to markets. As rural populations continue to grow (albeit at a slower rate than in earlier decades), access to quality farm land is going to increasingly be a problem that will preclude many rural households from participating as sellers in grain markets, unless there is tremendous growth in food crop yields. An important conclusion appears to be that, for the bottom 50% of the rural farm population, there is a triple burden of providing the means to put improved and appropriate farm technology in their hands, improving their access to land, and providing a stable market for the output that protects against severe downward price risk. This boils down to simultaneous improvements in farm technology (including for semi-arid conditions in which a large fraction of the smallholder populations in the region reside), access to credit, improved rural road infrastructure, the strengthening of land rental markets, and hospitable conditions for private investment in rural input retailing and crop assembly. For the top 50% of smallholders ranked by land and productive potential, the main challenges are reducing the transaction costs of marketing output and protection against downside price risk.

There is evidence of growing private investment and new entrants into the maize marketing system as liberalization has progressed. Farmers have many different outlets for their maize. In particular, the first stage in the system (farmer-assembly trader/first buyer) has developed and become competitive over the years. The growing number of maize assemblers definitely reflects an increase in the participation of the private sector in the maize trade following liberalization.

Assembly traders were by far the most common first buyer of farmers' maize. In virtually all villages surveyed, there were a high number of traders operating in the villages during the main marketing season, generally more than 30. Moreover, most farmers sold their maize at their farms or in their villages, even in the more remote areas. A small minority of farmers with larger quantities to sell would often organize transport to sell to millers or wholesalers in the towns in order to fetch a higher price.

These findings imply that access to markets may no longer be meaningfully defined in terms of distance to town markets, but rather in terms of the number of buyers competing to buy farmers' maize in the villages as well as farmers' ability to negotiate and obtain a remunerative price that represents a high proportion of the wholesale price in regional markets. Results showed great variation in farm-gate price even for farmers within the same

village and selling maize within the same time period such as a week. Additionally, farmers that had received training received better prices on average. This implies that there is scope for training farmers in order to improve their understanding of market behavior and gain both confidence and negotiation skills in interacting with traders.

The study found that the National Cereals and Produce Board purchases a relatively small proportion of maize produced by smallholder farmers. Roughly 3% of the 1,275 farm households contained in the Tegemeo Rural Surveys sold maize to NCPB. Nevertheless, the NCPB appears to play an important role in the market by purchasing large volumes from large-scale farmers and from smallholders in a few major surplus zones such as Trans Nzoia and Uasin Gishu. NCPB tends to increase its purchases in a good production season and reduce its purchases in a poor season to stabilize maize prices (Jayne, Myers, and Nyoro 2008).

The study found an apparent contradiction of very little seasonal storage occurring despite a great deal of storage space in the country available for rent. Interviews with traders indicate that the problem is not inadequate storage facilities but inadequate incentives and risks associated with maize storage. These include: constraints on borrowing capital, which are related to high risks as perceived by banks and other lenders, and the multiple harvests that occur in East Africa, which allow supplies from Uganda, Tanzania, and indeed parts of Kenya to enter the market at various times, thus putting downward pressure on prices and limiting returns to storage. Certain behaviors by the government, most notably the sudden changes in the import tariff rates on maize imports through Mombasa as well as sudden changes in the NCPB's maize selling price, exacerbate the risks of storing grain.

Because of these disincentives to store maize in many areas, grain surpluses in a given area, j , tend to be sold and quickly distributed to deficit rural areas and to urban areas for milling by large-scale firms instead of stored locally for later sale to meet the needs of deficit households in area j . This tends to create a circuitous flow of grain in which maize is exported out of certain areas directly after harvest only to be distributed back to these areas later in the season when many households run out of their own supplies and need to buy maize. The redundant transport costs involved inflate maize prices beyond what they would be in a well-functioning system where the risks of storage were lower. More generally, the disincentives for traders to store grain tends to depress prices right after harvest and (because relatively little is stored through the season) less is available for consumption later in the

