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THREE ESSAYS ON THE RISE OF SUPERMARKETS AND THEIR IMPACT ON FRESH FRUITS AND VEGETABLES SUPPLY CHAINS IN KENYA

By

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ABSTRACT

THREE ESSAYS ON THE RISE OF SUPERMARKETS AND THEIR IMPACT ON FRESH FRUITS AND VEGETABLES SUPPLY CHAINS IN KENYA

By

David Neven

Essay 1 The Rise of Kenyan Supermarkets and the Evolution of their Horticultural Product Procurement Systems

Supermarkets are rapidly penetrating urban food retail in Kenya and spreading well beyond their initial tiny market niche into the food markets of lower-income groups. Having penetrated processed and staple food markets much earlier and faster than fresh foods, they have recently begun to make inroads into the fresh fruits and vegetables category. The important changes in their procurement systems bring significant opportunities and challenges for small farmers, and have implications for agricultural diversification and rural development programmes and policies.

Essay 2 Supermarkets and Consumers in Africa: The Case of Nairobi, Kenya

Supermarkets in urban Kenya have risen from a tiny niche a half decade ago to a fifth of food retail, spreading well beyond the richer consumers to derive more than a third of their sales and half of their customers from low income and poor consumers. This essay explores the patterns and determinants of purchases of the overall food category versus

fresh fruits and vegetables, over Nairobi consumer income strata, for purchases from supermarkets versus traditional retailers. Implications are drawn for development programs to help farmers be well-positioned for change in the food markets facing them.

Essay 3 Farm-Level Perspectives on the Impact of Domestic Supermarkets on Kenya's Fresh Fruits and Vegetables Supply System.

The rise of supermarkets in Kenya has given rise to a new group of medium-sized farms managed by well-educated farmers. Focusing on kale, the essay shows that nearly all supermarket-channel farmers have the capacity to supply larger volumes year round and have transportation vehicles, an irrigation system, a packing shed, a cellular phone, and so on, pointing to the existence of a threshold capital vector which farmers must have in order to access supermarkets. Especially farm size and irrigation were found to be significant determinants of participation in the supermarket channel. Kale suppliers to supermarkets use more capital intensive production technologies, leading to average labor and land productivities which are 60-70% higher than in the traditional channel. Eighty percent of labor consists of hired workers, indicating that these farmers could be important in alleviating poverty for rural households with little or no land. While most traditional-channel kale farmers sell to brokers and get a price that lets them break-even at best, supermarket-channel farmers have a 40% gross profit margin. These margins and lower market risks in the supermarket channel have resulted in a strong growth dynamic of supermarket-channel farmers which have doubled the size of their operations over the last five years.

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It's been a hard day's night, as one of life's greatest philosophers once said. Nevertheless, with a little help from my friends I got by.

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KEY TO ABBREVIATIONS

CBS	Central Bureau of Statistics
COD	Cash On Delivery
COMESA	Common Market for Eastern and Southern Africa
DFID	Department For International Development (UK)
EAC	East African Community
FAO	Food and Agriculture Organization
FC	Factor Cost
FDI	Foreign Direct Investment
FFV	Fresh Fruits and Vegetables
GDP	Gross Domestic Product
GoK	Government of Kenya
HACCP	Hazard Analysis Critical Control Points
HCDA	Horticultural Crop Development Authority
HPHC	Horticultural Product Handling Centre
KACE	Kenya Agricultural Commodity Exchange
MD	Managing Director
MLE	Maximum Likelihood Estimation
MoARD	Ministry of Agriculture and Rural Development
MPV	Marginal Product Value
NGO	Non Governmental Organization
OLS	Ordinary Least Squares
SKU	Stock Keeping Unit
SMS	Short Messaging Services
SMT	Strategic Management Theory
TAV	Traditional African Vegetables
TCT	Transaction Cost Theory
USAID	United States Agency for International Development

INTRODUCTION AND SUMMARY

The Rise of Supermarkets in Developing Countries: General Problem Context

Changes in end-consumer demand (population growth, urbanization, rising incomes), policy shifts (trade and market liberalization) and globalization/foreign direct investment (FDI) have spurred a structural transformation process from traditional to modern in the agri-food systems of developing countries. At the forefront of this modernization process, as key agents of change, are the supermarkets, which have grown from niche players in the high income segment to the dominant actors in the food system[1].

The growth of supermarkets has downstream and upstream ripple effects. For consumers, on the one hand, supermarkets offer a greater variety of food products, value-added food products, more guarantees regarding the quality and safety of food products and generally lower prices for processed food. On the other hand supermarkets take market share away from traditional retailers (such as kiosks, over-the-counter shops, markets stalls, and street hawkers), lowering their margins or displacing them, and thus may reduce the set of retail outlets from which consumers can choose.

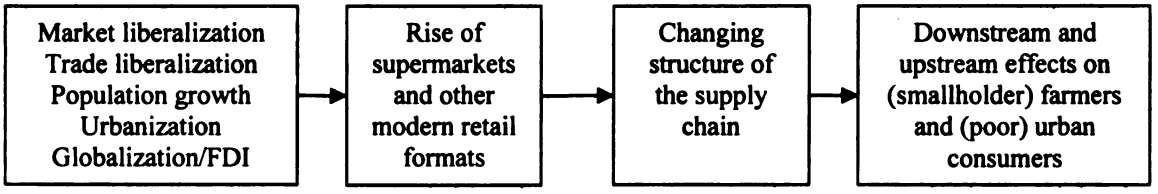
From the perspective of their suppliers, supermarkets are very demanding customers. They require higher and more consistent quality, consistent year round delivery, larger volumes per supplier, more stringent payment terms (e.g., a 15-day payment period rather than cash-on-delivery), and so on. Suppliers who are most

[1] 'Supermarkets' is a term used broadly here for all self-service retail outlets meeting minimum size criteria ($150m^2$ in the case of Kenya) and with food lines representing an important percentage of sales (>50%).

successful in meeting these criteria face great growth opportunities, but those who cannot make the grade are likely to be dropped.

As the market share of supermarkets in food retailing grows, the effects of this vendor rationalization process will not be marginal. This has raised considerable concern on how the most vulnerable agents in the food system adapt. For smallholder farmers there is a risk that they may not be able to adapt to the supermarkets' new procurement system, leading to exclusion from a potentially more profitable or less risky market. Alternatively, some small farms may adapt, through collective action, investments and learning, taking full advantage of the growth opportunity offered by supermarkets. Figure 1 depicts the problem setting.

Figure 1: Problem Setting



Supermarkets in Kenya: General Research Approach

The research presented here focuses on the impact of the rise of domestic supermarkets on urban consumers of and supply chains for fresh fruits and vegetables (FFV) in Kenya. Kenya provides an interesting case study because it demonstrates how even in a low income country in Sub-Sahara Africa, supermarkets are growing with all the irrepressibility of an idea whose time has come. In Kenya, we show here how

supermarkets have grown from a tiny niche at the start of the 1990s to 20% of the urban food retail sector in 2003. Furthermore, supermarket development in Kenya is currently in an early, formative stage where changes are taking place fast. This study thus allows us to capture these fleeting moments and provide a benchmark for future studies on urban food retailing in Kenya. We focused on FFV because it is an important sub-sector in the country, both from the consumer perspective (important part of the diet, the food expenditure) and the farmer perspective (great income potential for nearly 2 million small scale producers in Kenya). Within this context, this study aims to help answer the following three strategic questions, each at a different level of the supply chain: (1) at the retailer level: *'What is the importance of supermarkets in food and FFV retailing and what is the nature of the supermarkets' FFV procurement system?'*; (2) at the consumer level: *'What is the effect of the development of the supermarket sector on the (urban) consumers' food and FFV purchasing behavior?'*; and (3) at the farmer level: *'What is the effect of the development of the supermarket sector on (FFV) producers' behavior and net income?'*.

The approach to the research questions is framed in a broad, dynamic interpretation of the classical Structure-Conduct-Performance model, where the structure of the supply system determines the behavior of economic agents (be they retailers, consumers or farmers) and the behavior of agents in turn results in a new structure of the supply system. As the system evolves, there will be differential effects in terms of the performance of the different agents. Within this general framework, standard adoption models were used to analyze the choices agents make, i.e., choice is hypothesized to be determined by the incentives and capacities of agents which in turn are determined by

input and output prices, risk factors, quasi-fixed capital and shift factors. The theories from institutional economics, especially with regard to the role of transaction costs, are brought into the model to refine the interpretation of the independent variables. A variety of analytical methods was used, including case studies, analysis of descriptive statistics, econometric estimations of adoption and technology functions and farm-level, product specific gross margin analysis.

The data for this study were collected over 13 months of field research in Kenya (January-November 2003, April 2004, and August 2004). Given the absence of secondary data on retail in general, and on supermarkets in particular, in Kenya, the bulk of the research effort focused on primary data collection. A total of 1,174 respondents were interviewed. These interviews came in various formats and included key expert interviews, focus group discussions and surveys.

Retailer, Consumer and Farmer Perspectives on the Rise of Supermarkets in Kenya

This study takes on the format of a collection of three closely related essays. Each essay zooms in at a different level of the supermarket driven supply chain, each addressing one of the three strategic questions listed above. While the three essays are linked, complementing each other and jointly providing a complete picture of the supply system from farmer to consumer, they are written so that they can be read as individual essays.

Essay 1: The Rise of Kenyan Supermarkets and the Evolution of their Fruits and Vegetables Supply Systems

Research Questions

Essay 1 goes to the heart of the phenomenon under study, the importance of supermarkets, the drivers behind and patterns of their growth and the nature of their produce procurement system. The specific descriptive and research questions are: (1) what is the importance of supermarkets in terms of market share in food and FFV, growth rate and geographic spread? (2) How does growth of a supermarket chain determine: (i) the choice of the FFV supplier (in terms of their size and place in the supply chain); and (ii) the use of contracts, quality and food safety standards and centralization of procurement?

Data and Methods

The data collection effort consisted of (1) a supermarket survey (210 respondents, usually the branch manager, spread over 79 urban areas); (2) a similar survey of traditional retailers such as kiosks, over-the-counter shops and market stalls (250 respondents); and (3) key informant interviews (including interviews with the successive Managing Directors, since 1986, of Kenya's leading supermarket chain, Uchumi). Descriptive analysis of this data set, complemented with secondary data, allowed for a reconstruction of the path of supermarket development in Kenya and the identification of the key drivers behind it. The nature of the FFV procurement system is analyzed through case-studies of the two leading supermarket chains in Kenya, Uchumi and Nakumatt, who jointly represent 90% of the FFV sold through supermarkets in Kenya.

Key Findings

(1) Growing at rate of 18% per year, supermarkets in Kenya have grown from a niche in the mid 1990s to 20% of the urban food market and 4% of the urban FFV market in 2003.

(2) Supermarkets have spread from the capital to intermediate and small towns, with 44% of supermarket sales and 58% of supermarket stores located outside of Nairobi in 2003.

(3) The leading supermarket chains in Kenya are evolving, with a time-lag but at a comparable speed, to the same FFV procurement system that has become the dominant format for supermarkets in middle-income developing countries: (i) while the share of brokers (and the smallholders they buy from) in the vegetable supply of Kenya's leading supermarket chain (Uchumi) has gone down from 70% to 50% (and is expected to go further down to only 10% by 2008), the share of direct supplies by medium and large farms has gone up from 15% to 40% (and is expected to go up to 65% by 2008) and the share of smallholders as direct suppliers remains stable around 10-15%; (ii) both leading supermarket chains have moved towards the use of more centralized procurement systems for FFV; and (iii) there is an incipient use of standards for food quality and food safety, mostly linked to contracts, the use of which is expected to increase from the current 5% of FFV suppliers to 70% over the next 5 years.

Essay 2: Supermarkets and Consumers in Africa: The Case of Nairobi, Kenya

Research Questions

Essay 2 looks downstream from the retailer to the end-consumer. The supermarkets' gain in market share can only be explained by a concurrent shift in consumer behavior. The specific descriptive and research questions are: (1) How important are the different income-categories of consumers as a percentage of the customer base and sales of supermarkets for food in general and FFV in particular?; and (2) What are the socio-economic determinants of the consumers' retail outlet choice (supermarkets vs. other retail outlets) and shopping frequency decisions (at supermarkets) for food and FFV?

Data and Methods

The data for were collected through eight consumer focus groups (54 participants) and a consumer survey (445 respondents) in Nairobi. The consumer focus groups provided an initial understanding of the behavior of consumers and aided in the design of a short consumer survey instrument. The data from this survey were then used to: (i) describe the nature and motivations of consumers shopping in supermarkets versus traditional retail outlets across product groups and income classes; and (ii) test, in limited dependent variable regressions, the importance of different socio-economic variables (including income) in explaining retail outlet choice and shopping frequency.

Key Findings

(1) The poor are far more important in the development of supermarkets than is generally believed: in 2003 supermarkets derive more than a third of their sales and more than half of their customers from poor and low income consumers.

(2) In general, supermarkets have penetrated much further and faster into the consumer market for processed foods as compared to FFV. This is mainly because Nairobi supermarkets sell processed food much cheaper than do traditional shops. By contrast, supermarkets sell FFV at a higher price (on average) and are not located as close to consumers as are FFV shops. However, there are three factors that suggest that Kenyan urban consumers will shop more from supermarkets in the future for FFV: (a) younger consumers buy FFV more frequently from supermarkets; (b) supermarkets are increasingly price-competitive with many categories of traditional retailers for high-volume (commodity) vegetables like kale and tomatoes; and (c) supermarkets are developing smaller retail formats which can be located closer to consumers.

Essay 3: Farm-level Perspectives on the Impact of Supermarkets in Kenya's Fresh Fruits and Vegetables Supply System.

Research Questions

Essay 3 takes the upstream, farm-level perspective on the growth of supermarkets. The research question here are: (1) what are the determinants of the farmer's decision regarding channel choice (supermarkets versus traditional buyers) in terms of their capacities (farm size, use of technology, use of hired labor, education and gender of the farmer, and so on); (2) do farmers supplying supermarkets and farmers selling to

traditional supply chain agents use different production technologies (in terms of the relative amounts of labor, land and capital used); and (3) do farmers supplying supermarkets benefit from this market access in terms of net incomes and/or demand reliability?

Data and Methods

Two farmer surveys, mainly focusing on kale, tomato and banana (with 63 of the interviewed farmers supplying supermarkets and 103 supplying traditional markets), complemented with semi-structured interviews with supply chain intermediaries and input suppliers, were conducted to address these questions. The first survey takes a broader perspective, focusing mostly on kale, tomatoes and bananas (the two highest volume vegetables and the highest volume fruit in Kenya respectively). The descriptive data from this survey were used to address question (1) above. The second farmer survey, this time focusing on kale only and including detailed questions on input use and yields, addresses all three questions. This part of the analysis consequently consists of three steps. First, a probit implementation model is used to test channel adoption by farmers in terms of their capacities. Second, the essay tests the production technology differences between supermarket-channel farmers and traditional-channel farmers by comparing their marginal and average product values for various input factors in kale production. Third, gross margin analysis is used to assess the income benefit farmers derive from being able to sell to supermarkets. Qualitative analysis and descriptive statistics are further used to assess: (i) the role of market risk reduction as a benefit to the farmer; and (ii) the presence of a growth dynamic at the farmer level in the supermarket channel.

Key Findings

(1) The growth of supermarkets has stimulated the rise of a new class of FFV farms in Kenya. These are mostly recently established, medium-sized farms which, in terms of physical and human capacities, differ starkly from the smallholder farmers that represent the bulk of the FFV production in Kenya. Especially farm size and the presence of a modern irrigation system were found to be critical determinants of participation in the supermarket channel. This stark difference points to the presence of a threshold capital vector at the entrance of the supermarket channel.

(2) Supermarket-channel farmers have adopted more capital intensive production technologies which resulted in their average land and labor productivity being 60-70% higher than those of traditional-channel farmers. While they use 20% less labor per acre than traditional-channel farmers, supermarket-channel farmers rely heavily on hired labor (80% of the workforce) and could thus become important in proving jobs for rural households with little or no land. Not withstanding differences in the capital intensity of their production technologies, the two types of farmers have a comparable production cost per unit of output.

(3) While most traditional kale farmers sell to brokers and get a price that lets them break-even at best, supermarket-channel farmers have a 40% gross profit margin. These margins and lower market risks in the supermarkets channel has resulted in a strong growth dynamic for supermarket-channel farmers which have doubled the size of their operations over the last five years.

Implications for Development Programs

(1) The growing market share of supermarkets implies that they are becoming increasingly important as transformers of the food markets facing small farmers, and thus as agents to include in development programs aimed at improving market access to the small scale farmers.

(2) Small farmers, as individual suppliers, are one of the less attractive options for supermarkets to turn to as their FFV sales increase, because of the former's inability to deliver year-round and in the volumes and at the quality level required by supermarkets. Development programs aimed at assisting smallholder farmers to access the supermarket sector would have to make sure farmers meet the whole vector of supermarket requirements. As this implies investment and working capital requirements which mostly exceed the capacities of risk-averse smallholder farmers, development programs need not only organize farmers in groups but also look for or develop new creative ways of keeping capital requirements low (e.g., through factoring) and increase access to affordable credit. Given the wide scope of the criteria that need to be met, development programs will likely have to include multiple partners, specialized in different fields.

(3) Supermarkets prefer to work with a selected list of proven suppliers, who grow along with them. As these farmers are already selected in the early stages of the development of the supermarket's FFV procurement system, there is a degree of urgency in helping smallholder farmers to sell to supermarkets and build a long term trading relationship.

(4) Supermarket-induced supply chain dynamics (such as increased investments in irrigation, communication, transportation) result from an increase in scale and from an increased market reliability (long term relationships). Development programs aimed at creating similar dynamics in the traditional channel (which will dominate the FFV market for the foreseeable future in Kenya) should therefore look at investment stimulating scale increases at the wholesale and retailer level (e.g., small shops aggregating to form procurement clubs that can then contract directly from groups of smallholder farmers).

(5) In order to avoid the risk of an over-reliance on a single buyer and because supermarkets buy only the highest quality grades, farmers should look at supermarkets as one element in a portfolio of buyers.

(6) Supermarkets, as they centralize their FFV operations over a wider regional store network and as they increase their scale of operations, will stimulate regional market integration and production specialization, with the best suppliers for particular products increasingly found farther away from the area of production (this includes increased imports and exports as chains move into new countries). When selecting products and developing marketing plans for smallholder farmers, development programs should take these dynamics into account (both as opportunities and threats).

(7) Assistance programs focused on agricultural diversification can help small farmers with the necessary training and equipment, such as transport and cold chains, to produce

those perishables for which these farmers are likely to be competitive in the supermarket market-channel. This assistance should be carried out in a way that walks the tightrope between alleviating poverty as much as possible, and inducing distortions in market or investment incentives. We show in this study that these products are mainly the highly perishable products such as leafy greens (e.g., traditional African vegetables) in which a correctly equipped smallholder can have an advantage. Assistance programs are likely to find further promising new market opportunities amongst the wide set of produce items for which supermarkets are eager to shift away from the current traditional brokers to more direct supplies by farmers (e.g., potatoes, carrots). In some cases this will imply producers from different regions to cooperate with each other in order to address the year-round delivery requirement of supermarkets currently resolved by brokers (e.g., for mangoes). By contrast, we expect rapidly increasing cost and quality competition for small farmers competing in this channel in bulk products such as bananas and tomatoes.

ESSAY 1

THE RISE OF KENYAN SUPERMARKETS AND THE EVOLUTION OF THEIR FRUITS AND VEGETABLES SUPPLY SYSTEMS

1. Introduction

Recent research has drawn attention to the rapid growth of supermarkets and the resulting structural transformation in the agrifood systems of developing countries (for example, Reardon and Berdegué (2002) for Latin America, and Weatherspoon and Reardon (2003) for Africa, focusing mainly on South Africa). In this essay we demonstrate that the supermarket sector is also developing rapidly in Kenya, a poor country (with a per capita GDP of roughly a dollar a day) where supermarket growth is endogenous and indigenous – without the heavy influence of foreign direct investment (FDI) by global retail chains that plays such an important role in supermarket trends in Asia and Latin America. Supermarkets in Kenya have grown from a tiny niche market only seven years ago to 20% of urban food retail today, and are rising fast. At issue is how this phenomenon is affecting food markets facing farmers, via changes in supermarket procurement systems.

We focus on the fresh fruits and vegetables (FFV) category, because government and donors have high hopes of this being a motor of agricultural diversification for small farmers, given FFV's assumed lack of scale economies, and because the relationship between supermarkets and FFV producers tends to have fewer intermediate steps, in particular in processing; procurement system changes are therefore expected to change more directly the market facing small farmers. Moreover, FFV in Kenya is a large sector, producing 3.2 million tons of fruits and vegetables with a rural-market value in 2002 of

US$354m. (3% of GDP), and the majority of horticultural producers are smallholder farmers (providing 70% of the marketable FFV) who derive a large share of their cash income from horticulture (MoARD, 2002; Kamau, 2000). Prior work on the supermarket channel for FFV sales has focused on exports (Jaffee, 1994) including specifically to UK supermarkets (Dolan and Humphrey 2000), but the literature is bereft of studies on FFV sales to supermarkets in Kenya. Yet the great majority of Kenyan FFV goes to the domestic market (90% of the volume and 70% of the sales), and, as we show below, supermarkets in Kenya already buy half as much FFV as are exported (in volume terms). Finally, domestic FFV marketing studies, such as Dijkstra (1997, 1999a, b, 2001), do not cover local supermarkets.

The essay proceeds as follows. Section 2 discusses the collection of primary field-survey data on which the study is based. Section 3 presents data on trends in the development of the supermarket sector in Kenya. Section 4 analyses the Kenyan supermarket chains' procurement system changes for FFV and discusses the implications for farmers of these changes. Section 5 concludes with policy and program implications.

2. Data and Methods

Given the absence of supermarket (or retailer) associations and industry publications, secondary data on supermarkets in Kenya are scarce (basically limited to supermarket annual reports and articles in the popular press).

Hence this essay is based on primary, field-survey data collected by the author during March to November 2003 and April 2004. (i) In-depth interviews were conducted

with the executive managers and/or FFV managers of the top five supermarket chains, plus visits to their key FFV wholesale suppliers. (ii) A short survey was administered in 79 of the 87 urban areas with over 25,000 population (according to the 1999 population census, CBS, 2002b), where all supermarket stores found in these urban areas were visited and either a manager interviewed and/or observational data collected; in total, 210 valid interviews in this category were conducted. (iii) A similar survey instrument was used to interview 250 non-supermarket retailers (smaller self-service groceries and traditional retailers such as greengrocers, open air market stalls, kiosks, street hawkers and over-the-counter shops). (iv) A survey of 450 households in Nairobi, focused on their shopping habits. (v) A varied set of additional data was gathered, including interviews with government officials, key industry experts in the retail and agri-food industry sectors, and other private sector firms, and NGOs involved in the FFV industry.

3. Patterns and Determinants of the Rise of Supermarkets in Kenya

3.1 General Trends

We use the definition used by ACNielsen-Kenya for supermarkets, as 'self-service stores handling predominantly food and drug fast moving consumer goods (FMCG) with at least 150m^2 (1,625 sq.ft) of floor space'. We defined 'hypermarkets' as having at least 15 times that floor space (2,250m^2). Using these definitions, as of 2003, there were 225 large-format stores in Kenya – 209 supermarkets and 16 hypermarkets.[2] In the text, for

[2] We do not include in our analysis the estimated 900 to 1,400 mini-supermarkets and convenience stores, also non-traditional retail formats, that have emerged in recent years in urban Kenya.

simplicity, we use the term 'supermarkets' to refer to both formats, distinguishing only where needed. Note that, while the cut-off point for the definition of a supermarket is relatively low by international standards (where the threshold is usually 300-400 m^2), it is judged in relation to the traditional store size by the ACNielsen definition. However, it should be noted that the average size of a supermarket in Kenya is 9,900 sq. ft. Moreover, most (80%) of the stores are part of a chain of supermarkets. Thus, small independent supermarkets are a small share of the sector.

Supermarkets have taken market share away from traditional food retailers such as kiosks, greengrocers, over-the-counter shops, market stalls and street hawkers (Table 1). The supermarket sector had an estimated turnover of US$520m. in 2002. Supermarket food sales represent roughly 70% of total sales – US$365m. Using triangulation from macro-data, our consumer and retail surveys and secondary data, we estimate the total size of the urban food retail market at US$1.9 billion. The market share of supermarkets in total urban food retailing is therefore roughly 20%. (This is similar to Indonesia now or Mexico five years ago.) Sub-supermarket-size self-service shops represent another 17% of the market, and the rest, 63%, is the share of traditional retailers.

Table 1: Food and FFV Retailing in Urban Kenya by Type of Outlet, 2003

Type of outlet	No. of outlets	Food Sales US$ m.	Food Sales Market share (%)	FFV Sales US$ m.	FFV Sales Market share (%)
Kiosks, OTC shops, greengrocers	27,000	600	32	131	36
Market stalls and street hawkers	Na	590	31	211	58
Supermarkets and hypermarkets	225	365	20	15	4
Smaller self-service shops	1,200	310	17	7	2
All types	Na	1,865	100	364	100

Note: the exchange rate used was 1US$=Ksh76.9.
Sources: author's estimations based on authors' retailer and consumer surveys and secondary data (AC Nielsen, 2002; CBS, 2002a, b, c; World Bank, 2004; World Gazetteer, 2004; UN Population Division, 2003; UN Habitat, 2002; UN Statistics Division, 2003).

Over the next 5 to 10 years, the supermarket sector is expected to grow at a rate similar to the current growth rate, i.e. about 18% per year since 1995[3]. At this growth rate, and assuming a market growth (urban population growth) of 4.7% (UN Population Division, 2003), supermarkets will double their market share by 2009 and become the dominant urban food retailers by 2011. This may happen even earlier if global, Asian or South African chains include FDI in Kenya in their strategies in the near future, which is perhaps a reasonable assumption.

The supermarkets' share in FFV retail has lagged behind their overall penetration of food retail (as is common in other parts of the world, for example in Latin America, see Reardon and Berdegué, 2002), but the trends are parallel. We estimate that out of US$364m. worth of FFV marketed to the urban consumer in Kenya in 2002, supermarkets represent US$14m. or 4% (i.e., an estimated 35,000 MT). As expected, the share is higher in large cities; in Nairobi the market share is 6-7%.

[3] We expect this because the drivers of growth (urbanization, competition, trade and market liberalization; see section 3.2) are expected to continue.

However, it is interesting to compare supermarket sales of FFV (circa 35,000 tons) with exports of FFV – 67,000 tons (MoARD, 2002). While research and policy attention has focused either on the export market or the traditional market, this third market – the supermarket market – represents already 50% of exports in terms of volumes. Because of the higher quality, higher value-added and different product composition (e.g., shelf-ready pre-packs of Asian vegetables for UK supermarkets), the same cannot yet be set about the value. While supermarkets sold an estimated $14m. worth of fresh fruits and vegetables in 2002, the exported FOB value was $160m. In terms of farm value, the gap closes with supermarkets representing $9m. and exports $45m. as exporters have higher marketing margins than supermarkets (roughly 70% vs. 40%).

3.2 Determinants of Growth

While the supermarket is not new to Kenya (the first supermarkets arose in the 1960s), their rapid growth is a very recent phenomenon, having taken off since the mid-1990s. This growth of the supermarket sector in Kenya has mainly been driven by three factors that coincide with some of those important in supermarket diffusion in other developing countries.

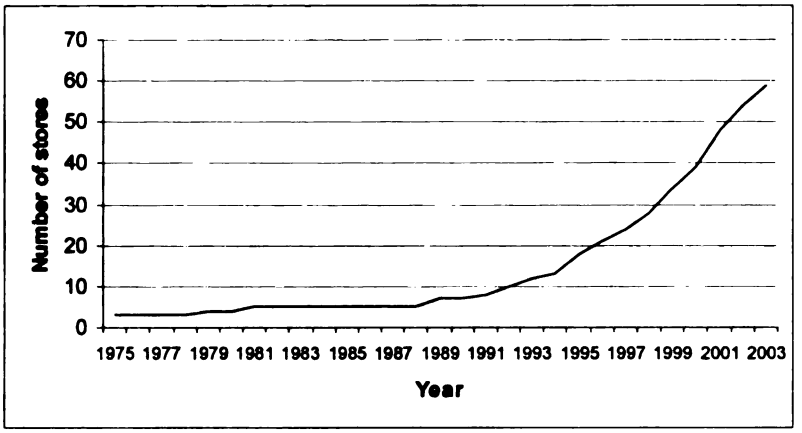
First, there has been rapid urbanization: the urban population made up 13% of the total in 1975, and 36% in 2000, and is expected to surpass the rural population by 2013 (UN Population Division 2003). Based on these UN statistics, the average urban population growth rate (4.7%) is triple that of the overall population (1.6%), as the rural population has started to decline even in absolute numbers. The populations of

intermediate cities like Nakuru and Eldoret doubled between 1989 and 2002 (*World Gazetteer*, 2004). Moreover, new registrations for buses and mini-buses, mostly consisting of public service vehicles providing intra and inter-city transportation, quintupled between 1993 and 2002 (CBS, 2002b, 2003).

Second, trade and domestic market liberalization started in 1993. Figure 1 depicts the growth of Kenya's current top five supermarket chains over the period 1975 (when Uchumi, Kenya's largest supermarket chain, was established) to 2003. It is a kinked curve with growth really taking off in 1995, i.e., after the 1993 policy changes were starting to have an effect. The 1993 economic reforms, including liberalization and stabilization policies, had several important effects for supermarkets. (i) Import licensing removal (more imports) and market liberalization (more domestic competitors) led to a dramatic increase in product variety and shifted the retail market from a sellers' to a buyers' market in which retailers had to fight for the consumers' shilling vote. The direct consequence of the increased product variety in the marketplace is that it favored the bigger stores (supermarkets) able to stock a wider assortment of products (economies of scope). (ii) Price liberalization also played into the hands of the supermarkets because it facilitated, in Kenya, the low margin-high turnover strategy that has been the core of most of the supermarket growth around the world. (iii) There was a mild and short-lived recovery of the economy in 1995/6 (with annual real GDP growth in the 4% range) which gave consumers the buying power to try all these new products that supermarkets were marketing to them. However, note that Kenya's economy deteriorated afterwards, ending the 1990s with no growth. With a downward trend in real GDP per capita over the last half-decade (CBS, 2002a), there is no indication of a general rise in consumer incomes in

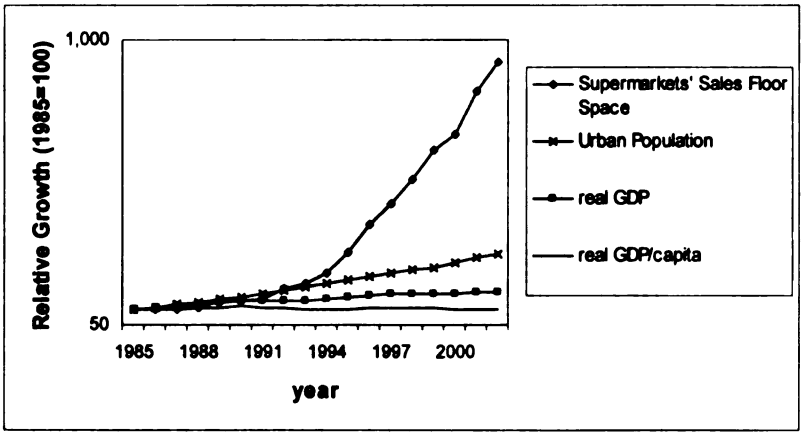
Kenya. Yet, as Figure 2 shows, the supermarkets' fast growth has persisted even in these slack economic times. This is probably due to their being able to offer low-priced processed foods and staples, appealing to lower middle-income consumer groups.

