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FRESH FRUIT AND VEGETABLE CONSUMPTION PATTERNS AND SUPPLY CHAIN SYSTEMS IN URBAN KENYA: IMPLICATIONS FOR POLICY AND INVESTMENT PRIORITIES

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ABSTRACT

Fruits and vegetables are an important source of food for a large number of Kenyans and comprise every household diet. They play an important role in nutritional balance, as they are rich in vitamins and other nutrients that are vital in controlling diseases. However, despite high rates of population growth, coupled with still higher rates of urbanization which have caused large increases in local demand for fruits and vegetables in urban centers, little empirical evidence exists concerning urban consumption of fresh fruits and vegetables. Moreover, information that links the consumption to trade issues is generally lacking.

This study looks at the urban consumption patterns of fresh fruits and vegetables and the major supply chain systems used in the distribution of fresh produce. The study integrates issues of supply chain organization and performance into the analysis of consumer demand for fresh produce. In particular, the study looks at how system organization and performance affects the ability of the system to satisfy consumer demand for fresh produce. The study pursues four main objectives, namely, to estimate the household consumption of fruits and vegetables per adult equivalent; to examine the shopping patterns of fresh produce consumers as compared to other food purchases; to examine the various supply chain systems for fresh produce;

This study is based in Nairobi. Data for the study was obtained from an urban survey conducted by Tegemeo in 2003, involving 524 consumers using the CBS clusters throughout Nairobi conducted in November, 2003. This has been augmented by interviews with 143 wholesale and retail traders involved in urban fresh produce trade. A further survey of the major wholesale markets between December 2004 and March 2005 was carried out to determine the commodity flows and the infrastructure in place in these markets.

The results show that fresh fruits and vegetables account for slightly over one-fourth of the households' total basic food expenditure, second only to staples which account for slightly over a third of the expenditure, and that this share is steady across all income groups. The study reveals that, while there are households consuming fresh produce at levels below WHO/FAO recommended levels across all income groups, the poorest people in urban areas also tend to be the lowest consumers of fruit and vegetables. Also, as income increases, the level of fruit and vegetable consumption increases and approaches the WHO/FAO standards. The study further shows that fresh produce consumption is influenced by education level, age and the gender of household head. The fresh produce consumers tend to be highly specialized in terms of their shopping patterns as compared to other food groups, often dominating the open air markets and kiosks. The study shows the importance of improving the traditional markets as a way of improving the marketing and hence consumption of fresh produce in urban centers and draws policy implications for government and investment priorities.

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FRESH FRUIT AND VEGETABLE CONSUMPTION PATTERNS AND SUPPLY CHAIN SYSTEMS IN URBAN KENYA: IMPLICATIONS FOR POLICY AND INVESTMENT PRIORITIES

1. INTRODUCTION

Fresh fruits and vegetables are consumed on a regular basis by nearly every household, rural and urban, in Kenya. They play an important role in nutritional balance, as they are rich in vitamins and other nutrients that are vital in controlling diseases (WHO/FAO 2003). Out of the total volume of national fruits, vegetables, herbs and spices produced in Kenya in 2003, amounting to approximately 4.35 million MT some 3.8 million MT or 88% was consumed domestically (Karuga, 2004).

Markets play a major role in this consumption: about 70% of rural households sell some amount of fresh produce, and over 90% buy an average of about Ksh400 of additional produce every month in markets. In urban areas, nearly 100% of households spend an average of over Ksh1,000 each per month on market purchases of fresh produce. Total market sales of fresh produce in urban and rural areas of Kenya likely average Ksh50 billion, or nearly US\$700 million per year. This is a big market!

Most fresh fruits and vegetables are only minimally storable, and are not processed before reaching consumers (except for slicing, dicing, mixing, and packaging for some high-end markets). These characteristics mean that the marketing system which links farmers and consumers of fresh produce has a preponderant effect on the level and stability of supply and prices, on the real comes of consumers and especially farmers, and on the quality and safety of these foods. Marketing systems are not static: they change as production patterns, consumption patterns, and technology change, and Kenya is no exception. These changes in Kenya have received a great deal of attention over the past two years, especially as regards the “rapid rise” of supermarkets, and their potential effects on farmers and consumers.

This paper contributes to the empirical basis for policy debate about this phenomenon. We focus on the fresh produce consumption patterns and the marketing system serving Nairobi, home to over 2 million people. After reviewing our data and methods, we ask two empirical questions: who consumes fresh produce (what are the *consumption patterns* for fresh produce in Nairobi), and how and where do they obtain it (what are the *shopping patterns* for these items)? Based on these findings, and on fundamental characteristics of the farm and consumer sectors in Kenya, we reach tentative conclusions regarding the market shares that supermarkets and “traditional” marketing channels are likely to have in a decade’s time. We then briefly examine selected characteristics of these marketing channels, and make suggestions for government and donor investment priorities to improve horticultural markets for farmers and consumers.

2. DATA AND METHODS

2.1 Data

The data used in this study comes from a cross-sectional random survey of 542 households in Nairobi’s urban areas and environs. The survey was conducted in November 2003 by the Tegemeo Institute in cooperation with the Central Bureau of Statistics (CBS). Census Enumeration Areas (EAs) were used as the primary sampling units (PSUs). The first step in developing the frame involved allocating the PSUs to the districts considered as the strata. This was followed by selection of the PSUs using probability proportional to size.

Due to socio-economic diversity in the urban centers, the six major towns (Nairobi, Mombasa, Kisumu, Nakuru, Eldoret and Thika) were stratified into five income classes (strata): upper, lower-upper, middle, lower-middle and lower. Nairobi was allocated a total of 108 primary sampling units out of the 1800 units in the national frame. These were then allocated to the five strata using optimal allocation and the PSUs selected with probability proportional to size. The allocation of PSUs among the five strata is shown in Table 1.

Table 1: Sampling Distribution of Urban Household data

Income Group	Income Strata	<i>Number of PSUs in Nairobi</i>	<i>Number of PSUs sampled for the study</i>
5.	Upper	28	8
4.	Lower Upper	12	3
3.	Middle	16	5
2.	Lower Middle	36	10
1.	Lower	16	4
Total		108	30

For the purpose of the household consumption survey, 30 PSUs were selected in Nairobi using systematic random sampling (Table 1). For each of the PSUs, 20 households were then systematically selected, giving a total of 600 households covered in the city. However, because of missing information on some surveys and other sources of attrition, the final sample size for analysis was reduced to 542 households. The household data was then weighted based on their selection probability.

Surveyed households were asked about their purchases and consumption of an array of fresh produce and other basic foods (staples, dairy and meat and eggs). Consumption figures exclude food commodities consumed at the urban household premises but produced at households' rural farms and transported to town, as well as the relatively few cases of food commodities grown and consumed from households' urban plots.

Consumption patterns were converted to "adult equivalents" to standardize consumption units within households. Adult equivalents are a commonly used technique that determines consumption on the basis of the sex and age of each specific household member. By aggregating the determined adult equivalents of the respective household members, the household's number of adult equivalents was derived (see Annex A1).

Household income was derived as the sum of proceeds from employment and business earned by household members for the whole year and reduced to monthly levels. Remittances from household members not residing in the household and pension

accruing to retired household members were also included in the computation as well as farm income. Households in the sample were ranked by income per adult equivalent and then stratified into five income quintiles to assess potential differences in consumption patterns by income.

Estimates of household monthly expenditure on particular food products were derived as quantities purchased multiplied by the median price paid by all households purchasing the food item. The descriptive tables and graphs presented later in the paper are based on these expenditure computations. The surveys contained recall questions to explicitly record consumption levels in different periods of the year to account for seasonality. However, it was found that little seasonal variation existed in Nairobi consumers' consumption of fresh produce examined in this study. Hence, we report monthly consumption patterns of the most recent period (mid November to mid December, 2003) covered in the survey.

In addition to the urban household data, two additional surveys were carried out: the retail trader and kiosk survey comprising 143 traders (aimed at understanding the channel characteristics), and the market monitoring survey (aimed at assessing the magnitude of trade flows to the selected markets). The kiosk survey was carried out in the same clusters as those used in the urban household survey. From each cluster, the number of kiosks were counted and then a sample drawn relative to the number of kiosks in the sample. The retail market survey was carried out in five markets, namely, kangemi, kibera (toi), city market, gikomba and korogocho. Using a similar approach to that of kiosks, the number of fresh produce retail traders in each market was established and then a sample of between 8 and 10 traders drawn. The trader and kiosk data was also weighted based on the probability of selection.

2.2 Data Analysis

Data analysis in this paper is both descriptive as well as model based. Descriptive statistics involve the use of tables and graphs to show the household statistics.

Expenditure elasticity estimates have been estimated using regression analysis. Also, regression of determinants of decision to shop in a supermarket chain is also explored in this study. The specific models are discussed in the respective sections of this paper.

3. CONSUMPTION PATTERNS FOR FRESH PRODUCE IN NAIROBI

3.1 Important Fresh Fruits and Vegetables in Urban Consumption

Urban consumers in Kenya purchase a number of fresh fruits and vegetables for consumption in their household. Table 2 shows the monthly purchases of major fresh fruits and vegetables by households in Nairobi. Among vegetables, nearly all households purchased tomatoes and onions, while more than four-fifths purchased *sukuma wiki* (Kales). Cabbages and Irish potatoes are purchased by some three-quarters of the population, and carrots by two-thirds. Cooking bananas, sweet potatoes and French beans are purchased by less than two-fifths of the Nairobi population.

In terms of quantities purchased among those purchasing, Irish potato, cooking bananas and *sukuma wiki* are the most important vegetables purchased by Nairobi consumers. Mean Irish potato purchases per household purchasing are 23kg, while cooking banana purchases average 13kg. Among the leafy vegetables, *sukuma wiki* is the leading item purchased by Nairobi consumers, with an average monthly household purchase of 13kg followed by cabbages. The average tomato and onions purchases are 10kgs and 5kgs respectively (Figure 1).

