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LOW INCOME FOOD SYSTEMS AND FOOD  
SAFETY IN KENYA: A CASE STUDY OF  
KANGEMI PERI-URBAN AREA.

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LOW INCOME FOOD SYSTEMS AND FOOD SAFETY IN KENYA:  
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ABSTRACT

This study was a part of a large study that examined food systems and food safety in developing countries. The Kenyan study was mainly based on a case study of Kangemi village, which is a peri-urban area of Nairobi.

At Kangemi, two major food systems exist. There is firstly, the typical low-income rural food systems, which mainly involve growing own food or buying locally grown food. In this system only a few essential items are purchased outside the farm, and nearly all food is prepared within the home. The major food safety problem in this system is due to inadequate drying and storage of staple food stuffs; poor practices of handling and preparing food within the home. Food safety standards in this system can be enhanced through teaching of food safety and extension of primary health care programmes.

The other food system is typical of any low-income urban areas. The people here are predominantly dependent on purchased food; consisting mainly of a cereal or starchy root staple with some vegetables and pulses together with supplementary sources of animal protein and fruit. Here the main food safety problem is due to considerable risks of deterioration, contamination and adulteration as the food moves through the distribution channel. In this system food safety standards can be enhanced through devotion of societal resources to health education to all involved in the distribution channel.

As a conclusion it must be emphasised that it is seldom appreciated how widespread food contamination is, nor how tremendous are the costs it imposes to our society. This study has also indicated very clearly that at this stage of our development, food systems and food safety can be improved and enhanced significantly only through government participation as the private sector finds it impossible without causing undue financial burden to low-income consumers.

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FOOD SYSTEMS AND FOOD SAFETY IN KENYAI INTRODUCTION

The first part of this paper outlines basic background information on the Kenyan economy, that we think are important in relation to food systems and food safety in the country. The rest of the paper is mainly based on the information from the case study of Kangemi pre-urban village.

Agriculture is the major sector of the economy (Table 1). In 1979 the gross domestic product (GDP) was Kf<sup>1</sup> 1545 million or Kf 129 per capita, of which about 38% was contributed by agriculture. Between 1978-79 GDP growth rate was 4.1% per annum while that of GDP per capita was 1%.

According to 1979 population census, the population of Kenya was just over 15 million. The population density is 27 persons per sq. km. Population densities are highest in Western and Central provinces. Kisii with 395 was the most densely populated district.

About 87% of the Kenyan population lives in rural areas. In recent years Kenya has been experiencing rapid population growth, at a rate in the neighbourhood of 4% per year. The urban population has been growing at a rate of over 6%. The crude birth rate is 51 per 1000 while crude death rate is 14 per 1000. Life expectancy at birth is 55 years.

Nearly 80% of the people earn their livelihood in the rural areas of the nation, 60% on farms or as pastoralists and 20% through non-farm activities. Rural production is the largest component of private sector activity and will remain a focal point of national development strategy for a long time. There are about 5,930,000 'economically active population.' In 1981 employment in urban areas stood at 1,234,700 compared to 1,063,800 in 1977. The average increase of 44,975 a year over this period was a little lower than the target of 50,000 new employees a year envisaged by the current development plan period (Economic Survey 1982). Unemployment is an important problem particularly in the urban areas. Table 2 gives the distribution of national employment.

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1. Kf equal approximately US \$1.6 (December 1982).

Table 1: Gross Domestic Product by Industrial Origin: Actual 1976; Projected 1983<sup>a</sup>

	Kf million in 1976 prices		Annual growth (%)		Share of total (%)	
	1976	1983	Actual 1972-76	Target 1976-83	1976	1983
Enterprises and nonprofit Institutions						
Agriculture	219.64	341.30	1.5	6.5	17.4	17.6
Forestry	6.33	10.70	5.9	7.8	0.5	0.6
Fishing	2.36	3.20	0.2	4.5	0.2	0.2
Mining and quarrying	4.15	7.10	11.2	8.0	0.3	0.4
Electricity and water	14.20	24.30	10.1	8.0	1.1	1.3
Manufacturing	167.41	306.20	9.4	9.0	13.3	15.8
Building and construction	46.20	84.50	-4.7	9.0	3.7	4.4
Wholesale, retail trade, etc.	144.46	211.50	2.0	5.6	11.4	10.9
Transport, storage and communications	69.15	109.60	4.1	6.8	5.5	5.7
Finance, insurance, real estate etc.	68.03	114.30	9.9	7.7	5.4	5.9
Ownership of dwellings	46.13	69.40	3.4	6.0	3.7	3.6
Other services	24.84	38.10	5.1	6.3	2.0	2.0
TOTAL ENTERPRISES	812.90	1320.20	4.2	7.2	64.4	68.3
Private household (domestic services)	10.93	21.30	13.6	10.0	0.9	1.1
Producers of government services	178.91	281.20	6.7	6.7	14.2	14.5
TOTAL MONETARY SECTOR	1002.74	1622.70	4.8	7.1	79.4	83.9
Semimonetary sector	260.11	311.30	0.8	2.6	20.6	16.1
TOTAL GDP AT FACTOR COST	1262.85	1934.00	4.0	6.3	100.0	100.0
Add (+) indirect business taxes	167.00	268.20	-4.1	7.0	13.2	13.8
Less (-) subsidies	-0.77	-8.50	-	-	-	-0.4
GDP AT MARKET PRICES	1429.08	2193.70	2.9	6.3	113.2	113.4

<sup>a</sup> SOURCE: Kenya Development Plan, 1979-83.