Figure 2: Growth of Top 5 Supermarket Chains in Kenya, 1975-2003



Source: author's national supermarkets survey.

Figure 3: Growth of Supermarkets in Broader Macro Context in Kenya, 1985-2003



Sources: sales floor space is based on author's supermarket survey; population data from Heston 2002; GDP data are from Econstats, 2004.

Third, while Kenya's supermarket revolution is unlike that of most developing countries outside of Africa that had massive inflows of retail FDI after investment liberalization in

the mid/late 1990s (but similar in the following respect to South Africa, see Weatherspoon and Reardon, 2003), Kenya's supermarket sector growth has been almost completely indigenous and endogenous. However, inter-chain competition in domestic investment has been very vigorous, playing the role of foreign versus domestic chains' investment competition seen elsewhere. Of course, 'if' and when outside chains do enter, the intensity of the investment rivalry will increase. The entry of foreign retailers after domestic supermarkets reach a critical point in their growth is what has been observed in other developing countries (e.g., in Argentina; Ghezan et al. 2002)[4]. These foreign chains bring with them high levels of operational efficiency and spark a price war which forces all supermarkets to speed up the already initiated process of driving down costs and pushing into new, less competitive but also less rich markets (smaller towns, lower income neighborhoods).

Before 1993, the main supermarkets grew within the boundaries of a single town, leading to local fiefdoms. Uchumi broke this pattern in 1993 by building its first store outside Nairobi, in Nakuru, starting a national-level competition that has built-in crescendo. Most notably, the rivalry between leading chains Uchumi and Nakumatt became an important growth driver; a new strategy by one chain forces imitation and/or a counter strategy by its competitor. For example, Nakumatt's introduction of large-format stores in 1995 led to the introduction of hypermarkets by Uchumi in 1997. Uchumi's subsequent introduction of a fully-fledged FFV department in that year (coinciding with its first hypermarket in Nairobi) was followed by Nakumatt in 2001. Over time, this

[4] The interest of South African supermarket chains to enter the Kenya markets dates back to at least 1994 when Pick'n Pay offered to buy Uchumi (author's interview with Suresh Shah, MD Uchumi 1986-99, 27 March 2003).

competition has moved from such conspicuous differentiation strategies to the more subtle price-based competition implying economies of both scale and scope.

3.3 A Three-Tiered Supermarket Sector with High Concentration: Emergence of Uchumi and Nakumatt as Market Leaders

Kenya's supermarket sector has three tiers (Table 2). The first tier consists of the two clear market leaders and also the leading FFV retailers, Uchumi Supermarkets and Nakumatt, which together control nearly 50% of the supermarket sector. The second tier consists of Tusker, Ukwala, and Metro Cash 'n Carry chains. These top five chains have 28% of the large-format stores in Kenya and 60% of the sales, indicating a concentrated sector (similar to Latin American and European levels of concentration). Figure 3 shows that since 1996, in terms of store size (a proxy for sales), the top five have surpassed the other supermarkets and are growing at a faster pace, increasing their dominance over time. The supermarkets in the third tier consist of small chains (of which there are about 40) and independent (single-store) supermarkets. There is only one publicly traded Kenyan supermarket (Uchumi) and one foreign-owned supermarket of significance (Metro).

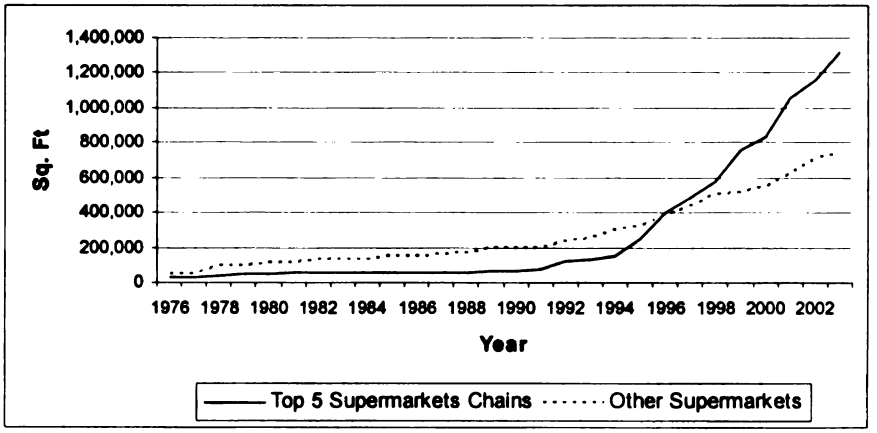
While selling FFV in supermarkets is not a rarity, given that overall 4 out of 10 supermarkets sell them to various degrees, it is highly concentrated in the hands of two leading chains. Of the Ksh1 billion worth of FFV sold through supermarkets, Uchumi and Nakumatt represent roughly 70% and 20% respectively.

Table 2: Supermarkets and Hypermarkets in Kenya, 2003

Company	Super-markets	Hyper-markets	Total stores	Average store size (sq. ft)	Market share (est.) (%)	Stores selling FFV (%)	Ownership
Market leaders							
Uchumi	23	4	27	16,400	26	100	Public Kenyan
Nakumatt	4	8	12	48,700	20	100	Asian Kenyan
Second tier							
Tusker	7	1	8	14,500	6	25	African Kenyan
Ukwala	9	0	9	9,100	4	0	Asian Kenyan
Metro	2	1	3	28,400	4	0	South African
Third tier							
Small chains	71	1	72	6,200	24	40	54% Afric. Kenyan 44% Asian Kenyan 2% Other
Independents	93	1	94	4,200	16	22	51% Afric. Kenyan 45% Asian Kenyan 4% Other
All supermarkets							
All	209	16	225	9,900	100	41	13% Public Kenyan 41% Afric. Kenyan 42% Asian Kenyan 4% Other

Note: market shares refer to total sales and are based on sales estimated from store sizes, interviews with upper-level supermarket managers, the supermarket survey and Uchumi's annual reports.
Source: author's national supermarket survey.

Figure 4: Growth of Supermarkets in Sales Floor Space in Kenya, 1976-2002



Source: Authors' national supermarkets survey.

Uchumi

Uchumi Supermarkets Ltd was established as a wholly government-owned company from three existing stores in Nairobi in 1975. In 1992, as part of the government's

ongoing structural adjustment programmes, Uchumi became a public company traded on the Nairobi Stock Exchange. However, its three main shareholders, who jointly owned 51% of the stock in 2003, are the original ones, namely, ICDC, wholly government-owned, and KWA and ICDCI, both of which have the government as a key shareholder (Uchumi, 2003). This means that the government has a strong presence on the board of Uchumi which has to approve major strategic decisions such as investments.

A new phase in the company's history began in 2001 when Uchumi embarked on an ambitious five-year expansion plan, key features of which include an increase in the number of stores from 17 to 50, an expansion into the regional market (Uganda, Tanzania), the construction of a new distribution centre in Nairobi and the installation of a satellite-based IT system linking all its stores to this new centre. Good progress was made at first: 10 new stores (including two hypermarkets in Nairobi and one in Kampala, Uganda) had opened by December 2002 (doubling its total floor space from 215,000 to 450,000 sq. ft over this two-year period), the new distribution centre was finished by 2003 and the new IT system started in September 2003. However, a combination of high-interest short-term financing tools and investments outpacing sales growth led to the first annual loss in the company's history (for the fiscal year ending 30 June 2003). The subsequent backlash from worried investors led to the decision to put the 5-year expansion plan on hold for a year.

Uchumi took $135m. in sales in 2003 (Uchumi, 2003), about 1% of Kenyan GDP, more or less the same as Wal-Mart/US sales are of US GDP. Uchumi today is the market leader with 27 branches in seven urban areas throughout the country (Nairobi, Mombasa, Nakuru, Eldoret, Meru, Karatina, Kisii) and one branch (a hypermarket and the

company's flagship store) in Kampala, Uganda. These 28 branches include various store formats, reflecting the fact that Uchumi targets customers from all socio-economic classes. Its 4 hypermarkets with large parking areas along the main entry/exit roads in Nairobi mainly attract high- and middle-income consumers. Its smaller 'neighborhood' stores in the city's residential areas ('estates') mostly target middle-income consumers. Its city centre stores near busy bus stages (5,000-20,000 sq. ft) mostly attract the middle- to low-income consumers.

In 1997, Uchumi was the first major chain in Kenya to introduce FFV items in its stores (as part of an overall strategy of building up 'fresh' categories: dairy, meats, bread, FFV). Starting out with some trial sales, FFV sales are now over Ksh50m. per month. Today, all Uchumi branches have a FFV section, although their size and assortment vary with the customer-base, with the most developed sections found in the hypermarkets where they can take up 7% of the sales floor space and offer over 300 stock keeping units (SKUs) from American pink sweet potatoes to zebra yellow melons (although only 100 or so are available at any one time). The FFV section in hypermarkets also includes value-added (and increasingly branded) products such as a line of organic products or pre-cut vegetable packs. In stores targeting lower-income consumers, the FFV sections are smaller, carry fewer SKUs and focus on the staple FFV items of the poor (such as kale, spinach, cabbage). Notwithstanding this broad customer targeting, FFV sales at Uchumi are still very much focused on Nairobi (90% of sales) and its hypermarkets (60% of sales).

Nakumatt

Privately-owned Nakumatt was established in Nakuru in 1985 (then still Nakuru Mattresses) and remained a small operation until it moved to Nairobi in 1992. By assertively opening stores in key locations and by expanding existing ones, Nakumatt grew into a major supermarket chain with 12 large-size branches in Kenya's three main urban centres (9 in Nairobi, 2 in Mombasa, 1 in Kisumu). Nakumatt's growth is facilitated by being part of a network of companies with cross-shareholdings (Nakumatt Holdings), which gives it excellent access to financing (investment loans), human resources (rotating managers) and physical capital (such as trucks).

In 1995, inspired by first-hand experience with large, customer-oriented US retail formats, Nakumatt introduced the supercentre store format into Kenya (i.e., department stores with a fully-fledged supermarket added à la Wal-Mart). Today 8 of its 12 branches can be categorized as supercentres. One of these, the Nakumatt Mega branch in Nairobi, has 175,000 sq.ft of floor space, making it the largest retail outlet in East Africa. The large average size of its stores explains why, although it has less than half the number of outlets of its main competitor Uchumi, Nakumatt has 30% more floor space (585,000 sq. ft vs. 450,000 sq. ft). Throughout, Nakumatt's consumer focus has been mainly on the high-income segment (50% of its customers fall into this category). In 2001 Nakumatt started selling FFV in its stores. Hesitant at first, it has now fully embraced the FFV section and is rapidly expanding it; all its branches have a modern FFV section. Chain-wide sales have grown to Ksh16m. per month and are expected to grow to Ksh50m. per month within the next three years.

Second and Third Tiers

The second tier in the hierarchy consists of the medium-sized Tusker Mattresses, Ukwala and Metro Cash 'n Carry chains with an estimated 6%, 4% and 4% of the supermarket sector respectively. All three are catering to and fiercely competing for the dollar vote of the middle- to low-income urban consumers, Tusker and Ukwala by operating stores located downtown near the busy bus stations used by consumers in this income class, who do part of their shopping before going home at the end of the day, and Metro indirectly by supplying the smaller self-service stores located near these same bus stages as well as in the residential areas. The Tusker and Nakumatt chains are in a strategic partnership which, given the two chains complementary customer bases, targets urban households from the lowest to the highest income category.

The third tier, the remaining 38% of the supermarket sector, consists of a varied group of smaller chains and independent stores. Here we find the supermarkets located in the smaller towns as well as those that have traditionally catered to high-income groups and expatriates (e.g., settlers' stores). These stores compete with the above chains by (i) moving to and expanding in understored areas, (ii) adjusting their product assortment with specialty foods for a particular target group (e.g., expatriates) and/or (iii) developing a more personalized service. The small chains group consists overwhelmingly of 2-branch and 3-branch chains (68% and 27% respectively). About 40% of these supermarkets sell FFV.

3.4 Diffusion Patterns

Our research revealed several interesting patterns in the socio-economic and geographic diffusion of supermarkets in Kenya. First, while Kenya's white and Asian consumers were important as part of the initial narrow base of consumers for the early stages of supermarket development, we calculate that their purchases now constitute a mere 15% of total supermarket sales.

Second, supermarkets have spread from higher-income niches in the capital, to middle- and lower-middle income segments in the capital and out into secondary cities and lately into towns. Table 3 shows that they are now found in urban centers of all sizes. In 2003, nearly 60% of the stores were located outside of Nairobi and basically every provincial capital had one or more supermarkets. Taking store size into account as a proxy for sales, Nairobi still accounts for the majority (56%) of sales. In terms of store density, it is clearly in the lead with 36 stores per million, nearly three times the level of the rest of urban Kenya.

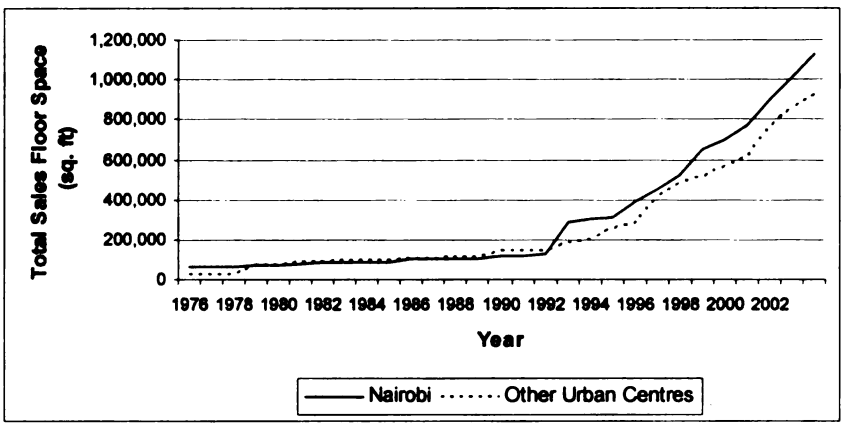
Table 3: Geographic Distribution of Supermarkets in Kenya, 2003

	Urban centers		Supermarkets		Supermarket floor space		Density
Name or pop. size ('000)	No. of centers	Aggregated population ('000)	No.	%	'000 sq. ft	%	(stores per m.)
Nairobi	1	2,600	94	42	1,190	56	36
Mombasa	1	800	10	4	220	10	13
100-350	18	3,320	66	29	480	22	20
50-100	30	2,670	33	25	190	9	12
25-50	37	1,730	17	8	50	2	10
10-25	33	760	5	2	20	1	7
All centers	120	11,880	225	100	2,150	100	19

Sources: population data extrapolated from 1999 census data (CBS, 2002b) using urban population growth data from UN Population Division (2003) and UN Habitat (2004). Supermarket data based on the author's survey.

Figure 4 depicts the growth of supermarkets in terms of floor space in Nairobi vs. other towns over the period 1975-2003. In the absence of historical statistics on the number and size of retail outlets, we used the year of establishment of the supermarket stores in existence in 2003 as a proxy. The figure shows that supermarkets are growing almost simultaneously in Nairobi and elsewhere.

Figure 5: Growth of Supermarkets in Nairobi vs. Other Urban Centers in Kenya, 1976-2003



Source: author's national supermarkets survey.

Nevertheless, there appear to be two successive waves of diffusion. First, one observes the emergence of independent stores which expand to other nearby centers, becoming small local chains in the process. Then the top five chains move into town, creating a shake-out whereby the out-competed smaller chains either close down completely or move to the next, less competitive and (increasingly) smaller town, thus fuelling the first wave of diffusion. From their base in Nairobi, the top five chains have moved into Mombasa (population 800,000) and intermediate cities (population 200-350,000). Uchumi moved to Nakuru in 1993, to Eldoret in 1999 and to Mombasa in 2000. Nakumatt moved to Mombasa in 1996 and to Kisumu in 1997. Metro moved to Eldoret in

1999 and to Kisumu in 2001. Ukwala followed suit moving to Eldoret in 1999 and to Kisumu in 2003. The top five chains are now also expanding into smaller towns: Uchumi, as part of its five-year plan, opened three of its latest stores in smaller towns like Meru, Karatina (both around 125,000 inhabitants) and Kisii (75,000 inhabitants) and announced further plans for expansion into other small towns like Thika and Nyeri.

In their expansion from Nairobi, the supermarket chains select towns that have (i) large populations (in the town centre and its hinterland), (ii) many households with a regular income (implying more potential regular customers), (iii) nearby high-consumption customers such as rich white farmers or major tourist resorts, and (iv) less competition from other supermarkets. Table 3 shows that moving away from Nairobi to intermediate and then smaller towns implies moving from high to lower supermarket density (and thus less competitive towns). Growing out into underserved urban areas is considered by the Kenyan supermarket sector a big opportunity – 'a domestic supermarket scene far from being saturated' (Wachira, 2002; Wahome, 2001).

The growth of Kenya's supermarkets has also taken on an East African regional character with outward Foreign Direct Investment (FDI) facilitated by regional trade agreements COMESA (Common Market for Eastern and Southern Africa) and (from July 2004) EAC (East African Community). Against the back-drop of a rapidly growing regional trade (for example, since 1998 COMESA has outgrown the European Union as Kenya's most important export market), Uchumi opened its first branch outside Kenya in Kampala (Uganda) in December 2002, a key motivation being the expectation of higher margins there (Akumu, 2003). From their regional expansion plans for the next five years it appears this is just the first drop of an upcoming flood of outward FDI by Kenya

supermarkets. When interviewed on the topic, Mr. Vijay Shah, Strategy Coordinator of Nakumatt, indicated that his company plans to open branches in Uganda (2), Tanzania (2), Rwanda (1), Burundi (1), Zambia (1) and Zimbabwe (1) over the next five years. Uchumi's expansion plans include stores in Tanzania and Rwanda as well as more stores in Uganda.

Such rapid diffusion of supermarkets – the start of a retail transformation in Kenya – is bound to have, as it has had elsewhere, important effects on the agrifood systems, and markets faced by farmers. To understand these changes we now focus on changes in the procurement systems of the leading chains.

4. Supermarket FFV Procurement Systems and Requirements

Our conceptual approach to the changing structure of the supermarkets' FFV procurement system mainly draws from strategic management theory (SMT) and transaction cost theory (TCT). Each theory addresses a different side of the same coin: SMT deals with the objective of creating competitive advantage (benefit-side), TCT looks at optimizing the cost efficiency of the institutional format (governance structure) used in creating competiting advantage (cost-side).

SMT postulates that economic agents develop and implement strategies which reduce competition in the industry and thus enable them to earn above normal profits (Porter 1980, Barney 1996). They do so by (continiously) creating competitive advantages[5] which competitors cannot easily imitate or nullify because of barriers to

[5] Examples of such competitive advantages are: lower production costs, higher perceived product quality, the development of products with unique benefits that are highly appreciated in the market.

entry (e.g., economies of scale, product differentiation, collusion in a concentrated industry, and so on). The extent to which firms can develop such competitive advantages critically hinges on how (well) they are linked to their input and output markets. In the TCT framework (Williamson 1985, 1991), economic agents (in our case the supermarket produce procurement managers) choose vertical coordination strategies that minimize the transaction costs which follow from having to deal with uncertainties caused by a combination of the agent's bounded rationality, the (potential) opportunism of their trading partners (in our case the FFV suppliers) and the presence of (physical and organizational) assets which are highly specific to the transaction (i.e., these assets loose much of their value in their next best alternative use). Vertical coordination strategies can be set out along a continuum from spot market transactions (high in flexibility, low in control) to vertical integration (high in control, but danger of x-inefficiencies) (Peterson et al. 2001).

Before the rise of domestic supermarkets, there existed two distinct FFV marketing systems, one at each of the extremes of the vertical coordination continuum: the traditional domestic system and the export system. Kenya's traditional FFV marketing system is characterised by fragmentation at both the producer and the retailer ends of the supply chain, market power with the wholesalers, long channels, direct payment to suppliers, little quality control or grading, few standards, little or no product innovation, small volume transactions and small inventories. In stark contrast, the export-oriented part of the horticultural sub-sector is highly dynamic, continuously developing new products and implementing institutional and organisational changes (such as

contracts, codes of good agricultural practices, traceability systems) that have increased competitiveness and spurred a rapid growth of exports to the European Union market.

The introduction of a fresh FFV section by the leading supermarket chains in the second half of the 1990s created a third marketing system for FFV in Kenya, which over time is shifting from the traditional to the export model. At first, supermarkets relied on traditional wholesale markets, basically taking the traditional informal sector supply chains of FFV as givens and working with these. This is the way the non-leading chains still work today, and we do not therefore deal with them in this section. Overall, wholesale markets remain the main source for these supermarkets, with on average 29% of supermarket FFV supplies coming from this source. Next are direct supplies from farmers (23%), supplies from brokers (19%) and supplies from importers (11%). The remaining 18% consist of supplies from own farms and from exporters.

The FFV section in Kenya's supermarkets has played an important role in their competitive strategies. At first, simply having a FFV section was the competitive advantage, this then shifted to having a larger assortment, better quality, more reliable availability and more value-added products (as the initial focus was on high-income consumers), followed by the current focus on getting prices down (in order to reach middle-to-low income consumers) and plans are being drawn to make food safety guarantees the next competitive advantage in the FFV retailing by supermarkets. In aiming for these different objectives, supermarkets face many uncertainties when sourcing form spot markets: quality, availability, price, and so on, are all fluctuating strongly. In order to gain more control over their supply chains, supermarkets have started shifting away from spot markets along the vertical coordination continuum. While

vertical integration (supermarkets owning their own farms) has emerged in Kenya's supermarket sector, it is rare and appears to be destined to disappear as those cases indicate that the costs of organizing such disparate activities under one management are high. The governance structures supermarkets are moving toward most clearly are therefore contract relationships (intended to be long-term) which provide more control than spot markets but keep overhead costs down and provide greater operational flexibility. A similar observation on the importance of long-term contractual relationships was made by Jaffee (1995) with regard to Kenya's FFV export channel.

Both to create competitive advantage and to manage transaction costs, supermarkets have implemented a number of technological, organizational and institutional changes: formal quality standards (and their enforcement mechanisms), contracts, distribution centers (centralized buying), IT systems for product flow management and communication, shorter supply channels (more direct links with farmers) and fewer (but larger) suppliers (like their customers, supermarkets prefer one-stop shopping for their procurement). As these chains grow, they are building up the market power, financial means and geographic presence to realize all these changes and to demand compliance from their suppliers. The supermarkets' FFV suppliers on the other hand have to make transaction specific investments of their own (e.g., organize their labor force to deal with short order cycles, develop staggered production systems which smoothen out supply over time, and so on) and are therefore also keen on establishing contractual relationships which help safeguard these assets to some extent. With supermarkets and their FFV suppliers continuously increasing the sophistication of

their supply chain in the pattern set out above, they are creating a fundamental structural change in agri-food supply chains.

In the remainder of this section we focus mainly on the two market leaders (Uchumi and Nakumatt, which sell 90% of FFV sold through supermarkets), in order to illustrate first the difference and then the convergence of their procurement systems. A few years ago, the two leading chains had very different systems (Uchumi with a decentralized system with a preferred supplier program that emphasizes the use of medium/large farmers, versus Nakumatt, with a centralized system but dependence on an outside specialized wholesaler who relied on small growers). Driven by the same determinants (create competitive advantage, lower transaction costs), the two systems have very recently converged, however, with Nakumatt bringing procurement in-house (into the same holding company) and shifting towards medium/large farmers to ensure quality and consistency and reduce transaction costs. For supermarkets, smallholder FFV producers operating in groups could theoretically provide the same advantages as larger farmers but few such groups exist for domestic market FFV, mainly because organizing smallholder farmers in efficient and effective groups has substantial costs associated with it and few intermediaries have (by 2003) taken initiatives in this regard. However, the thousands of smallholder producers involved in Kenya's (highly efficient) export channels illustrate that it is possible (Jaffee 1995).

From an initial total reliance on traditional suppliers, the leading supermarket chains have thus started to develop the five pillars that have characterized the evolving FFV procurement systems of supermarkets in developing countries that are ahead of Kenya in terms of supermarket development (Reardon et al., 2003): namely, (i)

centralization to distribution centers away from store-to-store deliveries; (ii) shift from reliance on traditional wholesalers to use of specialized/dedicated wholesalers; (iii) shift from the spot market to use of preferred supplier systems; (iv) shift from local procurement to regional, or regionalization; and (v) imposition of private safety and quality standards.

4.1 Uchumi: A Decentralised System with a Preferred Supplier Programme[6]

Centralization

FFV procurement at Uchumi is in a transitional phase from semi-decentralised to centralised. The retailer has most of its FFV suppliers deliver direct to its four hypermarkets and to the City Square branch (which housed its headquarters until 2003) in Nairobi. These five stores function as distribution centres to the smaller stores in Nairobi as well as the up-country branches. This system applies mostly to high-volume, semi-perishable items sourced domestically (e.g., onions, tomatoes, potatoes), imported fruits (e.g., citrus from Israel, South Africa, Egypt) and even some imported vegetables (e.g., garlic from China). At the same time, the smaller supermarkets in the chain have farmers supply some FFV items (such as greens) directly. The use of dedicated FFV trucks (with refrigeration) is not yet economical for the up-country branches, given the small volumes involved.

During 2003, Uchumi constructed a new (large) distribution centre (DC) of 15,000m^2, two units of which (one incoming, one outgoing) are equipped with cooling

[6] The information for Uchumi's procurement system is mostly based on several interviews with Mr Nzioka Kioko, Category Manager – Fresh Produce Uchumi, his successor Mr Peter Nderu and first-hand observations by the author, interviews with branch managers and the author's national survey.

facilities and intended for FFV. Improving quality level and consistency is the key reason for centralizing the FFV procurement. In combination with a modern IT system that links all of its stores by satellite communication (also installed in 2003) and that allows a centralized tracking of individual product items (SKUs) at each store, the DC will allow for better stock management of all SKUs (including the FFV which are sold bar-coded). With the DC facilitating the development of cold chains, Uchumi plans to introduce insulated trucks in 2004/5, at which point it will gradually start demanding investment in cold chain technology from its suppliers. All FFV items are delivered by the different suppliers directly and shelf-ready to the different procurement points. No packaging, labeling or primary processing (e.g., fresh-cut) is done by Uchumi.

Supplier selection

As most Kenyan horticultural producers lack the scale of operations to provide the large supermarket chains consistently throughout the year with the volume and quality of FFV they require, Uchumi's procurement managers purchase from a mixture of suppliers, including farmers of different sizes, traditional brokers and the wholesale market, specialised wholesalers, importers and exporters diverting their (excess or quality rejected) FFV to the domestic market. Table 4 indicates the composition of Uchumi's FFV suppliers in 1997 (the year of the first sales of FFV at Uchumi), in 2003 and in 2008 (as estimated/predicted by Uchumi's produce manager). In this table, 'farms' refers to farms that supply Uchumi either directly or via a single marketing facilitator who has a longer-term relationship with them. Examples of such market facilitators are farmer marketing associations and specialised wholesalers who work with farms through

outgrower schemes (e.g., exporters, lead farmers). Marketing facilitators are still rare amongst Uchumi's FFV suppliers (some examples are given below) and in this description we group them under 'direct supplies from farmers'. By contrast, traditional brokers and wholesalers are those who bulk supplies from many sources without registering or preserving the identity of the farms. We define 'small farms' as farms with less than 10 acres, 'medium-sized farms' as farms with 10 to 40 acres, 'large farms' as farms with 40 to 200 acres and 'plantations' as farms with more than 200 acres.

According to Table 4, for vegetables, which make up 45% of the value sold at Uchumi, roughly 50% is sourced directly from growers. Medium-sized producers supply the largest share, with 25%, followed by large farms with 15%, and small farms with 10%. Brokers supply 45% of Uchumi's vegetables, while the rest (5%) is imported. Small farmers supply mostly leafy greens (kale, spinach, traditional African vegetables) and vegetables sold in small volumes (e.g., herbs). Other vegetables are supplied by the larger farmers. The latter especially applies to fresh-cut vegetable packs because most small-scale farmers do not have a packing shed, which in this case is a key requirement. Currently 75% of fresh-cut vegetable packs are supplied by large farms and this percentage is expected to increase to 90% over the next 5 years. Brokers mainly resolve shortfalls. Imported vegetables include tomatoes, onions, garlic – basic products for which local supply chains are still inadequate relative to Uchumi's needs.

Table 4: Uchumi's FFV Supply Composition by Supplier Type, 1997-2008 (%)

Type of supplier	Vegetables			Fruits		
	1997	2003	2008	1997	2003	2008
Small farms	13	10	15	5	10	10
Medium-sized farms	10	25	30	10	10	10
Large farms and plantations	5	15	35	0	15	35
Traditional brokers/wholesalers	70	45	10	70	40	10
Imports	2	5	10	15	25	35

Source: author's interviews with Mr. Nzioka Kioko, FFV Manager, Uchumi.

For fruits, which make up 55% of the value sold, Uchumi sources 35% directly from growers, 15% from large-scale farms, 10% from medium-sized farmers and 10% from small producers. Imports represent roughly 25% of procured fruit and the remaining 40% is supplied by brokers. Small farms play only a small role with regard to fruits (examples of fruits where they are involved are watermelons, passion fruit and strawberries). For fruits there is a heavy reliance on brokers (because they buy mangoes, for example, from smallholder producers in different regions of the country as the seasons change), large-scale farms/plantations (e.g., Kakuzi, a 6,400-acre agrifood business listed on the Nairobi Stock Exchange) and imports. As a group these three suppliers represent 80% of Uchumi's fresh fruits supplies.