Households spend twice as much on tomato purchases as they spend on onions and *sukuma wiki*, and about three times as much as they spend on cabbages. Thus among vegetables, tomatoes and Irish potatoes are important in terms of both the percent of household purchasing and the mean household expenditure, followed by onions and *sukuma wiki*.

Table 2: Weighted Household Purchases of Major Fresh Fruits and Vegetables in Nairobi

Item	% of Households purchasing	Monthly purchases among those purchasing				Average monthly expenditure over all Hhs
		Quantity (kg)		Value (Ksh)		
		Mean	Median	Mean	Median	
VEGETABLES						
Tomatoes	96%	9.8	8.3	239	180	229
Onions	94%	4.5	3.0	121	78	114
<i>Sukuma wiki</i> (Kales)	82%	12.7	10.0	121	130	99
Cabbage	77%	3.8	2.8	88	60	68
Irish potatoes	77%	22.7	24.2	187	180	144
Carrots	67%	5.0	3.5	91	52	61
Cooking bananas	35%	13.3	8.4	136	80	48
Sweet potatoes	24%	6.7	4.0	97	64	23
French beans	16%	3.9	1.5	84	50	13
<i>Average total monthly purchases of vegetables over all households (Ksh)</i>						799
FRUITS						
Bananas	77%	9.1	4.0	190	100	146
Oranges	74%	4.2	2.4	151	80	112
Mangoes	53%	5.4	2.5	122	70	65
Avocado	48%	5.1	3.6	94	60	45
Pawpaw	40%	10.7	4.8	159	80	64
<i>Average total monthly purchases of fruits over all households (Ksh)</i>						431
<i>Average total monthly purchases of all fresh produce over all households (Ksh)</i>						1,231

Bananas and oranges are the major fruits purchased by consumers in Nairobi, each being purchased by three-quarters of the Nairobi population. Mangoes are purchased by half the consumers, while Pawpaw and avocados are purchased by less than half. Households purchasing these items purchase an average of about 11 kg of pawpaw, (but only 40% make these purchases), 9kg of bananas, 5kgs of mangoes and avocados, and 4kg of oranges. Mean household expenditure on these items vary, the highest expenditures being on bananas and the lowest on avocados. Based on figure 2, it is estimated that annual

fresh produce consumption in Nairobi 592,000 mt worth some Ksh70 billion. Potatoes account for more than quarter of this figure.

Figure 1: Weighted Mean Monthly Purchase of Major Fruits and vegetables consumed by households in Nairobi

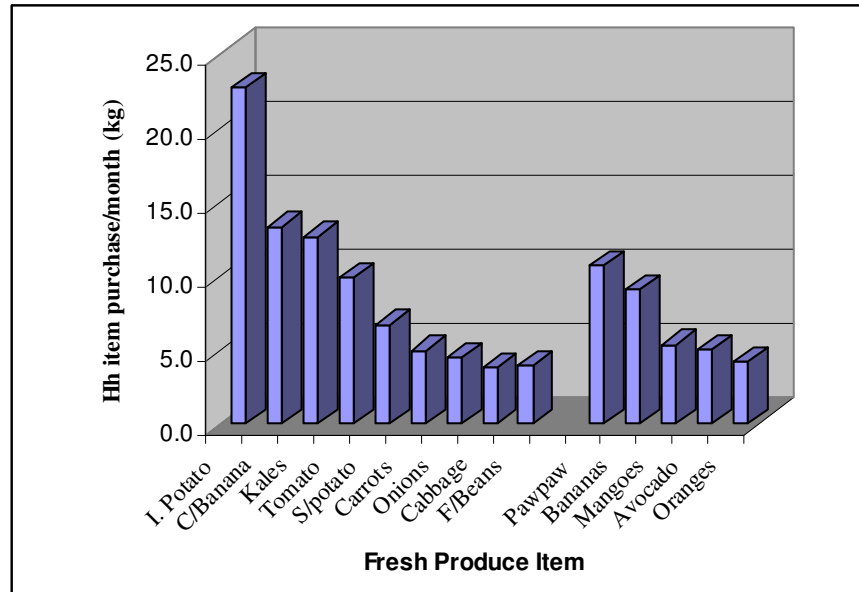
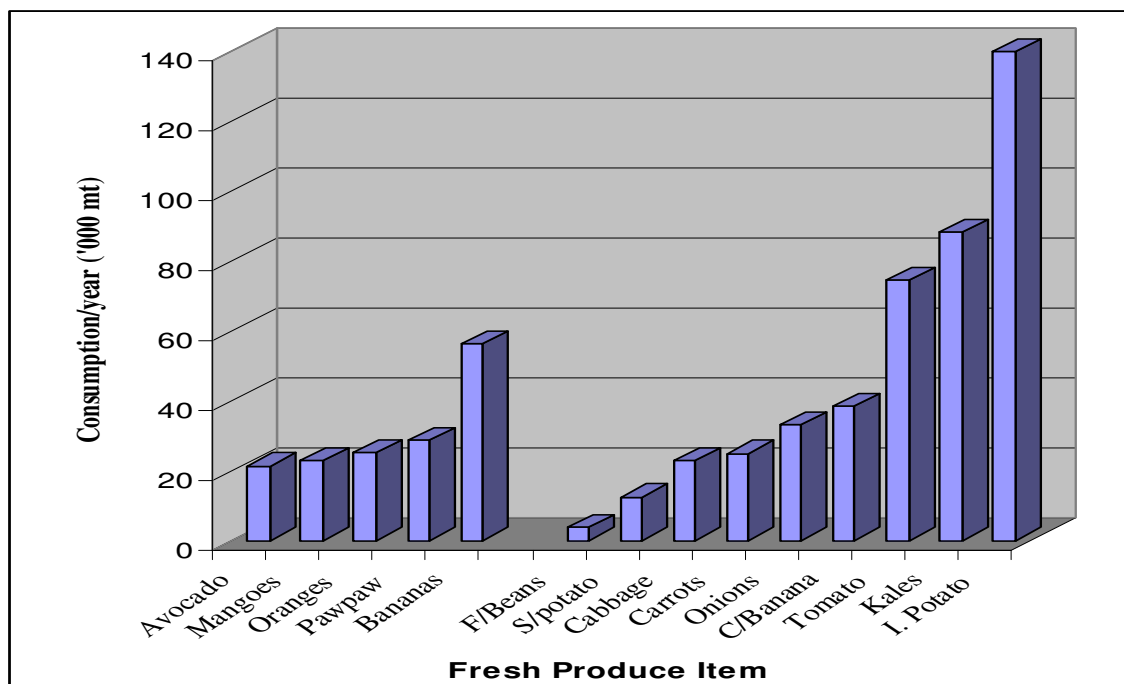


Figure 2: Annual consumption figures for selected fresh fruits and vegetables in Nairobi, October 2003



3.2 Fresh Fruits and Vegetable Consumption and Total Household Food Expenditure

Total household food expenditure patterns can broadly be categorized into four basic foods: staples, dairy, meat and eggs, and fresh produce. An analysis of household expenditure per adult equivalent on the basic foods reveals that 34% of the basic food budget is spent on staples, 26% on FFV, 21% on meat and eggs and 18% on dairy and dairy products (Table 2). The expenditure share on staples falls from 37% for the poorest one-fifth of households to 30% for the wealthiest one-fifth, while expenditure shares on fresh produce and dairy are fairly stable across the income groups. Meat and egg expenditures rise steadily through the income range, from 18% for the lowest quintile to 28% for the highest.

Table 4: Overall Share of Major Food Groups in Total Basic Food Expenditure per adult equivalent Income Quintile in Nairobi

Per Adult Equivalent Income Quintile	Mean Monthly AE Income	Food Category			
		Staples	Dairy	Meat and eggs	Fruits and Vegetables
-----% of Total Expenditure of over 40 food items-----					
1	749	37.2	18.6	17.6	26.7
2	1,890	37.6	17.0	19.0	26.4
3	3,314	34.6	18.9	19.0	27.5
4	5,599	32.0	17.8	23.8	26.4
5	23,654	30.1	19.7	27.5	22.7
Total	7,039	34.3	18.4	21.4	25.9

Table 4 provides more detail on expenditure patterns by showing what proportion of the basic food budget is spent by each income quintile on specific food items. From this table, expenditure per adult equivalent on dairy is higher than expenditure on the rest of the food items. Expenditure on maize, the major staple shows a steady decline from 15% for the lowest quintile to 6% for the highest quintile, while expenditure on rice and wheat

show a steady rise. Beef, mutton and poultry expenditures show a steady rise with income.

Among the fresh produce, vegetable expenditure shows a steady decline from 17% for the lowest income group to 11% for the highest income group, while Irish potato expenditure is steady across all income quintiles at about 2.8%. Fruit expenditure shows a significant increase with income, ranging from about 7% for the poorest 60% of households to 9% for the richest 40%. It is notable that expenditure on vegetables alone is higher than that on all maize products in every income quintile: the poorest households spend 15% more on vegetables than on maize products, while the richest households spend nearly twice as much on vegetables as on maize.

Overall, households in Nairobi spend 15% of their basic food budget on vegetables, 8% on fruit, and 3% on Irish and sweet potato. In comparison, they spend 18% on dairy products, 14% on beef, 12% on wheat products, and 11% on maize products. Thus for the low-income households, vegetables are actually the meal of choice, a necessity. With higher incomes, consumers include more meats and animal products in their diets and change the types of produce they consume to include fruits.

Table 5 shows the monthly mean purchases of, and expenditures on fruits and vegetables in Nairobi per adult equivalent. The monthly average fruit consumption per adult equivalent is 7kg while that of vegetable consumption is 10kg and Irish potato consumption is 5kg. Overall, the monthly fruit and vegetable per adult equivalent is 22kgs. These figures are based on the assumption that all that is purchased ends up being consumed. However, losses occurring for fruits and vegetables at the household level are likely to be much more than those for the other food items given their perishable nature, leading to a gross overestimation of the actual consumption of fresh fruit and vegetables. It is estimated that as much as 30% of the household purchases are lost in the process.