Table 2: Distribution of National Employment

	000's	Share of Total Employment
MODERN SECTOR		
Wage Employment	1024.3	17.3
of which		
Private Sector	540.1	9.1
Public Sector	484.2	8.2
Self-Employed	70.7	1.2
Total Modern Sector	1095.0	18.5
SMALL SCALE AGRICULTURE	3040.0	51.3
PASTORALISTS	445.0	7.5
RURAL NON-FARM	1180.0	19.9
URBAN INFORMAL	170.0	2.8
TOTAL EMPLOYMENT	5930.0	100.0

Source: Report of the Working Party on Government Expenditures, 1982.

There have been a number of studies of income distribution in Kenya: the International Labour Organization (1972), Ng'ethe (1976), Bigsten (1977), Lijoodi and Ruthenberg (1978), Hazlewood (1978), Crawford and Thorbecke (1978), and Vandermoortele (1982). In view of the wide variations in socio-cultural conditions, it is not clear that an aggregate measure of the distribution at the national level is very meaningful. At the very least it seems that urban and rural areas should be examined separately (McCarthy and Mwangi, 1982).

It should be noted (see Table 3) that the vast majority of the rural dwellers are smallholders with modest incomes. However, it is evident that non-farm income plays a major role for the "wealthier" smallholders. This component tends to be masked by the average per capita income figure of K133.7 per annum. There are also noticeable regional differences, those in the Central and some parts of the Rift Valley provinces being more affluent (Lijoodi and Ruthenberg, 1978). Table 4 shows rural income distribution in 1976. The lowest 40% of the rural

population are estimated to receive 14% of rural income, while the upper 20% receive 54%. This type of estimate tends to mask the fact that the top 5% receive more than 30% of the income.

Table 3: Rural income in 1976<sup>a</sup>

Occupation group	Population (Millions)	Income (Kf million)	Average per Capital income (Kf per annum)
Smallholders	10.11	341	33.7
Pastoralists, landless and squatters	1.29	21	16.3
Large and gap farms, professional, and govern- ment service	0.52	194	373.1
TOTAL	11.92	556	46.64

<sup>a</sup> Estimates based on Integrated Rural Survey 1 (IRS 1), 1974-75. This survey under estimated the Rift Valley and did not include the North-Eastern province.

Table 4: Rural income distribution in 1976<sup>a</sup>

Income group (%)	Income (Kf million)	Per Capita in- come (Kf p.a.)	Share of Population	Share of income
0 - 40 (lowest)	78	16.4	0.4	0.14
40 - 80 (middle group)	179	37.5	0.4	0.32
80 - 100 (upper group)	299	125.4	0.2	0.54
TOTAL	556	46.6	1.0	1.00

<sup>a</sup> The lowest 40% of incomes are obtained by combining those of 1.29 million pastoralists and others with the 3.48 million lowest smallholder incomes given in the IRS 1. The middle 40% are also obtained from the IRS 1 data, the upper 20% then being given as residual.

An estimate of the income distribution for urban area is based on a Food Purchasing Survey (Casley and Marchant, 1977). This study primarily dealt with households with incomes below Kf125 per month in Nairobi. It also excluded single-member households. If this omission is adjusted for, it is estimated that the lowest 75% of the urban population have a total annual income of about Kf 180 million, which suggests



distribution in 1976. This distribution indicates that the share of total urban income accruing to the urban poor is lower than that of rural income going to the rural poor. However, urban incomes are on the average five times greater than those in rural areas.

The daily per capita calorie supply in 1977 was about 2032 and this was 88% of the requirement. There is no good statistics on infant and child mortality rates but it is estimated to be between 80 and 120 per thousand.

Statistics on food poisoning are also lacking but statistics on various food and water borne diseases can be used as proxy for food poisoning. Table 6 shows reported cases of some infectious diseases related to food and water in 1980.

Table 5: Urban income distribution in 1976<sup>a</sup>

Income group (%)	Income (Kf million)	Per capita income (Kf p.a.)	Share of Population	Share of income
0 - 40	51	69	0.4	0.11
40 - 80	177	242	0.4	0.37
80 - 100	250	683	0.2	0.52
TOTAL	478	261	1.0	1.00

<sup>a</sup> Based on data from the Urban Food Purchasing Survey (1977).

Table 6 shows reported cases of some infectious diseases related to food and water in 1980.

Table 6: Reported Cases of Some Infectious Diseases, 1980.

Diseases	Cases	Deaths
Anthrax	132	-
Infectious hepatitis	2653	34
Schistosomiasis	16661	-
Typhoid fever	119	4
Cholera	4379	62
Ameobiasis	6982	2

Diarrhoea	65134	42
Gastro-enteritis	54463	140
Salmonellosis	7	-
<hr/>		
TOTAL	150530	284

Source: Statistical Abstract, 1981.