As Uchumi's sales of FFV increase, it is moving away from traditional brokers (and their long supply chains *and* the mostly smallholder producers they buy from) to get supplies directly from farmers. Table 4 indicates that brokers, as a source of FFV, have decreased from the main supplier category (70% in 1997) to less than 50% in 2003 (45% of vegetables and 40% of fruits). Reducing its reliance on brokers is the first priority at the moment for Uchumi's FFV procurement, and management expects that by 2008 brokers will make up no more than 10% of supplies, i.e. they will only be used to resolve shortfalls from regular suppliers (similar to Freshmark, Shoprite's FFV procurement arm

in South Africa; Weatherspoon and Reardon, 2003). Direct supplies by farmers allow supermarkets to increase simultaneously control over quality, supply reliability and price stability and thus make them more competitive with traditional retailers (in terms of product quality and reduced stock-outs).

Given the increase in scale and the need to be price-competitive, the supermarket FFV procurement managers are under cost pressures to deal with fewer and larger suppliers. Table 4 indicates that large farms are the main beneficiaries of Uchumi's declining reliance on traditional brokers. Between 1997 and 2008 large farmers are expected to increase their share in Uchumi's vegetable supplies 7-fold from 5% to 35%. Absent as suppliers of fruits in 1997, large farms now supply 15% and are expected to have a 35% share by 2008. A notable example is the 13,000-acre pineapple plantation that is a vertically integrated part of Delmonte, a pineapple and other fruits processor (canned fruits, tetrapak-packaged fruit juices). The key attraction for a supermarket chain like Uchumi is that a company like Delmonte is already used to dealing in large volumes, assuring a consistent volume of high quality supplies for its processing plant.

Uchumi already relies heavily on a small group of about a 100 medium to large suppliers, especially when supplies are low. These 100 farmers form the core of an emerging preferred suppliers list. All in all, there were about 150-220 regular, registered suppliers for FFV at Uchumi in 2003 (depending on the season). This number is expected to rise to 300 over the next four years, mainly because the planned network extension to 50 stores will include several up-country branches that will add suppliers from the local farming communities. Given the current decentralized procurement system, branch managers can (but are not restricted to) use this list of registered suppliers to order FFV

in a composition that fits their clientele (payments to suppliers are still dealt with centrally). As a group, medium and large farms already make up 40% of vegetable supplies and 25% of fruit supplies. By 2008 they are expected to become the dominant suppliers with 45% of fruit supplies, and 65% of vegetable supplies. Larger suppliers are not only gaining ground because they can supply larger volumes and thus reduce transaction costs for Uchumi. These farms are also the ones which have invested in irrigation systems which give them greater control over quality as well as allowing them to produce all-year-round. One reason why Uchumi prefers direct supplies by farms is that it allows them to inspect them and observe their irrigation system first-hand. Having reliable irrigation is a *sine qua non* for farmers who want to get on the supermarkets' preferred supplier list.

Marketing facilitators or wholesalers who are specialized (in a particular product) and/or dedicated (to a particular supermarket), are rare amongst Uchumi's suppliers, but they are emerging. Currently they focus on smaller-volume FFV items that address particular gaps in Uchumi's FFV product line. The following are some examples: Family Concern, Iga Muka, and Sunripe. Family Concern is an NGO that aims to combine development and business objectives in building horticultural linkages. Having identified, besides Uchumi, that there exists a high, unmet demand for traditional African vegetables, Family Concern set out to build supply capacity for traditional African vegetables amongst smallholders. These products appeared in the FFV section of Uchumi's Ngong hypermarket in 2004. Iga Muka, a 30-member farmers' association operating in the Sagana development scheme on the slopes of Mount Kenya, succeeded in linking up with Uchumi via the Kenya Agricultural Commodity Exchange (KACE), a

private sector firm that facilitates linkages between sellers and buyers of agricultural commodities, mainly by developing marketing information systems that reduce the information asymmetry between farmer and broker. Iga Muka supplies small volumes (60-100kg/week) of strawberries to Uchumi. Sunripe Ltd, one of Kenya's leading agro-exporters, produces from its own farms, but also buys from around 1,000 smallholder producers, predominantly as outgrowers through contract farming (Shah, 2004). Sunripe is Uchumi's key supplier for pre-packs of mixed vegetables. It is used to the high demands (for example, with regard to hygienic processing) and contracts often for more volume than it can sell in export markets. Since it is contracted to buy the FFV from the outgrowers, it needs a market for the excess production. Uchumi gets a high quality product while Sunripe gets more flexibility, while spreading its market risk.

Uchumi's historic relationship with the government (formerly government-owned and still with a strong government presence on its board) has had little impact on its selection of FFV suppliers, not only because Uchumi operates like a regular commercial player which has to respond to the challenges of a competitive market, but also because the government has largely been absent from the horticultural sub-sector.

Uchumi's selection of FFV suppliers is also determined by their business management skills. Compared with selling to traditional markets, selling to supermarkets implies far more formal transaction methods as well as more stringent delivery conditions. However, most relationships are informal – only a small number (about 5%) of suppliers have written contracts with the chain. These contracts stipulate the delivery volume and frequency (similar to a standing order), the quality standard for the product and (a limited set of) code of practice requirements such as non-use of banned chemicals,

the use of dust covers during transportation and use of clean irrigation water (as opposed to sewage water). Although a running average price for the year is indicated, the price is not fixed in the contract as Uchumi must be able to follow price movements in the market. Because Uchumi wants to build up long-term relationships with its farmers, its pricing policy is never to pay below the actual production cost (even if market prices drop below cost) and to balance this by paying lower prices when prices peak. Contracts also stipulate what constitutes an accepted reason for non-delivery. At this early stage in the formation of the supermarket's produce procurement system, these contracts are used more as an instrument to streamline and formalize the relationship between supermarkets and their preferred suppliers, than that it is intended as an enforceable legal document. At this stage both the farmer (who faces the risk of not being able to supply the required volume) and the supermarket (who risks having to pay farmers a price that is too high above fluctuating wholesale market prices to be competitive with traditional retail outlets) prefer contracts (in terms of volumes and prices) that have a great deal of flexibility.

Our interviews with management revealed that the percentage of farmers under contract is planned to increase dramatically to 70% within the next five years as key suppliers (who have proven their value) are identified. These key suppliers are expected to be distributed as follows: 30% as medium-sized farms, 40% as large farms and 30% as importers. Contracts will also focus mainly on products for which there exists a resolvable supply problem. For example, contracts are not needed for local pears, a seasonal item which is available in great quantity during a brief period of a few months and totally unavailable during the rest of the year.

Uchumi reduces transaction costs by requiring that listed suppliers have cell phones. About 85% of orders are placed by telephone – even to smaller producers – and for the most perishable FFV (e.g., the leafy greens) these orders are placed only 12 hours before expected delivery (evening call for next morning delivery). Suppliers should also have bank accounts, as Uchumi plans to move to payments through bank transfers on a monthly or bi-weekly basis. Suppliers without phones and bank accounts will be delisted in future.

Uchumi pays 2-4 weeks after delivery rather than the cash-on-delivery payment of the traditional systems. Suppliers to Uchumi also pay fees for breakages (unsold or spoiled produce) and for promotions. Before the introduction of these breakage fees (a flat rate of 7% of the purchase price), Uchumi used to inform farmers of the amount of breakage and ask for replacement at the farmer's cost – a system which was abolished because it increased transaction costs and suffered from the practical problem that it was difficult to know which supplier's produce was responsible for what percentage of the breakage. In terms of delivery conditions, supermarkets are much more stringent than the traditional system. For example, FFV needs to be washed and sorted (some sorting takes place at the receiving bay, but for the greater part if the product is not graded, the whole load is rejected). It also has to be supplied regularly (e.g., daily for tomatoes and greens, every 2-3 days for semi-perishables like onions), has to weigh an assured minimum, needs to be transported with great care (e.g., leafy vegetable bundles need to be transported loose, rather than stuffed into bags as is required traditionally) and, if packaged, needs to be bar-coded and labeled. Although not required at the moment, packing sheds will become compulsory.

It is evident that several benefits outweigh the above non-traditional costs and requirements of supplying to Uchumi, or this market would not attract medium-sized and large farmers that have market options. Namely, Uchumi lowers access costs and requirements for a variety of inputs. (i) Uchumi intermediates with seed, fertilizer, and chemical suppliers to negotiate lower prices and better quality for its preferred suppliers. (ii) Uchumi also intermediates with creditors for loans for investment in irrigation and trucks – and thus a written contract with Uchumi serves as a kind of collateral substitute. These loans can be substantial – from Ksh400,000 to Ksh6m[7]. In this context, Uchumi has been negotiating with organizations like the International Finance Corporation in order to provide better lines of credit to its FFV suppliers. Once supplier-contracts become more widespread, FFV suppliers will find it easier to access credit through regular channels as it will be easier to convince loan administrators at commercial banks of their creditworthiness. (iii) Uchumi reduces information costs by organizing meetings with its FFV suppliers to inform them of market opportunities and requirements; it is also considering providing direct technical assistance to its preferred suppliers (via a full-time agronomist).

Regionalization

Although horticulture is well-developed in Kenya, especially for vegetables, and most FFV items are procured locally, imported FFV are gaining importance on the supermarket shelves. As Table 4 shows, imports are expected to increase their share of Uchumi's vegetable supplies 5-fold from 2% in 1997 to 10% in 2008. For fruits, imports

[7] For comparison, the average value of land in our sample was around Ksh600,000 per acre, with smallholder farms having an average size of 5 acres. These loan amounts therefore are of a similar magnitude as the value of the land owned by smallholder farmers (usually their only possible collateral).

are even more important, with 25% of supplies today originating from other countries. For FFV as a category, imports make up about 15% at Uchumi, at least three times the share of imports in the country's urban FFV market as a whole (estimated at less than 5% of total consumption).

Imported FFV are becoming more important for several reasons, depending on product and season. (i) They complete the year-round availability of items which are not (e.g., apples), or only during a few months in the year (e.g., pears), produced in Kenya. (ii) They are more competitively priced and address low availability due to seasonality (e.g., the mostly informal imports of pineapples and bananas from Uganda and tomatoes, oranges and onions from Tanzania). (iii) They offer produce of a quality which is not available from producers in Kenya (e.g., oranges from Israel, bell peppers from Holland). In some cases, all of these reasons apply simultaneously. For example, garlic from China is cheaper, available year-round and of a superior and more consistent quality (at least visually) than the locally grown alternative. As a consequence, imported garlic, available in Kenya's supermarkets and open air markets alike, has grown from 0 in 1997 to 645MT in 2002 (FAO, 2004).

These reasons are particularly important to supermarkets that derive their competitive advantage over traditional retailers from their broad assortment, better quality, year-round availability and (for FFV to a lesser extent) lower retail prices. Furthermore, specialized importers provide a structure supermarkets are more familiar with from their dry foods retailing: one-stop order-points which can offer regular supplies throughout the year and are accustomed to formal business methods. Uchumi does not

import FFV directly, but relies on importers, as it does not yet deal in large enough volumes of these items.

Supermarkets, as they grow regionally, will look for suppliers from an increasingly wide pool, becoming regional traders in the process. For example, Uchumi's hypermarket in Kampala is closely linked in a bi-country procurement system with the Uchumi chain in Kenya.[8] Various FFV items are exported from Kenya to the Kampala store, most notably vegetables which are not as readily available in Uganda as they are in Kenya (such as carrots, cauliflower, herbs, pre-cut Asian vegetables). About 40% of the FFV sold in the Kampala store is imported from Kenya or elsewhere. At the same time, Uchumi is looking for opportunities to export FFV items from the 60% they source locally back to Kenya. This is considered desirable by the Ugandan government, in order to prevent the arrival of a Kenyan chain further exacerbating trade imbalances and the flooding of the Ugandan market with agri-food products from Kenya, but rather representing a 'win-win' situation where Uchumi helps to build a procurement system that relies on growers in both countries. No Uganda-to-Kenya trade exists within Uchumi's FFV procurement system at this time, although pineapples imported through traditional trading channels/brokers end up on its shelves in Kenya. The extent to which this regional sourcing will become important depends on many factors, most notably (i) how fast the chain will regionalize, (ii) how fast it will modernize its FFV procurement system (especially with respect to centralization and cold chains) and (iii) the nature of suppliers found in regional markets outside Kenya.

[8] The information in this paragraph is based on personal communication with Mr Bernard Kibaru, Uganda Country Manager of Uchumi, Kampala, June 2003.

Safety and Quality Standards

Since it first started selling FFV, Uchumi has required its preferred suppliers to dedicate all their top-grade output to it (they can sell lower grades to the traditional channels). FFV quality standards are 'private' (specified by the buyer, not the government) and are for the greater part limited to appearance (colour, size, blemishes, etc.). Produce is inspected visually by Uchumi personnel at the point of delivery (the five procurement points above). For example, for tomatoes the (current) Uchumi quality standard consists of about 20 specifications including for cleanliness, size, shape, weight, variety, and so on.[9] Produce not meeting the quality standards is rejected. About 10% of FFV is rejected, due to failure to meet quality requirements. Of this rejected FFV 45% comes from small farms, 45% from brokers and 10% from medium-sized farms and importers (produce from large farms is rarely rejected). Over time suppliers learn which quality is acceptable (it varies with seasonal availability; i.e., standards are lowered when supplies are low) and they work towards supplying this quality only to supermarkets.[10] Unlike the traditional marketing channels, selling a lower quality for a lower price is not an option.

Quality standards are applied at reception from preferred suppliers without contracts, or imposed within the contracts for the small (but rapidly increasing, as noted above) share of suppliers that have contracts. For the latter, Uchumi uses the measures for reducing quality risk identified by Hueth et al. (1999) in the case of FFV contracts in California: (i) monitoring farms in the field (e.g., irrigation system) to see if they have the

[9] Similar standards are already developed (for some products, e.g., for tomatoes since 1985) by the Kenya Bureau of Standards, but no case of their implementation in the domestic market was encountered or mentioned in the course of our research.

[10] This point was confirmed in our interviews with Uchumi suppliers, several of whom did mention, however, that standards were at times misused by individual receiving agents to reject their produce in favour of produce supplied by a broker with whom the agent has an informal business relationship.

capacity to produce FFV of quality; (ii) promoting management practices that lead to quality by specifying which variety farmers should grow, even assisting them to get the right seed quality to grow; (iii) measuring quality directly at the point of delivery; and (iv) sharing price risks with farmers (indirectly) via breakage fees.

Neither Uchumi nor any other supermarket in Kenya has developed its own private food safety standards; nor does Uchumi implement public food safety standards for FFV. Public health and food safety standards exist; there is in fact a Kenya standard Code of Practice for the horticultural industry (derived from the export industry) which deals with hygiene, worker welfare, environmental protection, and so on. However, our interviews with various economic actors indicated that these food safety/process standards are not (or minimally) implemented in practice (limited to, for example, cleanliness inspections of city markets). Nevertheless, Uchumi inspects the farms of key suppliers, *inter alia* to make sure no sewage water is used for irrigation (a practice observed in urban agriculture). This is a guarantee the brokers/wholesale markets cannot provide to their customers.

Another example of how food safety issues begin to come into play is that Uchumi is hesitant to procure from small farmers because they are unlikely to be able to invest in packing sheds (required for hygienic handling of produce). These sheds are not yet required by Uchumi, but before developing long-term relationships Uchumi wants to make sure that the farm has the capacity to grow with them. A third example illustrating the emergence of food safety monitoring at Uchumi is the specification for tomatoes supplied to Uchumi that they should be 'free of chemical residues'. However, detailed food safety process standards for FFV (such as the selection and use of pesticides by

farmers) are not yet employed by Uchumi or any other supermarkets in Kenya, nor are products sample-wise tested for bacterial or pesticide residues. However, Uchumi believes that if it could provide a safety assurance to its customers, it could triple its current FFV sales. These FFV items could likewise be sold under the Uchumi label (already used for the Asian pre-cut vegetable packs supplied by companies like Sunripe which comply with strict EU standards). FFV suppliers who meet high quality and safety standards (similar to those used in the export sector), and who can produce competitively for the domestic market, have substantial market opportunities.

4.2 Nakumatt: A Centralised Procurement System Relying on Procurement Outsourcing through Specialised/Dedicated Wholesalers[11]

Like Uchumi, Nakumatt built (and started using) a new DC in 2003. Unlike Uchumi, however, the retailer has no plans for moving produce through it, as it continues to rely on specialised wholesalers, who *de facto* represent FFV distribution centres. This use of specialised wholesalers is driven by two factors. First, Nakumatt started selling FFV with some reservations at first (in 2001, four years after Uchumi) when it had only seven branches, which implied that volumes were too small to warrant an in-house procurement system. Second, Nakumatt employs a strategy of outsourcing certain product lines (e.g., clothing, furniture, books, bakery and FFV; about 30% of its sales), while it focuses on its core competence, namely, building up a strong retail brand. Firms to which such activities are outsourced operate on a consignment basis: (i) they manage the store space

6 The information for Nakumatt's procurement system is mostly based on interviews with Mr Abdul Sidi (Managing Director) and Mr Rayhon Aswani (Assistant Manager) of Mugoya Vegetable Shop, Mr Mahesh (Manager) of Fresh 'n Juici, and first-hand observations by the authors, interviews with branch managers and the authors' national survey.

Nakumatt is willing to dedicate to the product category (e.g., the FFV section), retaining ownership of the stock; (ii) their product is sold by Nakumatt, which acts as their mercantile agent; and (iii) they are paid the sales revenue minus a commission (an agreed percentage of sales) by Nakumatt. In the case of FFV, this commission is currently 20% of sales and covers the use of the space (rent, water, electricity, etc.), access to the customer base, sales activities and a profit margin for Nakumatt supermarkets.

Nakumatt's specialized wholesalers are Mugoya Vegetable Shop, in November 2003 replaced by Fresh 'n Juici Ltd, for the Nairobi and Kisumu branches and Shree Ganesh for the two Mombasa branches. The need for two wholesalers is a direct result of the absence of cold chains in the domestic marketing of FFV. While transportation at night through the higher (and cooler) sections of western Kenya towards Kisumu is feasible in terms of preserving produce freshness, this is less the case when transporting to the more distant, hotter and more humid Mombasa region.

Mugoya and Shree Ganesh are greengrocers which over the years have built up a portfolio of institutional customers (schools, hotels, restaurants, government organizations, and so on) whom they supply directly. Mugoya, for example, has about 80 of such institutional customers. Catering to such a heterogeneous group, who need daily supplies in small volumes of a wide variety of fruits and vegetables, had given these wholesalers the capacities Nakumatt was looking for in 2001 when it wanted to sell FFV in its stores. However, by 2003, Mugoya and Nakumatt were no longer satisfied with their relationship. Mugoya felt that too much of its resources was going into supplying Nakumatt (relative to the revenues) at the expense of its relationships with its institutional customers. (Between 2001 and 2003, Nakumatt's share in Mugoya's sales grew from 0%

to 40%, with most of the remainder going to institutional customers; a small percentage was sold through its own shop and to Tusker, Nakumatt's strategic partner.) Nakumatt, on the other hand, wanted a faster growth of the FFV section as well as a higher commission. In November 2003, both parties separated amicably and Mugoya was replaced by Fresh 'n Juici Ltd, a wholly-owned subsidiary of Nakumatt Holdings, set up in 2003 as a dedicated supplier of fruits and vegetables to Nakumatt supermarkets (this is similar to Freshmark for Shoprite in South Africa, see Weatherspoon and Reardon, 2003). Like the latter, it benefits from its embeddedness in the Nakumatt network which offers enhanced access to financial, human and physical capital. The remainder of this analysis of Nakumatt's FFV procurement system will focus on its two (successive) Nairobi-based wholesale suppliers, Mugoya and Fresh 'n Juici, allowing us to track its evolution over time.

Mugoya's procurement system differs from Uchumi's in two main areas: (i) it has a stronger reliance on supplies from smallholder producers; and (ii) it has a broad-ranging set of in-house value-adding activities (from sorting to fresh-cut packs). Table 5 provides some detail on their supplier composition.

As Table 5 indicates, Mugoya, which has about 400 suppliers, purchases 60% of its fruits and 70% of its vegetables from small producers. Although most of these suppliers are located near Nairobi, Mugoya tries to reduce its supply risk by having suppliers from different regions. This heavy reliance on smallholders is a part of a broader structure which, aside from the fact that farmers supply directly to Mugoya's central facility in Nairobi, is not very different from the traditional system.

Table 5: Nakumatt/Mugoya's FFV Supply Composition by Supplier Type, 2003 (%)

Type of Supplier	Vegetables	Fruits
Small farms	70	60
Medium-sized farms	10	5
Large farms and plantations	5	5
Traditional brokers/wholesalers	14	20
Imports	1	10

Source: author's interviews with Mr. Sidi and Mr. Aswani, Mugoya Vegetable shop.

Relationships between Mugoya and its suppliers are not generally geared to the long term. Some farmers supply irregularly (in some cases only once or twice in a season) and just pass by Mugoya's facility at that time. Others have ongoing orders (e.g., 10 tons of cabbage a week) for which prices and volumes are adjusted on a weekly basis. Changes in orders are given during a previous delivery or are called-out. These orders are mostly given to a group of 35-40 larger producers (i.e., producers with 5-10 acres or more) or small-scale farmers who act as part-time brokers and bulk produce from neighboring farms. For example, there are 3-4 small-scale suppliers for cabbages, with some dropping out from time to time. No written contracts are used, partly because, according to Mugoya, they are too risky since farmers cannot guarantee volumes or do not stick to contracts, while Mugoya cannot guarantee prices. Within this context, these small-scale farmers, while mostly regular suppliers known to Mugoya, are not listed in a preferred suppliers list. Traceability is not an issue at this time.

Quality standards (as in written product specifications) are not used and products are not necessarily washed or sorted before delivery. Mugoya buys (in principle) everything farmers supply, as long as a price can be agreed. It can afford to buy FFV of a range of quality levels because it does its own sorting and has a range of customers with varying quality preferences. The best quality went to Nakumatt's FFV section because

this is where (mostly high-income) customers base their buying decision in part on how fresh and good the product looks. Poorer quality goes into its own processing and to the kitchens of its institutional buyers (who process part of the FFV). Mugoya is also responsible for taking back produce which is no longer fresh enough for display in Nakumatt's FFV section (in the consignment system it retains ownership of the produce until it is bought by a consumer) but does not charge the cost to the farmers. Quality permitting, some of the produce taken back can also be supplied to institutional buyers at reduced prices (in order to avoid a total loss). Although the firm has cold storage, this is used to store imported fruits, overnight storage of left-over produce and internally processed FFV, but not as part of a cold-chain structure. Farmers are paid cash-on-delivery at prices which follow wholesale markets very closely. While this system is less demanding for suppliers than Uchumi's and hence allows a greater participation by smallholders, it also offers fewer opportunities for growth and therefore fewer dynamics.

Medium-sized and large farmers (15% of vegetables and 10% of fruits) are important as they provide a dependable regularity in the supply of key items (e.g., kale, pineapples). These are also the farmers who are listed more formally as suppliers. Brokers (14% of vegetables and 20% of fruits) are only used in the case of shortages from regular suppliers (mango supplies, for example, depend on brokers during a few months in the year when supplies are low). Imports (1% of vegetables and 10% of fruits) are less important than for Uchumi, but are of a similar composition (pineapples, bananas and ginger from Uganda, apples, pears, plums, peaches, grapes, oranges, bell peppers from South Africa, Egypt, Israel or Holland, garlic from China, onions, oranges and tomatoes from Tanzania).

Mugoya, which has 150 employees, does all its value-adding in-house in its own centralized facility. It washes, cleans, grades and sorts the produce, ripens bananas, and pre-packs fruits (e.g., apples, oranges) and vegetables (e.g., onions, potatoes). It also does some primary processing, for example making pre-cut vegetable packs for supermarket shelves (e.g., stir-fry, snow peas, French beans, baby corn), potato chips/fries for the institutional customers, and fruit juices. In order to meet customer expectations with regard to hygiene during processing, Mugoya is in the process of obtaining HACCP certification (postponed momentarily because it contemplates moving to a new, larger facility). This processing capacity implies that, from its single facility, Mugoya can supply a supermarket like Nakumatt with all the product variety it needs to stock a fully-fledged FFV section.

When Fresh 'n Juici took over from Mugoya in 2003, its procurement system started off from a similar structure, and about half of Mugoya's suppliers shifted to it (at least for part of their supplies). It also produces all the processed vegetable packs it sells in Nakumatt supermarkets in-house. Like Mugoya, no contracts are used and quality compliance is limited to a visual inspection of the produce at the point of delivery. All supplies are delivered at Fresh 'n Juici's central facility in Nairobi, except for the (more perishable) leafy green vegetables which are delivered direct by farmers to the stores. The company has a cold storage facility and uses it in the same fashion as Mugoya.

However, Fresh 'n Juici has made some strategic changes. First, while it did get most of its current 150 suppliers from Mugoya, it did not inherit the latter's large smallholder supplier base. From our interview with Mr. Mahesh, Manager of Fresh 'n Juici, we learned that smallholders have all but disappeared as fruit suppliers and make

up only about 20% of vegetable supplies, the main reason being, according to Mr. Mahesh, that they cannot manage the quality and volume requirements demanded. For kale, for example, Fresh 'n Juici wants suppliers who can supply at least 300kg twice a week. Examples of FFV items where smallholders are still involved are yellow passion fruits, greens, traditional African vegetables and herbs. Smallholder producers are replaced by large farms and imports with respect to fruits and by medium-sized farmers for vegetables. Both in importance and function, brokers remain in a similar role to that they had at Mugoya, i.e., they represent about 10% of supplies and are mainly used to deal with shortages. In terms of supplier composition, the shift from Mugoya to Fresh 'n Juici implies a convergence of the development paths of Uchumi's and Nakumatt's FFV procurement systems, at least in terms of the relative importance in the supplied FFV volume of the different types of suppliers .

Second, Fresh 'n Juici also shifted to a low margin-high turnover strategy. Suppliers, still paid cash-on-delivery, received higher prices than they got under Mugoya (i.e. close to the prices in the traditional market), while consumer prices in Nakumatt's stores were reduced. Our price survey, for example, indicated that where as Nakumatt's prices for a selection of FFV items/stores were on average 17% higher than Uchumi's in November 2003, they were only 7% higher in April 2004. Taking a new price promotion into account, whereby consumers using Nakumatt's SmartCard (a customer loyalty card) get an additional 5% discount on FFV, the price difference almost disappears.

Third, its nature as a dedicated supplier to Nakumatt also facilitated a heavier involvement of management on the sales floor. In combination with a substantial investment in extensive personnel training (Fresh 'n Juici has 120 employees), this

increased attention led to a more attractive presentation of the FFV section. While it is mainly a dedicated Nakumatt (and Tusker) supplier, Fresh 'n Juici may well expand over time to include institutional buyers as well (thus also reducing its losses due to breakages). It has been given the objective (by the Nakumatt Holding group) of raising FFV sales at Nakumatt from the Ksh8m. per month under Mugoya in 2003 to Ksh50m. per month within 3 years. By April 2003 (only five months after it took over), Fresh 'n Juici was already well under way to reaching its objective as sales had doubled to Ksh16m. per month.

5. Implications for Development Policies and Programs

5.1 Importance as a Demand-Side Base for Agricultural Diversification

Supermarkets were a tiny niche in Kenya only a decade ago, but due to their 18% a year growth rate since 1995 continuously removing market share from traditional retailers along the way, they now have 20% of urban food retail. In a few years the urban population share will pass 50% (it stands at 40% today, from 15% in the 1970s), and at current growth rates supermarkets will be among the key gatekeepers to Kenyan dynamic urban markets in 5-10 years. This makes them increasingly important subjects of development policy attention for government and donors focused on helping Kenyan smallholders access dynamic urban markets and diversify their agriculture into higher-valued products.

Driven by demand-side reasons (consumers are shifting from traditional retailers to supermarkets), it is likely that the supermarket sector will continue to grow in Kenya and to displace traditional retailers – that is, following the international pattern. As the chains grow, they are more able to implement the kinds of procurement system changes discussed in this essay, which in turn drives down their costs so that they can charge lower prices and undermine traditional competitors, and so further expand – a virtuous cycle for them. There is already evidence that this pays off for them and for the urban consumers; Essay 2 shows that supermarkets charge on average 5% lower prices (compared with small shops) for processed foods, and although their prices are higher for most fruits and vegetables, for key 'poor consumers' foods' such as spinach, the largest chains already have prices at or lower than open markets for products of similar quality.

We posit that the above-described process of supermarket development is the start of an ascending competitiveness vis-à-vis traditional retailers of fresh foods, as has been seen in other developing countries for the same reasons. While Kenyan supermarkets have moved quickly into staples and processed food markets (such as for flour and edible oils and snacks), they have only begun to make inroads into the FFV market. This follows an international pattern. FFV are an important market for the promotion of agricultural diversification for small farmers, as the production of FFV is relatively free of economies of scale, at least with respect to land size (although the production and post-harvest processes are often demanding of various forms of capital, including human, organizational, and physical capital). Despite Kenyan supermarkets having only just started merchandising FFV, the volumes they handle, and the amount they procure from Kenyan farmers, are rapidly approaching the importance of the export market (handling

35,000 tons versus 67,000 tons exported). Moreover, the lead chains are increasing their FFV sales quickly, and working costs out of and quality into their procurement systems.

5.2 Challenges to Supermarket Procurement Systems in Kenya

The front-runner chains (in a concentrated supermarket sector) are moving towards a procurement system converging to the system developing elsewhere in developing regions (Reardon et al., 2003), including centralisation of procurement and shifts from traditional brokers to specialised/dedicated wholesalers, and from spot markets to use of preferred supplier systems, and to use of private quality standards with (barely) incipient use of private safety standards. These shifts have meant, already in this early stage of supermarket development in Kenya, that supplies come mainly directly from large and medium-sized farmers and somewhat from small farmers, and to a moderate but decreasing extent from brokers who, in turn, are supplied mainly by small farmers. These patterns and trends are driven by competition and a need for chains to reduce costs and enhance quality and consistency.

Over the next half decade, issues will probably arise with respect to supermarkets continuing to source mostly from large and medium producers producing for the domestic and export markets. As supermarket procurement volumes grow substantially, that system will be strained, and there will be a natural need to extend the grower base locally – or to import more.