Generally, the quantity of fruits and vegetables consumed per adult equivalent increases with income. The increase however is more pronounced for fruits and sweet and Irish potatoes than it is for vegetables. The lowest-income households consume 20% less

vegetables and about half the quantities of fruits and sweet and Irish potatoes as the highest one-fifth consumers. They spend Ksh85.00 per adult equivalent per month on fruits and Ksh150 on vegetables. In comparison, wealthiest one-fifth spends Ksh 220.00 on fruits and about Ksh 230.00 on vegetables.

Table 5: Overall Share of specific food items in Basic Food Expenditure per adult equivalent Income Quintile

Per AE Income Quintile	Mean monthly Income per AE	Food Items										
		Cereals			Sugar	Dairy	Meat			Fresh Produce		
		Maize	Rice	Wheat			Beef	Mutton	Poultry	Vegetables	Potato ^a	Fruits
		-----					% Share of food group in total Basic Food Expenditure -----					
1	749	15.0	4.9	10.3	6.9	18.6	12.2	0.5	5.2	17.1	2.8	6.5
2	1,890	13.0	5.7	10.8	7.5	17.0	14.4	0.6	4.0	15.8	3.2	7.3
3	3,314	11.9	5.4	11.9	5.6	18.9	12.9	0.8	5.3	17.3	3.2	6.9
4	5,599	9.5	5.7	11.7	5.5	17.5	15.9	1.1	6.6	15.2	2.3	9.1
5	23,654	6.0	6.3	13.3	4.7	19.7	14.7	3.1	9.5	11.0	2.5	9.1
Total	7,039	11.2	5.6	11.6	6.1	18.3	14.0	1.2	6.1	15.3	2.8	7.8

^a Both sweet and Irish potato

Table 6: Monthly Mean Fruit and Vegetable Purchases per adult equivalent by Income Quintile

<i>Per Adult Equivalent income Quintile</i>	<i>Per Adult Equivalent Income (Ksh)</i>	<i>Vegetable Purchases</i>		<i>Fruit Purchases</i>		<i>Sweet and Irish Potato Purchases</i>	
		Quantity (kg)	Value (Ksh)	Quantity (kg)	Value (Ksh)	Quantity (Kg)	Value (Ksh)
1	749	9.4	149	4.0	85	3.8	44
2	1,890	9.9	161	4.3	101	5.4	53
3	3,314	11.3	185	4.8	115	5.3	44
4	5,599	12.8	226	6.6	171	4.9	44
5	23,654	11.2	229	7.9	221	7.2	63
Total	7,039	10.9	190	5.5	139	5.3	50

3.3 Urban FFV Consumption and WHO/FAO Recommendations

The principal value of fruits and vegetables lies in their potential contribution to reduce risk of cardiovascular and cancer-related types of diseases. Studies show that many people throughout the world do not eat enough fruits and vegetables. According to WHO/FAO, the average recommended level of daily fruit and vegetable intake is 400g per person per day or roughly 150 kg per person per year, excluding the starchy tubers like potatoes (WHO/FAO, 2003). A look at how the Nairobi consumers compare with these recommendations reveals that the poorest people are also the lowest consumers of fruit and vegetables. At the lowest quintile, 70% of the households consume fruits at levels below the WHO/FAO recommendations as compared to 33% for the richest one-fifth. About half of the consumers in the poorest one-fifth do not meet the vegetable recommendations as compared to 44% in the richest one-fifth category.

An important point to note is that across income groups there is a sizeable population who do not meet the WHO/FAO recommendations. As income increases, the level of fruit and vegetable consumption increases and approaches the WHO/FAO standards.

Table 7: Percent consumers below the WHO/FAO fruit and vegetable Consumption Levels by AE income quintiles

<i>Per Adult Equivalent income Quintile</i>	<i>Per Adult Equivalent Income (Ksh)</i>	<i>% of consumers below WHO/FAO Recommended level of consumption</i>		
		<i>Fruit Consumption</i>	<i>Vegetable Consumption</i>	<i>Overall FFV* Consumption</i>
1	749	70	53	51
2	1,890	64	56	53
3	3,314	62	41	45
4	5,599	43	35	32
5	23,654	33	44	32
Total	7,039	55	46	42

* Excludes sweet and Irish Potatoes.

3.4 Characteristics of Urban FFV Consumers

We now turn to an examination of the types of households who consume relatively large amounts of fresh produce in Nairobi. We first examine the characteristics of households by their level of FFV expenditure (Table 7), and we then econometrically estimate the effects of selected variables on FFV expenditure.

Tabular Analysis: Table 6 breaks households into five equal groups (quintiles) based on their level of FFV expenditure. The group spending the least (Quintile 1), spends on average only 117 Ksh (about US\$1.50) per month per adult equivalent in the household. This mean expenditure rises by a factor of over 7 (to 813 Ksh per month per AE – about US\$11) for the group spending the most on FFV. Because these expenditures are expressed per “consuming unit” in the household, they represent a real increase in the quantity and quality of fresh produce being consumed. Overall, 80% of the urban consumers spend less than US\$6 (Ksh 450) per adult equivalent per month on average, which is just about half of what the highest one-fifth of spenders allocate for fresh produce.

Table 8: Who are the big consumers of FFV? Household Indicators by Quintile of Expenditure per AE on Fresh Produce

<i>Indicator</i>	<i>Quintile of Expenditure on Fresh Produce per AE</i>				
	1	2	3	4	5
Mean Expenditure on fresh produce per AE (Ksh)	117	216	305	417	813
Mean Monthly Income per AE (Ksh)	3,058	5,266	5,041	9,857	12,371
Mean Years of education of head of HH (Years)	10	11	11	14	13
Mean Age of head of HH (Years)	41	37	36	36	36
Female-headed household (%)	16	15	15	19	23
Share of children 15 or younger in household (%)	44	40	36	38	37
Share of fruit in total FFV expenditure (%)	21	25	28	36	38
Share of vegetables in total FFV expenditure (%)	69	61	60	50	50
Share of potatoes ^a in total FFV expenditure (%)	10	14	13	14	11

^a Sweet and Irish Potatoes.

Income also rises steadily across these groups. The lowest one-fifth FFV spenders earn a mean monthly income per adult equivalent of Ksh 3,058 (US\$40) as compared to those spending the most on FFV, who earn an average of Ksh 12,370 (US\$165).

There is some evidence, though the pattern in this table is not strong, that educational level of the head of household is positively associated with expenditure on fresh produce. Years of education for the 60% of households spending the least on FFV average 10 years, while for the top 40% it averages 13 years.

Gender of the head of the household head is another factor that influences fruit and vegetable consumption patterns. Overall, female headed households account for between 15% and 23% of FFV consuming households. Notably, there are more female-headed households in the highest FFV expenditure quintile (which also has the highest income)

than in the lowest, despite the fact that female-headed households tend to have lower incomes. This finding may be an indicator of economic independence among women with higher incomes, and probably also reflects different decision making processes regarding consumption in households where a woman is the primary decision maker.

Age of the household head between the various expenditure groups seems not to differ systematically. Consumers in the lowest quintile seem to be older, their age averaging 41 years while the upper 80% of spenders tend to be younger by about 5 years.

Households in the lowest FFV expenditure quintile tend to have more children below 15 years than do those who spend the most. This means that the lowest expenditure group has more children of school-going age than does the higher FFV expenditure group. The implication is that there is high dependency in these households and a large portion of the household income is committed to the paying the children's school fees and upkeep, leaving less income for food. The households may thus only afford basic food such as vegetables and will devote little to fruit consumption.

The share of vegetables in total FFV expenditure is higher for all the expenditure quintiles as compared to the share of fruit and potatoes. This shows the importance of vegetables in the FFV budget. However, vegetables' share falls (from 69% to 50%) as total FFV expenditure rises, while fruits' share rises sharply, from 21% to 38%. Perhaps surprisingly, the share of Irish- and sweet potatoes (which is dominated by Irish potatoes) is steady throughout the expenditure groups. These results echo those found in Table 3, which showed that, as household income rises, the share of vegetables in total food expenditure fall, potatoes hold steady, and fruit rises.

Econometric Analysis: The analysis so far gives us some clues about the factors that may influence FFV consumption. Tabular analysis, however, is not able to control for correlations among indicator variables, and therefore may at times give misleading indications regarding the actual impacts of our indicator variables on FFV expenditure. To improve the analysis and further understand how some of the indicators outlined

above influence FFV consumption, we turn to econometric analysis. We carry out two sets of regression analysis to understand this. In the first set of regressions, we sequentially regress the natural log of expenditure on the indicated food item against a number of variables listed below.

$$TOTEXP_i = f(INCOME, EDHHH, AGEHHH, FEMHEAD, HHSIZE, SE) \quad i=1, \dots, n$$

Where,

TOTEXP _i	The natural log of the household's expenditure on fresh produce item <i>i</i>
INCOME	The natural log of the household's total income from salaries, business activities, remittances, and agricultural production and sales
EDHHH	The years of education of the head of the household
AGEHHH	The age of the head of household in years
FEMHEAD	Whether the household declared itself to be headed by a female (FEMHEAD=1) or not (FEMHEAD=0)
HHSIZE	The number of people in the household ¹
ES	A series of dichotomous (0/1) variables indicating the estate in which the household lives

The second set of regressions is identical to the first, except that we replace the natural log of household income with the natural log of total (food plus non-food) household expenditure.

$$TOTEXP_i = f(TOTEXP_{hh}, EDHHH, AGEHHH, FEMHEAD, HHSIZE, SE) \quad i=1, \dots, n$$

Where, TOTEXP_{hh} is the natural log of total household expenditure. This is calculated by adding reported expenditure on 18 additional expenditure groups to expenditure on food². Results of these two regression analyses are displayed in Table 8.