In 1975 17% of the Kenyan population had access to safe water. The population per physician was .11,630 in 1977 while the population per nursing person was 1,090.

Rail road and road communications are good to excellent coastward to Mombasa and Westward to the Lake Victoria region. There are approximately 150 000 kilometres of usable roads in Kenya of which approximately 50 000 kilometres are national roads. There are however several rural areas which still cannot be reached by road but the government is understanding a big rural access roads programme. About 87% of the Kenyan population lives in rural areas. This population depends on 'traditional' food systems for their normal food requirements. Supermarkets, high class butcheries and self-service stores are non-existent. Infact even the 13% of the population living in urban areas less than 60% will depend on these high class food systems.

The country aims at self-sufficiency in basic food-stuffs and food imports are usually a small proportion of total imports except in years of severe shortages. For example, 1980 food imports were 5% of total imports compared to 2% in 1979. 1980 was a year of severe food shortages in the country.

According to 1977 urban food purchasing survey, expenditure on food as a proportion of total consumer expenditure was 45% and 21% for low income group and high income group respectively. While in rural areas it was 61% and 31% for the household with the lowest income and the household with the highest income respectively.

## II THE CASE STUDY OF KANGEMI

The development of Nairobi as a city can be dated back to 1899 when the Uganda railway reached the present site of the city. It was then that a railway workshop and a locomotive depot was established: Nairobi

continued to grow gaining the status of a township in 1903, that of a municipality in 1919 and became capital of Kenya in 1908.

By the early forties the population of Nairobi was just over 100,000 ,by 1970 it was above 500 000 and now stands at 835,000 according to the 1979 census. Prior to the attainment of independence in 1963 the movement of Africans as well as their living in urban areas was restricted. These restrictions were relaxed after Kenya became independent. At the same time the land consolidation especially in Central Kenya, created a pool of landless people. These factors created an influx into Nairobi of people lacking both jobs and capital.

The area of Nairobi before independence was 88 sq. km. After independence ,the city boundaries were extended ,the new area being 690 sq. km. It was at this point that Kangemi was incorporated within the city boundaries. Prior to this it was under Kiambu district administration. Kangemi is one of the sublocations that constitute Dagoretti division. It is situated 12 kms. west of the Nairobi city center and lies along the main Nairobi - Nakuru road.

According to 1969 census the total population of Kangemi was 9178. The 1979 census show the population has risen to 21,081 and that there are 5979 households. These figures give an average of 3.5 persons per household. Out of the 5979 households 4608 (77%) are headed by males and 1371 (23%) are headed by females. The total area of Kangemi is 5 sq.km. giving a population density of about 4,200 persons per sq. km.

Table 7: Population of Kangemi by sex and age group.

Age Yrs	0-4	5-9	10-14	15-49	50+	Not stated	Total
Male	1888	1322	865	6949	468	48	11540
Fenale	1940	1318	1019	4900	341	23	9541
Total	3828	2640	1884	11849	809	71	21081

Source: Census record 1979. (CBS).

Kangemi is inhabited by various ethnic groups but Kikuyu is the dominant group. Proportions as found by Mullick (1979) are given in Table 8.

Table 8: Ethnic composition of Kangemi Population

Ethnic group	%
Kikuyu	60.9
Luhya	23.3
Luo	6.2
Kamba	4.1
Others	5.5

Source: Mullick, 1979.

Kangemi like the rest of Nairobi experiences two rainy seasons. The long rains and short rains. The long rains fall mid-March to end of May, while short rains occur in mid-October to mid-December. The amount of rainfall varies year to year ranging from 500 mm to 1500 mm with an average of 900 mm.

The average temperature varies from 70°C in July and August to 20°C in March. The average daily range in May is 10°C while it is 15°C in February with the lowest temperature experienced very early in the morning.

Administratively, Kangemi is directly under a sub-chief whose office is at Kangemi, township and a district officer whose office is at Waitthaka. Kangemi being within the city, is also under the city council, under the responsibility of an area councillor.

Before the Land Consolidation in Kenya, all land in Kangemi was privately owned and had rural character with the whole area dominated by a subsistence economy. Land tenure changed and with land consolidation, the area was divided into three main categories: township, satellite and farmland. During the demarcation, both the township and satellite consisted of  $\frac{1}{2}$  acre plots, public purpose plots and rights of way. Rezoning of plots in 1968 reduced the plots in these two areas to  $\frac{1}{3}$  and  $\frac{1}{4}$  acres. This has resulted in densely developed cheap housing units. The farmland plots are large and still maintain their rural character, where cattle rearing and crop production go on. Even in the satellite and township some subsistence farming goes on. The subsistence crops include potatoes, peas, cassava, yams, beans, spinach, caggage, taro, kale, maize, tomatoes

and carrots. The amount of cultivated land is diminishing with construction of more and more dwelling units. The 1969 population estimates show that while the country's total population grew at a rate of 3 percent between 1962 and 1969, its total urban population grew by 8% between the same period with Nairobi having a growth rate of 10% per year. The consequence of this fast urbanization is the inability to provide adequate housing, employment and general provision of infrastructure and other community service. The existing housing stock within the city boundaries falls far too short of satisfying the current housing needs. As a direct reaction to this general shortage, the majority of the sprawling population find their way into the fringe areas, such as Kangemi, in search of shelter.