On the one hand, there may be few obstacles to sourcing much more from Kenyan large/medium farmers in the short to medium term. These farmers are indeed switching

from traditional to supermarket channels, but they are also increasing their overall production, including production for supermarkets – so one could argue that they will be able to handle increased sales to supermarkets in the future (essay 3). Moreover, in other countries, such as Costa Rica, China, Chile and Mexico, we have seen medium/large farmers who were focused solely on exports turn in recent years to being major, and increasing, suppliers to local supermarkets as the profitability of such sales, and the capacity of the supermarket procurement system, have grown. Some of this growth in Kenya will, of course, come through commercial outgrower schemes which in general engage small growers. In fact, in places like Mexico much of the small farmers' involvement in the supermarket channels has been via grower/shippers who have their own production as well as outgrower schemes with small growers; they select top grade for export, top-second grade for supermarket channels, and the rest goes to the wholesale market. This seems a likely scenario over time for supply expansion to Kenyan supermarkets as medium and large growers need to expand volumes beyond their own-production capacity.

On the other hand, supermarkets can increase their produce volumes by drawing on imports, creating intra- and extra-regional trade. Note that Kenyan supermarkets (and the traditional sector brokers) are already selling cheap produce from the East Africa region and even cheaper produce from China, such as garlic. What is to prevent Kenyan supermarkets to increase sourcing cheap produce directly from Tanzania or Uganda in the region or from more distant, but very price-competitive suppliers in India or China? Kenya's leading supermarket chain (largely government-owned Uchumi) has always stuck to its policy of sourcing at least 85% of what is sells from Kenyan suppliers (Daily

Nation 2004), but can it afford to continue to do so in the increasingly competitive supermarket environment? Government policy, such as regional trade policy, will also affect the extent to which supermarkets will be able to expand produce supply from external sources or will have to rely on local producers. From a policy viewpoint, the issues are mixed. The Tanzanian government reacted to Shoprite importing cheap tomatoes by imposing protection at the behest of local producers. In contrast, Uchumi indicated a willingness to source Ugandan produce to send to Kenya as part of its entry into Uganda. And Uchumi sends Kenyan produce into its Ugandan stores. The supermarket chains will be motors of trade in the region, and the debate about the pros and cons of protection and regional trade liberalization will be magnified as the chains spread.

5.3 Impending Challenges to Smallholders

The above means that small farmers are only one of several options for supermarkets to turn to as their growth strains current procurement systems and sources. And it means that supermarkets may join policy and other market-institutional changes in Kenya as key motors in transforming the food markets facing small farmers.

The squeeze on small producers, as it is manifesting itself, comes through supermarkets' reduced reliance on brokers, who source much of their stocks from smallholder producers. Smallholders are thus squeezed out as indirect suppliers via brokers to supermarkets, but smallholder supplies can replace the large farmer supplies diverted in the traditional system. Hence, at this initial stage of supermarket development

in Kenya, the rise of supermarkets is not yet excluding small farmers from supplying the market, but is rather reducing the presence of their large/medium competitors from the traditional system, opening up an opportunity for them in the traditional system to a large extent, and in the supermarket market channel to a limited/modest extent at least as long as supermarkets can keep up their 18% annual growth, while sourcing mainly from larger/medium commercial farmers.

However, looking to the next 5-10 years, there are several impending challenges and opportunities that will face small farmers as the supermarket sector develops, and policy-makers and development programs should observe the situation closely in order to help farmers adapt to it.

(i) As supermarkets increase their share in urban markets and the traditional retail market concomitantly shrinks, small farmers, if they want to sell to urban markets, will increasingly have to sell to supermarkets or the surviving non-supermarket urban food market that is competing with them. The latter competition may take the form, as elsewhere in the world today, of small shops aggregating to form procurement clubs, or open air or covered markets improving quality and hygienic standards. All this means that the market requirements facing small farmers will follow an upward trend, whether directly or indirectly caused by the retail transformation.

This does not mean that small farmers should be aiming at shifting from other buyers to only selling to supermarkets, even if they are able to do so. It is clear that, with the combined vicissitudes of any given retail company (such as the trade press currently reports for Uchumi; Wachira 2004) as a client for a farmer, and the stiff requirements of participating in the supermarket channel, it behooves a farmer to manage risk, seek

market options for the various grades of his/her product, and sell to a portfolio of market channels, including exports, supermarkets, and wholesale markets, not to mention keeping the rural market option.

(ii) Much of the direct sourcing from small farmers by the major chains is done at present in the 'up-country' stores that are not – yet – well connected to nationwide or regional sourcing systems. The development of efficient transport, distribution centers, and cold chains will, in Kenya as elsewhere, make it easier for the chains to source from all zones of the country. Thus, current small-farmer suppliers for up-country stores will increasingly have to compete with medium/large farmers, and competitive small farmers, throughout Kenya for a number of product markets that were formerly *de facto* protected by high transaction costs for the chain, but will soon not be. International procurement from a number of countries will extend this competitive pressure on the local small farmer competing with Chinese or Tanzanian farmers in the procurement arena.

(iii) A critical issue is the extent to which small farmers themselves will make the requisite investments (in risk management, product diversification, value added, and marketing expansion) to take advantage of the important opportunities provided by the supermarkets. Much will depend on the terms and conditions they face from the buyers (the chains or their dedicated wholesalers), such as contracts that reduce risk, limited payment periods to cut the financial burden, and so on. We have seen in other countries that small farmers, on the margin of profitability and with few if any cash reserves, are sensitive to these conditions, which are, of course, also the subject of government regulation and/or private sector commercial codes in Europe, the United States and parts now of Latin America and Asia. Much will also depend on whether governments, NGOs,

and donors build up the capacity of small farmers, in particular in groups, to sell to this channel (in particular, the vector of capital needed to meet the market requirements of the supermarket channel, including physical, organizational, social, and human capital). This essay is limited in its scope to data from retailers and wholesalers, but essay 3 presents detailed data on grower decisions to participate in the supermarket vs. traditional market channel, and their relative costs and benefits, shedding further light on these emerging issues of grower participation.

5.4 Implications for Development Programmes and Policy

Given the impending challenges quite probably just around the corner, the next few years provide the crucial window through which government, NGO, and donor programmes can help to upgrade the upper tier of small farmers to be able to position themselves as suppliers to this dynamic urban market. The changes in the procurement systems discussed above (of supermarkets, and probably also of other urban retailers competing with them) suggest that this upgrading will need to be diverted towards increases in quality, consistency, volume, new commercial practices, and use of new technologies.

We have briefly shown that it is possible for small farmers to participate (such as the case of small farmers selling greens to Uchumi), and we believe that these experiences can and must be replicated and scaled up. This is now done mainly through traditional intermediaries who aggregate product over many small farmers and has the advantage of overcoming the volume and transaction-costs problems facing individual small farmers selling to supermarkets, but has the disadvantage of relying on a declining

market (the traditional broker) and forgoing the margin. Two other options are attractive: working for a grower/shipper (supplying local supermarkets) in an outgrower scheme under contract, or supplying directly via an association bulking, grading, packing and shipping product from its members. Development programs and policy-makers can do several things to help farmers take, and prosper in, these paths.

First, governments, NGOs, and donors can facilitate small farmers' access to three key elements in order to have the capacity to supply the supermarket channel: (i) market information identifying the buyer and its requirements, and establishing a market relationship such as having an implicit or explicit contract from the supermarket or the specialized wholesaler, i.e., being on the list; (ii) viable organization/association to reduce co-ordination costs and enforce delivery from members; and (iii) the requisite physical investments (say in equipment) and managerial improvements to meet the specific product and transaction standards required by the supermarket chain. A program that aims to assist a farmer to sell to supermarkets (or outgrower schemes or wholesalers) by providing one of these but not the others will not work; for example, association-building is necessary but not sufficient. Berdegué (2001) illustrates this point with examples of successes and failures of small farmer organizations in Chile. Moreover, these elements can be mutually reinforcing, for example where having a contract (being on the preferred suppliers' list) acts as a substitute for collateral, inducing a bank to make a loan to a small farmers' group for the purchase of equipment (an example from Croatia is given in Dries et al., 2004).

Second, governments, NGOs, and donors can facilitate tri- or quadri-partite relationships that facilitate smaller farmer participation. An example can be found in

Indonesia, where there is a combination of a small farmer organization (Makar Buah), a supermarket chain (Carrefour), a seed/chemical company (Syngenta), a government extension program, and a specialized/dedicated wholesaler (Bimandiri), in a fruitful combination to market melons (Reardon, 2004). Carrefour supplies the guaranteed market, Syngenta the financing, and the wholesaler the intermediation and co-ordination. This kind of combination can also be accomplished through a donor development project, such as the USAID/Michigan State University Partnerships in Food Industry Development – Fruits and Vegetables project (PFID-F&V) in Nicaragua, where a US university facilitates the market connections for small farmer organizations with the local supermarket chains, NGOs such as Technoserve provide technical assistance, supermarket chains such as CSU and La Colonia provide the guaranteed market, and donor funds from USAID provide the financing. The project has a graduation policy whereby the small farmer-organizations progressively take over the needed investments and then maintain the market link themselves (Weatherspoon and Membreño, 2004).

Third, assistance programs focused on agricultural diversification can help small farmers with the necessary training and equipment, such as transport and cold chains, to produce those perishables for which these farmers are likely to be competitive in the supermarket market-channel. This assistance should be carried out in a way that walks the tightrope between alleviating poverty as much as possible, and inducing distortions in market or investment incentives. We have seen above that these products are mainly the highly perishable products such as leafy greens (e.g., traditional African vegetables) in which a correctly equipped smallholder can have an advantage. Assistance programs are likely to find further promising new market opportunities amongst the wide set of

produce items for which supermarkets are eager to shift away from the current traditional brokers to more direct supplies by farmers (e.g., potatoes, carrots). In some cases this will imply producers from different regions to cooperate with each other in order to address the year-round delivery requirement of supermarkets currently resolved by brokers (e.g., for mangoes). By contrast, we expect rapidly increasing cost and quality competition for small farmers competing in this channel in bulk products such as bananas and tomatoes. These can be large-volume profitable enterprises, but the programs should be aware of the competitiveness bar that will steadily be raised.

ESSAY 2

SUPERMARKETS AND CONSUMERS IN AFRICA: THE CASE OF NAIROBI

1. Introduction

Over the past decade, supermarkets have emerged as important agents of change in the agri-food systems of developing countries (Reardon et al. 2003); for example the share of supermarkets in domestic retail rose roughly from 15% to 55% on average in Latin America from 1990 to 2002 (Reardon and Berdegue 2002). This emergence could only have taken place in the context of changing behavior of consumers who, in liberalized markets, ultimately decide which retail firms and what products succeed. If the appeal of supermarkets were limited to the higher income segments of the population, little change in retail structures would have been noticed. As we show in this essay for the case of Nairobi, the appeal of supermarkets is much wider with the majority of consumers, not just the rich, changing their shopping behavior both in response to and driving the growth of supermarkets.

Agri-food firms, whether domestic or foreign, who want to sell their products in the emerging markets created by the rise of supermarkets need a good understanding of the dynamic relationship between the consumer and the supermarket. Not withstanding this importance, few studies have analyzed the role of consumers in the rise of supermarkets in emergent markets in detail. Some recent important exceptions include Zhang (2002) for China, Al-Mazrooei et al. (2001) for Oman and Rodriguez (2002) for Argentina. Although supermarkets are also on the rise in Africa in general

(Weatherspoon and Reardon 2003), and in Kenya in particular (Essay 1), there have been no such consumer studies in this region.

By analyzing consumers and supermarkets in the Nairobi food market, we address this gap in the literature. This exploratory study aims at shedding light, from the consumer perspective, on the positive feedback loop between consumers giving their dollar vote to supermarkets and supermarkets using it to create more value for consumers. More specifically this research analyses the following research questions: (1) which attributes of retail outlets and the products they sell are important to consumers when deciding where to buy their food?; and (2) which socio-economic and demographic factors affect retail outlet choice and shopping frequency? We focus on food in general as well as on fresh fruits and vegetables (FFV). The latter allows us to assess if consumer behavior is different between the dry foods and fresh foods categories as food perishability is likely an important factor in a country like Kenya where few households have refrigeration.

The essay proceeds as follows. The next section describes the data and methods used in this study. Section 3 describes the rise of supermarkets in Kenya in a broader context. Section 4 then analyses the patterns and determinants of consumer behavior with respect to retail outlet choice and shopping frequency. Section 5 provides the conclusion and implications.

2. Data and Methods

This consumer study is part of a broader study on the rise of supermarkets in Kenya which included primary data collection during a 10-month fieldwork period (March to November 2003, April 2004). The consumer study had two parts.

The first part in the consumer study consisted of consumer focus group research. Eight focus group sessions were conducted in Nairobi. These included four all-female and four all-male sessions with a total of 54 participants from all income categories. Following standard guidelines for focus group research (see e.g., Churchill 1999), we controlled each session for gender and income class so that within a specific session participants were similar in those two respects and they would feel at ease communicating in the group. These focus groups allowed us to get familiar with nature of and the main motivations behind the shopping behavior of Nairobi's citizens with respect to food in general and fresh fruits and vegetables in particular. It also allowed us to understand the vocabulary used by consumers to describe their shopping behavior, thus further facilitating a good design of the survey instrument.

The second part consisted of a consumer survey. The designed survey instrument focused on two sets of comparable questions, one for food and one for FFV. These question sets related to retail outlet choice, shopping frequency, expenditure levels and reasons for retail outlet choice. A set of socio-economic questions were included to obtain the independent variable values. This instrument went through several pre-tests and revisions before a final format was decided upon.

In order to get a good geographic and income-class representation, a stepwise sampling process was implemented. Within each of Nairobi's eight administrative divisions (used as sub-population strata), we selected (within the context of the stratum) the lowest, a middle- and the highest income location. This selection was based on the poverty gap for the location (CBS 2003). The poverty gap measures how much those who are under the poverty line are, on average, below the poverty line. For each selected location, we then conducted a field reconnaissance with the assistance of the location Head (Chief) and composed a list of the estates (i.e., residential neighborhoods demarcated by a high degree of internal socio-demographic similarity). From this list we then made a random selection of 24 estates. Enumerators were assigned a street (usually the main street) in an estate to start from and were free to select a (any) dwelling in the street as the starting point. Subsequent interviews then took place at each 3rd house until a pre-determined number of interviews, relative to the population size of the location, was attained. A similar sampling design was used by Zhang (2002) in China. If a household refused to collaborate or was not home, it was skipped. In order to minimize this replacement method leading to a bias against small households (where all family members work during the day on weekdays), interviews were conducted in the weekend.

A total of 445 valid interviews were conducted in the interviewees' homes during November 2003 by a team of 18 business students from Kenyatta University. Enumerators worked in several rounds of data gathering so that their work could be checked and they could be re-instructed were needed as the survey progressed. Response rates were high, except in the high income estates where enumerators indicated that it was very difficult to get admitted by the house-guards to households. (Zhang (2002)

made a similar observation.) This led to an under-representation of the high income households in our sample. In order to correct for this, weights were used where the analysis below describes the population as a whole. These weights are based on a distribution of Nairobi's population over different income-classes estimated from various sources (World Bank 2004, CBS 2002a, Obudho 1997).

3. Supermarkets, Population Dynamics and the Urban Food Market in Kenya

It is important to first give the definition of a supermarket we used in this study as this definition varies from country to country. The terms "self-service store" and "supermarket" are used interchangeably in Kenya, irrespective of their size, as both have exploded on the retail scene together. Furthermore, supermarket chains have developed different store formats to reach different customer segments. Hypermarkets with large parking areas along the main entry/exit roads in Nairobi and Mombasa mostly attract the high and middle-income consumers. Smaller 'neighborhood' stores in Nairobi's residential areas ('estates') mostly target middle-income consumers. City center stores near busy bus stages mostly attract the middle to low income consumers. Based on the Kenya branch of the international retail auditor AC Nielsen, supermarkets are here defined as "self-service stores handling predominantly food and drug fast moving consumer goods (FMCG) with at least 150m^2 (1,625 sq.ft) of floor space". We defined supermarkets of 15 times this size as hypermarkets (i.e., 2,250m^2 or 24,460 sq.ft). Using these definitions, there are about 209 supermarkets and 16 hypermarkets in Kenya.

At the same time, an estimated 900 to 1,400 smaller self-service shops have entered the retail sector. These shops include mini-supermarkets in smaller towns as well as convenience stores in residential areas and at gas stations. In small towns, the emergence of these mini-supermarkets is just as radical a departure from the traditional shopping experience of consumers as hypermarkets are to consumers in Nairobi. Although this implies that small self-service shops are an important part of the retail revolution taking place in developing countries, this essay focuses on the 225 supermarkets meeting the size criteria above (essay 1).

In 2003, supermarkets sold US$520 million worth of products of which US$365 million in food – or roughly 20% of the US$1.9 billion urban food market in Kenya (essay 1). The rest of the urban food market consists of smaller self-service shops which represent 17% of the urban food market, while the remaining 63% of sales comes from traditional retailers. Since 1995, supermarkets (in terms of their aggregated sales) have been growing at an average annual growth rate of 18%, i.e., much faster than aggregated urban income. Consequently supermarkets are increasing their market share vis-à-vis traditional food retailers such as kiosks, greengrocers, over-the-counter shops, market stalls and street hawkers and at current growth rates, supermarkets will become the dominant food retailers by 2011.

The rapid growth of the urban population, due to both overall population growth and urbanization, has been a key driver of the growth of supermarkets since their emergence in the 1960s[12]. Supermarkets are located in urban areas only in Kenya, hence

[12] The urban population is here defined as all people living in urban centers of 10,000 or larger. Based on the 1999 population census (CBS 2002b) and UN growth projections (UN Habitat 2004, UN Population Division 2003) we estimate the urban population in 2002 at 11.9 million or 37% of the overall population.

our focus on urban consumers. Between 1989 and 2002, Kenya's population has grown from 21 million to 33 million and is expected to reach 42 million by 2010 (Mungai et al. 2000). In addition, the average urban population growth rate is double that of the overall population growth rate (United Nations, 2002). In 2003, nearly 40% of Kenya's population and half Kenya's households (given smaller household sizes in cities) already lived in urban centers and the rural population, in absolute numbers, has started to decrease. Given currently anticipated growth rates, the urban population is expected to surpass the rural population by 2013. Although the overwhelming majority of the people migrating to and living in Kenya's urban areas are poor, their aggregated demand constitutes the effective demand modern supermarkets, with their low margin - high stock turnover strategy, can thrive on (Pralahad and Hammond 2002).

The effect of urbanization is amplified by a related change in life-style. Relative to rural households, urban households have less time to shop for food and prepare meals (e.g., because of women working out of the home or men working a migrant labor to provide for their rural family), have higher incomes and are more mobile. At the same time, on-going market and trade liberalization since the mid-1990s increased product variety in the Kenyan market place dramatically and induced a shift from a supplier to a consumer-driven economy. Increasingly, supermarkets, with their broader assortment provided an alternative for traditional retail outlets with limited assortments. The urban population also consists overwhelmingly out of young adults (43% are aged between 15 and 34, CBS2002a) who have embraced a westernized life-style in which supermarkets are the retailer of choice.

Fresh fruits and vegetables (FFV) is a fairly new and, given the high perishability, far more difficult to manage product category for supermarkets in Kenya. Nevertheless, FFV hold great potential for supermarkets looking for growth opportunities because they are an important part of the diet of urban consumers in Kenya who (for vegetables) consume twice the volume of rural consumers (i.e., an estimated annual per capita consumption of 40kg; GoK 1994) and, as they generally have less time and land to produce their own fruits and vegetables, spend 7% of their income on buying fruits and vegetables from urban retailers (CBS 2002a). Although the supermarkets only had a 4% share of the US$364 million urban FFV market in 2003 (that share is 6% in Nairobi), on-going changes in their procurement system in combination with changing consumer habits are expected to increase that share substantially over time (essay 1). While selling fresh fruits and vegetables in supermarkets in not a rarity, given that overall four out of ten supermarkets sell them to various degrees, it is very much concentrated in the Nairobi hypermarkets of two leading supermarket chains. Produce sections in these hypermarkets (which attract the high-income consumers) can take up 7% of the store's sales floor space and offer over 300 stock keeping units (SKUs) from American pink sweet potatoes to zebra yellow melons (although only 100 or so are available at any given time)[13].

Kenya's supermarket sector has three tiers (essay 1). The first tier consists of the two clear market leaders and also the leading produce retailers, Uchumi Supermarkets and Nakumatt. These two supermarket chains represent nearly 50% of the supermarket sector in terms of sales. While Uchumi targets consumers from all socio-economic classes, Nakumatt's consumer focus has been mostly on the high-income segment (50%

[13] For comparison, fresh produce sections in US supermarket chains have on average 634 SKUs (Perosio et al. 2001).

of their customers fall in this category). The second tier consists of the Tusker, Ukwala and Metro Cash 'n Carry chains. These three chains are fiercely competing for the shilling vote of the middle-to-low-income urban consumers. The Top 5 supermarket chains represent 28% of stores and 60% of the sales, indicating a concentrated sector. The supermarkets in the third tier exist of small chains and independent (single-store) supermarkets.

In terms of geographic spread, supermarkets have expanded rapidly although the consensus in the sector is that there still remains much room for growth. In 2003, nearly 60% of the supermarket outlets (and 44% of the supermarket sales) were located outside of Nairobi and essentially every provincial capital in Kenya had one or more supermarkets. However, the top five chains are present in only eight urban centers and only about half the urban centers with a population of more than 25,000 have a supermarket. The country-level supermarket density of 7 supermarkets per million people is still far below that of countries with similar incomes and urbanization rates (such as Central America with double the rate).

The Nairobi food market is an interesting case for several reasons. With a city population of about 2.6 million, it is the largest city in East Africa (and the 12th largest in Africa). Its population is growing fast, with a recent study predicting that (mainly through rural-to-urban migration) Nairobi's population will grow to 7.5 million over the next 20 years, i.e. an increase of almost 700 additional inhabitants every single day (African Population and Health Research Centre 2003). Nairobi also leads the rest of the country in several other aspects: (1) Nairobi still accounts for majority (56%) of supermarket sales; (2) in terms of store density, Nairobi is clearly in the lead with 36 supermarkets per

million, nearly triple the level of the rest of urban Kenya (comparable to a Central American city, Berdegue et al. 2004); (3) the FFV market share of supermarkets is also the highest in Nairobi (at 6%).

4. Empirical Results and Discussion

4.1 Supermarket Customers and Household Income

Table 6 reports results from the Nairobi consumer survey. In Nairobi, 80% of households buy part of their food from supermarkets on a regular basis, i.e., at least once a month (Table 6). That figure is 60% for the lowest income-group. Households with monthly incomes of less than Ksh15,000 make up 56% of the customers in supermarkets and 36% of their sales. Table 6 also illustrates why the upper-middle and high income classes are a key battleground for the leading chains: although they make up only 15% of the population they represent 44% of the supermarkets' sales. At country level, given the far higher average household income in Nairobi (CBS2002a), low-income consumers are expected to be even more important in terms of the percentage of customers and revenues they represent with regard to supermarkets.

The above findings allow us to estimate the importance of the relatively large high-income Asian Kenyan and Western expatriate segment of the population (about 200,000 in 2003, i.e., 1.7% of the urban population)[14]. While this segment has played an important part in providing a nucleus from which supermarkets have been able to arise

[14] This number is estimated by the author from data on the ethnic distribution of the Kenyan residents (based on the 1999 population census) as received from Corporate Africa (a Nairobi-based financial services firm that also specializes in entrepreneurship education and development, policy analysis and research).

Table 6: The Supermarkets' Customer Base by Income Class in Nairobi, 2003

Income Class	Monthly HH Income	% of the Pop.	# of People in Class	% of Class Shopping in Supermarket	% of Class Buying Fresh Produce in Supermarket	% of HH FFV Expenditure Spend in Supermarket	% of Supermarket Customers from Class	% of Supermarket Sales from Class
Poor	< Ksh5,000	30%	780,000	60%	<1%	<1%	20%	12%
Low	Ksh5-15,000	35%	910,000	85%	15%	5%	36%	24%
Lower Middle	Ksh15-40,000	20%	520,000	93%	15%	5%	22%	20%
Upper Middle	Ksh40-100,000	9%	234,000	93%	30%	15%	11%	19%
High	> Ksh100,000	6%	156,000	>99%	67%	40%	12%	25%
All		**100%**	**2,600,000**	**80%**	**15%**	**6%**	**100%**	**100%**

Note: the self-reported nature of income, the recall-based expenditures, respondents thinking of smaller self-service shops as supermarkets and the low number of observations in the high income category (9) make the data in the table indicative only.

Sources: author's consumer survey; population data are based on the following secondary data sources: CBS2002a, 2002b, 2002c, World Bank 2004, World Gazetteer (2004), UN Population Division (2003), UN Habitat (2004), and UN Statistics Division (2003).

(and these segments are still an important part of the customer base, especially for fresh produce), supermarkets have moved well beyond this segment. In 2003, the Asian and expatriate community, which made up an estimated one third of the upper-middle and high income consumers, represented only 15-20% of supermarket sales.

The Nairobi consumer survey also revealed a sharply different picture with regard to the buying of fresh fruits and vegetables. Only 15% of Nairobi's households get (some of) their FFV from supermarkets. Less then 1% of the households with incomes of less than Ksh5,000 buy fresh produce from supermarkets. Only 15% of the households in the next income-classes (Ksh5,000 to Ksh40,000) buy fresh produce from supermarkets. Because these 15% do not buy all of their fruits and vegetables from the supermarket, only 5% of the total FFV expenditure of households in this income class is spend in supermarkets. Buying FFV from supermarkets becomes more important for the upper-middle and especially the high-income households of which 30% and 67% buy FFV in supermarkets respectively. However, even in the high income class, only 40% of the FFV expenditure goes to supermarkets. In other words, supermarkets do not dominate FFV markets in any income-class at this point in time, although they are getting close with regard to the highest income class.

How can we explain these patterns? Our consumer focus group research in Nairobi's low-income neighborhoods (e.g., Kibera, one of Africa's largest urban slum areas) indicates that most of the residents shop at nearby supermarkets, albeit not so frequent (mostly once a month) and for small values at a time. The low per capita expenditure of low-income consumers is partially off-set by their vast numbers (e.g., Kibera alone has an estimated 800,000 residents). Table 7 ranks the reasons why

consumers in Nairobi buy food from supermarkets or from other retail outlets such as kiosks or over-the-counter shops. Traditional shops hold two key advantages over supermarkets, especially for the poor: (1) they are easy to get to, and (2) they provide credit. Especially the convenient location of kiosks, right next to where consumers live, is important as the majority of consumers (70%) shop from home rather than from work. Nearly 90% of those who shop in traditional shops cite location as a reason to shop at traditional retailers, while for nearly 60% of them it is the number one choice criterion. Credit is an important strategic advantage that traditional shops hold over supermarkets because it implies a long term relationship: kiosks or over-the-counter shops provide credit to their regular customers.

Table 7: Reasons for Retail Outlet Choice in Food by Nairobi Consumers

Reasons to Buy Food from Supermarkets (N=338)			Reasons to Buy Food From Other Retail Outlets (N=335)		
Reason	**% of Customers Ranking it as the No. 1 reason**	**% of Customers indicating it as a reason**	**Reason**	**% of Customers Ranking it as the No. 1 reason**	**% of Customers indicating it is a reason**
Low Prices	58%	81%	Easy to Get To	58%	87%
Large Assortment	23%	64%	Credit Available	17%	49%
Easy to Get To	8%	45%	Low Prices	12%	25%
Product Quality	4%	22%	Friendly Service	2%	12%
Easy to Buy Bulk	3%	23%	Packaging	2%	6%
Other Reason	4%	Na	Other Reason	9%	Na
	100%			**100%**	

Source: author's consumer survey (Nairobi, November 2003).

The two most important incentives for consumers to shop at supermarkets are the lower prices and the large assortment. Table 8 compares prices for a selection of high-turnover processed food items between supermarkets and traditional food retail outlets. Prices in supermarkets are generally lower, albeit with only 3-4% on average. Nevertheless, as in

other countries, low prices are single-most important driver behind the fast consumer acceptance of supermarkets in Kenya, especially amongst the more price-sensitive low-income consumers. From the focus group participants in low-income neighborhoods in Nairobi we further learned that they buy mostly easy-to-store bulk goods such as a 2kg bag of sugar or a rod of soap from the supermarket, while for their smaller volume purchases (e.g., 50gr of loose sugar) they go to kiosks who can sell from bulk bags in any quantity the customer wants (or can afford!).

Table 8: Supermarkets vs. Other Retailers Price Comparison for Processed Foods

Selected Basic Processed Foods							
Item	Price at Super-market (Ksh)	Price at Nearest Trad. Retailer (Ksh)	Price Difference with Nearest Traditional Retailer: All Super-markets	Ukwala	Uchumi	Nakumatt	Tusker
Loose Tea 100gr	31	32	-4.8%	-6.1%	-4.9%	-3.8%	-0.6%
Sugar 2kg	99	104	-4.7%	-9.0%	-6.4%	-3.2%	-3.3%
Maize Flour 2kg	52	54	-3.7%	-5.2%	-2.0%	+0.7%	-0.8%
Oil 1kg	95	97	-2.7%	-4.3%	-2.8%	-4.1%	-1.8%
Wheat Flour 2kg	64	65	-2.5%	-6.3%	+0.3%	-2.9%	+1.6%
Bread 400gr	20	21	-1.9%	-3.9%	-0.8%	-0.1%	-1.0%
All 6 Items	**361**	**373**	**-3.4%**	**-5.8%**	**-2.8%**	**-2.3%**	**-1.0%**

Source: author's national supermarket survey (May-July 2003). Traditional retailers are kiosks or over-the-counter groceries.

In FFV retailing, supermarkets have not penetrated the middle and lower income classes to the same extent as they have for food. Table 9 ranks the reasons why consumers in Nairobi buy FFV from traditional shops or supermarkets. Consumers (especially the poor) continue to buy FFV from traditional retailers (mostly open air markets, kiosks and greengrocers) for three main reasons: (1) price, (2) retailer location, and (3) freshness.

Table 9: Reasons for Retail Outlet Choice in Fresh Produce by Nairobi Consumers

Reasons to Buy Fresh Produce from Supermarkets (N=77)			Reasons to Buy Fresh Produce From Other Retail Outlets (N=397)		
Reason	**% of Customers Ranking it as the No. 1 reason**	**% of Customers indicating it as a reason**	**Reason**	**% of Customers Ranking it as the No. 1 reason**	**% of Customers indicating it is a reason**
Freshness	27%	44%	Low price	38%	58%
Quality	18%	31%	Location	29%	57%
Assortment	17%	35%	Freshness	17%	51%
Low price	12%	31%	Assortment	6%	20%
Location	9%	24%	Friendly Service	3%	14%
Other	17%	Na	Other	7%	Na
	100%			**100%**	

Source: author's consumer survey (Nairobi, November 2003).