¹ This variable and the ES variables are not included in the table. HHSIZE is included in the regression analysis to avoid biasing the estimated impact of other variables, because we use total household expenditure on the food group as the dependent variable. The ES variables are included to control for locational effects on expenditure patterns, e.g., the distance to kiosks, markets, supermarket, etc.

Four results stand out in this analysis. First, all food groups are “normal” economic goods in the sense that, as income or total expenditure rise, expenditure on these goods also rises, though by less than the increase in income or total expenditure. Second, in both the income and expenditure regressions, fruit has the highest elasticity, followed in order by meat and eggs, dairy, potatoes, staple foods, and vegetables. Thus, in their relative ranking of the relationship between household economic resources (as measured by income or total expenditure) and expenditure on the food groups, the two regressions are entirely consistent. The fruit expenditure regression, with a coefficient of 1.04 on total expenditure, suggests that fruit may be a “luxury” good in economic terms, its expenditure increasing more than proportionally to the increase in total expenditure. Expenditure on vegetables barely rises with income. Third, controlling for income and other variables, years of education of the household head seems to have a positive effect on purchases of meat and eggs, and fruit; through these two food groups, it has a positive impact on overall food expenditure. Finally, female-headedness has a positive effect on purchases of dairy products, fruit, and overall food.

This econometric analysis thus helps us refine our understanding of some of the determinants of expenditure on fresh produce. Specifically, the impact of education and female-headedness is through fruit, not vegetables or potatoes.

² See Annex 2 for more detail on the calculation of total household expenditure and its relationship to household income.

Table 9: How does expenditure on FFV vary with household income? Elasticity of expenditure on food groups with respect to several variables of interest

<i>Food Group</i>	<i>Variables Affecting Expenditure on Food Group</i>				
	Income	Total Expenditure	Education of household head	Age of household head	Female-headedness
	<i>% Change in expenditure for 1% change in variable of interest</i>		<i>% Change in expenditure for 1 year change in variable of interest</i>		<i>% Change in expenditure with switch in variable</i>
Staples	0.108 ***	0.314 ***	0.002	0.004 *	0.011
Dairy	0.218 ***	0.619 ***	0.026	-0.014	0.489 *
Meat and eggs	0.253 ***	0.849 ***	0.043 **	0.001	-0.118
Fresh Produce	0.171 ***	0.485 ***	0.015	-0.001	0.186 *
<i>Fruit</i>	0.491 ***	1.040 ***	0.054 **	0.003	0.562 *
<i>Vegetables</i>	0.055	0.298 ***	0.004	-0.001	0.061
<i>Potatoes</i>	0.176	0.530 ***	0.014	0.004	0.499
Overall “basic food”	0.169 ***	0.445 ***	0.015 ***	0.004 *	0.118 **

Note: * = significant at 0.10 or better, ** = significant at 0.05 or better, *** = significant at 0.01 or better. Coefficient estimates for education, age, and female-headedness are from the regressions with household income.

4. SHOPPING PATTERNS FOR FRESH PRODUCE

In this section we examine the food shopping habits of consumers in Nairobi, including the number of outlet types they tend to frequent, what they tend to buy in each outlet type, and the factors associated with shopping in supermarkets.

4.1 Food Shopping Habits

Consumers in Nairobi follow a shopping pattern that is highly diversified across food groups but, with the exception of staples, relatively specialized within any food group. When asked where they shopped for food during the previous month, over 90% indicated that they had purchased at least one food item in three or more types of retail outlets, and

three-quarters had done so in at least four (Table 10).³ This pattern is quite stable across income groups, with the richest 20% shopping in nearly as many outlet types as the poorest. Within food groups, dairy shows the most specialized shopping habits: 84% of households had utilized only one type of retail outlet for dairy purchases during the previous month. Over 90% of households used only two or fewer outlets for their fresh produce purchases, while about 80% had used two or fewer for meat and eggs. Staple purchases are the least specialized, with about 30% of households using three or more outlet types.

Table 10: How do Consumers Shop? Frequency Distribution of Number of Retail Outlet Types Used during past Month, by Food Group

Number of Retail Outlet Types Used Last Month	Food Group				
	All Food Items	Staples	Dairy Products	Meat and Eggs	Fresh Produce
	----- % of Households -----				
1	0.2	21.6	83.9	23.5	58.6
2	5.7	48.0	15.2	55.2	34.6
3	19.9	28.7	0.8	21.3	6.8
4	41.7	1.6	0.2	0.0	0.0
5	24.0	0.0	0.0	0.0	0.0
6	7.9	0.0	0.0	0.0	0.0
7	0.7	0.0	0.0	0.0	0.0

Between 80% and 90% of households visited a traditional Duka or shop, a butchery, or an open air market (“Any Food Item” column in Table 11). Two-thirds visited a kiosk, one-third an independent supermarket, and about one-quarter visited a supermarket chain or a hawker. Focusing on fresh produce, 72% visited an open air market last month, and 56% a kiosk. Only 6% made fresh produce purchases in a supermarket chain.

³ Over the entire sample of 542 households, 23 different types of retail outlets were mentioned.

Table 11: Where do Consumers Shop? Percent of Households Purchasing at Least One Item in each Retail Outlet Type, by Food Group

Retail Outlet Type	Food Group				
	Any food item	Staples	Dairy Products	Meat or Egg	Fresh Produce
	----- % of HHs Purchasing at Least One Item in this Outlet Last Month -----				
Large Supermarket Chain	28	26	11	5	6
Small Supermarket (not a chain)	32	28	5	2	3
Duka / shop	90	84	63	58	3
Open Air Market	83	48	0	24	72
Hawker	25	3	17	2	8
Kiosk	66	20	12	16	56
Butcher	87	0	0	87	0

The results in Table 11 suggest that staples tend to predominate among purchases in supermarket chains, while fresh produce predominates in open air markets and kiosks. Table 12 confirms these patterns. Staples account for sixty percent of all purchases in supermarket chains, and nearly 90% in small supermarkets. In each, dairy is the second most important purchase. These small independent supermarkets are the most specialized (except for butchers) among the major retailers. Staples and dairy also predominate in Dukas. Fresh produce accounts for 85% of purchases in green grocers, nearly 75% in open air markets, and over 60% in kiosks.

Table 12: What do people buy in each type of outlet? Share of food groups in total food purchases, by retail outlet type

Retail Outlet Type	Staples	Dairy	Meat	FFV
	---- % of total value purchased in the location ----			
Supermarket Chains	60.0	22.4	8.2	9.3
Small Supermarkets	88.3	8.1	2.2	1.4
Dukas	56.1	35.7	7.6	0.6
Green Grocers	14.8	0.0	0.0	85.2
Open Air Markets	11.2	0.0	15.2	73.7
Hawkers	4.1	71.5	6.8	17.6
Kiosks	18.5	13.9	6.6	60.9

Focusing on fresh produce, we find that the market share of open air markets and kiosks remains remarkably stable across income groups (Table 13). Fifty-five percent of all FFV purchases by the lowest income quintile are made in open air markets, and this share actually rises to about 60% in the next three quintiles, before falling slightly to about 48% in the highest income group. Kiosk's share of the FFV market moves from over 40% among the lowest income households to about one-third among the richest. The strong performance of these "traditional" retail outlets across all income groups for fresh produce reflects their ability to adapt to the needs and preferences of different types of consumers. Open air markets especially show great variability in ease of access, cleanliness, security, and selection. A market like Korogocho lies near the lower end on each of these characteristics, and caters to a very low income group; City Market, on the other hand, is much cleaner, less congested, and secure, and thus caters to relatively high income households.

Table 13: Who Shops Where for FFV? FFV Market shares of various retail outlet types, by quintile of income per AE

Per AE Income Quintile	Mean Income per AE (Ksh)	Market Outlet							
		Super- market Chain	Small Super- market	Duka	Open Air Market	Kiosk	Hawker	Green Grocer	Total
		----- % of total FFV expenditure -----							
1 (lowest)	749	0.0	0.1	0.2	54.7	41.5	3.6	0.0	100.0
2	1,890	0.0	0.0	1.3	60.6	34.4	3.7	0.0	100.0
3	3,314	0.4	0.7	0.0	60.7	36.4	1.8	0.0	100.0
4	5,599	1.7	0.1	0.3	59.5	38.0	0.4	0.0	100.0
5 (highest)	23,654	13.7	0.4	1.3	47.8	32.6	2.4	1.7	100.0
Overall	7039	4.4	0.3	0.7	56.1	35.9	2.2	0.5	100.0

4.2 Who Shops in Supermarket Chains?

We now turn to a closer examination of who shops in supermarket chains, first presenting a tabular analysis of the characteristics of supermarket shoppers (Tables 13 and 14), and then examining the determinants of the choice to shop in supermarket chains in a regression framework (Table 15).

Households that shopped in a supermarket during the past 30 days preceding the survey period had mean incomes more than three times higher, and median incomes more than double, those of households who did not shop in a supermarket chain (Table 13). About half of supermarket shoppers owned a refrigerator and a car, while less than 10% of other households owned these items. Compared to households that did not shop in supermarkets, supermarket shoppers were older, more educated, had larger families, and were somewhat more likely to be female-headed. With the exception of household size, all these differences are more accentuated when we compare households purchasing fresh produce in supermarket chains (6% of Nairobi's population) with those that did not (94%). Mean incomes of the first group are six times higher than the second group; 80%-85% of the first group owns a car or refrigerator, respectively, while 12%-15% of the second group owns these items. These findings confirm the widespread perception that supermarket shoppers – and especially those purchase fresh produce in supermarkets -- are much better off than those that choose to shop elsewhere. The fact that supermarket shoppers are older than other households is perhaps surprising, and is contrary to findings by other researchers (Neven and Reardon 2005)

An additional relevant finding on shopping habits is that, among households that did visit a supermarket chain, 78% did not purchase fresh produce. Even among the richest 20% of households, 61% of those that went to a supermarket chose not to purchase their fresh produce there. This finding highlights both the challenges that supermarkets face to penetrate the fresh produce market, and the potential for doing so if they are able to bring down prices and convince shoppers that their produce is as fresh as that found in markets and kiosks.