In 1968 rapid development occurred with building of dwellings in Kangemi, especially in both the township and satellite. The development came as a result of a high demand for housing.

There are two reasons for high demand of housing in this area; easy accessibility of the area from major working centres and availability of considerable amount of undeveloped land. The existing housing stock in Kangemi consists of three forms. An illustration of the types is given in Table 9.

Table 9: Forms of major house types in Kangemi Satellite.

House type	No. of houses	Percentages
Timber rental units	171	72.0
Mud and wattle rental units	29	12.1
Residential stone houses	38	15.9
Total	238	100.0

Source: Mmella; 1977.

In another study (Kogi, 1980) covering both township and satellite, 69.6% of the families (from a study composing of 171 households) were living in timber houses, 28.1% in mud houses and 2.3% stone houses. The satellite is more developed and has more commercial buildings than the other parts and therefore has better houses.

Half (50%) of the 171 households were living in single roomed dwellings. For the purpose of providing privacy in these single rooms 44.4% of the rooms were partitioned with cloth curtains, 0.6% with cardboard and 4.8% were not partitioned at all.

The roofing of 95.9% of the dwellings consisted of corrugated iron sheet roof and 4.1% consisted of old rusty aluminium scrapes. Many (67.3%) had concrete floors and 32.7% had earthen floors. Most of the single units are in the dimensions of 9 x 10 feet and 12 x 12 feet.

Rents in Kangemi vary according to the particular land-lord, size and quality of the dwelling unit. Nevertheless the majority (71%) pay between Ksh. 61-100<sup>2</sup> (5-8 US dollars).

Table 10: Variations of rents in the study area.

Rents category K.Sh.	No. of households	Percentage
21-40	6	3
41-60	14	7
61-80	88	44
81-100	54	27
101-120	2	1
121-140	6	3
141-160	6	3
161-180	4	2
181-200	4	8
201 & over	16	100
Total	200	100

Source: Mmella, 1977.

A recent visit to Kangemi revealed that rents have gone up by as much as 60%. More than  $\frac{3}{4}$  of the areas, housing is in technical violation of the building code and nearly all the plots developed with single unit timber rental dwellings are at densities far above the official maximum.

The single units are usually overcrowded and most household activities i.e. cooking, dining, sleeping take place in this unit.

The units usually have one door and one small window per room. During a walk through the area it was noted that quite a number of families prefer to keep their windows closed most of the day hours and obviously during the night. It was also noted that inside, the houses were usually hot and dark, implying inadequate ventilation.

Most of the dwellings though illegal and far from meeting the city council's building code still stand as the council has no means of enforcing the code and the demand for the houses is high. From the above description it is clear that houses in Kangemi lack essential amenities and this has serious implication on food safety.

Water supply, sewage disposal, surface drainage and refuse collection are basic services of prime importance in determining health conditions in any given housing area.

Approximately 16% of the household live in houses that have piped water; another 5% draw water from the river while the rest (79%) collect water from a tap within their compound or from neighbouring compounds. Some of these people pay for the water together with the rent, meaning they pay a basic charge that covers house rent and water; others buy water on cash basis paying cents 30-50 per 'debe': metal or plastic container holding 4 gallons of liquid). According to city council regulations people who sell water are supposed to sell it at cents 10 per debe.

Installing of water into the compound is the responsibility of the landlord. Consumption of water is controlled by landlords who go to pay the city council for the water consumed from their compounds.

The water used in Kangemi area comes from Kabete reservoir. Kangemi like most of the other areas in Nairobi suffers periodically from water shortages.

There is no form of drainage in the area and 12% of the compounds have pools of stagnant water all the time caused either from water used for laundry or as in the case of the foot paths; flooded with water during the rainy seasons. In places small streams form during the morning time of the day, when most households are doing their washing which is done outside the house but within the compound. Waste water causes stagnation favourable for breeding of flies and mosquitoes. Many of the access roads become impassable during the rainy season.

Apart from the main shopping area - situated at Kangemi satellite - and the Health Centre, there is no form of organized refuse collection by the city council elsewhere. Even in these places the services are very inadequate and highly irregular.

For most households therefore, refuse is usually left scattered indiscriminately in the compounds, but even though, a few residents have dug shallow holes for their garbage or throw it in a heap at a specific place within the compound and then burn it.

Kangemi is mainly served by pit latrines which serves 98% of the population. The pit latrines are used on communal basis, some serving upto 20 households. The remaining few have flush toilets which are limited to the modern houses.