Unlike for dry foods, prices for FFV are generally higher in supermarkets because (1) the produce items have a higher value-added (e.g., they are washed, sorted by size and/or quality grade, and so on) and (2) supermarkets apply a higher mark-up to their purchase price in part to cover higher overhead costs relative to traditional retailers (e.g., facility rental costs). For a selection produce items, table 10 compares the price at the supermarket with those at traditional FFV retail outlets. These price comparisons have an important limitation as they do not take differences in quality into account (the quality being generally more consistently higher at supermarkets and greengrocers than at open air markets). With this limitation in mind, two key findings emerge from table 10. First, supermarkets are close to becoming price-competitive with the greengrocers, kiosks and covered market stalls where the middle-to-high income groups traditionally bought their FFV. This implies that with little difference in quality and prices, greengrocers, kiosks and covered markets catering to the higher income groups have been the hardest hit by the introduction of FFV in supermarkets as the latter hold the strategic advantage of being able to offer the convenience of one-stop shopping to their customers.

Table 10: Supermarkets vs. Other Retailers Price Comparison for Fresh Produce

Selected Fresh Fruits & Vegetables					
Item	Average Price at Supermarket (Ksh/kg)	Price Difference (negative. % = lower price in supermarket)			
		Covered Markets	Open Air Markets	Greengrocer	Kiosks (high income residential area)
Spinach	12	-36%	-5%	-22%	-31%
Kale	15	-14%	+49%	-8%	-33%
Oranges (local)	43	-10%	+88%	-9%	-18%
Cabbage (green)	12	-9%	+89%	0%	-28%
Carrots	24	+1%	+95%	+30%	-35%
Tomatoes	44	+14%	+52%	+10%	+8%
Mango (Ngowe)	56	+17%	+129%	+22%	-5%
Potatoes (Meru)	27	+20%	+160%	n.a.	+8%
Bananas (eating)	50	+41%	+108%	+7%	+71%
All 9 Items	**283**	**+6%**	**+87%**	**+24%**	**-1%**

Note: if prices were not indicated in Ksh per kg, the produce was bought and weighed. Were possible prices were negotiated as to reflect normal buying patterns. Prices reflect differences in quality, sorting and value-adding (e.g., cleaning) which could not be taken into account.
Source: prices for fruits and vegetables were collected in Nairobi on August 14 and November 14, 2003 and April 14, 2004 at the Jogoo Road, Railway and Westlands branches of Uchumi, the covered markets Westlands City Council Market and City Park Market, the open air markets of Wakulima and Kangemi, Zuchini (a high-turnover greengrocer frequented by high-income consumers), and a group of kiosks in Highridge, a high-income residential area. Zuchini, City Park and kiosk prices were collected on April 14, 2004 only.

Second, supermarkets are, relative to the open air markets where the urban poor buy their FFV, substantially higher priced (on average nearly 90%) for most (but not all) produce items. The leading supermarkets chains, who represent 90% of the FFV sold through supermarkets and who did not start selling FFV until recently (Uchumi since 1997, Nakumatt since 2001), at first focused on getting the quality right for the (less price-sensitive) high-income consumers they were targeting. Nevertheless, table 10 shows that price differences are becoming smaller for some key products (tomato, kale) while for spinach supermarkets are already selling at a lower price than any other retailer in Nairobi. Another indication that supermarkets are bridging the price-differential is given by the observation that street hawkers and small shops have started sourcing their FFV from supermarkets like Uchumi (especially in middle-income residential areas). These

traditional retailers make their margin by dividing up in smaller quantities and by bringing the produce closer to the consumer (but at a higher price per kg).

Apart from price, retailer location plays a key role in the consumer's decision on where to buy FFV. Even if supermarkets can bring their FFV prices down to the level of the open air markets and the kiosks in the low income neighborhoods, it is unlikely that this will attract large numbers of poor consumers. Because low-income household do not have refrigerators, they are forced to buy perishables (like milk and vegetables) in small quantities at higher frequency (usually daily)[15]. From the focus groups we learned that poor households work with a more or less fixed budget for FFV, e.g., Ksh50 per day. The ubiquitous kiosks are usually within a few minutes walking distance, while getting to the far less omni-present supermarkets (especially those selling FFV) often requires a long walk or maybe even a bus ride. Taking a bus for Ksh5 only to buy FFV for Ksh50 will make little economic sense to consumers, especially if it concerns a daily shopping activity. In other countries, supermarket chains developed smaller store formats that can more easily be integrated in residential areas (e.g., superettes in South Africa). Such store formats have not yet sprung up in Kenya (Metro's Lucky 7 trading group comes close but does not yet distribute FFV). However, the smaller supermarkets that Uchumi opened in Nairobi's middle income residential neighborhoods (e.g., Buru Buru) have been very successful in selling FFV. This suggests that the location card may play much less against the supermarket chains in the future in produce retailing.

Table 9 lists freshness as the third key reason for consumers to select traditional retail outlets as their source of FFV. When supermarkets just started selling FFV, they

[15] Zhang (2002) found similar results for the case of Shanghai, China.

had to go through a learning process with regard to procurement and shelf management. In those early days, shelf management was not optimal in the produce section. Supplies were late, leading to empty shelves or produce was kept on the shelves for too long, leading to an unattractive presentation (less bountiful, less fresh). In contrast, traditional retailers have over the years perfected the art of presenting FFV at their freshest. This involves excellent matching of supply with demand as well as being well-linked to other retailers (most notably street hawkers) to whom less fresh produce could be sold at starkly reduced prices (but not at a complete loss). This phase created a perception in the consumer's mind that FFV sold in supermarkets are less fresh. Although supermarkets only buy the best quality FFV available (in the volumes they need) at any given time (varies throughout the year), stock-outs and keeping the produce too long on the shelves still occurs sporadically (even for high turnover items like bananas).

Nevertheless, the findings of this study reveal that Nairobi consumers feel that supermarkets have made great progress, since freshness is the most frequently no. 1 ranked reason for consumers' buying FFV from supermarkets. The consumer focus groups further revealed that low-income consumers mistrust the presence of refrigeration which they believe allows supermarkets to keep produce beyond their ideal freshness. Traditional retailers, who for the greater part have no refrigeration, cannot 'fool the consumer' because consumers would immediately see it if a retailer kept produce for too long.

4.2 Retail Outlet Choice and Shopping Frequency

In this section we want to assess how household socio-economic factors (such as income, household composition, education, whether there is a maid or not, and so on) influence the following four decisions: (1) whether or not households shop for food at supermarkets at least once a month (Y_1); (2) whether or not households buy FFV at supermarkets at least once a month (Y_2); (3) how frequently households shop for food at supermarkets (Y_3); and (4) how frequently households shop for FFV at supermarkets (Y_4). Since negative dependent variables are not possible and assuming non-linear effects of the independent variables, we modeled the first two decisions as probit models for a binary response (Wooldridge 2000), and the latter two as ordered multinomial logit models with three frequency levels in the dependent variable, 3=high (more than twice a month), 2=low (once or twice a month) and 1=rarely or never (less than once a month) (Greene 2000).

Model (1) $\quad \text{Prob}(Y_1=1|X) = G(\beta_{01} + X\beta_1)$

Model (2) $\quad \text{Prob}(Y_2=1|X) = G(\beta_{02} + X\beta_2)$

Model (3) $\quad \text{Prob}(Y_3=1\ |X) = \Lambda(-X\beta_3)$

$\text{Prob}(Y_3=2\ |X) = \Lambda(\kappa_{32}-X\beta_3) - \Lambda(\kappa_{31}-X\beta_3)$

$\text{Prob}(Y_3=3\ |X) = 1 - \Lambda(\kappa_{32}-X\beta_3)$

Model (4) $\quad \text{Prob}(Y_4=1\ |X) = \Lambda(-X_4)$

$\text{Prob}(Y_4=2\ |X) = \Lambda(\kappa_{42}-X\beta_4) - \Lambda(\kappa_{41}-X\beta_4)$

$\text{Prob}(Y_4=3\ |X) = 1 - \Lambda(\kappa_2-X\beta_4)$

The determinant variables (X) included in this analysis here are: (a) whether or not the household owns a motorcycle or car (own_tran); (b) whether or not the household owns a refrigerator (own_refr); (c) whether or not the household has a credit card (has_card); (d) whether or not the household has a maid (has_maid); (e) the per capita income of the household based on income category (8 categories) and household size (pcincome); (f) the education level of the household heads who do the actual shopping (averaged if both wife and husband shop) using four categories: 0=none, 1=primary, 2=secondary, 3=university (educat); (g) the proportion of young family members (under 30) in the household (prpyoung); (h) the age category (6 categories) of the responding household head (agehhead). These variables capture mobility (car or motorcycle ownership), ability to buy larger quantities of fresh food (refrigerator ownership), purchasing power (credit card ownership, per capita income), opportunity cost of time (having a maid or not, demographic variables) and preferences and life-style (education level, demographic variables).

Based on maximum likelihood estimation (MLE), tables 11 and 12 present the probit and logit estimators ($\hat{\beta}_i$) of the different models. Table 11 indicates that the results are as hypothesized, namely, the probability of a household buying food from a supermarket increases as the household has (i) a higher purchasing power, (ii) a higher level of education of the heads of the household, (iii) younger heads of household, (iv) a refrigerator. The impact of car or motorcycle ownership, credit card ownership, whether or not the household has a maid and the proportion of younger household members did not have a significant impact on the probability of the household buying food in the supermarket.

Table 11: Probit Results Retail Outlet Choice Consumers

Independent variables	Model 1 P(Shops at supermarkets) (t-value)	Marginal effect	Model 2 P(Buys FFV in supermarkets) (t-value)	Marginal effect
Owning car or motorcycle	0.277 (0.88)	-	-0.016 (0.06)	-
Owning refrigerator	0.571 (1.87*)	10.7%	1.20 (5.04***)	30.5%
Owning credit card	-0.165 (0.54)	-	0.201 (0.74)	-
Maid help	0.129 (0.53)	-	-0.114 (0.46)	-
Income per capita	0.384 (2.04**)	8.6%	0.171 (1.51)	-
Education	0.242 (2.08**)	5.4%	0.216 (1.91*)	3.8%
Young members proportion	0.064 (0.17)	-	0.881 (1.94*)	15.3%
Age of family head	-0.169 (1.81*)	3.8%	-0.025 (0.23)	-
Constant	0.474 (0.71)	-	-2.87 (3.57)	-
No. of observations	355		354	
(Pseudo) R-square	0.095		0.202	

Notes: * = significant at the 10% level, ** = significant at the 5% level, *** significant at the 1% level.
Marginal effect measured at the mean levels of the determinant variables.
Source: author's consumer survey.

Table 12: Ordinal Multinomial Logit Results Shopping Frequency Consumers

Independent variables	Model 3 P(Shopping frequency in supermarkets) (s.e)	absolute t value	Model 4 P(Buying FFV frequency in supermarkets) (s.e.)	absolute t value
Owning car or motorcycle	0.361 (0.324)	1.12	0.171 (0.432)	0.40
Owning refrigerator	0.108 (0.32)	3.37***	2.25 (0.425)	5.29***
Owning credit card	-0.983 (0.376)	2.61**	0.261 (0.469)	0.56
Maid help	-0.027 (0.298)	0.09	-0.248 (0.442)	0.56
Income per capita	0.134 (0.153)	0.88	0.106 (0.16)	0.66
Education	0.283 (0.135)	2.10*	0.339 (0.199)	1.70*
Young members proportion	0.669 (0.475)	1.41	1.288 (0.785)	1.64
Age of family head	-0.216 (0.128)	1.68*	-0.151 (0.199)	0.76
No. of observations	320		354	
(Pseudo) R-square	0.0510		0.1597	

Notes: * = significant at the 10% level, ** = significant at the 5% level, *** significant at the 1% level.
Source: author's consumer survey.

When we look at the probability of a household buying FFV in a supermarket (table 11), a similar picture emerges with, however, the following three differences. First, income per capita is no longer a significant determinant, which is an unexpected result given that table 6 indicated a positive correlation between income and buying FFV from the supermarket. Although we could not identify exactly why, this may in part be explained

by realizing that (1) FFV are relatively inexpensive purchases and (2) for some FFV items supermarkets are price and quality competitive as shown above. Second, the proportion of younger household members becomes a significant and positively correlated determinant. This fits the predicted pattern that younger households are increasingly accustomed to finding (and buying) FFV in supermarkets and consequently are less conservative in their buying behavior with regard to fresh categories such as FFV. The third difference is the starkly increased significance of refrigerator ownership as a determinant of the household's decision to buy FFV from the supermarket. The marginal effect indicates that, for the average household (in terms of the independent variables), having a refrigerator increases the probability that the household buys FFV at the supermarket by 31%.

Shopping frequency at supermarkets increases as refrigerator ownership and education increase, as the (responding) household head is younger and when the household does not have a credit card (table 12). While the first three signs are as hypothesized, the negative relationship between credit card ownership and the frequency of shopping for food is maybe less evident, given that the use of credit cards is encouraged by retailers exactly to smoothen out once-a-month purchases linked to salary payments. One possible explanation is that credit cards represent a greater flexibility in purchasing power, and so the consumer is less likely to limit her or his purchases at any given trip to the supermarket, making additional trips less necessary. Another related explanation is that in Nairobi credit cards can only be used in the larger supermarkets. Because these usually require more time to reach and carry larger assortments, credit

cards will lead to consumers going less often to make larger purchases from supermarkets.

Looking across the four models we see that education and refrigerator ownership are consistently significant determinants in the shopping behavior of Nairobi's households with regard to supermarkets. Especially refrigerator ownership, and the storage capacity it represents, appears to be the key driver. Furthermore, in three of the four models, younger households or households with younger decision makers have an increased probability of shopping at supermarkets as well as of doing so more often. Given the recent nature of the strong emergence of supermarkets and produce sections in them (i.e., since the mid-1990s, less than a generation ago), it is more likely that this represents a behavioral shift from one generation to the next rather than a decreasing interest in supermarkets on the part of consumers as they grow older. The focus group finding that for households with children, shopping at the supermarket is seen as an outing for the whole family further strengthens this theory.

5. Conclusions and Implications

This essay has demonstrated that supermarket growth in Kenya is following a pattern similar to that observed in other countries (e.g., Central America). By developing various new store formats and entering smaller towns and residential neighborhoods, supermarkets have rapidly increased their share of the urban food market from a small niche a decade ago to 20% in 2003. Our findings indicate that this market penetration first occurs for processed and dry foods with penetration in the FFV market lagging

behind. Very rarely in the recent work on supermarket diffusion in developing countries has consumer-side evidence been brought to bear to explain the variations in trends. The findings here target that gap in the knowledge. Several main findings emerged.

The key finding is that supermarkets are not merely are place where the rich buy their food. Supermarkets have penetrated the markets for the poor: 60% of Nairobi's poor buy some of their food from supermarkets each month while the poorest two thirds of the population already represent 56% of the supermarkets' customer base and 36% of their food sales.

The main reason why the poor buy food from supermarkets is that they are perceived as being cheaper than the traditional retail outlets, at least for dry foods which these consumers usually buy once a month. Supermarkets derive this competitive advantage from the large volumes they trade, which allows to them to buy direct from manufacturers at discounted prices. For fresh food items, such as FFV, poor consumers still rely heavily on the traditional retail outlets for two main reasons. First, the poor have no refrigeration and therefore need to buy these items in small quantities on a daily basis, making the closer-to-home traditional retail outlets far more convenient. Secondly, FFV are generally more expensive in supermarkets. However, there are signs that the latter may change soon. On the one hand, supermarkets are developing smaller retail formats which can be located closer to where the consumers live. These new store formats may be the precursors in Kenya of the smaller self-service store chains that have succeeded in making in-roads in the low income consumer segment in other developing countries, such as the "superettes" in South Africa (Weatherspoon and Reardon 2002) and the 7-11 stores in Thailand (Feeny et al. 1996). These new stores in residential areas not only provide

easier access to end-consumers directly but also indirectly through the smaller, traditional retailers (such as street hawkers) who procure from them (rather than from the farther away wholesale markets). On the other hand, for some FFV items (most notably leafy greens such as spinach and kale) supermarkets are already the price leader. It is likely that more of their FFV items will become price-competitive as supermarkets further increase the efficiency of their FFV procurement system and pass these savings on to their customers in a bid to gain market share.

A number of managerial implications for farms and food firms arise from the foregoing findings. On the one hand, supermarkets create new market opportunities relative to traditional markets. Supermarkets play into the desire of consumers to have a broad assortment of products to choose from (consumerism). Increasingly, for both dry and fresh foods, these are value-added and branded or quality-guaranteed products. The research here further shows that households that have more younger members or younger household heads and that have better educated household heads, are more likely to shop in supermarkets and to do so more frequently. These are households whose shopping behavior is more likely to be influenced by new product introduction or enhanced product attributes, such as food safety standards in the case of FFV. As supermarkets further penetrate the large low income consumer segment, they offer opportunities for their suppliers to develop and market more products in small-volume, low price packs that fit into the fixed-budget driven consumption habits of the lower income consumers.

On the other hand, supermarkets bring additional challenges for their suppliers. Higher quality standards and tougher delivery terms (short order cycle, volume consistency, supplier credit, and so on) must be reconciled with a competitive pressure to

constantly lower costs. Supermarkets further intensify competition between agri-food suppliers by providing an attractive, low transaction cost point of entry for foreign producers of agri-food products. For domestic agri-food firms (planning on) supplying supermarkets this almost inevitably implies the need for an increase in the scale and sophistication of operations (production and distribution logistics). This essay has shown that this challenge is coming rapidly for processed foods as this market is becoming dominated by the supermarkets. The fresh produce growers have a good deal more time to make the adjustment – and there is time but also incentive for development programs to either help farmers prepare for the challenges of the supermarket channel, or work hard to develop alternatives for them.

ESSAY 3

FARM-LEVEL PERSPECTIVES ON THE IMPACT OF DOMESTIC SUPERMARKETS ON KENYA'S FRESH FRUITS AND VEGETABLES SUPPLY SYSTEM

1. Introduction

The rise of supermarkets in developing countries has received considerable attention in the development economics literature over the last few years (Reardon and Berdegue 2002, Weatherspoon and Reardon 2003, Hu et al. 2004). The research presented in those articles mostly focused on the retailer-level, revealing that supermarkets are (i) growing fast, (ii) becoming important, even dominant agents in the food supply chain and (iii) implementing very different procurement systems than those observed in the traditional food marketing system. In Kenya for example, essay 1 showed that supermarkets are growing at an annual rate of 18%, had a 20% share of the urban food market in 2003 and are rapidly developing the various pillars of the new procurement system (i.e., centralization, regionalization, preferred suppliers, specialized wholesalers, private standards and grades). While indicating a likely differential impact of this more demanding procurement system on farmer participation in the supermarket channel, the analyses in this first wave of research on supermarkets in developing countries was for the greater part limited in its scope to data from retailers and wholesalers. Based on farmer surveys in the fresh fruits and vegetables (FFV) sub-sector, this essay aims to fill this gap in the literature by analyzing the rise of supermarkets in Kenya from the farmer perspective.

The strategic objective of this essay is to assess the effect of the development of the supermarket sector in Kenya on FFV producers' behavior and net incomes. Controlling for product we have the following three research questions:

(1) What are the determinants of the farmers' channel choice (supermarket channel vs. the traditional channel)?

(2) What are the effects of participation in the supermarket channel on the farmer's production technology?

(3) What are the effects of participation in the supermarket channel on the farmer's net income?

The research presented here focuses on kale[16] growers, although some limited analyses for tomatoes and bananas is included to get a broader perspective. These products were chosen (i) because of their importance in terms of volume in Kenya's produce sub-sector and (ii) because they represent different risk-return trade-offs. Kale is a labor-intensive crop (requiring intensive weeding) with a reliable yield (relative to agro-ecological conditions), but a generally low market price, making it well-suited for risk-averse smallholder farmers who have a high labor-to-capital ratio. Tomatoes are more capital

[16] Kale, a leafy green vegetable (member of the cabbage family) is the most widely grown and consumed vegetable in Kenya. Its low price and high nutritional value make it especially important in the diet of the poor who consume it with the local (maize-flour-based) staple ugali (hence its local name sukuma wiki, Swahili for 'push the week'). In 2002, overall kale production in Kenya reached 317,000MT with an estimated rural market value of Ksh2 billion, i.e., 30% of the total volume and 17% of the total value of vegetable production respectively (MoARD 2002).

intensive (requiring irrigation for water control, more chemicals to control diseases, more expensive good quality seeds, and so on) and their yield is more variable, but prices are generally higher, thus attracting farmers with more capital, who can afford to take greater yield risks in return for higher potential returns. In banana production, access to planting materials (e.g., tissue culture) is a critical issue as demand for these materials outstrips supply (MoARD 2000), so that less mobile and less informed smallholder farmers have less access to it.

The essay is structured as follows. The next section briefly lays out the conceptual approach to the research questions. Section 3 indicates how supermarket-channel farmers and traditional-channel farmers were defined in this study and describes the data that were collected. Section 4 compares the characteristics, the production practices and the marketing practices of farmers directly supplying supermarkets and farmers supplying the traditional system of brokers and wholesalers. Section 5 uses the case of the kale supply chain to assess the determinants of channel participation (supermarket channel vs. traditional channel) and analyzes the production technology and net income effects of this participation. Section 6 concludes and provides recommendations for development policy and programs.

2. Conceptual Approach

The rise of supermarkets in Kenya is here modeled as a shock to a domestic FFV supply system that has shown few dynamics over the last few decades, apart from a steady growth in volumes and in the number of rural producers in response to urbanization

(Dijkstra 1999a). On the one hand, supermarkets may pay higher prices to farmers and/or may offer them more demand reliability both in terms of price and volume. On the other hand, meeting the supermarket's higher standards for food safety and quality and other delivery conditions may imply the presence of (or additional investments in) certain production and marketing capital as well as an increased need for working capital to deal for example with higher input use and buyer credit. In other words, the rise of supermarkets in Kenya is hypothesized to contribute to an industrialization of the food system as observed in other countries (Reardon and Barrett 2000). Here we shall take an essentially micro-economic approach, focusing on how this shock impacts the behavior of FFV producers as individual agents.

First, we model the farmer's decision on whether or not to sell to supermarkets as a standard static adoption decision, where the adoption of X (in this case the supermarket channel) is determined by the incentives for and capacities of farmers (Feder et al. 1985). The different requirements of supermarkets are hypothesized to determine a K^* vector of threshold capital requirements, embodying a technology, which suppliers must have before the supermarket channel enters their opportunity set. Different technologies as embodied in different capital vectors (e.g., a labor intensive K_1^* and capital intensive K_2^*) may exist, with both giving farmers the capacity to meet the supermarkets' requirements. Furthermore, K^* may only be weakly enforced by supermarkets and will likely be a moving target for farmers (supermarket requirements become more stringent over time). K^* may include physical capital (e.g., land, vehicles), human capital (e.g., business experience), financial capital (e.g., cash reserves) and organizational capital (e.g., group membership). Farmers with a capital vector $K>K^*$ are expected to enter the

supermarket channel if the incentives are there. Farmers with $K<K^*$ are excluded from the supermarket channel. The latter may be undesirable from a social welfare point of view, if the supermarket channel represents higher net incomes for farmers and if the smallholder farmers who make up the bulk of Kenya's population are being excluded from it. Our conceptual model then takes on the following general reduced form (i.e., the input demand function as derived from the farmer's profit function; Sadoulet and De Janvry, 1995):

$$\text{channel choice} = f(p, r, \sigma, k, z),$$

where p, r, σ, k and z represent output prices, input prices, risk factors, quasi-fixed capital and shifters respectively. Output prices, input prices and risk factors (including transaction costs) are in part implicit to the channel choice (which determines governance structure) and are further determined by farm characteristics such as its location and size. Therefore input and output prices and risk factors will not be directly entered in the implementation model (section 5.1). Given the limited geographic spread of the sample populations (see next section) and thus too limited variation across the sample for this variable, location as a key shifter will also be excluded. This implies that our channel choice model will mainly be determined by quasi-fixed capital. The latter both represents resources internal to the farm and at the same time co-determines access to external resources. For example, size of the land owned by the farmers is a direct resource as well as an indicator of access to credit (Carter and Wiebe 1990).

Second, we assess the differential effect of channel choice on production technology by comparing the production functions for farmers supplying supermarkets

and farmers supplying traditional marketing channel agents. The distribution of the farmers over these two groups is not random but rather the outcome of a self-selection process and this non-randomness may bias the estimated coefficients in the production function. In order to control for this selectivity bias, we use Heckit's two-stage method (Heckman 1979). In the first stage, a probit model is used to estimate the selection model, i.e., channel choice regressed on a set of exogenous determinants using the whole sample. From this estimation, the inverse Mill's ratio (λ) is calculated based on the residuals of the selection equation. This ratio represents a summarizing measure which reflects the effects of all the unmeasured characteristics which are related to channel choice (Smits 2003). In the second stage of the Heckman procedure, we estimate the production function (the substantial model which is the real focus here) for both sub-populations while adding the lambda variable as an explanatory variable to control for self-selection bias.

Third, we assess the net income effect of channel choice using gross margin analysis. We then place this net income effect in the broader context of value chain theory (Kaplinsky and Morris 2001). According to value chain theory, the following dynamic models the growth process of a firm: (1) the performance of firm A depends on the performance of A's network partners and vice versa (systemic efficiency); (2) the participation of A in a supply chain takes on a particular governance structure (system access) depending on A's performance, the policies of the government and the channel captain of A's supply chain and the location and network relationships of A; (3) the benefits accruing to A depend on the governance structure for A, the performance of A and A's market power (distributional effects); (4) the amount of benefits accruing then

determine the degree of upgrading, which in turn affects the performance of A (coming full circle: system dynamics). We will assess this model by comparing (income and risk related) benefits accruing to farmers, governance structures and upgrading/growth in the supermarket channel vs. the traditional channel.

3. Definitions and Data

Farmer Surveys

The central objective of this essay is to better understand the nature and behavior of the FFV farmers who are supplying supermarkets in Kenya. There are basically three types of FFV suppliers to supermarkets (essay 1): importers (14% of supplies), brokers or other middlemen relying mostly on smallholder producers (43% of supplies) and farmers supplying direct to the supermarket (43% of supplies). Of the latter, 23% come from small farms (<10 acres), 42% come from medium-sized farms (10-40 acres) and 35% come from large farms/plantations (>40 acres). Farmers as direct suppliers of FFV can further be classified into listed and unlisted suppliers, i.e., based on whether or not they are part of the list of regular FFV suppliers to the supermarkets. In 2003, 125 out of an estimated 400 direct FFV suppliers to the leading two chains were listed, with the non-listed suppliers mainly consisting of smallholder farmers and brokers ad hoc addressing shortages not yet resolved by listed suppliers (according to our interviews with the supermarkets). In this context, the target population is here defined as 'the farmers listed as direct FFV suppliers to Uchumi and Nakumatt supermarkets'. This population was selected for the following four reasons. First, within the next five years, 85-90% of the

locally sourced FFV sold in supermarkets are expected to be supplied directly by farmers (or farmer groups), as opposed to through traditional brokers (in 2003, 50% was directly supplied by farmers; essay 1). Second, as supermarkets develop their FFV procurement system these direct supplies will come from listed suppliers only. Third, farmers supplying supermarkets indirectly through traditional brokers feel no impact from supermarkets because the brokers' buying behavior is not different, as these are, again according to our interviews with the supermarkets, the same brokers supplying wholesale markets in Nairobi (i.e., they are not specialized brokers working with the same group of farmers over time). Fourth, 90% of FFV sold through supermarkets are sold through the two leading chains, Uchumi and Nakumatt (essay 1). We shall further refer to this population of 'farmers listed as direct FFV suppliers to Uchumi and Nakumatt' as 'supermarket-channel farmers'.

In order to assess to what extent these supermarket-channel farmers are different from farmers supplying through the traditional FFV system, a similar data set was also collected on farmers who supply directly to traditional marketing agents (brokers, wholesalers, open air markets), but not to supermarkets. Since this is a large and heterogeneous population, we focused on farmers in selected key production regions for selected produce items bound for the Nairobi market. The selected products are kale, tomato and banana, which are in terms of volume the two most important vegetables and the most important fruit in the domestic market. The production areas for these products were selected based on their relative importance as indicated in interviews with operators at Nairobi's key FFV wholesale markets (Wakulima, Gikomba, Kawangare, Kangemi). We shall further refer to this population as 'traditional-channel farmers'.

Two farmer surveys were conducted. The first farmer survey took place in the period September-November, 2003 and focused on the capacities of the farmers and the marketing methods they used. A total of 115 farmers were interviewed, comprising two sub-samples. The first sub-sample consists of 49 supermarket-channel farmers randomly selected from the supplier lists provided by Uchumi and Mugoya, the (then) specialized FFV wholesaler of Nakumatt (these 49 farmers equal 40% of the listed FFV suppliers). One of the requirements for being a listed supermarket-channel farmer is that the farmer can easily be reached by phone. Thanks to the emergence and rapid diffusion of cellular phones in Kenya, many farmers, not just the rich ones, have (access to) a phone (e.g., 30% of the traditional-channel farmers in our research could be reached by cellular phone). This allowed us to contact the supermarket-channel farmers by phone to set up a time and place to meet for the interview. If a farmer could not be reached or refused to participate, he or she was replaced by the next farmer on the list (which consists almost exclusively of individual farmers). The interviews usually took place on the farm, but on occasion at a supermarket after delivery or at an in-town office (as we shall discuss in more detail in section 4.3, quite a few of the key supermarket-channel farms started out as "hobby-farms" of those with well-paying formal jobs in Nairobi who turned commercial in response to the rise of supermarkets). Most of these farmers produced a wide variety of FFV items (most of them marketed to the supermarkets) but each farmer was interviewed in detail only for her or his highest volume produce item[17]. In terms of location, around 80% of the supermarket-channel farms were located in favorable FFV

[17] These items are: kale (12 growers), tomato (5 growers), banana (5 growers), spinach (12 growers), papaya (3 growers), lettuce (2 growers), cabbage (2 growers), pineapple (2 growers), and broccoli, mangoes, capsicum, black nightshade (mnavu), French beans and potatoes (1 grower each). In the comparative part of our analysis we focused on the 5 tomato, 12 kale and 5 banana growers in this sample.

zones within a 100km radius around Nairobi (mostly in the highlands north and north-west of the capital), the same zones where most of the traditional-channel farmers are located. The other 20% were located either farther from Nairobi or in the less fertile rural areas south-east of Nairobi (which have the advantage of lower prices and greater expansion possibilities due to the far lower population density). The average distance from the farm to Nairobi is 72km (i.e., closer than the traditional channel farmers in this study). For this sample we found that 25% of them are small farms (<10 acres), 43% are medium-sized farms (between 10 and 40 acres), 18% are large farms (between 40 and 200 acres) and 14% are plantations (>200 acre). This closely matches the distribution of the FFV supplies over different sizes as given by the supermarkets.