Table 14: Who shops in supermarkets? Characteristics of households who utilized a supermarket chain during the past 30 days

Indicator	Any Food Item		Fresh Produce	
	Purchased a food item in a supermarket chain in past 30 days	Did not purchase any food item in a supermarket chain in past 30 days	Purchased fresh produce in a supermarket chain in past 30 days	Did not purchase fresh produce in a supermarket chain in past 30 days
% of households	28%	72%	6%	94%
Mean (median) per AE income (Ksh/mth)	14,493 (7,018)	4,505 (3,122)	32,838 (16,291)	5,476 (3,170)
% owning a car	45%	5%	80%	12%
% owning refrigerator	50%	8%	85%	15%
Mean (median) age, head of h3	41 (39)	36 (34)	43 (45)	37 (35)
Mean (median) yrs of educ, head of hh	15 (13)	11 (12)	16.5 (19)	11.5 (12)
Mean (median) household size	5.3 (5)	4.4 (4)	4.6 (4)	4.7 (4)
% female-headed	21%	17%	25%	18%

How dependent are supermarkets for their sales on the upper end of the income distribution? Previous research (Neven and Reardon 2005) has found that a surprisingly large share of shoppers in supermarkets (50%) comes from the bottom two-thirds of the income distribution, and that these shoppers account for one-third of all purchases in supermarkets.

What do our results show? We divide all households into five equal groups based on income per AE (income quintiles) and examine the share of shoppers and expenditure on various food items that each group accounts for. Results show that the bottom 60% of income earners account for 19% of all shoppers in supermarket chains, 21% of all food purchases, and 2% of all FFV purchases (Table 15). Consistent with other results in this paper, these findings suggest much more than past research that supermarkets remain highly dependent on high income households for their purchases, especially of fresh produce.

Table 15: Who shops in supermarkets (2)? Share of each income/AE quintile in total expenditure in supermarket chains, by food group

AE Income Quintile	% of all shoppers in supermarkets that came from this income quintile	Food Group				
		Staples	Dairy	Meat	FFV	Total
		% of expenditures in supermarkets made by this income quintile				
1 (lowest)	6	5	0	0	0	3
2	6	9	6	1	0	7
3	7	7	6	6	2	7
4	18	20	17	16	9	18
5 (highest)	62	59	70	74	86	65

Tabular analysis does not allow one to fully control for the correlation among variables of interest, and thus limits the extent to which firm conclusions can be drawn regarding the impacts of these variables on consumer behaviour. We turn therefore to econometric analysis to better control for these factors. We conduct two regressions that explain the factors associated with a household's decision whether or not to shop in a supermarket chain. In the first case, our dependent variable takes on a value of 1 if the household purchased any of the 40 food items in our survey in a supermarket chain, zero otherwise. We limit our second regression to fresh produce items; in this case, the dependent variable is equal to 1 only if the household purchased a fresh produce item in a supermarket chain, zero otherwise. Independent variables are the same in each case, with the exception of "dummy" variables which control for the type of food in the first case (staples, dairy, vegetables, fruit, potatoes, meat) and for the specific fresh produce item in the second case. Each regression controls for locational effects on purchase habits by including dummy variables indicating the estate in which the household resides⁴.

Results for the two regressions are quite similar, and differences between them are in line with expectations. Female headed households are more likely to shop in supermarkets, especially for fresh produce, than are male-headed households who are similar in other regards; female-headedness itself, and the impacts it has on household decision making,

⁴ For brevity, and because they are not the focus on the analysis, we do not include the coefficients of these estate variables in the table

appears to favour shopping in supermarkets (though still only one-third of female headed households purchased any item – and only 8% an FFV item – in a supermarket chain during October 2003). In both cases, household income, along with the ownership of a car and a refrigerator, has a large and statistically significant positive effect on the probability of shopping in a supermarket chain. In the first regression (for any food item), the impact of car and refrigerator ownership is slightly greater than the impact of female-headedness, while in the second (for FFV items only), these impacts are three times and two times greater, respectively, than the impact of female-headedness.

Echoing findings in the tabular analysis, households are most likely to purchase staples and dairy products in supermarket chains. Among FFVs, households are most likely, in decreasing order, to purchase French beans, oranges, onions, carrots, sukuma wiki, and tomatoes in supermarkets.

Household size in these regressions appears to have no impact on the probability of a household shopping in a supermarket, despite tabular results showing that supermarket shoppers had larger households. The relationship between age and shopping habits may also change in this analysis. While tabular results showed supermarket shoppers to be older, the regression results show no significant impact of age of head of household in the first regression (purchase of any item), and a negative and significant (though small) impact on FFV purchases. This suggests, in line with previous research, that younger shoppers may be more likely than older ones to purchase fresh produce in a supermarket

Taken together, these results provide strong evidence that supermarket chains as of late 2003 remained highly dependent on high income consumers for their sales of all food, and especially so for purchases of fresh produce. This leads us in the next section to a consideration of the likely growth paths of the various marketing channels currently competing for the consumer's FFV expenditure.

Table 16: Who shops in supermarkets (3)? Regression results for determinants of decision to shop in supermarket chain

Independent Variable	Any Food Item ¹		Fresh Produce ²	
	Coefficient	Sig.	Coefficient	Sig.
Constant	-7.013	0.000	-6.488	0.000
AGE of head of household, in years	-0.002	0.567	-0.014	0.060
FEMHEAD: The household is self-declared female-headed	0.765	0.000	0.949	0.000
EDHHH: Years of education of head of household	0.061	0.000	-0.003	0.901
HHSIZE: Number of people in household	0.024	0.158	-0.056	0.170
INCAE: Monthly income of hh per AE ('000 Ksh)	0.012	0.000	0.010	0.000
CAR: The household owns a car	0.808	0.000	2.745	0.000
REFRIG: The household owns a refrigerator	0.978	0.000	1.966	0.001
STAPLE: The food item purchased is a staple	2.683	0.000		
DAIRY: The food item purchased is a dairy product	1.652	0.000		
IPOT: The food item purchased is Irish or Sweet potato	-0.456	0.134		
VEG: The food item purchased is a vegetable	0.194	0.229		
FRUIT: The food item purchased is a fruit	0.191	0.273		
SPOT: The food item purchased is sweet potato			-1.213	0.140
TOMATO: The food item purchased is tomato			0.728	0.056
CABBAGE: The food item purchased is cabbage			0.455	0.256
SUKUMA: The food item purchased is sukuma wiki			0.787	0.066
CARROT: The food item purchased is carrots			0.996	0.009
ONION: The food item purchased is onions			1.013	0.008
FBEANS: The food item purchased is French beans			1.817	0.000
BANANA: The food item purchased is sweet banana			0.290	0.481
CBANANA: The food item purchased is cooking banana			-0.440	0.536
AVOCADO: The food item purchased is avocado			0.237	0.659
ORANGE: The food item purchased is orange			1.052	0.007
PAWPAW: The food item purchased is pawpaw			0.089	0.837
MANGO: The food item purchased is mango			0.366	0.394
Cox & Snell R-squared = 0.309;	.309		0.232	
Nagelkerke R-Squared = 0.548.	.548		0.603	
Percent correct: Did NOT purchase the item in a	96.5%		98.2%	
Percent correct: Did purchase the item in a supermarket	50.4%		47.5%	
Percent correct: Overall	89.8%		94.8%	

Note: 1) Independent variable is SUPCHAIN: 0 = did not purchase the item in a supermarket chain, 1=did purchase the item in a supermarket chain. 2) sample is limited to FFV items. Both regressions are at the level of purchased item

4.3 How Rapidly Might the FFV Market Share of Supermarket Chains Grow?

The rate at which supermarket chains will be able to capture FFV market share, and the impact that key public and private investments in the traditional marketing system can have in maintaining its competitiveness against supermarkets, are key policy issues in Kenya and other developing countries. With an FFV market share of less than 5% in Nairobi and 2% -- 3% nationally⁵ in late 2003, what growth rate can government and donor development planners expect supermarkets to have over the next decade? We will first lay out some simple growth scenarios, and then briefly examine two key demand side determinants of this growth and three supply side determinants.

Growth Scenarios: We conduct a simple mathematical simulation to answer the question “at what annual rate will supermarket sales of FFV have to grow to reach national market shares of 10% and 20% in 10 years time?” Conclusions depend on the current national FFV market share of supermarket chains, and on the growth in overall demand for horticultural produce in the country. Regarding the latter question, reasonable expectations on population and income growth suggest that total horticultural demand in Kenya is likely to grow by between 3% and 5% per year over the next decade. We thus consider scenarios of 3%, 4%, and 5% (Table 17). We have already estimated the current FFV market share of supermarket chains in Nairobi at 4.4%. Previous research agrees that urban market shares in other areas are lower than in Nairobi (Neven and Reardon). Using Tegemeo Institute data on rural households, we estimate that 38% of all market purchases of fresh produce in Kenya take place in rural areas⁶, where supermarkets have no market share. On this basis, we estimate that supermarket chains’

⁵ We’ve have shown that the rural FFV market is about 40% of the total market, and that supermarkets have a zero percent share there. If their 4.4% share in Nairobi reflects their urban share throughout the country, then supermarkets’ national market share is $(4.4 \times .6) = 2.64\%$. This is likely an upper bound on their share, since their urban market share outside Nairobi is lower than it is within Nairobi.