Not only do most pit latrines become unuseable during the rains, but also, pit latrines whose floors are collapsing are a common site. A walk through the low cost housing area revealed many full pit latrines which overflow and spill into the compound. Normally it takes a landlord months before digging another one. Such latrines are a health hazzard and a danger to the residents apart from being inappropriate for young children. Many defacate indiscriminately either inside or outside the house where the mother may or may not remove it. Some mothers remove it from their house or door step only to throw it somewhere in the compound. Observations were made



on compounds in the study area which revealed presence of excreta in 17% of the compounds. Fifteen percent of mothers representing 171 households admitted that their children defacate just anywhere and it is eaten by chicken or dogs while 25% give the child a piece of paper to defacate on. It was found that 52% of the pit latrines were clean and usable while 48% were either too dirty to be used or were collapsing, not safe, and therefore, were not used.

Kangemi is easily accessible from the rest of Nairobi. The main road from the city centre is a modern tarmac dual carriage road. The rest of the road systems in the area are poorly developed. Most of the narrow access-roads are poorly drained and become impassable during the rainy season.

Kangemi is served by both Kenya Bus Service and a fleet of 'Matatu' (small public vehicles). Public means terminus is at Kangemi satellite. Most people have to walk long distances to and from the terminus to get home. Accessibility to the majority of plots is by foot.

Kangemi received postal services only in the last months of 1978 and the service still provides no telephone for the public as it has no call-box. The few telephones that are there belong to individuals, the schools, health centre and the social hall.

Kangemi health centre is the only health facility run by the city council within the sublocation. It serves the whole of Kangemi sublocation and some of the neighbouring sublocations. It is meant to cater for over 32,000 people. Owing to the high population densities and the huge catchment area, the facilities are inadequate to cope with the present demand.

In addition to the health centre, there are three private physicians and one traditional healer in the area. There are also two unregistered traditional midwives.

There are two primary and one secondary school in Kangemi. One of the primary schools has a pre-primary unit. There is also one community nursery school. Kangemi youth centre caters for children who

are either too old to be in a nursery school, or their parents came to Nairobi on transfer, did not have a birth certificate and therefore found difficulties in securing a place in a primary school.

There are still many children in this area who do not go to school as there are just not enough classes. In fact there are many children who go to school outside Kangemi making it more expensive for parents who have to pay more in bus fare.

Acquisition of certificates; both academic and professional certificates is very important in procuring of employment, advancing one's academic aspirations and eventually in determining one's socio-economic status. Table 11 is presented to show educational achievement of a sample population from Kangemi, comprising of househeads and mothers to depict a picture of literacy rate of Kangemi people.

The findings show that nearly 30% of mothers and 17.9% of household heads in Kangemi never had any formal education. Even for those who went to school 59.6% mothers and 62.8% heads never achieved the Kenya Junior Secondary Examination Certificate (K.J.S.E.). It means therefore that the majority of Kangemi people are likely to be in low wage employment. Furthermore 70.5% of the heads had no technical training, 9% had less than one year training 6.4% more than 2 years of technical training. As for mothers 82.6% had no technical training, 8.4% had less than one year, 6.6% one year and 2.4% two or more years of training.

A study carried out in Kangemi (Kogi, 1980) showed that out of 171 household heads who were interviewed, 17.2% of them declared themselves unemployed. All except one of these heads were women.

Of those 82.8% who were employed 22.7% were self employed, 8% were government employees, 52.1% were employed by private companies and institutions.

The majority 72.5% of the same households were dependent on one source of income, 16.9% had two and 10.5% did not state the number of sources. The wives/mothers from 71.6% of the household did not contribute to family income, 10.1% contributed additional income and 18.3% were the sole household contributors.

Table 11: Education Levels as completed or not completed  
by heads of households and mothers

Level of Education	household head		mothers	
	No.	%	No.	%
No education	28	17.9	49	28.9
Std 1-4	14	9.0	16	9.6
Std 5-8 completed	47	30.1	42	25.3
Std 5-8 not completed	18	11.5	28	16.9
Form 1-2 completed	4	2.6	3	1.9
Form 1-2 not completed	19	12.2	13	7.8
Form 3-4 completed	25	16.0	15	9.0
Form 3-4 not completed	1	0.6	1	0.6
Total	156	100.0	166	100.0

Source: Kogi, 1980

Example of 2 income sources:

- household 1 household head - clerk  
his wife - shopkeeper
- household 2 household head - landlord and secretary
- household 3 household head - driver  
his wife - tailor
- household 4 household head - clerk  
wife - housegirl

The average monthly income for the employed (Tate, 1973) was estimated as KSh. 600 with only 22% of the employed getting over KSh. 1000. Another sample estimate (Kogi, 1980) indicated the income of 42% of the households as earning Ksh. 100-600 (18.3% from this group earning a maximum of K.Shs 200), 30% earned upto K.Sh. 1200 and 28% earning over KSh. 1200. Three of the households claimed a monthly income of Ksh. 3000. Household income expenditure estimates in 1980 showed 32.7% of the households spend upto Ksh. 500, 37.6% spend up to 1000 while the rest 29.7% spend upto K.Sh 2000 per month.

Many (60%) households were unable to save a part of their money income. They claimed that they were not getting enough to meet their needs and that they mostly survived on credit. The rest 40% managed to save some of their monthly earning from some of the months.

III. Before examining closely consumption patterns in our area of study it is important to have a global view of consumption patterns in the country.