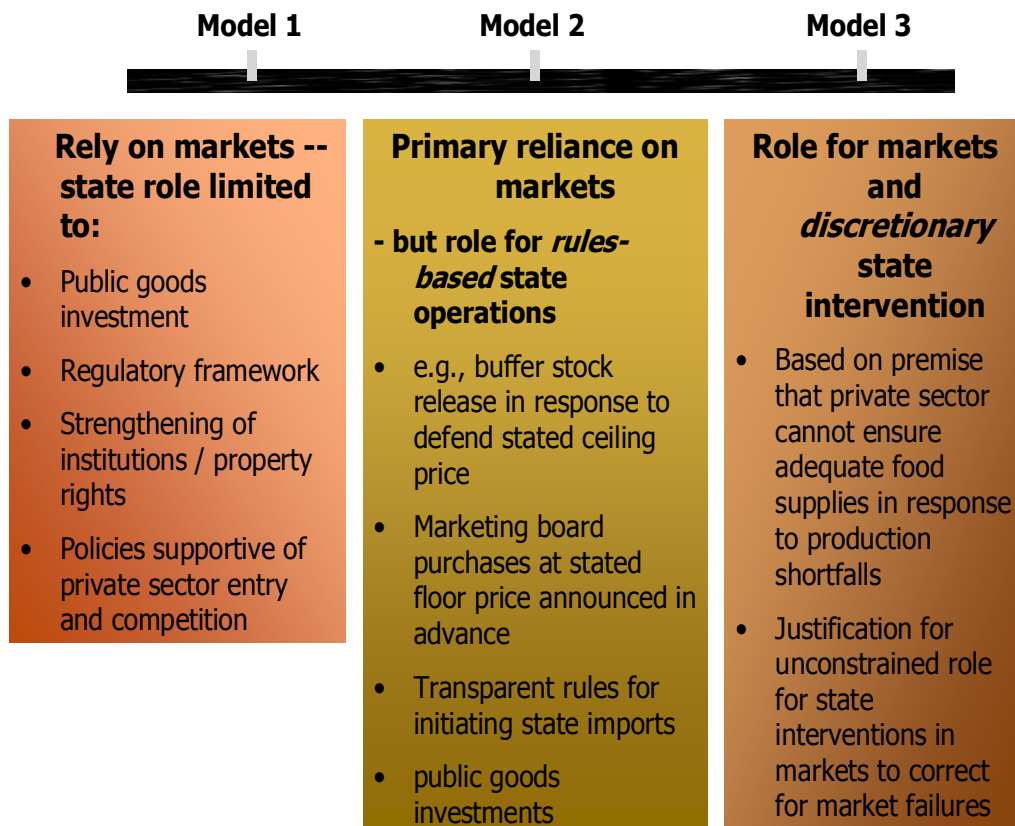
season which raises prices more during these periods. In order to drive down the price of maize grain and meal to rural and urban consumers, there is a need to address the disincentives to on-farm and trader storage.

6.2. Alternative Visions of the Role of Government in Maize Markets

Even as the liberalization process has continued, there is a consensus that the government has a crucial role to play in developing strong output markets, but there is still debate as to what exactly its roles are, and how they should be implemented.

Currently, there are three competing models that dominate policy discussions in Kenya, as in much of Africa, regarding the appropriate role of the state in staple food markets as outlined by Jayne and Tschirley (2010). These three competing visions are presented in Figure 19.

Figure 19: Competing visions of staple food market development



6.2.1. Model 1: State Role Confined to Provision of Public Goods to Strengthen Markets

This approach relies on the private sector to carry out the main direct marketing functions – purchase/assembly from farmers, wholesaling, storage, transport, milling, and retailing. The role of the state is confined to provision of public goods: market rules and regulations, physical infrastructure, regulatory oversight of finance, market information, investment in new technology, organizing farmers into groups for means of reducing costs and risks of accessing finance, inputs, and marketing. This position is close to the *Washington Consensus* framework of the 1980s and 1990s, which is now generally out of favor.

6.2.2. Model 2: Rules-based State Interventions to Stabilize Market Activity

This approach also relies on markets to carry out most of the direct food marketing functions, but the role of the state is expanded to include direct marketing operations, especially in the arrangement of imports, the management of food buffer stocks, and release of stocks onto markets when prices exceed a publicized ceiling price. The rationale for state operations is based on the premise that markets fail in some respects and direct rules-based state operations are necessary to maintain food prices within reasonable bounds. The defining feature of Model 2 is that there is pre-commitment: the rules governing state operations are determined in advance, publicized, and followed in a non-discretionary manner. This approach appears to be favored by many technical analysts.