⁶ 96% of respondents in a survey of 2,300 rural households purchased fresh produce in a market during the previous month, in an average value of Ksh 430. Nearly 100% of urban households in Nairobi spent a monthly average of Ksh 1,300. If we assume that the rural population is 65% of the total, and that purchase patterns in Nairobi reflect those in other urban areas, then 38% of the national fresh produce market is transacted in rural areas: $(430 \times .65) / (430 \times .65 + 1300 \times .35)$. Because FFV expenditures by urban households outside of Nairobi are likely lower than in Nairobi, this calculation places a lower bound on the rural share in the national FFV market.

share of the national FFV market is no higher than 3%, and may be as low as 2%. Other researchers (Neven and Reardon) estimate a 4% national market share. We therefore consider current shares of 2%, 3%, and 4% in our simulation. Results show that, under the most “optimistic” scenario (3% annual growth in total domestic horticulture market and 4% current market share of supermarket chains), FFV sales by these chains would have to grow 13% per year for a decade to reach a 10% market share, and 21% per year to reach a 20% market share. Under the most “pessimistic” scenario (5% annual growth in total domestic horticulture market and 2% current market share of supermarket chains), supermarket FFV sales would have to grow 23% per year to reach a 10% market share, and 32% per year to reach a 20% market share. The middle scenario (4% growth rate in total market demand and 3% current market share of supermarkets) requires annual growth of 17% and 26% to reach market shares of 10% and 20%, respectively, in 10 years time.

Past behavior provides some clues as to what future growth might be. Growth in *total* supermarket chain sales over the past five years – a period of very rapid expansion – appears to have been 18%; growth in fresh produce sales has been lower. Thus, growth in FFV sales of 17% per year over the next decade (required to reach a 10% market share in a decades’ time) probably represents more rapid growth than has been shown over the past five years. Growth of 26% per year, which would give supermarkets a 20% market share at the end of a decade, would represent a huge increase over past rates and an unprecedented level of sustained growth. We conclude from this simple experiment that supermarket FFV market shares are likely to lie in the low end of the 10% - 20% range in 10 years time.

Table 17: Growth Scenarios for FFV market share of supermarket chains over 10 years

Assumed growth rate of domestic horticulture market	Assumed current national FFV market share of supermarket chains	National FFV market share of supermarket chains in 10 years' time	
		10%	20%
		Annual % growth in real terms required to reach indicated market share	
3%	2%	21%	30%
	3%	16%	25%
	4%	13%	21%
4%	2%	22%	31%
	3%	17%	26%
	4%	14%	22%
5%	2%	23%	32%
	3%	18%	27%
	4%	15%	23%

Demand Side Determinants: Per capita incomes and urbanization are both positively associated with the growth in supermarket share of the FFV market. Table 18 presents data on both these variables, along with FFV supermarket shares, for selected Latin American countries, along with Kenya and South Africa. Three points stand out. First, Kenya's per capita income is less than half that of the lowest Latin American country, and about one-tenth that of South Africa and the wealthier Latin American countries. Relatedly, 59% of all FFV purchases in Nairobi in October 2003 were made by households with per capita incomes of less than US\$2/day. Second, Kenya's urban population as a percent of total population is also the lowest in the group. Finally, even among the wealthier Latin American countries, where supermarkets have been expanding much longer than in Africa, supermarket shares of the FFV market are typically about 20% -- Brazil at 50% and Argentina at 35% are unusually high.

Table 18: Purchasing Power Parity Gross National Income per Capita, Urban Population %, and Supermarket Share of FFV Market in Kenya, South Africa, and Selected Latin American Countries

Country	PPI GNI per capita	Urban Population %	FFV supermarket share	Source of FFV share
Argentina	10,980	89	35 (2003)	Ghezán et al, 2003
South Africa	10,910	55	15-20?	Weatherspoon, et al
Costa Rica	9,260	52	18 (2002)	Berdegúé, et al, 2002
Chile	8,840	85	3-8 (2001)	Reardon and Berdegúé, 2002
Mexico	8,240	74	21 (2001)	Schwentesius and Gomez, 2002
Brazil	7,070	81	50 (2003)	Farina
El Salvador	5,160	47	11 (2002)	Berdegúé, et al, 2002
Guatemala	4,380	40	9 (2002)	Berdegúé, et al, 2002
Honduras	2,760	47	12 (2002)	Berdegúé, et al, 2002
Nicaragua	2,150	65	5 (2002)	Berdegúé, et al, 2002
Kenya	970	33	4 (2002)	Current Authors, 2004

Supply Side Determinants: On the supply side, one key determinant of supermarket share of the FFV market is the ability of these firms to bring down costs and improve quality through “preferred supplier” programs and centralized procurement. Doing both is critical in a country like Kenya, where the mass of low income consumers are unlikely to pay sustained price premia for higher quality produce and where traditional retail markets and kiosks are well adapted to their buying habits. In this regard, it is clear that the poor physical infrastructure and under-developed system of grades and standards in Kenya simultaneously push supermarkets towards preferred suppliers and centralized procurement and raise the cost of instituting these systems. Thus, while Uchumi and Nakumatt seem to view these procurement approaches as vehicles to lower cost and improve quality, it remains unclear **when and** to what extent they will be able to achieve these objectives. It is also important to note that the empirical record across Europe, Latin America, and South Africa of movement towards these parallel procurement systems – and away from reliance on traditional wholesale markets – is mixed (Cadilhon, et al 2003; Tollens 1997; Fresh Produce Marketing Section 7 Committee 1999;

Schwentenius and Gomez 2002). In South Africa, for example, FFV sales through fresh produce markets exceed direct marketing volumes by a factor of about six (Fresh Produce Marketing Section 7 Committee; 1999), while in Mexico **until very recently** most FFV for supermarkets and for export **has been** procured in modern wholesale markets with a high level of service provision. In Europe, wholesale markets on the continent have maintained greater importance in FFV distribution – **especially in southern areas of the Continent --** than in the UK.

The structure of horticultural production and marketing in a country also has major implications for the rate at which supermarkets can grow their share and the manner in which they need to do so. Table 19 shows the structure of horticultural production in Kenya. We divide all households into seven groups: those not producing fresh produce, those producing but not selling, and quintiles of those selling, from least to most sales value. N results stand out. First, about three-quarters of all farmers sell horticultural produce, but over 45% (the bottom three quintiles and some of the fourth) do so in values of about US\$100 or less; most farmers market very small amounts of fresh produce. Second, marketing is very concentrated: 20% of sellers (15% of all farmers) account for about 80% of all sales of fresh produce. Third, even these farmers are not large by commercial standards, selling an average of about US\$600 each.

A more complete picture of the supply base in Kenya requires data on the share of all farmed area in medium- and large-scale farms oriented towards horticulture. Yet it is clear that the vast majority of the horticultural supply base in the country is in the hands of small farmers. This fact raises important questions about the rate at which supermarkets might grow, and about the *way* in which they will have to grow. Specifically, one must ask whether supermarket chains will be able to reach market shares even of 20%-30% without relying on smallholder farmers for an important share of their supply. And if they do have to rely on smallholders to reach such market shares, what does this imply about their ability to maintain uniformly high quality and safety standards while keeping prices within the reach of the poor consumers who will remain the vast majority of the demand base?

Table 19: Concentration of horticultural production and sales: selected household level indicators by quintiles of total household horticultural sales value

Horticultural Sales Category	% of farmers	Total Cropped area (acres, Main season)	Average value of horticultural production per hh (Ksh)	% of total prodn in sample	Average value of horticultural sales per hh (Ksh)	% of total sales in sample
No production	3.2	3.4	—	—	—	---
Production, no sales	21.2	4.9	3,911	5%	0	0%
1 Lowest sales quintile	15.1	3.6	3,475	3%	234	0%
2	15.1	3.8	5,927	6%	1,112	2%
3	15.2	5.0	8,953	9%	2,807	5%
4	15.1	4.8	15,496	15%	7,850	14%
5 Highest sales quintile	15.1	5.9	61,995	61%	43,980	79%

Finally, the extent to which public investment is channeled into public wholesale and retail markets to enhance their competitive position *vis a vis* supermarkets can have a major effect on how these two channels grow. Wholesale markets serving traditional retail outlets in the Netherlands and France have increased their market share in recent years due in part to public commitment to them, while in Italy public investment in wholesale markets has helped them and their traditional retail clients maintain a dominant position in FFV markets. Indeed, investment in public wholesale markets can help both the traditional and supermarket retail sectors by reducing procurement costs and improving quality for both. Such investment thus contributes to a more diversified, competitive, and higher quality food system – and especially fresh produce system – in general.

Based on this brief review, we reach three conclusions. First, the overall food market share of supermarket chains is likely to grow over time, meaning that these firms should be an important force of change in African food systems. Second, this growth is likely to be much slower in the FFV sector, and market shares of supermarket chains will remain substantially lower for FFV than for other food items. As a result, traditional retail outlets served by public wholesale markets will maintain a dominant market share in FFV for the foreseeable future; we suggest that this share will remain near 90% over the next decade.

This pattern would echo those found in many Latin American countries where, for example, Schwentesius and Gomez (2002) indicate that in Mexico, “Despite the growth ..., expectations regarding (supermarkets’) ... ability to displace traditional retailing have not been met.” In the final chapter we turn to the policy implications of these conclusions.

Third, public policy and investment towards wholesale and related assembly and retail markets, and in facilitating high quality smallholder production for the market, will be a major determinant of the structure of the FFV production and marketing system. If these markets and the farmers and traders that use them are ignored, a dualistic system may emerge in which supermarkets work with commercial farmers and a small number of organized smallholders in a parallel procurement system that bypasses wholesale markets, while the large mass of farmers, traders, and consumers operate in a traditional sector characterized by high unit costs, low quality, and low value-added. On the other hand, forward looking investment in these markets and in vertical linkages throughout the chain would help establish a more integrated but diverse and competitive system in which consumers can access high quality produce in a variety of outlets, and small farmers and traders can earn favorable returns in a progressive traditional system.