The analysis of urban consumption patterns is based on information collected by the urban food purchasing survey (Casley and Marchant, 1977) while the rural analysis is based on the IRS 1 1974-75 data.

The data are summarized in Table 13. The differences in the average rural and urban patterns are particularly noticeable. Urban dwellers consume about 20% less maize and virtually no millet or sorghum. However, the urban dweller consumes more wheat, primarily in the form of bread, and also rice. He also consumes more sugar, fat (mostly cooking oil), and meat. He can enjoy this consumption pattern partly owing to the higher income level he enjoys, but also because of the efficient marketing in urban areas. The rural dweller consumes more potatoes and considerably more cassava. He adjusts to his lower income level by obtaining a large share of his calories through the cheaper sources: millets, sorghum, and cassava. He also produces a large proportion of his own consumption.

Table 12 Food Consumption Estimates for 1976

COMMODITY GROUP	PER CAPITA CONSUMPTION (KG PER ANNUM)		
	RURAL	URBAN	NATIONAL
Maize	125.6	97.1	121.9
Millet, sorghum	19.8	-	17.2
Wheat	10.0	24.7	11.9
Other cereals (rice)	1.4	13.1	2.9
Potatoes	26.2	14.8	24.7
Cassava and other roots	30.5	3.0	26.0
Sugar	10.4	20.6	11.7
Pulses	14.2	13.8	14.1
Milk	72.1	88.6	74.2
Meat	15.1	33.6	17.5
Fat	1.7	6.5	2.4
Vegetables	20.4	36.9	22.5

Source: Urban estimates are based on the urban food purchasing survey (Casley and Marchant, 1977) while rural estimates are based on Integrated Rural Survey 1 (1974-75) data. Both estimates are adjusted to 1976 values.

### III: FOOD CONSUMPTION PATTERNS IN KANGEMI

The first food offered to newborn babies is breastmilk. Breast-feeding may continue upto the time a child is aged two years, although 50% of the children are no longer on breastmilk by the time they are nine months old.

Supplementary feeding starts quite early even before the baby is two weeks old. Many mothers as a routine give their babies the home-made sugar salt solution. This solution is meant for babies with diarrhoea, but many mothers in Kangemi give their children as a daily routine. The other feeds comprise of cowsmilk, tinned baby foods i.e. Lactogen, cerelac (some mothers give weatabix) and home made porridges. A typical diet for a baby aged 0-3 months would comprise of breastmilk, cowmilk or tinned milk, a cereal and potato and banana mixture mashed. About 2% would be eating vegetables and 6% fruits. At this age mothers prefer to give their babies citrus fruits in form of juice which is diluted with water and sweetened with sugar. Some of the mothers boil the

water they use but others do not. In the early age only orange juice is given but when the child is older lemon juice is also given. Pawpaw and ripe bananas are also popular fruits for young children. The proportion of families utilising fruits on regular basis remains below 10% and even tends to diminish after age of 18 months.

The diet changes as the child grows older. For example, by age of five months 10% of the children take tea or coffee with milk and not plain milk; 25% by age of seven months, 52% by age of thirteen months and all by age of three years have stopped taking plain milk and either take it in tea, coffee or porridge.

Maizemeal porridge plain or with milk and margarine, depending on their availability in homes, is used by many mothers as the main food for babies most of their first year in life. It is used as a breakfast dish for elder children or for the whole family. In some families children have porridge for breakfast while adults take tea or coffee. The other main dish for children is a mashed mixture of potatoes and green bananas.

By the time the child is fifteen months old, it is already eating the family diet except in families eating whole maize. Children start eating whole maize as early as the age of 18 months.

For most families meals comprise of the following breakfast - either - tea or coffee with or without

Milk/sugar

- tea or coffee with bread
- porridge mainly made of maizemeal and rarely millet/sorghum flour.

Lunch/supper

- Ugali (a stiff mixture made from maizemeal or sorghum) with green vegetables
- ugali rarely with meat/fish stew
  - ugali with milk (rare).
  - a mixture of maize and one of the pulses
  - rice or chapati (wheat flour unleavened bread) with stew or milk.

Less than 5% of the families eat these last two dishes as regular meals. They are too expensive. Many families, especially those of Kikuyu origin would prefer githeri (a boiled mixture of maize and one of the pulses) if they could afford it. Legumes are expensive to buy, e.g. a kilogram of dry beans costs K.Sh. 8, an average Kangemi family would therefore require more than a kilogram, then maize has to be bought. Preparation of githeri is also expensive in terms of fuel cost. Charcoal is the main cooking fuel at Kangemi and it is also expensive. A heaped 2 kg. Kimbo tin of charcoal cost Ksh. 2.50. Githeri is served either plain, where after the mixture is cooked the water is drained off, and either it is discarded or used as gravy, salt and sometimes fat is then added to the mixture and served. Githeri can also be iried with vegetables, or it can be served in the traditional Kikuyu way, whereby potatoes and pumpkin leaves are added to the githeri and the mixture mashed.

Ugali is made by adding either, maize or sorghum flour to boiling water stirring it all the time until the mixture becomes stiff and is left to cook for a short time. Occasionally, sorghum ugali is prepared by the Luhya or Kalenjin families. The vegetables used for accompanying ugali are usually fried with onions and it is normal to add to it one or two tomatoes, or carrots when available.