6.2.3. Model 3: Discretionary State Intervention to Provide State with Maximum Flexibility to Achieve State Policy Objectives

The defining feature of this model compared to Model 2 is that state operations are not confined to pre-committed rules that would constrain the state's ability to intervene only when these intervention criteria are met. Most governments in eastern and southern Africa are essentially following Model 3 and have done so from the start of the liberalization process. In practice, Model 3 has provided a highly unpredictable and discretionary approach to grain trade policy, commonly imposing export and import bans, variable import tariffs, issuing government tenders for the importation of subsidized grain, and selling their grain stocks to domestic buyers at prices that are unannounced in advance and often far below the costs of procuring it.

There are very few examples of Model 1 for staple foods to examine in Africa or perhaps anywhere for that matter. The rationale for Model 2 is that well executed parastatal price stabilization operations can in theory put an upper bound on food prices and protect against downside price risk by defending floor and ceiling prices through stock accumulation and release onto markets. Successful implementation of Model 2 requires that the marketing boards possess a great deal of technical and management skill.

The weaknesses of Model 2 are that (1) given the long history of ad hoc state intervention in food markets, it is not clear whether Model 2 could be regarded as a credible policy; and (2) given constraints on available government funds for agriculture, spending on expensive government operations in food markets reduces the amount that can be spent on public investments that could potentially earn a higher social return.

Despite being the most common approach for the role of government in food markets, Model 3 is clearly vulnerable to lack of trust, cooperation, and coordination between the private and public sectors. A discretionary approach to government operations leads to elevated risks for private sector and tends to impede the private sector from performing functions that it would otherwise do more confidently under Models 1 and 2. The poor performance that results from this high degree of uncertainty and lack of coordination is often attributed to market failure. However, a strong case can be made that the more central and underlying causes are chronic under-investment in public goods and a lack of credible commitment in the policy environment, leading to low levels of trust and coordination among public and private sector actors in the staple food systems.

The Model 3 scenario is largely incompatible with the sustainable development of modern risk management institutions. Despite the apparent potential for using market-based instruments such as commodity exchanges and warehouse receipting systems to manage food sector risks, there has been little use to date of these instruments in Kenya and most other African countries for a number of reasons. Contract enforcement may be difficult for food staples in times of local shortage. The small size of farms and traders serving the traditional food sector in these countries, and poorly developed financial markets, also limit the liquidity required for successful trading. Few of these countries have the market intelligence systems, grades and standards systems, communication systems, storage and marketing infrastructure, and experience and education to use these markets effectively.

Basis risk is another major impediment to both futures and options trading and index-based weather insurance. And somewhat ironically, one of the most serious impediments to innovation and development of risk management markets for Kenya may be highly unpredictable government intervention in maize markets. These policies reduce or destroy the incentive to participate in market-based risk management mechanisms because there is no incentive to manage risk when prices are being stabilized via policy, and because such policies tend to disconnect local prices from world prices which reduces the hedging potential of the global markets. Furthermore, if government interventions are discretionary and difficult to predict then they can add another layer of risk that individuals and firms may find difficult to hedge using available market-based risk management instruments.

6.3. Implications for Government Actions to Improve the Performance of Maize Markets in Kenya

The government's use of discretionary trade policies tends to introduce unnecessary levels of risk and uncertainty in maize markets. This in turn tends to stifle private sector investments in the marketing system. A more predictable and transparent set of rules governing state involvement in markets, particularly with reference to changes in import tariff rates and NCPB purchase and sales prices, could further reduce costs and margins in the maize value chain. Formalized periodic consultations between the private and public sectors would also help to ensure that future government actions that could potentially affect market supplies and price levels could be anticipated well in advance. This would reduce risks and enable greater coordination between private and public decisions in the market. Therefore, creating a forum for regular consultation and coordination between the private and public sectors to manage the potential need for maize imports and exports would enhance food security, trade, and business.

There is also need to focus government budgets on a key set of public investments that promote productivity growth throughout the maize value chain. These public investments include rehabilitation of the road, railway, and port infrastructure in order to reduce the costs of transacting for productivity-enhancing inputs as well as for improving farmers' access to buyers.

Public investments are also needed to raise the productivity of farmers' land and labor through investing in seed breeding and improved agronomic practices, and extension services aimed to both improve farmers' farm husbandry and marketing skills.

Streamlining the payment of cess, so that traders pay cess only once in the district in which the grain is produced, will also reduce marketing costs that are ultimately borne by farmers and consumers.