5. “TRADITIONAL” MARKETING CHANNELS FOR FRESH PRODUCE IN NAIROBI

This paper has shown that “traditional” markets, especially open air markets and kiosks, hold a dominant market share for FFV throughout the country, and will continue to hold a dominant position for the foreseeable future. What are some of the key characteristics of this system that allow it to maintain its dominance, and what are the key problems that the system faces, and which it will have to resolve if it is to remain competitive over the long-term? We look briefly at both questions in this chapter, using data that Tegemeo Institute has collected among retail traders, in its urban consumer survey, and in its wholesale market monitoring survey. A more thorough analysis of these marketing channels will be forthcoming in a separate research report.

5.1. Why are traditional marketing channels competitive?

Traditional markets’ competitiveness in FFV chains is based on price, locational convenience, additional services they offer to frequent buyers and cultural factors important to the large majority of poor consumers. We briefly examine the first three of these factors in this section.

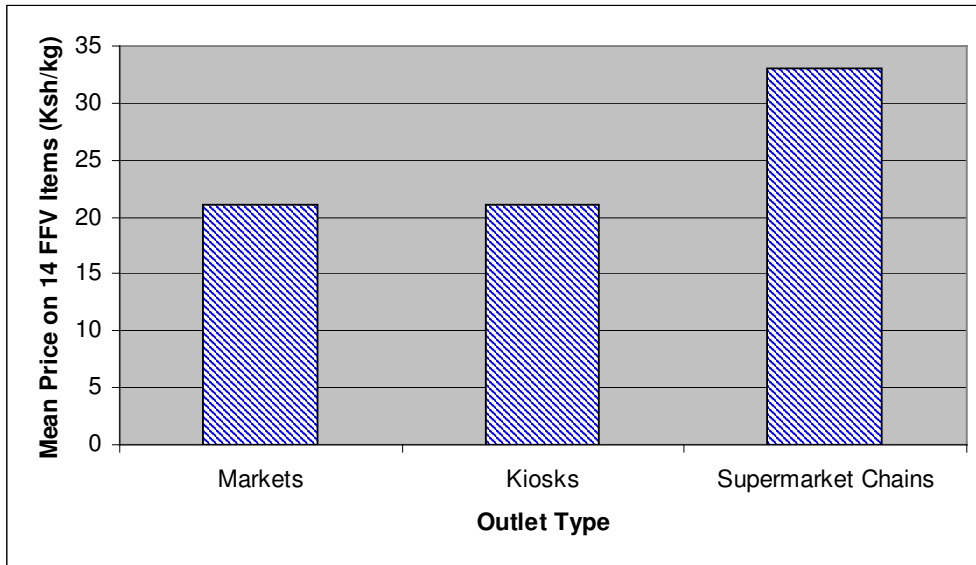
Prices: Table 20 presents median prices and number of observations for 14 FFV items from the urban consumer survey. We present results for the four most common market channels for FFV purchases. The table shows that the three traditional retail outlets (open air markets, roadside kiosks, and hawkers) had similar prices over the 14 items, and that large supermarket chains (Uchumi and Nakumatt) on average charged about 60% more than these outlets for the same items.⁷ Figure 3 summarizes the mean price data over all 14 FFV items. These results are consistent with previous comparisons made by these authors (Tschirley et al, 2004) and by other researchers (Neven and Reardon 2004) and make it clear that, compared to traditional retail outlets, supermarket chains are a substantially higher cost option for consumers purchasing FFV in Nairobi.

⁷ These data do not allow for quality comparisons among channels.

Table 20: Prices for selected FFV items from urban consumer survey in Nairobi, October 2003

Produce Item	Open Air Market		Roadside Kiosk		Large Supermarket		Hawker	
	Median Price/kg	# of Obs.	Median Price/kg	# of Obs.	Median Price/kg	# of Obs.	Median Price/kg	# of Obs.
Irish Potatoes	8	268	10	115	20	20	10	7
Sweet Potatoes	17	100	17	22	60	3	20	6
Tomatoes	24	277	25	179	30	36	24	16
Cabbage	29	234	21	139	29	25	14	12
Sukuma Wiki	15	223	13	189	20	20	10	5
Carrots	20	197	25	113	25	38	20	10
Onions	20	280	26	167	40	41	30	12
French Beans	30	43	28	10	50	27	40	4
Bananas	30	211	30	163	30	26	18	12
Cooking Bananas	11	130	11	57	6	3	14	5
Avocado	17	132	17	107	17	9	17	8
Oranges	33	211	33	134	50	37	33	14
Pawpaw	17	123	13	64	30	19	13	10
Mangoes	20	166	20	89	55	19	20	11
Simple Mean	21		21		33		20	
Minimum Price Frequency	8		6		2		9	

Figure 3. Mean Prices of 14 FFV Items in Open Air Markets, Kiosks, and Supermarket Chains in Nairobi, October 2003



Locational convenience: Another major factor leading to the competitiveness of traditional market outlets as compared to supermarkets is their locational convenience. The traditional markets are in most cases strategically located and are easily accessible to the consumers. Take the case of kiosks for example. These outlets are located within the estates thus allowing consumers to take a shorter time in making their procurement of the frequently purchased fruits and vegetables. Additionally, there is the advantage of purchasing the fresh produce from someone personally known to you.

Results discussed earlier in the paper show that only 12% of consumers purchasing in these outlets own a car, and only 15% have a refrigerator (Table 11). This means the majority of consumers are not likely to make purchases of fresh produce far from their residences since they generally do not own cars, and even if they did, they cannot afford to make bulk purchases since they do not have facilities to store the fresh produce for longer period. For this group of consumers, a high premium is therefore put on locational convenience, as they tend to make frequent purchases in small amounts. This tends to create customer loyalty to various traders

Credit and other services: A random survey of 40 retailers in Kibera, Kangemi, Marikiti, and Gikomba markets found that all of them had at one time or another had loans out to preferred customers, that 30 of them (75%) currently had an average of Ksh 1,280 out in four different loans, and that only 2 (5%) no longer intended to provide loans to customers. Credit is thus a very common practice in the traditional marketing system, with perhaps more than 9,000 consumers having credit at any one point in time, without considering credit provided by kiosk owners⁸. Additionally, over one-quarter of these traders delivered goods to selected consumers. Both of these practices provide traditional FFV retailers with a competitive advantage that supermarkets cannot match.

⁸ We estimate that there are about 3,000 market vendors of FFV in the city: $3,000 \times 0.75 \times 4 = 9,000$.

5.2 What Challenges do traditional channels face?

Here, we review self-reported problems among market vendors and kiosk owners, and also briefly examine the way in which the wholesale marketing system in the city has adapted to the congestion and other problems in Wakulima market.

Key problems cited by retailers: Market traders and kiosk owners are faced with a number of challenges while carrying out their trade. Owners were asked to list two major challenges to their trade in order of importance. These were then weighted by assigning a factor of 2 to the most important problem and 1 to the second most important challenge, then standardized over the maximum potential score (88 for market traders and 194 for kiosk owners). The results of this ranking are displayed in Table 21.

The major challenge for retail traders is low sales caused by high operating costs and numerous traders within the market. Since there is very little product differentiation, traders offer almost similar products. They must compete for the same customers and this result in low sales. Lack of operating capital is also serious among traders leading to low stocking levels. The other serious challenges include perishability of the products, insecurity and high cost of procurement. For kiosk owners, the number one challenge is lack of operating capital followed by low sales and bad debts. Other major challenges for this group of traders are credit management (especially arising from bad debts and delayed credit payments) and insecurity.

Even though insecurity is ranked a distant fourth by retail traders the losses incurred can be large considering these are small-scale traders. Table 22 shows incidences of theft among the retail traders and the average monthly losses. From the table, theft incidences seem to be most serious in Korogocho, Kibera and Kangemi and relatively low in Gikomba and city market. However, in terms of monthly losses to theft, traders in City market lose the highest (Ksh1,500) while those in Korogocho lose the least.

Table 21: Major Challenges facing market traders and kiosk owners

Problem	Market Traders		Kiosk Owners	
	% of maximum Score	Rank	% of maximum Score	Rank
Low Sales	49	1	46	2
Operating Capital	39	2	52	1
Losses due to perishability	13	3	--	--
Insecurity	9	4	7	5
Procurement Cost	6	5	8	4
Bad Debts	--	--	9	3
Delay in repaying credit	--	--	8	4
Police/Council harassment	--	--	4	6

Table 22: Average Monthly Trader Losses from Theft at the Point of Sale.

Market	Theft Incidence among Traders (%)	Mean Monthly Trader Loss (Kshs)
Gikomba	11	880
Kangemi	33	560
Kibera	50	810
City Market	22	1500
Korogocho	78	234
Overall	38	615

5.3 Wholesale Marketing in Nairobi

As part of this study, we carried out a market monitoring exercise in four major wholesale markets Nairobi city, namely, Wakulima, Gikomba, Kangemi and Kibera to assess the fresh produce commodity flow into these markets. The exercise was carried out for two weeks each in December 2004 and a repeat done in March 2005. Part of the results of this survey is reported here though a full report will appear in a later issue. The results are summarized in Table 23. It can be observed that overall, the most delivered commodities during this period were, respectively, Irish potatoes, cabbages, carrots, bananas and onions. Sukuma wiki deliveries were very low, considering its widespread consumption among households.

In terms of market shares, Wakulima holds a solid market share, accounting for about three-quarters of all deliveries to the selected markets followed by Gikomba. The two markets account for over 90% of total fresh produce deliveries and therefore dominate the fresh produce wholesaling in the city. It can be noted however, that while Wakulima dominates in Irish potatoes, cabbage, carrots, onions, mangoes, watermelon and oranges, Gikomba dominates in tomatoes, bananas, green maize and sukuma wiki. This suggests some commodity specialization among the markets. The other two markets have smaller shares in all the commodities. It is therefore evident that Wakulima remains the key market, but it is no longer the leader in some items.