Sometimes other stews are prepared to accompany ugali, rice or chapati. They can be prepared with fish (most popular with Luo and Luhya) or beef or mutton stew on rare occasions. Most meat is eaten at the end of the month. Tripe and intestines are more common than red meat. These are cheaper than other cuts of meat. Maize, whole or in its milled form is the staple food for Kangemi people. Cereals is the single food group supplying a substantial amount of both calories and proteins to people in Kangemi.

All fruits consumed in Kangemi are consumed in their raw state. Tomatoes, carrots are sometimes eaten raw. Depending on an individual some wash the fruits or vegetables before eating, others do not. Sugar cane stems are commonly eaten in Kangemi, both at home and away from home. Some people remove the outer cover with their teeth as they eat.

An indication of the prevalence food is given in form of a list of the seven most preferred foods starting with the most popular.

List - Seven foods items with the highest consumption rate:

1. maizemeal
2. Kale (sukumawiki)
3. milk
4. maizemeal and millet
5. fats
6. Potatoes
7. Green bananas.

The list was compiled for preschool children but is reflective of a family's diet since children start eating the family diet before they are two years old. It should be noted that maizemeal and sukumawiki top the list. This is because these make the diet Kangemi people survive on, "ugali na sukumawiki."

An inventory record of foods consumed by 171 households in Kangemi in August 1978 is given to show variety of foods used by the people in Table 14. Soft drinks are also consumed in quite a number of households. These include brands such as; tree top/trufru squashes, fanta, coca cola etc.



Table 13: Inventory record of food consumed in month of August 1978.

1. Animal products	4. Cereals	7. Green vegetables	10. Yellow vegetables
milk	maize	kale	carrots
eggs	rice	cabbage	tomatoes
meat	wheat	spinach	
liver	millet/sorghum		
tripe			
2. Pulses	5. Tuber & plantain	8. Fruits	11. Commercial food
peas	potatoes	ripe bananas	cerelac
beans	taro	oranges	farex
	green bananas	lemon (juice)	weetabix
		pawpaw	ribena
3. Fat	6. Beverages	9. Sweets	orangesquash
margarine	tea	sugar	soft drinks
pit fat	coffee	jam	(soda)
vegetable fats	cocoa		
i.e. kimbo,			
cowboy			

SOURCE: Kogi, 1980

The staple family diet does not vary greatly with seasons. Families have their usual basic diet throughout the year although amounts may vary from time to time. Seasonality occurs in two forms. Firstly when foods, such as tomatoes, are in season, the price goes down and therefore the family can purchase more. Consumption of fruits is also very dependent on seasonality e.g. from the month of February consumption of mangoes goes up, this is true for whatever fruit is in season.

The second type of seasonality occurs in the middle of the month to the time people receive salaries. This is a more serious type of seasonality as families can very easily go hungry. This is the time many people live on credit. Debts incurred at this period have to be cleared before any food can be purchased for the new month. What most people in Kangemi earn cannot be budgetted to last from one month end to the other.

In 87.1% of the households meal preparation is done by the 'mothers' while in 12.9% of households meals are prepared by employed housemaids or another member of the family. Over half (53%) of the households have facilities for preparing one pot at a time. This has influence on the length of cooking time per pot and also on method of preparation. Food is usually cooked for a short period, average time for preparing breakfast was 25 minutes and 30-50 minutes for lunch and supper. Timing was done from the time first pot was put on fire upto the time the last one was removed, if there happened to be more than one pot which was the usual case with lunch and supper.

Enough food is prepared for one meal, except in preparation of the maize legume mixture which can be made to last for two days. Members of the family usually eat all meals at home except those working or going to distant schools who eat lunches away from home.

Many families do not use spoons but use hands for eating. All households use hands when eating ugali. Spoons, can be used for eating rice or githeri with gravy, otherwise dry githeri is eaten by hand. Nearly all children use their hands even when they are given a spoon.

Eating time is one time that food can be easily contaminated before it goes to the stomach. A child can pour all the food onto the floor then pick it up back to the plate or eat from there. It is also common for a child to put their hands on the floor then put food in their mouths with the same unwashed hands. It is a common habit for children to sit on the floor while they eat. It should be noted that may be a few minutes earlier a child had diarrhoea or urinated on the same floor and a paper used to wipe the floor, then on the same floor food is picked to the mouth. Feeding bottles are another source of contamination. Nearly all mothers use feeding bottles which are prevalent upto the age of 18 months. In a place like Kangemi it is difficult to keep such bottles free from contamination.

There is no special storage of cereals and their products. Meat and vegetables are bought fresh cooked and consumed the same day. For dry foods like cereals; maizemeal can be purchased in 2kg. packets from shops. This maizemeal is highly refined. Some of the families which grow maize or which buy dry maize have it milled in a nearby mill.

This maize is not highly refined and there is no extraction. Sometimes maize is milled into njenga (dry maize broken into particles the size of rice and cooked like rice).