The second sub-sample consists of 66 traditional-channel farmers (22 kale growers, 22 tomato growers, 22 banana growers), all of them located in zones which are well-suited for these crops and which are key production zones for the Nairobi-bound supplies of these produce items[18]. In terms of distance, these farms are located farther away from Nairobi than the supermarket-channel farmers (less than 70% are within a 100km radius around Nairobi, while the average distance to Nairobi is 122km). With no crop specific population frameworks available, farmers were selected (within a division) based on a judgment sample with the assistance of local traders and/or the division's horticultural development officer. The latter were asked to select a sample that was in terms of farm size representative for the division. The average farm size for the traditional-channel farms in our sample is 5.2 acres, which is similar to the average farm size indicated in other reports as varying from 3 to 7 acres depending on the specific

[18]The selected districts were Kirinyaga (22 farmers) for tomatoes, Kiambu (12 farmers), Thika (6 farmers) and Nyandarua (4 farmers) for kale and Meru (14 farmers) and Muranga (8 farmers) for bananas.

location (e.g., Dijkstra 1992, Ministry of Agriculture 2003, 2004). Of the traditional-channel farmers sampled in this survey, 85% were smallholders and 15% were medium-sized.

The second farmer survey (August 2004) focused on technology choices and net income effects. For this survey we focused on kale only. Kale was selected because it is a produce item for which there is a sufficiently large group of suppliers to supermarkets and for which supermarkets have developed their supply system the most with nearly all of the kale being supplied directly to the supermarket by listed farmers (and thus providing an interesting case-study of the farm-level impact of supermarkets). A total of 51 farmers were interviewed in this survey, again comprising of two sub-samples. In the first sub-sample, we selected 14 out of 30 listed farmers supplying kale to Uchumi and/or Nakumatt (this sample thus represents roughly half of the kale suppliers to these chains). Of these farms, about 60% were located in the same key production area from where we selected the traditional-channel sample (i.e., Kiambu district, well-suited for growing kale in terms of agro-ecological conditions and, because of its proximity to Nairobi, well-suited for marketing the highly perishable kale). The other 40% were located in the less fertile (peri-urban) zones south-east of Nairobi, where as mentioned above, land is more available and thus less expensive. The average (total) farm size in this sub-sample is 31 acres and the average distance to Nairobi is 36km (i.e., ten times the size of the traditional-channel farmers described in the next paragraph and located slightly closer to the capital).

To have a comparable sample (second sub-sample), we then interviewed 37 traditional-channel farmers located in two divisions which were identified as key kale

production areas for the Nairobi market (Lari and Limuru divisions in Kiambu district). Kale growers in these two divisions represent a production volume that is 50% of the estimated consumption in Nairobi. The average distance to the market is, as in the first farmer survey, greater for traditional-channel farmers than for supermarket-channel farmers (49km vs. 36km). As in the 2003 survey, farmers were selected based on a judgment sample with the assistance of divisional horticultural development officers. The average farm size of the traditional-channel farmers in this sample is 3 acres, which is in line with the officially reported average farm size of 3 acres (Ministry of Agriculture 2004).

Semi-Structured Interviews

In addition to the two farmer surveys, additional semi-structured interviews were conducted to get a better understanding of various aspects of the domestic FFV system in Kenya. These included interviews with: (1) selected input suppliers to obtain cost data on certain inputs; (2) key experts on the different technology options; and (3) the successive intermediaries downstream from farmer to retailer in the traditional FFV market channel.

4. The Nature of Supermarket-Channel Farmers

4.1 Supermarket-Channel Farmers Compared to Traditional-Channel Farmers

In this section we will compare supermarket-channel farmers and traditional-channel farmers with respect to a set of key characteristics for the three selected products: tomato,

kale and banana. The data indicate that there are substantial differences between supermarket-channel and traditional-channel farmers in terms of landholdings, labor use, gender, human capital, physical capital, diversification, organization capital and marketing practices. In this section we shall discuss only the findings where the significance of the difference is at the 10% level or higher.

Land Related Differences

Supermarket-channel farms are on average much larger, in overall farm size, than traditional farms (Table 13). This holds across the three products, but is especially stark for the kale farmers where the ratio between the two sizes is 12 to 1. One reason for this may be that kale is a less risky crop than tomatoes (requiring fewer inputs, less capital) and therefore involves more smallholder farmers in the traditional channel thus reducing the average overall farm size in this group. Not only is the overall farm size, but also the land devoted to the specific crop (tomato, kale or banana) is greater for the supermarket-channel farmers. The main reason is that given their higher land availability supermarket-channel farmers will optimize by bringing an area under cultivation that is in line with the size of the orders they get from the supermarkets, taking into account that for a year-round delivery (as preferred by the supermarkets) several plots of the produce item in various successive stages of the harvest cycle are required. By contrast, the traditional-channel farmers use part of the farm size for food-crop production (beans, maize), for dairy, for their home-stead, and so on, leaving only small plots (relative to the supermarket-channel farmers) for FFV production, even if these plots represent a large

portion of the farm size (e.g., for kale on average nearly 25% of the overall farm-size, compared to only 7% for supermarket-channel farmers).

Other patterns, related to technology and land-use, which hold across the three selected products are that supermarket-channel farmers have less of their land under cultivation (e.g., in the case of kale 71% versus 87% for traditional-channel farmers), but have a larger percentage of it under irrigation. Both patterns are related to the need to supply supermarkets on a regular basis throughout the year. Fallow periods, as a part of crop rotation cycles, are facilitated when farms are large and enough land is available to take the place of the land under fallow. Another reason for the higher percentage of the land not farmed is that supermarket-channel farmers have bought land for future expansion as they are growing fast (see section 5.5). Irrigation is a condition sine qua non for regular year-round supply and the most critical requirement demanded by supermarkets (essay 1). Again, the difference is most pronounced for the kale farmers (75% of the farm size is irrigated for supermarket-channel farmers versus only 18% for traditional-channel farmers). As before, this results from the large number of small farms which have specialized in kale and which do not have the capital to invest in irrigation systems.

With regard to landownership, clear distinctions emerge across the products. Amongst kale growers, supermarket-channel farmers basically own all of their land while only two thirds of the farm land of the traditional-channel farmers is owned by them. This is mainly because of land provided for free by parents to their children in the selected divisions for kale (relatively densely populated areas with limited opportunities to buy or rent land). Supermarket-channel farmers who supply tomatoes on the other hand opt

mostly for leased land relative to their traditional competitors. One reason is that the tomato growing regions selected in this study have a relatively dense network of rivers so that there is no need to install boreholes and neither are other permanent structures (e.g., greenhouses) used for tomato growing. The presence of such fixed capital assets would create an incentive to buy rather then lease land in order to secure them. For banana growers there is no significant difference in landownership (as a percentage of the farm size) between supermarket-channel farmers and traditional-channel farmers. The observation that many coffee growers shifted to banana growing after sustained periods of depressed coffee prices (MoARD 2002) and the more long-term nature of the cultivation of bananas are two likely determinants of relatively high degrees of land-ownership for both groups of farmers (nature of crop provides incentive to secure investment through land-ownership). Specialization in horticulture (as a percentage of the farmed land) appears to be slightly higher for supermarket-channel farmers, except for kale. We further found a negative correlation between land ownership and specialization in horticulture (significant at the 1% level), indicating that leased land is used more intensively for FFV. This may be the result of leased land being leased for a particular purpose (e.g., to grow only tomatoes) and for a particular time period, potentially short enough not to care too much about depleting the soil because of intensive cultivation of one particular crop (another, more fertile piece of land may be leased for the next cycle). It can further be expected that a resource (like leased land) with a specific use limitation (duration of the lease) and explicit cost (rent payment) provides more of an incentive to get the highest possible return from it.

Table 13: Land Related Differences (supermarket- vs. traditional-channel farmers)

Crop	Tomato		Kale		Banana	
Farm characteristic	Trad. Farm. (N=22)	Super. Farm. (N=5)	Trad. Farm. (N=22)	Super. Farm. (N=12)	Trad. Farm. (N=22)	Super. Farm. (N=5)
farm size (acres)	6.1 *	23.0 *	3.8 *	45.6 *	5.8	34.0
land owned (% of farm size)	60 *	20 *	66 ***	99 ***	87	80
land irrigated (% of farm size)	93 **	100 **	18 ***	75 ***	41	66
land farmed (% of farm size)	89	80	87 *	71 *	93	88
land used for horticulture (% of land farmed)	90 ***	100 ***	83	65	52	66
Land used for crop (acres)	2.5	4.5	0.9 *	3.4 *	1.5 *	9.3 *

Notes: *=significant at the 10% level, ** = significant at the 5% level, *** significant at the 1% level.
Source: author's farmer survey 2003.

Labor, Gender and Human Capital Differences

As expected given the difference in farm size, supermarket-channel farmers have more permanent employees and more casual workers than traditional-channel farmers (Table 14). The average labor-to-land ratio (number of permanent farm workers per acre of farmed land for the whole farm, not just the specific crop) is lower for supermarket-channel farmers than for traditional-channel farmers, mainly due to a heavy reliance on abundantly available family labor amongst the latter. For example in the case of kale, 79% of the permanent farm workers on traditional-channel farms are family members, while for supermarket-channel farms 79% of the permanent farm workers are hired employees. This pattern also holds at the aggregated level (i.e., sum of all farm workers over sum of all farm sizes for each product-farmer type combination), although the difference become less stark because the larger traditional-channel farmers are less labor intensive. The aggregated numbers imply that the size of the farm is taken into account and we found that labor-to-land ratio and size (measured as land farmed for all products) are negatively correlated for traditional-channel farms (significant at the 1% level). For example, kale farms (in the traditional channel) below five acres have a labor-to-land

ratio of 1.9, while farms above five acres have a labor-to-land ratio of 0.9. The high number of hired permanent and casual workers on farms in the supermarket channel implies that supermarket-channel farmers are (in absolute numbers) important providers of job opportunities for rural households with little or no land. For permanent employees, this also holds in relative (labor per acre) terms. In the case of kale growers for example, the average farm-level number of permanent hired workers per acre of farmed land (across all products, not just kale) is 0.9 for the supermarket-channel farmers and only 0.5 for the traditional-channel farmers. However, the opposite holds for casual workers: for kale growers, for example, the average number of casual workers per acre of farmed land is 2.1 for the supermarket-channel farmers and 1.3 for the traditional-channel farmers. However, the comparison is less straight forward as the actual labor time for which casual workers are hired is difficult to estimate (it was not estimated in this study which merely asked farmers to indicate the number of casuals hired during peak times).

Table 14: Labor, Human Capital and Gender Differences (Supermarket vs. Traditional-channel farmers)

Crop	Tomato		Kale		Banana	
Farm characteristic	**Trad. Farm. (N=22)**	**Super. Farm. (N=5)**	**Trad. Farm. (N=22)**	**Super. Farm. (N=12)**	**Trad. Farm. (N=22)**	**Super. Farm. (N=5)**
permanent employees(#/farm)	4	19	3 **	33 **	3	8
casual labor (#/farm)	10 **	17 **	4 *	19 *	4 ***	11 ***
family labor (% of permanent empl.)	47 ***	3 ***	79 ***	21 ***	74 ***	11 ***
labor-to-land ratio (farm level)	1.4	0.9	1.6	1.1	1.1	0.5
labor-to-land ratio (aggregate)	0.9	0.9	1.1	0.9	0.6	0.4
schooling farm head (yrs)	9 **	13 **	7 ***	13 ***	7 ***	15 ***
age farm head (yrs)	35	38	40	47	53	46
years in farming farm head	10.6	9.4	12.9	13.4	21.2 **	9.6 **
female labor (% of empl., farm level)	24	41	54 **	39 **	47	20
female labor (% of empl,, aggregate)	22	59	51	34	36	10
female headed farms (%)	5	20	32	17	27	20

Notes: *=significant at the 10% level, ** = significant at the 5% level, *** significant at the 1% level.
Source: author's farmer survey 2003.

The age of farmers does not appear to be different between the two groups of farmers, and except for banana growers (some of whom have been in farming since the 1930s and 1940s), the same can be said about the years of farming experience the farmers have. There is however a very clear pattern regarding the education of the farmers: traditional-channel farmers on average have a primary education, while supermarket-channel farmers on average have a secondary education. This can be explained mostly by the observation that many of the supermarket-channel farmers had (or still have) formal jobs in the private or public sector and started out as hobby-farmers (see section 4.2 for more detail). Hence higher education gave access to formal, well-paying jobs, from there to savings invested in farms and from there to supermarket channel participation.

The survey also allows us to make some observations regarding farm-level gender-related aspects of the impact of the rise of supermarkets in the domestic FFV supply channel. First, for kale and banana there appear to be fewer farms headed by women amongst the supermarket-channel farmers while the opposite appears to hold for tomato, although no statistical differences could be found. Second, the average percentage of full-time employees who are women is significantly lower for kale supermarket-channel farmers than for kale farmers in the traditional channel. Within the limitations of the data set, this pattern does not hold across all produce items as tomato supermarket-channel farmers appear to hire more women than their traditional competitors do.

Physical Capital Differences

Table 15 paints a stark picture regarding the diffusion of physical capital in the two farmer groups. When we look at the kale farmers, we see that all of the supermarket-channel farmers have a phone and their own (motorized) means of transportation, and that a large percentage have an advanced irrigation system (i.e., drip or sprinkler), a packing shed and electricity at the farm (either through a generator or from the grid). By contrast, significantly less of the traditional-channel farmers use these technologies, with (cellular) phones having reached the highest degree of diffusion amongst traditional-channel farmers (3 out of 10 traditional-channel farmers have (access to) a cellular phone). Other technologies such as greenhouses, shadow netting and cold rooms were encountered, but only at very few farms, all of which are supermarket-channel farmers. The latter is related more to the nature of these farms than that this has resulted from the requirements of the supermarkets. For example, some of the supermarket-channel farmers (about 10%) also supply (different produce items) for the export market and have set up cold chain technologies for this. This implies that these farmers have an advantage if and when domestic supermarkets would start requiring cold chain technology from their produce suppliers.

While the small numbers of supermarket-channel farmers for tomato and banana does not allow meaningful chi-square tests, it appears this wide divide in technology use between supermarket-channel farmers and traditional-channel farmers also holds for these two produce items. The relatively high percentages of traditional-channel farmers using irrigation for tomatoes and bananas results from tomatoes needing at least furrow

irrigation and one of the selected banana growing areas having a government installed irrigation infrastructure (main line).

The high rate of technology diffusion amongst the supermarket-channel farmers (close to 100%) indicates that there probably is a threshold level capital vector (K*) which farmers must have in order to access the supermarket channel. Supermarkets indicated to us that they select their FFV suppliers on the basis of their ability to become reliable suppliers over the long term. This means that these farms must demonstrate their ability to produce year-round (presence of irrigation system and year round source of clean water) and to deliver with short lead times (presence of phone, transportation, packing shed). The presence of these technologies is at present a very strong but not yet strict requirement (not all these technologies have a diffusion rate of 100% for all produce items), mainly because the FFV procurement system of the supermarkets is still in an early, formative stage. A strict implementation of these physical capital requirements is likely for the near future.

Table 15: Physical Capital Differences (Supermarket vs. Traditional-channel farmers)

Crop	Tomato		Kale		Banana	
Farm characteristic	**Trad. Farm. (N=22)**	**Super. Farm. (N=5)**	**Trad. Farm. (N=22)**	**Super. Farm. (N=12)**	**Trad. Farm. (N=22)**	**Super. Farm. (N=5)**
farms with phone (%)	29	100	31 ***	100 ***	24	100
farms with irrigation system (%)	100	100	27 ***	92 ***	55	100
farms with drip/overhead irrig. (%)	5	40	18 ***	92 ***	32	40
farms with transp. vehicles (%)	14	80	9 ***	100 ***	5	80
farms with a packing shed (%)	0	80	0 ***	75 ***	0	40
farms with electricity (%)	0	20	5 ***	83 ***	5	20

Notes: *** significant at the 1% level.
Source: author's farmer survey 2003.

Differences in Diversification, Organizational Capital and Marketing Practices

Table 16 compares supermarket-channel farmers and traditional-channel farmers over a broad set of farm characteristics. In terms of diversification, two observations can be made. First, we found no statistically significant difference in the percentage of overall income coming from farming. Across the three products and two channels, farming is, on average, the main source of income. Second, farmers growing tomatoes and kale for supermarkets grow more than twice as many different horticultural crops and are therefore far less dependent on the production and market risks of any particular crop. This is in part the result of the greater availability of land for supermarket-channel farmers.

Table 16: Differences in Diversification, Organizational Capital and Marketing Practices (Supermarket vs. Traditional-channel farmers)

Crop	Tomato		Kale		Banana	
Farm characteristic	**Trad. Farm. (N=22)**	**Super. Farm. (N=5)**	**Trad. Farm. (N=22)**	**Super. Farm. (N=12)**	**Trad. Farm. (N=22)**	**Super. Farm. (N=5)**
% of hh income from farming	87	82	81	60	87	60
# of different horticultural products grown (at a given time)	2 *	5 *	3 ***	7 ***	3	2
farms collaborating with other farms (%)	46	0	32	33	29	80
farms member of coop/assoc. (%)	18	0	73 ***	8 ***	77	0
farms with livestock (%)	41	0	68	92	96	60
output marketed of crop (%)	84 ***	99 ***	72 ***	96 ***	74 ***	100 ***
farms keeping farm records (%)	64	80	33 ***	92 ***	18	100
farms transporting to buyer (%)	23	100	9 ***	100 ***	14	100
farms getting phone-orders (%)	0	80	5 ***	100 ***	0	100

Notes: *=significant at the 10% level, ** = significant at the 5% level, *** significant at the 1% level. Transportation to buyer is for transportation beyond the main road. Most kale farmers will take produce to brokers near main road on a donkey cart.
Source: author's farmer survey 2003.

In terms of organizational capital, table 16 shows some interesting variation. While the degree of collaboration amongst kale farmers is not related to the channel they operate in,

the nature of this collaboration is related. Kale farmers in the traditional channel collaborate mostly on the marketing side, bulking their produce to facilitate transporting it themselves to the wholesale market where they get a better price (this type of collaboration is more prevalent as the farms are located closer to Nairobi). Kale farmers in the supermarket channel, who know each other in part because of the farmer meetings organized several times per year by the supermarkets, mostly collaborate on production issues (sharing of best practices). For tomatoes, it is the traditional-channel farmers who collaborate more because it allows them to overcome their small size and jointly transport their produce to the wholesalers in Nairobi. This is related to the nature of the tomatoes which require proper synchronizing of production and marketing (once at the right ripening stage for the intended market, tomatoes need to be harvested relatively quickly). This means that tomato farmers in the traditional channel (who for the greater part have no transportation) are more at the mercy of (collecting) brokers, a dependency they try to avoid by taking the marketing of their tomatoes in their own hands through collective action. Tomato growers in the supermarket channel on the other hand have their own transportation (as well as a larger volume) and therefore have less incentive to collaborate with other farmers. For bananas on the other hand it is the supermarket-channel farmers who collaborate more. This is because these farmers (1) want to collaborate on the production side, trying new banana varieties and new propagation techniques such as tissue culture bananas; and (2) these farmers are trying to develop new marketing supply chains for bananas, with some farmers taking the lead and organizing other growers. While point (1) above results from the fact that supermarket-channel farmers are better educated and thus have better access to new technologies (not from any specific initiative

of the supermarkets), point (2) is to some extent stimulated by the growth of supermarkets. For example, one of the supermarket banana suppliers (who uses tissue culture bananas) found that the Kampala banana was more popular amongst consumers than the Cavendish banana he was growing, but realized that the Cavendish's longer shelf life would still make it the winner in supermarkets. Having been a supplier to Uchumi since 2001, he has worked out a concept for a supplier organization (with collection points for multiple farmers, cold storage, and ripening rooms in Nairobi) that could provide the supermarkets with the banana supply they need (year-round supply of good quality bananas with a long shelf-life). The main (basically only) obstacle to the realization of his concept is a lack of capital.

Table 16 indicates that there is greater participation in cooperatives or associations amongst traditional channel farmers than amongst supermarket-channel farmers. An important reason for this is that the former are linked in cooperatives or associations related to non-FFV products. For example, an important diversification strategy of traditional-channel farmers is to go into dairy and many of those with dairy cows are a member of a dairy cooperative (this is especially the case for the kale growers in Kiambu district)[19]. While about half of the supermarket-channel farmers also have livestock (especially kale farmers), very few (less than 5%) of them are members of a dairy cooperative. Other traditional-channel farmers are part of formal self-help groups (especially women), mostly with the objective to pool financial resources and create a revolving fund from which members can draw to make investments or deal with emergencies. Some of the traditional tomato and banana farmers in Kirinyaga and

[19] Livestock/dairy provides a perfect complement to FFV production as it transforms the nearly worthless FFV wastage into meat, milk and manure. For smallholder producers dairy is also important because it creates a more continuous income to offset the more erratic income from FFV.

Muranga districts also grow coffee and are members of coffee coops. Only two FFV cooperatives were encountered within the study's sample, both for traditional-channel farmers in Muranga district. The first is the Mukago Bio-Banana Group which is focused on organic growing methods for bananas intended for the domestic market and has 60 members who are organized around a farmer field school. The other is the Koome Self Help Group which has 156 members and is focused on the marketing of horticultural crops. Farmers did indicate that coop membership gives them greater access to low-interest loans which they could use in their FFV farming and which could facilitate market access. However, the data presented here clearly indicate that coop membership is not a determinant of access to the supermarket channel at this point in time. The main reason for group formation amongst FFV farmers is to overcome a small scale which stands in the way of efficient marketing. Supermarket-channel farmers, because of their size, have less need to group themselves for marketing purposes.

Finally, table 16 points to some differences in the marketing practices of the two farmer groups. First, supermarket-channel farmers market a higher percentage of their crop than do traditional-channel farmers. This is in part related to the latter's smaller size, which implies that home-consumption plays a more significant role. However, FFV are mainly intended for selling to the market as for all three produce items and for both types of farmers more than 70% of the production is marketed (it is nearly 100% for the supermarket-channel farmers). Second, the way in which the produce is marketed differs between the two supply channels in important ways. Supermarket-channel farmers receive their orders by phone, transport the ordered produce to the supermarket and keep records of their deliveries in order to be able to follow up with payments. By contrast,

traditional-channel farmers just harvest when they think the market price is good (or when they can no longer postpone harvesting), sell the produce either from the farm or take it by bicycle or donkey cart to a collection market near the main road and keep no records of their transactions. These differences hold across the three produce items as could be expected given that they are directly determined by channel choice (by the supermarkets).

Differences in Marketing Capacity

Looking across the four tables in this section, it becomes apparent that supermarket-channel farmers differ greatly from traditional-channel farmers in their marketing practices because they differ greatly with respect to their marketing capacity. The latter has four components. First, there is a physical capital component. Nearly all supermarket-channel farmers have a pick-up truck, a packing shed and a cell-phone. Renting transportation provides less control and farmers may supply markets too late (loose a buyer or face lower prices). Second, there is a human capital component. Supermarket-channel farmers have a larger labor force (needed to allow for short order-cycles) and better business management skills. The latter follows from their higher level of education and more extensive business experience (e.g., having had their own non-farm business or experience with supplying FFV to exporters, institutions, wholesalers). Third, there is a risk component. Supermarket-channel farmers' risk management strategies are more market-focused: more diversified income, more market options, more produce items. Compare this to small-scale farmers whose risk management tools focus on the production side and include keeping quasi-fixed capital low, minimizing cash outflows

and integrating horticulture with livestock/dairy. Fourth, there is a working capital component. Accessing the supermarket channel greatly increase working capital needs, as payment periods shift from zero days (the cash-on-delivery used in the traditional channel) to periods of up to 30 days[20]. Again, these differences over a broad set of capacity variables indicate the existence of a threshold capital vector at the entrance of the supermarket supply channel.

Given the limited marketing options available to smallholder farmers, it is not surprising that our survey reveals that 60% of the traditional-channel farmers say they have never thought about supplying supermarkets. The 40% who did think about it either had no idea on how to initiate the contact or saw another obstruction that closed off the channel for them (e.g., no transportation).

4.2 The Relative Impact of Export Channel Farmers in the Supermarket Channel

Exporters and export-channel farmers are only of limited importance as suppliers of FFV to supermarkets, with only 10-15% of supermarket-channel farmers being involved in export markets as well. Exporters are critical in some produce lines (mostly the higher value, lower volume items such as French beans or avocado), and absent in other produce lines (most domestic market fruits and vegetables, e.g. banana, tomato, kale). Mainly this is because there is little overlap in product types. For example, for kale, tomato and banana (which combined represent in volume terms 50% of the domestic FFV

[20] The up and downs of supermarkets can increase the working capital challenge. Cash flow difficulties at Uchumi in 2004 led to partial payments to FFV suppliers. One farmer for example indicated that the supermarket held two months worth of his turnover in its accounts payable to him. Only farmers with sufficient financial working capital can survive such cash-flow pressure and remain in the supermarket channel.

production), exports are insignificant (less than 100MT in 2002; MoARD 2002). These produce items find ready markets in Kenya and FFV exporters have instead focused on (directed their capital toward) higher value produce items such as French beans, snow peas, Asian vegetables (okra, eggplant) and avocadoes (these exports also include fresh-cut, shelf-ready (and at times even labeled) vegetable packs for supermarket chains in the EU). For fruits, the only two items which are of importance to both the export and the domestic market are mango and passion fruit, but even then only 4% of production is being exported.

The importance of exporters thus critically depends on the type of produce. The three main instances where the export and the domestic supermarket channels do overlap are: (1) semi-processed fresh vegetable packs of typical export produce items such as French beans or snowpeas (90% comes from exporters); (2) Asian vegetables, such as okra and eggplant, mainly directed to the large Asian community (50% comes from exporters); (3) fruits which are of some importance for exports, i.e., pineapple[21], avocado, mango and passion fruit (20-100% coming from exporters, e.g., 100% for pineapple, 20% for mango).

Farmers who are linked to both the export channel and the domestic market channel (like the 10% of the supermarket-channel farmers mentioned here), in many cases do so for different produce items (or even non-produce items: two of the supermarket-channel farmers in our sample exported flowers). For example, a farm may produce French beans as an outgrower for one of Kenya's major FFV exporters and at the same time produce tomatoes as a listed supplier to supermarkets in the domestic market.

[21] Fresh pineapples are not very important in Kenya's FFV exports, but Kenya's largest pineapple producer (DelMonte) is a major exporter of canned pineapple, while at the same time it sells fresh pineapples and pineapple juice in the domestic market (including supermarkets).

Typically these farmers are: (1) first involved in the export channel for a particular crop (say French beans); (2) using the experience and earnings from exports to expand their capital vector (land expansion, additional vehicles, construction of a packing shed, familiarity with good agricultural practices, and so on); and (3) then using their increased capital assets to also enter the supermarket channel as producers of domestic market crop (say spinach). The other instance where the export channel and the supermarket channel overlap is when the leading exporters divert some of their production (second grade unless there is oversupply) from the export market to the domestic market (see for example the case of Sunripe, section 4.4). And even here, there is a tendency to move away from the exporter: Fresh 'n Juici, Nakumatt's specialized FFV supplier, is doing most of the fresh-cut processing in-house (in part because supermarkets want affordable, first grade produce for their customers). However, the volumes involved are of relatively minor importance to both the exporter (almost all is exported) and the domestic supermarket (almost all FFV sales are for domestic market crops; although this is likely to increase in importance as supermarkets increase their market share in the FFV market).

For farmers, the difference in accessibility between the supermarket channel and the export market channel depends in great part on their size. Whereas (some) smallholder producers can access the export channel through various outgrower schemes[22], this is far less feasible in the supermarket channel since few such outgrower schemes exist and hence fewer smallholder producers are involved (apart from through traditional brokers, but supermarkets are moving away from brokers; essay 1).

[22] Albeit increasingly less so due to the increasingly stringent food safety standards in the export channel (see for example Dolan and Humprey 2000).

4.3 Supermarket-Channel Farmers Categorized

When we look at the supermarket-channel farmers as a group, it becomes apparent that to a large extent they represent a newly emerging class of farmers in Kenya. In the previous two sections we made the case that supermarket-channel farmers are distinct from both the typical traditional-channel farmers and the export-channel farmers. So where then does this emerging class of farmers come from? Based on our random sample of 49 farmers from the leading supermarkets' FFV supplier lists, we can distinguish four types of supermarket-channel farmers: (1) *specialized farms*, whose main focus is the production of FFV for domestic supermarkets; (2) *intensifying farms*, whose main focus is not FFV for the domestic market, but who use part of their resources to also supply FFV to supermarkets; (3) *specialty product farms*, whose main focus is value-added FFV (e.g., vegetable packs) which they supply to supermarket amongst others; and (4) *market diversifying farms*, whose main focus is FFV for the domestic market, but who do not have the domestic supermarkets as their main focus.

Type 1: Specialized Farms

The first type consists of recently established farms (in the last 10 years) that linked up with supermarkets in the last 5 years, started shifting to supplying mainly or even only domestic supermarkets and experienced fast growth since. An estimated 43% of the farmers fall in this category, all of them mainly growing vegetables. In many cases, the farmer is a well-educated individual who has or had a primary job in Nairobi (e.g., private or public sector employees, small business owners) and invested his or her

savings in land (landownership also has an important socio-cultural meaning in Kenyan society). This land was at first either not used, used for non-intensive farming (e.g., maize) or used for intensive farming (horticulture), but remained mostly a hobby for its owner. Some of the more entrepreneurial farmers in this group took samples of their produce to the supermarket's produce procurement manager in order to get a trial order and farmers successful in getting the quantity, quality and delivery right for the initial supplies succeeded in linking up with the supermarkets in a more long term relationship (i.e., the usual way farmers got linked up with supermarkets once the latter started to really expand the FFV category). Once they gained entry, these farmers quickly realized the potential (increasing supply orders from supermarkets coming in), but found that continued access would require them to make additional investments in production and marketing technology and run their farms under more professional management. In many cases, it implied an exit from other professional engagements (albeit not necessarily for both spouses in a household). In other cases, farms were set up from the start for full-time, commercial farming.