Table 23: The wholesale market shares of various fresh produce items in selected wholesale market outlets in Nairobi, December 2004 – March 2005

<i>Fresh Produce Item</i>	<i>Average Daily Quantity Entering all Markets (tons)</i>	<i>Share of market in commodity delivery (%)</i>			
		Wakulima	Gikomba	Kibera	Kangemi
Irish potatoes	348	95	1	3	2
Cabbage	57	45	26	3	25
Tomatoes	51	8	76	5	12
Carrots	44	99	<1	<1	1
Bananas	39	15	77	1	6
Onions	36	98	<1	1	1
Green maize	32	14	62	10	14
Mango	27	85	1	4	9
Sukuma wiki	16	5	65	16	15
Watermelon	10	100	<1	<1	<1
Oranges	8	100	<1	<1	<1
Total (tons)	666	491	117	21	40
Total (%)	100%	74%	18%	3%	6%

That sukuma wiki accounts for only 2% of daily commodity deliveries to the major wholesale markets suggests that a lot of fresh produce bypasses the major wholesale markets on its way to the retail outlets. This finding is supported by preliminary results from retail trader survey, showing that about one third of fresh produce procurement for retailing is directly from farmers, not from the city's major wholesale markets. A number of factors could contribute to this loss in dominance, among which are the congestion at the markets, unhygienic and filthy conditions, poor traffic flow, lack of market information, insecurity, lack of quality and standard controls, and cartelized intermediary operations, especially at the wholesale markets.

It is worth noting that the City Council recently carried out a major cleanup exercise and organized trading in the Wakulima and Gikomba wholesale markets. This is the first time in many years that such an effort had been made. I Wakulima for example, over 700 tonnes of mound was removed. In addition, the council repainted the parking/loading lines and labeled the commodity yards. This should be viewed as the first step in long term modernizing the market and the council should not stop at this. There is also need to follow the impacts of this action on trading at the market.

6. IMPLICATIONS FOR GOVERNMENT AND DONOR INVESTMENTS

We have shown in this study that fresh fruit and vegetable consumption in urban Kenya is very important in household food expenditure, accounting for about one-quarter of the household food budget. This share second only to staples and is stable across the income groups. Within fresh produce, the vegetable expenditure share has been shown to decline while that of fruit increases with income. However the actual quantity consumed of each group rises with income, the greatest increase being in fruit consumption.

The study has further shown that urban Kenya consumers take less fruits and vegetables as compared to FAO/WHO recommendations. Notably, the poorest people are also the lowest consumers of fresh fruits and vegetables. Thus there is potential in increasing the consumption of this group of commodities, considering their nutritional status. The major factors that influence consumption of fresh produce include income, education of the head of household and whether or not the household is female-headed.

Nearly all households purchase their produce from open-air markets and kiosks, the so-called traditional market channels and only a few, especially the wealthy, make their fresh produce purchases from supermarkets. The traditional channels tend to be preferred because of their price, locational convenience and other service advantages to the consumer. However, these outlets suffer from poor conditions that tend to deter consumption of the fresh produce, including congestion, lack of hygiene and insecurity, among others.

All these results point to the persistence for the foreseeable future of a highly diversified system, especially in FFV. Supermarkets will be one part of this, but we anticipate that their share of the FFV market in Kenya in 10 years' time will at most be, 10-20%. Traditional marketing channels will continue to dominate. There is thus an urgent need to focus on improving the traditional marketing system: modernize the whole supply chain; rethink the role of traditional market intermediaries; improve the wholesale, retail, and assembly market places, and establish vertical linkages up and down the chain that

allow farmers more easily to know what consumers and traders need and want, and to satisfy that demand more efficiently.

In order to stimulate urban fresh fruit and vegetable consumption, we emphasize four policy and investment conclusions. First, since the open air market and kiosks are the most important retail outlets for fresh fruits and vegetables, the dominant focus of government and donor agencies must be on dramatically improving the efficiency, cleanliness, and progressiveness of the traditional marketing system.

Second, urban wholesale market improvement should be the starting point for any investment program. Improvements in three key areas should be given priority. Improved logistical efficiency, especially for traffic flow, loading, and unloading, will reduce costs and improve hygiene in the markets. Secondly, garbage collection, sewerage, and other hygiene improvements combined with logistical improvements will make these markets more attractive options for a broader range of retail outlets. And thirdly, more easily available information on prices and volume by grade of product will increase market transparency and further attract customers. This will also be a good starting point for practical upgrading of grades and standard for the traditional system. Additional investments such as cold storage and simple value-added services will be important once the basic logistical and hygiene improvements are consolidated. Whether all these improvements should be made in Wakulima and Gikomba markets where they now exist, or in new locations, requires additional study.

Third, selected retail markets also need improvements in physical infrastructure, hygiene and market information. These investments are likely to be less expensive than wholesale market investments.

Fourth, because many of these investments are costly, and because their success depends on private sector acceptance, active partnering between government, private sector and donors will be crucial to mobilize the needed financial resources and knowledge to make these improvements. Existing wholesale and some retail market places will need substantial physical improvements, and may need to be moved to achieve these. In many

instances throughout the world, improved or new wholesale markets have not been used by the private sector for a complex set of reasons. It is thus imperative that the decision on market location be part of a broader process that focuses on modernizing and improving FFV wholesaling and retailing, and creating better links back to the assembly and on-farm production processes. Furthermore, the running of the markets needs a business approach that would be better fulfilled through bringing together those with business acumen and the public sector. This will ensure that the markets are run on business principles while still serving the public good.

Under certain circumstances, government and donors could play an important role partnering with supermarkets to reduce the cost to them of dealing directly with smallholder farmers. Using government and donor funding, the extension service and national and international NGOs could bear the cost of developing viable smallholder farmer organizations and nurturing the relationships between these organizations and supermarkets. Once the organizations have developed sufficiently and the relationship with the supermarket has been stabilized, the assistance can move on to other areas. On the other hand, if investments in the traditional system are successful in improving quality and reducing costs, then traditional wholesale markets could become attractive once again to supermarkets, at least for a range of basic items. Thus, improvements in the traditional system and efforts to increase smallholder access to the direct procurement systems of supermarkets should be seen as complements, not substitutes.

Finally, municipal authorities need to find an approach to dealing with kiosks that balances legitimate concerns about congestion in busy areas with these outlets' demonstrated importance for consumers. We find that over one-third of all FFV purchases in Nairobi, and 15% of all basic food purchases, are made in kiosks, and that this share falls very little as incomes rise. These outlets clearly provide a valued service to a broad range of consumers, suggesting that destruction or forced movement of kiosks on little notice imposes real costs on many consumers. A more balanced approach is thus needed.

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ANNEX A1: CONVERSION FACTORS TO COMPUTE ADULT EQUIVALENTS

Annex A1 shows the conversion factors used in computing adult equivalents

Annex A1: Conversion Factors to Compute Adult Equivalents

Adult Equivalence		
<i>Age</i>	<i>Males</i>	<i>Females</i>
Under 1 year	0.33	0.33
1 - 1.99	0.46	0.46
2 - 2.99	0.54	0.54
3 - 4.99	0.62	0.62
5 - 6.99	0.74	0.70
7 - 9.99	0.84	0.72
10 - 11.99	0.88	0.78
12 - 13.99	0.96	0.84
14 - 15.99	1.06	0.86
16 - 17.99	1.14	0.86
18 - 29.99	1.04	0.80
30 - 59.99	1.00	0.82
60 and over	0.84	0.74

As per the World Health Organization (Jayne and Argwings-Kodhek 1997)

ANNEX 2: COMPUTATION OF TOTAL HOUSEHOLD EXPENDITURE, AND RELATIONSHIP WITH TOTAL HOUSEHOLD INCOME

Annex A2 shows the items whose expenditure was added to total food expenditure to estimate total household expenditure on all items, and the recall period for each item in the household interview.

Annex A2. Expenditure items beyond food consumed in home used to compute total household expenditure

ITEM	Recall Period
2 = food consumed outside home	Past Month
3 = housing rent	Past Month
4 = transport (fuel costs, <i>if owns car</i>)	Past Month
5= transport (other; <i>fare etc</i>)	Past Month
6 = water	Past Month
7= charcoal	Past Month
8 = Gas	Past Month
9 = paraffin	Past Month
10= electricity	Past Month
11= All other items	Past Month
12= household appliances	Past Year
13 = household furniture	Past Year
14 = bicycle	Past Year
15 = car/motorcycle	Past Year
16=medical expenses	Past Year
17=School fees	Past Year
18 = Buying Land/House	Past Year
19= all other large expenditures	Past Year

Annex A3 shows mean total household expenditure and mean total household income per month, but quintile of household income. Overall means for the two variables are nearly identical, and the pattern as one moves from lowest to highest incomes is in line with expectations: low income households dis-save while the highest income households save.

Annex A3. Mean household income and total expenditure by quintile of income

Per AE Income Quintile	Mean Monthly Income per AE	Total Household Expenditure per Month	Total Household Income from all Sources per Month
1	749	12,841	2,451
2	1,890	11,859	6,292
3	3,314	15,852	10,589
4	5,599	24,799	20,207
5	23,654	70,114	98,934
Total	7,039	27,301	27,761

Annex A4: Calculation of the Potential Size of Kenyan FFV Market

Population:	35,000,000	
% urban:	0.35	
% rural:	0.65	
Urban pop:	12,250,000	
Rural pop:	22,750,000	
Urban hh size:	4.75	Mean from 2003 Nairobi hh survey
Rural hh size:	5.00	Mean from 2004 rural hh survey
# urban hhs:	2,578,947	
# rural hhs:	4,550,000	
Mean exp, urban	1231	Ksh/mth/hh. Mean for all urban hhs.
Mean rural exp.	412.8	Ksh/mth/hh. 96% of hhs spent an average of 430 per month.
Total exp, urban (ksh)	3,174,684,211	
Total exp, rural (ksh)	1,878,240,000	
Total exp, rural & urban (Ksh)	5,052,924,211	
Total exp, rural & urban (US\$)	70,179,503	