Strategies for improving grades and standards will reduce the circulation of wet maize, which increases storage losses and contributes to problems of aflatoxin (a toxic mold caused by poor handling and drying of maize after harvest). In 2010, Kenyan officials estimated that at least 300,000 bags of maize might have been contaminated. Ultimately the impetus for the use of grades and standards will need to originate from millers, both because they have a great deal to gain from a reliable system of maize grading and also because they are in the best position to enforce a system of inspection. Once wholesalers and assemblers realize that the prices they receive for maize grain will depend on quality, they will in turn impose grading more strictly on farmers.

Finally, a more stable and predictable policy environment that is supportive of private investment in the value chain will ultimately be in the interests of farmers and consumers.

6.3.1. Trade Policy and Trade Logistics Issues

Nearly two decades after the liberalization of maize marketing in Kenya, the government and the private sector are still grappling with trade policy issues. This mainly arises because of the uncertainty of government behavior with respect to decisions on import tariff rates as well as the NCPB pricing and marketing operations. This uncertainty stifles private investment and makes it harder to develop and improve competitiveness in the maize value chain. This also hampers the objective of meeting food security needs, particularly when the country is facing a huge shortfall in production and imports are needed to bridge the gap. A case in point is what the country went through in 2008. It was estimated that 10 million bags of maize needed to be imported by May 2008. Initially, the imports, which started flowing in by November 2008, were brought in by the government through the NCPB. However, these imports failed to meet the demand due to red-tape in the procurement process, and were also expensive (maize was obtained at cost of Ksh 3,750 per 90 kg bag which pushed up the price of maize meal). It was not until January 2009 that the government waived the 50% import

duty, thereby providing incentives for millers and private traders to import maize from the world market.

Analysis by the Tegemeo Institute demonstrated that this duty removal had a moderating effect on local grain and flour prices, but this effect was not substantially evident until 5 months later. While imported maize started landing at Mombasa port within three weeks after the duty was waived, the Grain Bulk Handling facility at the port was able to offload grain at a capacity of roughly 300,000 tons per month. However, significant bottlenecks exist both at the port and during the process of transporting grains inland, which both limit the efficiency of the port's Grain Bulk Handling facility and add additional costs to the consumer price for imported grain.

Per ton ocean shipping charges are lowest for vessels with large capacity. In the port of Mombasa vessels suitable for hauling grain are limited to 30,000 tons by their drafts, which cannot in any case exceed the quayside depth of 9.36 m. The normal ship discharge rate at the port is 7,000 tons per day from the quay, which is served by the port's only bulk transfer terminal. Thus a 30,000-ton vessel requires 4-5 days to unload. Because the Port has only one berth dedicated to bulk transfer, vessels require additional time queuing up and waiting for access to this berth. On average a vessel requires 8-10 days to discharge in Mombasa. Under demurrage rules, which are standard for different sized vessels in the global vessel chartering market, the first 7 days are free to the shipper and at that point charges of \$15,000 per day accrue for a 30,000 grain vessel. When data was collected for this study during November of 2009, four vessels were waiting at anchor in Mombasa while one was being discharged.

Ocean shipping fees represent a significant share of final delivered price for most grains, but other transport cost elements which are absorbed into the price of delivered imports are significant as well. A break out of transport costs and related charges per ton of grain is as follows: i) ocean shipping: \$35 per ton; ii) Mombasa terminal charges: \$12.5 per ton for flow through. Bagging charges in the terminal can add another 10.00 per ton. Port dues and fees add yet another \$5 per ton; iii) inland transport charges to Eldoret via rail are \$20 per ton.

With increasing grain imports, capacity issues at the port have become even more important than cost issues. With one berth reserved for bulk transfer, the Port of Mombasa currently offers a loading capacity of 300,000 tons per month. However, the operation of a single bagging line at the GBHL terminal and the prevailing mode of distribution of bagged product

to the interior, coupled with the need to clear, clean and reset the bagging line for each throughput lot, effectively reduces the throughput capacity of the port to 200,000 tons per month.