A typical example of a farmer of this type is L Farm[23]. L farm was started in 1999 by a former employee of the Central Bank of Kenya who over time had build up a three-branch supermarket chain in the greater Nairobi metro area. L-farm initially supplied its own supermarkets. Since its start in 1999, the farm has specialized in leafy green vegetables (because of their high turnover) and almost exclusively supplied supermarkets (because they offered the best prices and presented the lowest transaction costs as they buy in large volumes). As the supermarket sector was growing and becoming more

[23] Farm names are withheld throughout this essay in order to comply with the MSU/UCRIHS stipulations.

competitive, the farmer felt his competitive advantage was in farming and so he sold his supermarkets for premium prices to the leading supermarket chains and invested the proceeds in the expansion and upgrading of his farm. The farm is located 35km south of Nairobi in the dry, very sparsely populated areas of Kiserian district on three pieces of land bought from the pastoral Masai tribe. It is relatively inexpensive land with almost boundless expansion options, only limited by the presence of aquifer layers. The latter must be accessed by boreholes of which L Farm has installed two. Given the limited availability of water, 64% of the farmed area is under an efficient drip irrigation system which allows the farm to grow and supply FFV year-round. Supplies of leafy vegetables (e.g., kale) to the Nairobi market show strong seasonal patterns (as most of the production takes place under rainfed conditions) with shortages (especially of good quality produce) occurring during several months each year. L farm's ability to produce good quality leafy vegetables in those low-supply months thus addresses the supermarket's key requirement of year-round supply ability of farmers.

L Farm started from an initial size of 30 acres in 1999. In 2001 it began supplying the leading supermarket chains, Uchumi and Nakumatt, growing along with them as they expanded their produce sections. By 2004, L Farm had grown to 110 acres (of which 55 are farmed, the rest set aside for future expansion), had four transportation vehicles and three hand-tractors and employed 50 workers. Not withstanding this high growth rate, the farmer indicated that he could have increased his production much faster if affordable credit would have been available to invest in additional boreholes. The absence of such credit is the farmer's most critical problem and one he has been trying to discuss with supermarkets, requesting them (1) to provide farmers like him (who have all the right

capacities: market knowledge, size, irrigation system, close to Nairobi, and so on) with formal supply agreements that can be used to demonstrate credit worthiness of farmers and (2) to even broker with commercial banks or other lending institutions to provide affordable credit to their (listed) FFV suppliers. In conclusion, the case of L Farm demonstrates the emergence of a list of preferred FFV suppliers in the supermarket's strategy to assure supply consistency. This is similar to what has been observed elsewhere (see for example Berdegue et all. (2004) for the case of Central America).

Type 2: Intensifying Farms

The second type of supermarket-channel farmer consists of larger farms with extensive business experience whose main economic activity is not FFV production for the domestic market, but who use part of their land for the latter in order not to leave it laying idle. These main activities (which are to these farms more profitable than the supply of FFV to supermarkets) are varied and include flowers or vegetables grown for export, tea, livestock and dairy processing, amongst others. In most cases, FFV were first supplied to traditional-channel agents, such as wholesalers, and only later to domestic supermarkets (when these became bigger sellers of FFV). We can classify 22% of the supermarket-channel farmers in this category.

A good example here is SR Farm. SR Farm is an exporter of flowers to the EU. The 250-acre farm has 258 employees and was a coffee plantation until 2000. With coffee prices depressed, the farm shifted to alternative, more lucrative horticultural products with 60 acres under horticulture by 2003 (the remaining 190 acres are still under coffee but are not harvested (because of the low prices) nor uprooted because of

government restrictions and for strategic reasons, i.e., a future increase in coffee prices). Of these 60 acres, 12.5 acres were allocated to the production of roses for export which are now the main focus of the farm (they are the most profitable part, high turnover per acre). Another part of those 60 acres is devoted to vegetables for the export market (e.g., 8 acres of French beans). However, most of the 60 acres under horticulture is used for the production of FFV intended for the domestic market For the latter they produce a wide variety of items, including 3 acres of bananas, 4 acres of cabbages and 14 acres of kale. Of the kale about 60% was marketed to the supermarkets and 40% to traditional local markets. Their expansive, advanced irrigation system (covering 100 acres) allows them to produce FFV during the off-season. The farm is capital intensive using 5 tractors, two trucks, charcoal and electric coolers, modern packing sheds and greenhouses (1/2 ha).

For supermarkets, the main attraction points of SR Farm are its large supply capacity, its ability to supply constantly throughout the year and its business skills, which make it easy to order from them (e.g., place orders by phone, pay through bank transfers, and so on). While there is a loosely followed continuous supply agreement between SR Farm and Uchumi, the farm would like to move to a stricter implemented supply contract. Without the latter SR Farm is unlikely to make additional investments in its FFV production for the domestic market (such as making the organizational investments needed to optimize its harvest cycles to the needs of the supermarkets).

Type 3: Specialty Product Farms

The third type of supermarket-channel farmer, of minor importance at this point in time (4% of suppliers), consists of specialty produce suppliers who have catered to more

sophisticated markets domestically or abroad. Here we find for example the producers of pre-packaged, pre-cut vegetables for export.

An interesting example is provided by GD Farm. Started in 2000 as a supplier to the airline and tourism industry, GD Farm is a 10 acre farm specialized in organic mixed salad packs, although it produces various other organic FFV as well (e.g., strawberries). Because all products are organic, produce items can be marketed for twice the price of their conventional counterparts. The farm has 30 employees, is fully irrigated, has five acres under shadow netting, has a washing and packing shed and complies with HACCP standards as this is demanded by the airlines. In order to get its highly perishable salad bags in good condition to customers, they use the cold chain system of a leading meat processor, with whom they forged a partnership. Its salad bags are bar-coded and labeled under their own brand name. In 2003, the airline and tourism industry on the one hand and the domestic supermarkets on the other hand, each took about half of its supplies. Its past growth has been financed by loans, retained earnings and credit by suppliers (e.g., of irrigation equipment). The farm is developing various new products to extend its range and plans to increase the acreage under production as well as make additional investments in irrigation. The main attraction for supermarkets of having GD Farm as a FFV supplier is that (1) it helps them complete both their line of value-added vegetable packs and their line of organic FFV items, which is important in attracting the higher income consumer segment; (2) it has the capacity (experience from other sectors, packing shed, clean water, and so on) to wash, package, correctly weigh and label the product (important aspects for these higher value-added produce items intended for the more

discerning high-income consumer segment); and (3) it has the capacity to supply these produce items year-round (irrigation system).

Type 4: Market Diversifying Farms

The fourth type of supermarket-channel farmers consists of a varied group of farmers whose main product focus is FFV for the domestic market, but for whom supermarkets are not the main focus. These farmers have merely diversified their market by supplying part of their output to supermarkets without showing much change in their farm practices or turnover because of it. Of the supermarket-channel farmers, 31% fall into this category. Here we find most of the fruit suppliers, which include (i) farms who have recently shifted from coffee (low prices) to bananas or from export crops (market exclusion, e.g. due to inability to meet quality requirements in export markets) to vegetables for the domestic market, (ii) medium-sized to large fruit growers and (iii) big plantation farms such as Delmonte (13,000 acres of pineapples). For the larger producers in this category, supermarkets are expected to have little or no impact for the next five to ten years, as they represent only a minor part of the turnover of these producers. However, small and medium sized farms in this category are expected over time to either fully engage in the supermarket channel (thus becoming farmers of the first type) or to exit this channel because the participation costs or the opportunity costs are too high.

F Farm is an example of the smaller farmers in this category of supermarket-channel suppliers who finds himself at such a cross-road. Established in 1997, F Farm is a 15 acre farm near Naivasha (85km west of Nairobi) which employs 4 full-time workers and 10 casuals when needed. The farmer used to be in poultry, but exited this market

when prices were too low. He then shifted to FFV, growing a very wide variety of FFV (13 different crops at the time of the interview, from celery over broccoli to papaya). Some of these items are sold to the leading supermarket chains (since 2000) in addition to traditional buyers. For example, 80% of his spinach sales go to the supermarket while 20% goes to the main wholesale markets in Nairobi. Whatever cannot be marketed for either lack of quality or lack of demand goes to waste.

For the supermarket, F Farm is a qualified supplier because it has an irrigation system, its own transportation, a phone, and so on, indicating it can meet the requirements for year-round supplies and short order-cycles (in the case of more perishable leafy vegetables). The farmer likes selling to the supermarkets because they are easy to supply to (less time-consuming), because the volumes are larger and because the payment systems allows him to organize the farm's accounts (e.g., worker payments). The problem is that the orders he gets are too erratic (supermarkets telling him "call tomorrow or the day after"), which makes it difficult to organize the harvesting. The farmer also feels that receiving agents at supermarkets are not knowledgeable about produce and that supermarkets take too long to pay him (up to a month). If this changes and he gets more stable orders, he would further invest in the farm (especially irrigation) and would likely become a dedicated supermarket-channel farmer. If things remain as they are, the farmer will likely exit the supermarket channel, already indicating that should prices for poultry get better, he would move back into that direction.

4.4 Cases of Smallholder Farmer Groups Supplying Supermarkets

Based on the estimated FFV turnover and distribution over the different types of suppliers (essay 1), we estimate that around 1,000 smallholder farmers were part of the supplier base of the supermarkets in 2003. These farmers supply (1) indirectly through brokers/wholesalers (roughly 900 farmers) and (2) as (irregular) direct suppliers to individual stores, mostly for highly perishable vegetables like leafy greens to up-country branches (roughly 100 farmers). With supermarkets shifting away from brokers to direct supplies by farmers and moving to procurement centralization (essay 1), the importance of smallholder producers in the supermarket channel is expected to dwindle to about 20% of FFV supplies (their absolute number will be determined by the FFV turnover in supermarkets as this is growing rapidly from a small base).

Given this bleak scenario for smallholder producer participation in the supermarket channel on the one hand and the rising importance of supermarkets and the potential benefits of becoming a regular (listed) supplier to them (see section 5) on the other hand, we briefly present five cases that demonstrate different strategies that may allow for a greater participation by smallholder farmers in the supermarket channel. These cases represent all the formats we could identify (based on interviews with industry experts, including the supermarkets' FFV procurement managers) of smallholder involvement other than through traditional-channel brokers or through direct supplies. The types of suppliers presented in these cases were not included in the distribution of the FFV suppliers presented earlier because they represent (in this early stage of supermarket development) too small a fraction of the supermarket's FFV supplies (<1%). Across the

five cases, three key success factors emerge: (1) a focus on products with a clear market potential; (2) the catalyzing involvement of private or public organizations as marketing facilitators with a commercial basis (i.e., intended to be sustainable without subsidies); and (3) group formation amongst farmers. The case-information is mostly based on in-depth interviews with key stakeholders, but also on secondary information sources.

Case 1: Family Concern – An NGO Organizing Smallholder Farmers

Family Concern, a Kenyan NGO whose mission it is to combine development and business objectives in building marketing linkages for small scale growers, is the lead organization in a project that aims to facilitate the supply of traditional African vegetables (TAV)[24] from smallholder producers to domestic supermarkets in Kenya. The International Plant and Genetic Resources Institute (IPGRI) and the Kenya Agricultural Research Institute (KARI) where involved as technical partners on the production side, FARM Africa (a UK based NGO) was involved to provide expertise and financial support and Uchumi was involved on the marketing side.

Based on consumer market studies, Family Concern had identified that (1) there existed a high and growing demand for TAV, and (2) that this demand was not matched by supplies. Uchumi had come to the same conclusion as it could not keep these vegetables on the shelves and was trying (but not fast enough succeeding) in getting its listed FFV suppliers to produce more. In 2003, Uchumi estimated that potential demand for TAV was three times the actual sales of 100MT per month. When in 2003, Family Concern approached Uchumi with the proposal to organize smallholder farmers for the

[24] These are leafy vegetables such as black nightshade, spiderplant, cowpeas and amaranth.

production and marketing of TAV, the supermarket was very interested to get involved. Family Concern and its partners then went to work, enlisting 50 smallholder producers in the rural and peri-urban areas around Nairobi (with on average .25 acres available for TAV) and organizing them in a sort of outgrower scheme to organically grow TAV under well-defined good agricultural practices (e.g., with regard to use of clean water). Farmers receive seed and technical assistance, are inspected with regard to their farm practices and are, since 2004, marketing their produce through Family Concern, who is responsible for transporting the bunches of TAV to Uchumi based on the latter's order schedule. In order to differentiate its product in the market place, Family Concern supports its product with in-store advertising and plans to introduce its own label (African Delicacies).

The project benefits farmers as well as the supermarket. Farmers get assistance in growing a cash-flow friendly product (ready for harvest after only 4-5 weeks, pest and diseases resistant) for a reliable market, while Uchumi resolves (at least partially) one of its key FFV supply shortages, expands its lines of organic and branded FFV items and improves its image as it advertises its assistance to smallholder farmers to consumers in its stores.

Case 2: HPHC – A Government-Owned Company Organizing Smallholder Farmers

Established in 2003, the Horticultural Produce Handling Company (HPHC) is a government-owned company set up to own and commercialize an elaborate modern cold chain infrastructure (financed by the Japan International Cooperation Agency JICA) which is intended to improve the marketing system for horticultural produce from smallholder producers. While initially managed by the parastatal Horticultural Crop

Development Authority (HCDA), government involvement is expected to be greatly reduced over the period 2004-2005 (both in terms of ownership and management). An initial focus on the EU export market has been replaced by a dominantly domestic and East Africa regional focus because of difficulties in accessing export markets. HPHC's facilities include seven satellite depots with pre-cooling units, a central warehouse in Nairobi (near Jomo Kenyatta International Airport) with cold storage facilities and insulated trucks of various capacities to maintain the cold chain from collection point to supermarket.

Under the stringent quality and safety requirements normally associated with the export market, farmers produce and supply as groups of 15-40 outgrowers to a collection center which has a charcoal cooler, a toilet and clean water. Selected farms have sizes varying from 0.125 to 2 acres and are located within a 5km radius of a collection center (which is financed by the farmers themselves). Pre-cooled and insulated HPHC trucks (2MT capacity) then pick the produce from these collection points and take it to the nearest satellite depot. Larger trucks (8MT) take the produce from the satellite depots to the Horticultural Centre in Nairobi and from there to various buyers. Farmers get planting, harvesting and spraying schedules and technical assistance from HPHC as well as buy their seeds from them. For this organization of the farmers and the cold chain distribution, HPHC charged (in 2003) a low commission of 17% of the sales price leading to higher prices for farmers (the 17% is far below the 65% of the wholesale price going to brokers and wholesalers in the traditional channel). One of these buyers has been Uchumi who bought Asian vegetables from HPHC in 2003 (albeit for small volumes and on an irregular basis).

HPHC has not started off as an instant success. Lack of marketing experience and trading network partners have largely kept it out of export markets and in 2003 the company was operating at only 5% of its capacity. However, its recent shift in market focus to the domestic and regional market may fit well the strategic objectives and needs of a supermarket like Uchumi. HPHC can offer the volumes and the food quality and safety assurances that are key pillars in the FFV procurement system currently being developed by the leading supermarkets in Kenya. It is therefore not surprising that in 2003 HPHC and Uchumi were exploring potential collaboration. If HPHC succeeds in getting its marketing strategies right (e.g., by getting supermarkets like Uchumi and others in the region such as South Africa's Shoprite on its customer list) then its potential impact is large (HPHC's management indicated to us that they aim to get a 5% share of the domestic FFV market by 2006).

Case 3: Iga Muka – A Farmer Group Assisted by a Private Sector Marketing Facilitator

Started in 1989, Iga Muka is a self-help group of about 30 smallholder farmers growing a wide variety of FFV on their farms located on the slopes of Mt Kenya (some 200km from Nairobi, i.e., further away than most FFV suppliers for the Nairobi market). The farmers group succeeded in linking up with Uchumi via the Kenya Agricultural Commodity Exchange (KACE). Operational since 2000, KACE is a private sector firm that facilitates linkages between sellers and buyers of agricultural commodities, in part by setting up market information points which have small trading floors where buyers and sellers (like Iga Muka and Uchumi) can interact. KACE gets its revenues from selling market price information on commodities (e.g., through SMS messages on farmer's cellular phones)

and taking commissions on brokered sales as well as from donor support (e.g., from USAID and DFID). Although it plans to overcome it, KACE was still dependent on donor support in 2003.

In 2002, Iga Muka contacted KACE on the possibility of finding a market for its strawberries, which are the group's biggest income earner. Through an initial contact at a KACE auction in Nairobi, Iga Muka placed a first order with Uchumi which then turned into a longer term supply arrangement. The strawberries are harvested and collected three times a week. In a small packing shed, the strawberries are graded according to size, stage or ripening and appearance and packaged in plastic punnets of 1/2kg. The product is not labeled, other than with a barcode to comply with supermarket requirements, as the costs of labeling are considered too high at this point. Iga Muka has a full-time grader on its payroll at the collection point and has a marketing agent (representative) in Nairobi. This agent collects the orders from Uchumi (and other buyers). As the group does not have its own transportation, it uses public transportation (mini-buses) to transport about 60 to 100kg of strawberries three times a week to Nairobi (200km of partially very rough roads). Small volumes of about 60-80kg of strawberries per week, out of a maximum of 300kg, are intended for Uchumi, the rest is either marketed through KACE to non-supermarket buyers (e.g., institutions, greengrocers, and so on) or goes to waste.

While the group has succeeded in remaining in the supermarket channel, it is not really equipped to supply supermarkets and has not been increasing its business because profits are too low and access to credit is restricted. For example the group would like to invest in small-scale processing equipment which would help solve the demand volatility problem as well as make the grading more efficient (first grade to supermarkets, lower

grades for jam). However, it has not been able to build the capital from retained earnings while commercial loans are considered too risky. The absence of growth as well as increasingly delayed payments by Uchumi (which was working through some financial problems in 2003-2004) have lowered morale and undermined the internal stability of the group which would have exited the supermarket channel already if it were not for its relatively transparent accounting system and for its good organization (i.e., a constitution that spells out a code of conduct for its members in addition to penalties for going against the group's bylaws).

Case 4: Sunripe – An Exporter with Smallholder Outgrowers Supplying Supermarkets

Sunripe, a family business founded in 1969 and in 2004 one of Kenya's largest FFV exporters, growing at an average annual rate of 20% over the last 15 years (Shah 2004), produces 40 different high-value lines of fruits and vegetables from its own farms as well as from 1,000 contracted smallholder producers. A (small) part of its output is sold to Uchumi.

Sunripe is a change leader in Kenya's export industry. In 1999 for example, it was one of the first exporters in Kenya to start developing fresh-cut and washed & ready-to-eat vegetable prepacks for the export market. Because (1) there are lower grades of produce which fail to meet export standards and (2) there is sometimes oversupply if the quantity contracted from farmers exceeds fluctuating demand from buyers in the export market, exporter like Sunripe have excess produce for which they need alternative markets. Around the same time (since 1997 and onward) supermarkets like Uchumi were rapidly developing their FFV sections, continuously adding new items (especially in the

hypermarkets). Given this strategic fit between supply and demand, Sunripe started supplying Uchumi with a number of different organically grown pre-packed vegetables (e.g., pre-cut French beans, mixed stir-fry vegetables, and so on), providing an alternative market for Sunripe and making a major contribution to both its line of organic products and its line of pre-packed vegetable products for Uchumi. Another area where the two companies are considering collaboration is with respect to the setting-up of quality and food safety control systems for Uchumi's FFV suppliers. Sunripe, which became EurepGAP certified in October 2003, would be an excellent source of expertise in this area, especially with respect to the implementation of traceability systems (for food safety) amongst smallholder producers.

Sunripe's 1,000 smallholder outgrowers, thus demonstrate yet another way in which smallholder producers of FFV can be connected through non-traditional channels to domestic supermarkets in Kenya. However, recent research indicates that the implementation of increasingly stringent food safety standards imposed by EU supermarkets on their FFV suppliers will likely lead to a declining role for smallholder farmers in Kenya's FFV export sector (Dolan and Humphrey 2000).

Case 5: B Farm – A Lead Farmer Organizing Smallholder Farmers

Another format under which smallholder growers could remain or become linked to supermarkets is that of a lead farmers who organizes and buys from a group of other farmers. While this type of supplier is not yet important in the supplier base of the supermarkets, it appears to be increasing in importance as several of these groups have emerged in 2003-2004. B Farm, a 16 acre family farm located 25km from Nairobi,

provides a good example here. This farm was started in 1992 and began supplying kale to Uchumi in 2002. As the supermarket orders grew in size and regularity, the farmer decided to source kale from other farmers rather than to expand his own farm. By 2004, he sourced from 40 other farmers (mostly smallholders) who are as a group organized so that the supermarket can be supplied with bunches of kale on a daily basis. For the participating farmers, the key differences between selling to brokers or selling to B farm is that (i) they now face a much more secure demand for kale and (ii) they get a better price (as B Farm pays a premium to secure supplies). These are crucial differences for smallholder farmers as risk reduction and higher profitability are important steps toward a growth dynamic. B farm is also a retailer of farm inputs which further facilitates access to inputs for the participating smallholder farmers and may be a precursor on the path to interlinked supply contracts.

5. The Impact of Supermarkets in the Kale Supply Channel

5.1 Kale Supply Channels in Kenya

Kale Production Characteristics

There are two key characteristics of kale production in Kenya that are important for the present analysis. First, most of the kale production in Kenya takes place under rain-fed conditions, leading to strong supply and price seasonality (annual production cycles are tuned to a short rains and a long rains season). This implies that for supermarkets, who want year-round supplies, kale must be ordered from farmers who have irrigation and a year-round source of water. Second, there are no specific, formal quality or food safety

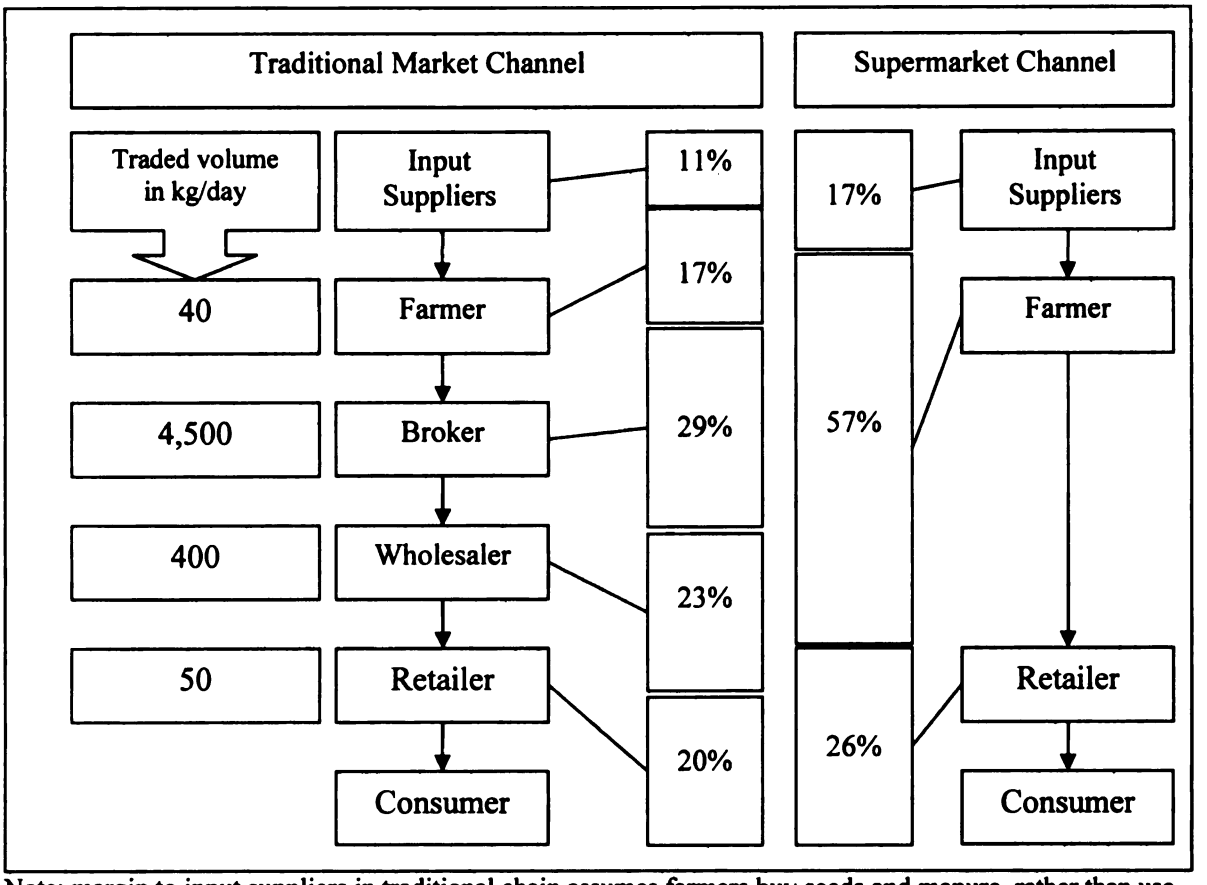
standards in the domestic market (in the traditional channel nor in the supermarket channel) but quality, mostly determined by freshness, leaf size and color and the degree of damage due to pests or other decay, does play a role in price determination. For the supermarkets who want to differentiate themselves on quality, only the best quality of FFV will be accepted. This implies that farmers supplying supermarkets must be able to control quality (e.g., through pest management, by being located close to Nairobi so the highly perishable kale arrives fresh, and so on).

Kale Supply Chains

The entry of supermarkets in the kale supply chain leads to supply channel integration. Kale farmers in Kenya have potentially four market options, depending on their capacities: (1) they sell to brokers from their farm; (2) they sell to brokers near the main road; (3) they sell to wholesalers in main urban areas; and (4) they sell directly to retailers or institutions. Which option is chosen is mostly determined by the transportation capacity of the farmer and his or her willingness to take risks (the more downstream the farmer takes the produce, the higher the price, but also the higher the transportation costs and the higher the price risks). Given that most traditional-channel farmers are risk-averse smallholder producers without (motorized) transportation, most farmers in this channel sell to brokers at the farm or near the main road (rural collection market). For example, in our farmer sample we found that of the Lari farmers (at 60km from Nairobi), 52% sell kale from the farm, 38% take it to the main road and 10% take it to wholesale markets in Nairobi. Supermarket-channel farms on the other hand are larger and have their own transportation and are capable of taking their produce direct to the

supermarkets. Figure 1 compares the traditional market channel with the supermarket channel for kale, indicating the distribution of the marketing margin over the supply chain's successive economic agents, as well as an indication of the size (in terms of sales volume) of these economic agents for the traditional channel. Figure 1 indicates that the shift from the standard traditional supply chain to the supermarket supply chain for kale implies a vertical integration, with the farmer integrating the broker and part of the wholesale function and capturing a far greater part of the marketing margin. This extends earlier research on the applicability of market channel theory in Kenya to the supermarket channel. Dijkstra (2001) showed how channel theory (i.e., vertical channel disintegration (i.e., the number of successive distinct business entities in the supply chain) is negatively correlated with the size of producers and retailers) could explain long supply channels for FFV in Kenya. Here we find the mirror image: supermarkets (as large retailers) and supermarket-channel farmers (as larger producers) lead to short (direct) supply channels.

Figure 6: Marketing Margins in Kale Supply Chains



Note: margin to input suppliers in traditional chain assumes farmers buy seeds and manure, rather than use their own.
Source: author's farmer survey, interviews with 15 channel participants, including brokers, wholesalers and retailers and price-measurements throughout the chain.

Traditional Kale Supply Chains

Traditional kale supply chains provide marketing solutions to smallholder farmers, but are characterized by a small percentage of the marketing margin captured by the farmer, high transaction costs (produce changes ownerships many times) and brokers with high market power (they trade the largest volumes and are most knowledgeable about prices at the farm and in the wholesale markets). In the standard traditional supply chain for kale, a farmer stuffs the harvested kale leafs in bags of 75kg and takes them by donkey cart to an

open air collection market near the main road to Nairobi[25]. At this rural market, independently operating brokers arrive with a pick-up or a larger lorry. They negotiate the prices with farmers and, once a price is agreed upon, they pay loaders to load the lorry to maximum capacity. The broker then takes the kale bags to one of the wholesale markets in Nairobi, pays a fee to enter the market, and starts negotiating prices again, this time with several wholesalers[26]. Once a price is agreed upon off-loaders are paid by the buyer to unload the bags of kale. It takes about 10 wholesalers to buy a whole lorry-load of kale and so it can take brokers the better part of a day to sell it all. Wholesalers then take leafs from the bags and bunch them in bunches of approximately 650gr. In the next step, small, traditional retailers such as market stalls, kiosks or street hawkers come to the wholesale market where prices (this time per bunch) are once more negotiated. Retailers then pay cart pullers to bring the bought produce to their retail outlet. These retailers then break up the bunches into smaller bunches of maybe 200gr and offer them for sale to the end-consumer, who again will negotiate the price.

While quite challenging for the resource-poor, risk-averse smallholder producers (who form the bulk of the producers in the traditional channel), there are variations to the above supply chain structure which allow farmers to capture more of the marketing margin and reach an intermediate step to selling to supermarkets. Farmers may form small groups whose combined harvest is sufficiently large to make it economical to rent a truck and take the produce directly to the wholesale market or even to retailers (some of the ad hoc supplies of kale to supermarkets come from smallholder farmers this way).

[25] Alternatively, the farmer may sell directly off-farm to a broker who was directed to the farm by agents hired by the broker. Agents are local people who are very knowledgeable about which farmers have a ready harvest. Or the farmer may pay another farmer to take her or his bags to the road-side market.

[26] Alternatively, a small group of wholesalers may join forces and hire a transporter to go to the rural market to buy a number of bags of kale or they place a joint order with an established broker.

Farmers may also bunch the kale leafs themselves in order to capture the value-added. When bunches are made closer to the farm, they are usually transported in extra large bags (approximately 200kg).

The Supermarket Kale Supply Chain

At the other extreme is the supermarket supply chain for kale, which is relative to the traditional supply channel shorter, more efficient from a transaction cost point of view, allows the farmer to capture a large portion of the marketing margin (farmer and supermarket each capture a part of the wholesaler's margin) and controlled by the supermarket in stead of by the broker (who disappears). The supermarket calls the farmer in the afternoon with the order for the next day, indicating also if the price has changed since the last order and if so by how much. Early in the morning of the next day, the farmer puts his entire workforce (if needed supplemented with casual labor) on the kale harvest, and in about 2 hours the farm workers have picked and bunched enough leafs to fill the order and have loaded them directly on a truck (no bags), covered with canvas. The farm's driver then takes the kale to the supermarket's reception bay, has the delivery-book filled out and returns to the farm less then an hour after delivery. Supermarket employees place the kale bunches in the FFV section. The farmer is paid bi-weekly (in principle) for the cumulative supply over that time period. Given the wide variety of produce items grown by supermarket-channel farmers, they usually supply more than one item per delivery to the supermarkets.