Inland transport capacity is also a major constraint. The Kenyan Railways system linking Mombasa to the main population centers in central and western Kenya had stopped operating and private transport capacity was insufficient to handle the massive grain imports that were concentrated into weeks immediately after the import duty was lifted. Grain traders interviewed during this period indicated that the maximum transport capacity from Mombasa is 150,000 tons per month. This would have been sufficient to transport to upland population centers if imports had been mobilized earlier by mid- to late-2008, but which were not possible to stave off shortages by the time the import tariff was actually lifted in late January 2009. Consequently, rationing of maize was experienced in late 2008 and domestic prices continued to climb upward of \$350 per ton, even as the cost of importing maize to Nairobi had fallen to the \$300-320 per ton range. Because grain did not arrive at the port early enough to transport sufficient volumes upcountry (given transport capacity constraints) to meet demand requirements, maize market prices continued to climb during the first half of 2009 well over import parity. This state of affairs could have been avoided if the import tariff was lifted much earlier, especially since national shortfalls were predicted by the early warning systems and by local policy institutes as early as May 2008.

The compression of maize imports into a two-month period (late February-April 2009) also generated additional marketing costs that were ultimately borne by Kenyan consumers. Because inland road transportation was insufficient to handle the volumes imported (estimated at 0.7 million tons), traders were forced to store their grain in facilities outside the Mombasa port waiting for available transport to arrive. Upland transport capacity was further constrained by the fact that fertilizer importation for the main growing season typically occurs in February-March as well.

By September 2009, domestic maize prices were again falling in line with import parity as imports continued to relieve the deficit and production from some areas of the country began to hit the market.

Under such circumstances, it is imperative that the government gives a clear direction on the duty waiver, considering that suspension of duty earlier not only promotes more timely availability of grain in such times of a domestic shortfall, but also reduces uncertainty and

allows for adequate planning by the private sector especially millers and importers. This underscores the need to have in place clearly defined and transparent rules for triggering government intervention to reduce uncertainty. In addition, it is important that regular periodic government-private sector consultations be held in order to coordinate decisions and actions. Such a move will ensure that the country is able to deal with food security issues during lean times as well as times of a bumper harvest.

Additionally, when the food balance sheet indicates that the need for imports is vital, a quicker response by the government and all stakeholders is necessary for three reasons. First, imports potentially require major budgetary allocations, particularly when large deficits are expected, and so good planning is required. Such a response would ensure that the country avoids situations where NCPB has insufficient funds to acquire maize for strategic reserve either domestically or through imports. Secondly, there is a time lag between the time when maize import orders are made and when that maize arrives in the country. This factor needs to be put into consideration to ensure that such imports are timely. Thirdly, even when grain importation is timely, transportation to rural areas is a major constraint, and this calls for the improvement of the road/railway infrastructure that currently hampers the capacity to transport grain upcountry.

Looking forward, it is important that these trade-related issues be taken into account if the maize value chain is to perform in the best interests of Kenyan farmers and consumers.

6.3.2. Concrete Guidance

1. Raise public investment in maize seed breeding and agronomic research to make it possible for improvements in smallholder crop productivity.
2. Explore options for improving public and private extension programs to enable farmers to adopt improved farm technologies generated from point 1.
3. Examine options for bringing more land in Kenya under potential cultivation by smallholder farmers. Unless the land constraints in currently densely populated rural areas of Kenya are relieved, it is unlikely that a large portion of farmers in Kenya that own less than one hectare will be able to rise out of the semi-subsistence conditions that keep them trapped in poverty.
4. Support training programs to enable smallholders to develop more effective marketing strategies and to negotiate more effectively with traders, in order to raise the prices that they receive for their maize.

5. Raise public investment in road, rail, and port infrastructure to reduce marketing costs as well as the cost of modern inputs such as fertilizer to the farm gate. Rehabilitating the Kenyan railway system would be a key priority. If this were done prior to 2009, maize imports could have arrived in greater volumes much faster in early 2009 and pushed food prices down faster.
6. When early warning estimates predict a need for large import quantities, remove the import tariff soon enough to allow traders to import over a sufficiently long time period to avoid transport capacity constraints and domestic stockouts.
7. Review the rationale for denying import licenses when applied for by traders.
8. Consider the costs and benefits from the standpoint of governments of transitioning from discretionary trade and marketing policy (Model 3) to adherence to more systematic rules-based policies (Model 2). As concluded earlier, nurturing credible commitment concerning trade policy is likely to promote market predictability and therefore, lead to greater supplies and price stability in food markets during times of domestic production shortfalls.
9. Consider whether current proposals for international stockholding would be effective in the presence of domestic transport capacity constraints. International physical or financial reserves would not be able to relieve localized food production shortfalls unless local transport capacity is adequate to absorb sufficient imports within a concentrated period or unless import licenses are provided or the state carries out or contracts for the importation from the international stock source.

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