5.2 Determinants of Farmer Participation in the Supermarket Channel

In this section we want to assess how farm characteristics determine the participation of the farm in the supermarket channel for kale (Y). Since negative dependent variables are not possible and assuming non-linear effects of the explanatory variables, we modeled this channel adoption decision as a probit model. The model takes on the following form:

$$\text{Prob}\,(Y=1|X) = G(\beta_0 + X\beta),$$

where G is the standard normal cumulative distribution function. In their most general form, adoption functions contain the following five categories of explanatory variables: prices of inputs and outputs, risk factors, quasi-fixed capital and shift factors. Prices of inputs and outputs were not directly included as they are implicit in the channel choice and further determined by the size and location of the farm. The risk factor and quasi-fixed capital explanatory variables we want to include here capture risk-sensitivity (land ownership), land capital (size of the farm), access to financial capital (size of land and ownership, education), human capital (age, education, gender) and physical capital (presence of an irrigation system). Each of these explanatory variables is hypothesized to ceteris paribus increase the probability of adoption of the supermarket channel. With regard to gender it is hypothesized that men are more likely to enter the supermarket channel because they (1) are assumed to have better access to the required production factors and (2) tend to get more involved when the transactions become more formal, sizeable and rewarding (Dolan 2001). Two variables normally presented in adoption

models, household size (quasi-fixed capital) and location (shift factor), were omitted here. Most of the supermarket-channel farmers rely for the greater part on (often large numbers of) hired employees, making size of the household (indicating the availability of family labor) not a very meaningful variable. Location was left out the model because the traditional-channel farmers were selected from only two nearby divisions so that for this sub-sample there was too little variation over the location variable. One further departure from the standard adoption model is that for the size of the farm, land ownership and the presence (or absence) of an irrigation system we used the 1999 situation. The 1999 data reflect the position of the farms at the time when they became suppliers to supermarkets (all the supermarket-channel farmers became suppliers to supermarkets around or shortly after 1999). If we would have used the current situation (e.g., the size of the farm in 2004) then there could potentially be an endogeneity problem as farm-size could well have been influenced by supermarket channel participation. Based on the above, the implementation model has the following determinant variables (X):

(a) the percentage of the farm size that is owned in 1999 (percent owned 99);

(b) the size of the farm in acres in 1999 (size 99);

(c) the number of years of schooling of the head of the farm (education of head);

(d) the age in years of the head of the farm (age of head);

(e) the gender of the head of the farm (gender of head); and

(f) a dummy variable indicating if the farm had an irrigation system (sprinkler or drip) in 1999 (irrigation 99).

Based on maximum likelihood estimation (MLE), Table 17 presents the probit estimators ($\hat{\beta}_i$) of the above model. Table 17 indicates that the results are as hypothesized, namely, the probability of a farm participating in the supermarket channel increases as the farm (i) is larger and (ii) has a drip or overhead irrigation. The marginal effect indicates that, for the average farm (in terms of the independent variables), having one more acre of land (i.e., a relatively large 10% increase relative to the average size of 10 acres) increased the probability that the farm will participate in the supermarket channel with nearly 12% while having a drip or overhead irrigation system increases this probability with a dramatic 46%. The latter indicates that having irrigation is a critical capital requirement for farms who want to become FFV suppliers to supermarkets. Education, age, gender and land-ownership did not have ceteris paribus a statistically significant impact on the probability of a farm participating in the supermarket channel in our sample.

Table 17: Determinants of Farmer Adoption of the Supermarket Channel (Probit Results)

Independent variables	P(Supplies kale to supermarkets) (s.e.)	Marginal effect
Size 99	0.30 (0.157)*	+11.8%
Education head	0.19 (0.164)	-
Percent owned 99	-0.01 (0.014)	-
Irrigation 99	1.35 (0.746)*	+46%
Gender of head	0.55 (1.078)	-
Age of head	0.02 (0.031)	-
Constant	-5.76 (3.930)	-
No. of observations	57	
(Pseudo) R-square	0.7621	

Notes: * = significant at the 10% level. Marginal effect measured at the mean levels of the determinant variables.
Source: author's farmer survey 2004

5.3 Supermarket Channel Participation and the Farmer's Production Technology

In this section we want to compare the production technologies used by supermarket-channel farmers and traditional-channel farmers. In the micro-economic theory of the firm, technology is represented by a production function which reflects the technological relation that exists between any particular combination of inputs and the resulting levels of outputs q (Sadoulet and de Janvry 1995). These inputs consist of an X vector of variable inputs (e.g., fertilizer) and a Z vector of quasi-fixed inputs (e.g., land). Various types of production functions exist. Here we select the Cobb-Douglas production function which is the most used functional form for the analysis of farm efficiency (Battese, 1992; Bravo-Ureta and Pinheiro, 1993). This production function takes on the following form:

$$q = A\, X^{\alpha} Z^{\beta}$$

Where α and β represent the elasticity of production for the inputs with respect to the output, i.e., the percentage change in output for a 1% change in the input keeping all other inputs fixed ($\partial q \cdot x / \partial x \cdot q$, $\partial q \cdot z / \partial z \cdot q$). By selecting land, labor and fertilizer as the inputs and taking the natural logs, we get the following two production functions which we want to estimate and compare:

Supermarket-channel farmers: $\text{lnoutput} = A_1 + \alpha_1 * \text{lnlabor} + \beta_1 * \text{lnland} + \gamma_1 * \text{lnfertil} + e_1$ (1)

Traditional-channel farmers: $\text{lnoutput} = A_2 + \alpha_2 * \text{lnlabor} + \beta_2 * \text{lnland} + \gamma_2 * \text{lnfertil} + e_2$ (2)

Whereby lnoutput is defined as the natural log of output measured as kg of kale produced by the farmer from the current acreage over 1 cycle; lnlabor is the natural log of the number of full work-days used for land preparation, planting and weeding of kale; lnland is the natural log of the number of acre-months used for kale growing (we want to take into account a harvest cycle length which over the sample varies from 2 to 12 months[27]); and lnfertil is the natural log of the number of kg of fertilizer applied to the current acreage over 1 cycle (summarized over the various types of fertilizer which in terms of value per kg do not differ widely). The last term, e, is the estimated error (disturbance) which contains the unobserved explanatory factors.

Chow Test

A method often used in econometrics to test for differences in regression functions across groups is the Chow test (Wooldridge 2000). The Chow statistic tests the null hypothesis that the intercept and all the coefficients are the same across the groups. For equations (1) and (2) above we get:

$$H_0: A1=A2, \alpha_1= \alpha_2, \beta_1= \beta_2, \gamma_1= \gamma_2$$

The Chow test involves estimating a restricted model (the four restrictions under H_0) and an unrestricted model (under the alternative hypothesis that H_0 does not hold). The following F statistic must be calculated:

[27] Kale leafs can be harvested from the same plants at regular intervals over periods stretching up to 12 months, although the normal harvest cycle is about three months (East Africa Seed Co. 2002).

$$F_{k+1,\, n-2k-2} = [(SSR_r - SSR_1 - SSR_2)/(SSR_1+SSR_2)] \,.\, [(n-2k-2)/(k+1)],$$

where (i) SSR are the sum of squared residuals obtained (through ordinary least squares estimation) for the restricted model (using all observations) and for two separate regressions, one for each group (using only the observations for one group at a time), (ii) k is the number of coefficients to be estimated and (iii) n is the overall number of observations. The value of the F-statistic here is 1.891 with a corresponding p-value of 0.129. This means we can reject H_0 at the 15% level. The test indicates that there is a statistically significant difference (at the 15% level) between the production functions of supermarket-channel farmers and traditional-channel farmers.

Estimation of the Production Functions Corrected for Self-Selection Bias

The distribution of the farmers over the two groups (supermarket channel, traditional channel) is not random but rather the outcome of a self-selection process. In order to control for this (potential) selectivity bias, we use Heckit's two-stage method. In the first step, this method calculates the inverse Mill's ratio (λ) for each observation (via a probit model for channel choice) which then in the second step is added in to the substantial model (the production function) as a control variable. The models now become:

Supermarket-channel farmers:

$$\text{lnoutput} = A_1 + \alpha_1 * \text{lnlabor} + \beta_1 * \text{lnland} + \gamma_1 * \text{lnfertil} + \delta_1 * \lambda + e_1 \quad (3)$$

Traditional-channel farmers:

$$\text{lnoutput} = A_2 + \alpha_2 * \text{lnlabor} + \beta_2 * \text{lnland} + \gamma_2 * \text{lnfertil} + \delta_2 * \lambda + e_2 \quad (4)$$

Table 18 lists the estimated parameters for both models. The λ regressor is significant for equation 4 which means its presence corrects for a self-selection bias. We further find that both models are significant and that the signs of the coefficients are as expected, namely output increases as, ceteris paribus, more land or more fertilizer are used. Labor was found not to have a statistically significant effect in either model.

Table 18: Heckit Two-Stage Estimates of the Cobb-Douglas Production Functions

Dependent variable: lnoutput Independent variables	Supermarket farmers Coefficient (s.e.)	Traditional market farmers Coefficient (s.e.)
Constant	6.8237 (1.1484)***	6.6034 (0.8699)***
Lnland	0.8681 (0.3133)***	0.5794 (0.2453)**
Lnlabor	-0.3254 (0.2527)	0.0446 (0.2388)
Lnfertil	0.2407 (0.1070)**	0.2030 (0.1553)
Mill's lambda	0.1952 (0.2471)	0.9889 (0.5379)**
Wald Chi^2	107.3	28.25
Significance	0.0000	0.0000

Notes: ** = significant at the 5% level, *** significant at the 1% level.
Source: author's farmer survey 2004.

Table 19 compares the marginal product values for the significant coefficients of table 6. The marginal product value is calculated by multiplying the marginal productivity of a factor x_i ($\partial q/\partial x_i = \alpha \cdot q / x_i$) with the market price of the output. Several observations can be made. First, the data indicate that the marginal product value (MPV) differs greatly between the two groups of farmers: in absolute terms the MPV is larger for the well-capitalized supermarket-channel farmers while as a relative measure (relative to gross revenue) it is larger for the traditional-channel farmers who capture only a small percentage of the marketing margin. Where one additional acre-month of land would increase revenue from the sale of kale with Ksh3,217 for traditional-channel farmers (i.e., roughly 10% of their average total revenue per acre), it would increase revenues for

supermarket-channel farmers with Ksh8,073 (i.e., roughly 5% of their average total revenue per acre). Second, each of calculated marginal product values is larger than the corresponding factor cost, indicating that these factors are used below the optimal quantity for both groups of farmers. For traditional-channel farmers, this may indicate that land access is constrained by a limited access to land (high population density). For supermarket-channel farmers, who on average only use 70% of their land, the bottleneck is more likely to be found in the limited access to capital for irrigation system expansion. Third, the average land productivity and the average labor productivity are respectively 59% and 73% higher for supermarket-channel farmers than for traditional-channel farmers. This results from the more capital intensive production methods used by supermarket-channel farmers (more variable inputs like fertilizer or chemicals and more quasi-fixed inputs per unit of labor and per unit of land). Relative to daily wages (which are Ksh150/day and Ksh120/day for supermarket-channel and traditional-channel farmers respectively) average labor productivity is four times the wage rate for supermarket-channel farmers and three times the wage rate for traditional-market farmers. This extends to the supermarket-led part of the FFV supply system, the findings of Carter and Wiebe (1990) that higher access to capital (in this case of the supermarket-channel farmers) impacts the agrarian structure and productivity in Kenya.

Table 19: Input Use and Farm Efficiency

Input	Supermarket farmers MPV		Supermarket farmers FC	Traditional farmers MPV		Traditional farmers FC
Land (acre-months)	8,073Ksh	>	667Ksh	3,217Ksh	>	1,083Ksh
Fertilizer (kg)	56Ksh	>	28Ksh			
Productivity Measures						
Labor productivity (average output value per work day)	605Ksh			349Ksh		
Land productivity (average output value per acre-month)	10,264Ksh			6,437Ksh		

Notes: marginal product value (MPV) valued at farm-gate price of Ksh3.6/kg. Factor costs (FC) are sub-sample averages.
Source: author's farmer survey 2004.

5.4 Net Income Effect of Supplying Supermarkets

In this section we assess whether or not there is a positive net income effect for farmers if they supply kale to supermarkets rather than to traditional buyers. Table 20 provides a gross margin analysis for the two types of farmers. The top half in this table, which looks at production, allows for a straight forward comparison between supermarket-channel and traditional-channel farmers. However, the marketing part forced us to make a choice. The supply channel for supermarkets has a particular given structure, with all farmers taking their harvest directly to the supermarket. Traditional-channel farmers can however supply to brokers, wholesalers or retailers (other than supermarkets). Furthermore, either type of farmer may sell to a wider set of buyers at different links in the supply chain. For example, a supermarket-channel farmer may sell his highest quality grade to supermarkets and the lower grades to wholesalers. Or a traditional-channel farmer may sell to a broker at the farm for one harvest, but collaborate with other farmers to take the next week's harvest to a wholesaler. However, in most cases, both types of farmers sell

most, if not all, of their harvest to a single type of buyer. In table 20 we opted to compare the most extreme (but also most common) marketing choices, namely supermarket-channel farmers sell (nearly) 100% of their kale to supermarkets (applies to 60% of the farmers) and traditional-channel farmers sell (nearly) 100% of their kale to a broker at the farm (applies to 46% of the farmers).

Table 20 indicates that there are substantial differences between the two groups of farmers. On average, supermarket-channel farmers use about twice the amount of inputs (fertilizer, manure, chemicals) traditional retailers use, but pay less per unit as they buy larger volumes. Supermarket-channel farmers use less seed, but seed of a higher quality (traditional-channel farmers produce their own seed which is cheap and of lower quality). The variable production costs incurred by supermarket-channel farmers further include the costs for tractor rental and energy to operate an irrigation system. Traditional-channel farmers use more labor per acre, mostly because there is an abundance of family labor relative to the small farm sizes. Wages for hired labor are higher in the supermarket channel than in the traditional channel. (Family labor was valued at the same rate as hired labor in table 20.) Given the higher input levels, yields per acre are higher for supermarket-channel farmers[28].

When we translate these farm practices into the production cost per kg of kale, we see that there is almost no difference between the two groups of farmers, with both types of farmers producing kale at about 3.5Ksh/kg on average. From this comparable starting

[28] Yields per acre vary greatly because of differences in variety, harvest cycle length, soil quality, climate and farm practices, but are estimated at 6MT per acre on average (MoARD 2002) while yields up to 15MT per acre are possible (for comparison, kale yields in the US can go up to 18MT per acre; Oregon State University 2002). The relatively high yield found here for traditional-channel farmers may be due to the specific selection of our sample (a key kale production area for the Nairobi market) or to the farmer's overestimation of the quantity harvested and/or underestimation of the area under kale.

point at the production level, the two paths diverge. Traditional-channel farmers incur limited marketing costs (only harvesting and bagging), but also receive a low price from brokers at the farm-gate which allows them to break even at best. Supermarket-channel farmers on the other hand also incur transportation costs, but receive a price which is more than three times the farm-gate price, resulting in a gross profit of about 40%.

Let us now return to the net income effect of supplying supermarkets. Before selling to supermarkets, most current supermarket-channel farmers already had the capacity to market their production to buyers in Nairobi. Selling to supermarkets, who buy larger volumes per delivery, lowers the farmer's transaction costs (several farmers told us that the time spend in selling was reduced from a day to an hour) and pays them a higher price (about 10-20% higher), and thus has a strong positive net income effect for these farmers. For individual traditional-channel farmers, shifting from a broker at the gate to selling to supermarkets would not have a positive net income effect as the transportation costs would be prohibitively high (given the small volumes). Table 21 indicates how the supply capacity differs between the two groups of farmers. When harvest cycle length and size of the farm area under kale are taken into account, supermarket-channel farmers can supply more than five times the volume of traditional-channel farmers. This large difference in supply capacity (and the fact that supermarket-channel farmers grow a wider variety of crops) allows for far more efficient transportation.

Table 20: Gross Margin Analysis Kale Supermarket vs. Traditional-channel farmers

Data are per acre		Farmers supplying 100% to supermarkets				Kiambu farmers supplying 100% to brokers at the farm			
Line Items[1]	Unit	Units	Unit Cost (Ksh)	Cost Total (Ksh)	% of Rev.	Units	Unit Cost (Ksh)	Cost Total (Ksh)	% of Rev.
Seed **	Kg	0.4	1280	512	0.3	1.1	790	869	2.6
Inorganic fertilizer	Kg	314	28.0	8,792	5.7	177	28.8	5,098	15.1
Manure ***	MT	6.6	1,300	8,580	5.6	3.3	2,100	6,930	20.6
Chemicals *	L	3.3	1,090	3,597	2.3	1.6	1,135	1,816	5.4
Cost Irrigation (var.)	Month	5.4	2,200	11,880	7.7	0	na	0	0
Tractor rental	Acre	1	2,000	2,000	1.3	0	na	0	0
Total inputs				*35,361*	*23.0*			*14,713*	*43.7*
Labor by activity									
Land preparation	Mds	17	150	2,550	1.7	28	120	3,360	10.0
Planting	Mds	12	150	1,800	1.2	19	120	2,280	6.8
Weeding	Mds	55	150	8,250	5.4	85	120	10,200	30.3
Labor by Source									
Family labor ***	Mds	8	150	1200	0.8	120	120	14400	42.8
Hired labor ***	Mds	76	150	11400	7.4	12	120	1440	4.3
Total Labor Cost	Mds	84	150	12,600	8.2	132	120	15,840	47.1
Total Product. Cost	**Kg**	**12,800**	**3.7**	**47,961**	**31.2**	**9,350**	**3.3**	**30,533**	**0.8**
Harvesting	Mds	77	170	13,090	8.5	26	120	3,120	9.3
Take & Sell Market	Mds	29	300	8,700	5.7	0	Na	0	0
Rope (bag or bunch)	Pce	19,700	0.08	1,576	1.0	125	2	250	0.7
Bags	Bag	Na	Na	0	0	125	20	2,500	7.4
Transport (var.)	Km	1,700	10	17,000	11.1	0	Na	0	0
Phone Cost	Na	Na	Na	390	0.3	Na	Na	0	0
Total Market. Cost	**Kg**	**12,800**	**3.2**	**40,756**	**26.5**	**9,350**	**0.6**	**5,870**	**17.4**
Total Cost			**6.9**	**88,717**	**57.8**		**3.9**	**36,423**	**108**
Total Revenue			**12.0**	**153,600**	**100.0**		**3.6**	**33,660**	**100**
Gross Profit			**5.1**	**64,883**	**42.2**		**-0.3**	**-2,763**	**-8.2**
Gross Profit (excl. family labor)			**5.2**	**66,083**	**43.0**		**1.2**	**11,637**	**34.6**
Yield			**12.8 MT/acre**				**9.4 MT/acre**		

Notes: (1) significance for production line items: * = significant at the 10% level, ** = significant at the 5% level, *** significant at the 1% level; (2) numbers are indicative only as they are based on the farmer's estimations, not direct measurement; (3) prices used are weighed sample averages for both groups of farmers; (4) weight conversions used: 1 bag=75kg, 1 bunch=0.65kg (author's field measurements).
Source: author's farmer survey 2004.

Table 21: Supply Capacity Supermarket vs. Traditional-channel farmers

	Traditional Farmers	Supermarket Farmers	Difference
Yield 1 (MT/acre)	9.4	12.8	+37%
Harvest Cycle Length (months)	5.1	4.4	
Yield 2 (kg/acre, month)	1,843	2,909	+59%
Average Land Under Kale (acres)	0.9	3.6	
Supply Capacity (bunches/week)	415	2,600	+527%

Source: author's farmer survey 2004.

However, if traditional-channel farmers would join together to market their output, supplying to supermarkets would have a dramatic effect on their net income, as it would allow them to capture the 40% gross profit margin now enjoyed by the supermarket-channel farmers. Various factors hinder the emergence of marketing groups amongst traditional-channel farmers. First, there is a dire lack of experience with marketing produce (in fact, most farmers dislike to be engaged in marketing activities). Second, risk-averseness deters traditional-channel farmers from selling to more downstream buyers. On the one hand, selling to wholesalers exposes farmers to high price fluctuation risks which may average out for a broker supplying daily, but which could financially cripple a group of smallholders who could maybe market once a month. On the other hand, selling to supermarkets, which could provide more stable prices, implies that farmers have access to affordable credit and are willing to risk taking out a loan to invest in the irrigation system required by supermarkets. Furthermore, selling to supermarkets, who at times take up to a month to make payments, will often also exceed the working capital capacities of cash-strapped farmers.

5.5 Supermarkets and Farmer Growth Dynamics

Confirming the financial benefit of increased net income for farmers who can access the supermarket channel as indicated in the previous section, 93% of these farmers said that supplying to supermarkets has affected their profitability favorably. However, supermarkets also provide other benefits which are even more important to farmers than a higher price. While 34% of the supermarket-channel farmers say that the higher price is a key reason for selling to supermarkets, 46% say that the ease of selling to supermarkets is the key attraction. Consider a farmer in the traditional channel. Uninformed about the price of the day (maybe reacting to the previous day's price), the farmer decides to harvest (maybe because there was no longer time to postpone it or because of an urgent need for cash) and takes her or his produce to the rural market. Many farmers and few brokers may show up at this market, leading to plummeting prices, which the farmer has to accept, even if they are below production cost, as the opportunity cost of the kale is close to zero (animal feed). Even within a given day, prices can fluctuate strongly, making the marketing process much like a gamble. Now consider a supermarket-channel farmer. Since supplies are made to order, the farmer is certain, before harvesting, that the sale will take place and at what price. Prices paid by supermarkets change step-wise, remaining constant over longer time intervals, a stability which is desired by both the supermarket and the farmer. These orders are also coming in throughout the year with some reliability (at least for the growing group of FFV suppliers who get long term supply agreements). While supermarkets and their FFV suppliers start to build up long

term relationships, 95% of the traditional-channel farmers are selling in spot markets with buyers varying all the time.

The combination of higher net incomes and greater stability in volumes and prices in the supermarket channel, have created a strong growth dynamic. Of the farmers supplying kale to supermarkets, 75% said they increased production in response to supermarket demand. Supermarket-channel farmers have kept investing in their farm, resulting in a strong growth: the average farmed acreage of supermarket-channel farmers increased by 104% over 1999-2004, compared to by only 10% for traditional-channel farmers. In search for growth, the single most important input access constraint faced by supermarket and traditional-channel farmers alike is access to credit (Table 22). It is in this context meaningful that 44% of the supermarket-channel farmers believe that their status as a supplier to supermarkets (which gives them formal proof of a steady income flow) has increased their access to credit. However, increased access to credit does not necessarily mean affordable credit. Commercial credit is expensive (15-20% interest rate), while government supported loans (10% interest rate) are, according to the farmers, too difficult to obtain because of slow and selective bureaucratic procedures. This probably explains why even for supermarket-channel farmers access to credit remains a key constraint. Nevertheless, growing as they are, the current list of supermarket-channel farmers are likely to be able to follow growing demand for FFV by supermarkets for the next five years: 71% of these farmers state that, should supermarkets ask them to, they could double their current supply of kale within one (five month) cycle (92% of them by increasing production, 8% by sourcing from other farmers).

Table 22: Farmers' Access Constraints to Key Inputs

% of farmers indicating that:	Traditional Farmers	Supermarket Farmers
access to credit is a problem	88%	85%
access to inputs is a problem	43%	16%
access to land is a problem	8%	19%
access to labor is a problem	3%	8%

Source: author's farmer survey 2003.

6. Summary, Conclusions and Recommendations

Our research has shown that the rise of supermarkets has given rise to a new group of farmers in the domestic FFV market. The key suppliers of FFV to supermarkets are mostly recently established, medium-sized farms (10-40 acres) managed by well-educated farmers and specialized in supplying supermarkets. Around 40% of supermarket-channel farmers fell in this category in 2004 and it is expected that these farmers will become dominant in the supplier base over the next five years. In terms of their capital, supermarket-channel farmers differ starkly from traditional-channel farmers. Especially size and the presence of an irrigation system were found to be critical determinants of participation in the supermarket channel. This is so because it addresses the current FFV procurement priorities for supermarkets in Kenya: finding farmers who can supply large volumes year-round. The fact that nearly all supermarket-channel farmers have the capacity to supply large volumes, have one or more transportation vehicles, an irrigation system, a packing shed, a cellular phone, and so on, points to the presence of a threshold capital vector which farmers must have in order to enter the supermarket channel. Only 25% of the farmers supplying supermarkets directly can be classified as smallholders (less than 10 acres) and while we gave several examples of

groups of smallholders who, assisted by market facilitators, are linked into the supermarket channel, the importance of such smallholder groups as direct suppliers of FFV to supermarkets is minimal. We further found that amongst kale suppliers to supermarkets, women are less frequently the head of the farm (1/6 in stead of 1/3 of the farms as is the case for traditional-channel farmers) and make up a smaller percentage of the employed workforce (a third in stead of half).

Farms supplying kale to supermarkets have adopted capital intensive technologies. They use more quasi-fixed capital (e.g., irrigation systems) and apply (per acre) twice the amount of fertilizer, manure and chemicals used by traditional-channel farmers outside the supermarket channel. Consequently, average land and labor productivity are about 60-70% higher for supermarket farms. Although supermarket-channel farmers include few smallholder producers (relative to the traditional channel) and have a lower labor-to-land ratio, they employ many hired workers. On average there are 13 full-time workers per supermarket farm and 80% of these are hired laborers. The overall effect on labor is about a 20% reduction per acre. Furthermore, commensurate with their higher productivity, these hired farmed workers are paid a 15% higher wage on average. Our analysis further shows that, for kale, overall productivity of supermarket-channel farmers and traditional-channel farmers is similar as both have nearly the same production cost per kg of kale. Therefore, on the production side, the essential limitation of traditional producers (85% of which are smallholders) is not their production efficiency but their lack of scale and inability to produce year round (in the absence of modern irrigation systems).

An even more important difference between supermarket-channel farmers and traditional-channel farmers is their marketing capacity. Most (individual) traditional-channel farmers do not have their own (motorized) transportation and lack the scale to rent it. Therefore these farmers are forced to sell to brokers who come to the farms at prices that allow them to break even at best. On the other hand, many supermarket-channel farmers were already supplying their produce to wholesalers or retailers in Nairobi and could easily make the switch to supplying supermarkets. The 10-20% higher prices paid by supermarkets (relative to wholesalers) give supermarket-channel farmers a healthy gross profit margin of 40% (for kale).

If smallholder farmers could achieve the same transportation efficiency as supermarket-channel farmers (by marketing in groups) and could supply direct to supermarkets, they would get three times the price they currently get from brokers at the farm, capturing the same 40% gross profits currently enjoyed by the supermarket-channel farmers. Furthermore, supermarket-channel farmers indicated that the benefits of market risk reduction (more stable prices and volumes) and reduced transaction costs are even more important than the higher price. The combination of higher gross profits and a stable long term trading relationship has been a powerful determinant of a strong growth dynamic amongst supermarket-channel farmers. The latter have, on average over the last five years, doubled the size of their operations (where the traditional-channel farmers in this study only increased theirs with 10%). This strong growth further indicates that the current supermarket-channel farmers will likely keep pace with the growth of supermarkets and even increase their share of the supermarkets' FFV supplies.

Development Policy and Program Recommendations

For development policies and programs, the key insight revealed by studies on the rise of supermarkets in developing countries (like this one), is that supermarkets are changing the structure of the food system whether directly through their actions or through the competitive response they provoke in the traditional system, and that they are doing so fast. Those (farmers) who adapt (fast) will benefit from this change. Therefore, if we want to help smallholders in this new context, whether by helping them to link up with supermarkets or by making traditional channels more competitive, a similar set of recommendations can be put forward. The following three recommendations will help the design of development programs in taking the new reality of retailer driven food systems in developing countries into account.

First, assistance programs must focus on complete supply chains, not individual agents, not parts of a chain. It is not enough to merely start from the market. There is a need to design the whole chain from the beginning. As we have shown in this paper, farmers need to meet a vector of criteria in order to gain access to supermarkets which cannot be addressed by assistance programs targeting an isolated problem in a particular industry (horizontal level), such as developing a higher yielding variety for farmers independent of other considerations regarding the structure of the supply chain. Essentially, this implies multiple partners to be involved in the development program, especially retailers. The design of the supply chains may further imply the creation of new market facilitators (e.g., outgrower schemes), which in turns raises the need to carefully look at potential agency problems in the design (are the stakeholders, more specifically the smallholder farmers, in control and benefiting?).

Second, scale increase is needed throughout the chain. At the heart of the dynamics created by supermarkets chains is an increase in scale, first at the retail level, but then throughout the chain. Scale facilitates investment as well as the use of risk reducing institutions such as contracts, standards and grades, and so on. This implies group formation at the farmer level (investment capital, harvest schedules, volume), but also (simultaneously) group formation at the wholesaler and retailer level (e.g., a new type of smaller 'farmer markets' that can be located near residential areas and which share a FFV procurement system). The size of group formation is determined by the economies of size associated with transportation vehicles and irrigation systems as well as by the volume requirements of the supermarkets (or other larger-scale buyers of FFV).

Third, one of the most critical challenges in any program designed to help smallholder farmers in accessing modern supply chains is how to assist them in dealing with the inherent higher working capital requirements. Smallholder growers are very sensitive to working capital and cash flow issues as indicated by the frequently reported break-down of contractual relationships between farmers and buyers because of the former (either in temptation or in need) selling to brokers for cash (e.g., Jaffee and Morton 1995). Therefore there is a strong need to develop and integrate creative solutions that help keep working capital (and cash-outflows) down for farmers. The following are some examples in this context: blended fertilizer, labor-driven pumps, factoring. One project in Western Kenya involving 25 farmers has developed a fertilizer which is blended specifically for a particular application in a particular area (based on a soil analysis) and is marketing the fertilizer in small affordable bags (Okwemba 2004). Initial results indicate yields that are 200% higher, which implies, inversely, that cash-strapped

farmers could reduce their expenditure on fertilizer without loss of yield. Kenya's MoneyMaker pumps, recently heralded as one of 'Ten Inventions That Will Change the World' by Newsweek magazine (Stone 2003), provide a labor-intensive solution to the required irrigation system. The pumps are (relatively) low cost in purchase ($60) and in operation (using the labor of a worker pedaling the pumps' pistons). Factoring, in Kenya pioneered by the Kenya Gatsby Trust (an NGO), is a financial tool that could greatly help farmers in dealing with the payment terms of supermarkets. Factoring entails buying out (at a fee) the buyer's payment obligation to the supplier after delivery took place. For example, a farmer supplies Ksh5,000 worth of FFV to the supermarket and receives an immediate payment of Ksh4,800 payment from the factoring agent, rather than waiting 30 days for the payment to come from the actual buyer. Factoring could be worked out more systematically in order to take away the farmer's temptation of defaulting on a contract by selling to a broker because the latter offers cash on delivery.

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