Wheat is consumed in form of flour usually as bread, chapati, mandazi or samosa. Wheat flour is available from shop either in 1kg or 2 kg packets. Three types of wheat flour are used in Kangemi, plain white wheat flour, self raising flour and atta (a brownish less refined wheat flour). Other wheat products consumed in Kangemi include breakfast cereals like weetabix, cerelac and cakes.

Rice is available in its usual grain form but comes in various grades of refinement.

Storage for all these foods is in their packets even when, like in the case of maizemeal, they are purchased in great amounts at the end of the month to last for a period ranging from one week to three. Wholemaize is kept in metal or sisal bags and baskets.

The pulses used in Kangemi in ranging frequencies include beans, peas and grams. Pulses are stored in paper packets, metal containers in bags made of sisal or heavy polythene paper. Sometimes weevils, infest grains during storage either at home or at the shops. For example, a survey (Muraguri et,al. 1981), on which foods were tested for mycotoxins, and of which Kangemi was one of the sampled areas foods where collected from for testing, revealed that 17.6% of maize and maize products and 20.5% of all foods tested were found contaminated.

In the case of fresh foods; vegetables and fruits are consumed fresh. Some families wash them before consuming or cooking but many do not. Vegetables are used within a day or two and they are kept in baskets or cartons while awaiting to be cooked.

Meat is bought fresh, cooked and consumed the same day. If it is to be kept until the following day it is fried or boiled in salted water. Most families wash tripe and intestine before cooking. These in most cases contain faecal matter as butchers do not clean them at all.

Although a few families get fresh cowsmilk, the majority depend on pasteurized milk from Kenya Creameries Cooperative (KCC) which comes in  $\frac{1}{2}$  litre tetrapaks. Fresh cowsmilk is boiled immediately after delivery. Boiling of the KCC milk varies. If the milk is to be used shortly it is not boiled, but if it is meant to last a whole day most households boil it. Milk after boiling is stored either in the same container or in a different container. It is normal to cover it after it has cooled or keep it in a cupboard uncovered.

Any leftover cooked food is left in the pot it was cooked in. If left over from an individuals plate it is kept separately. The food is kept covered or uncovered and in the latter case flies have easy access to the food. Not all families have cupboards where cooked food or perishable foods can be safely stored; in such cases food container is left on the floor somewhere in a corner or against the wall.

In Kangemi meals are served at the following times:

Breakfast	6 a.m.	-	10 a.m.
Lunch	10 a.m.	-	2 p.m.
supper	4 p.m.	-	9 p.m.

Timing includes the time meal preparation starts to the time families finish eating. Most families have breakfast between 7 and 8 a.m., have lunch between 11 and 12 and supper between 6 and 7 p.m. (Kogi, 1980).

Some families grow some of the food they use. The amount depends on the amount of land available and the yield. The foods include vegetables, maize, beans, yams, taro etc. However, the majority of people depend exclusively on purchased food.

IV: FOOD MARKETING AND DISTRIBUTION SYSTEMS

The food industry heads the list of Kenyan industries for output especially if the beverage and tobacco classification is included. Production has grown particularly in flour milling, dairy products, sugar, beer, fruit and vegetables.

The National Cereal and Produce Board (NCPB) has monopsony/monopoly powers over maize and other cereals especially those traded outside of district boundaries, but this control is widely avoided. NCPB has 35 depots located all over the country. Maize and wheat are crops processed in mills throughout the country. The baking industry is characterized by many small establishments, but the four largest account for more than half of the total production.

The Kenya Meat Commission dominates the meat processing industries (some 10 slaughter houses), with the Uplands Bacon factory handling pork. The dairy industry is dominated by the Kenya Co-operative Creameries Ltd. (KCC) producing inter-alia butter, cheese and whole milk in 9 factories. KCC has virtual monopoly in main urban markets but imperfectly controls small urban markets and little power in rural areas although it acts as a willing buyer of milk produced by member societies.

The food industry is centred in Nairobi, which has a large industrial estate area, but some dairy production also exists in other towns while sugar is processed at Chemelil, Miwani, Muhoroni, Awendo, Nzoia, Mumias and Ramisi.

Most of the important foods such as maize, and maize meal, milk and milk products, beef and other meats, other produce such as beans etc. have their prices rigidly fixed by the state from the farmer through processing, wholesaling and retailing. Only a handful of products such as the highly perishable fruits and vegetables, poultry and eggs are not under state intervention.

The system of producer pricing for food commodities and livestock is uniform throughout the country. This pricing system imply hidden subsidies for producers who are further from the markets and to consumers who are located far from the production areas.

The country has about 30,000 permanent retailers. Large corporations, self-service stores, general retail stores, smaller speciality shops, open-air markets, individual street hawkers and peddlers offer a range of foods to the consumer in the larger towns. For the rural areas and small towns the Asian style "duka" is the primary commercial establishment. In addition to its retail activities it often acts as a wholesale outlet, selling goods to other shop keepers, peddlers and petty traders.

The transport of foods is mainly by motor trucks although NCPB moves a great deal of maize by rail. Road transport permits regular movement of produce throughout most of the country at what appears to be reasonable costs. Transportation is especially critical for the highly perishable commodities like milk, fruits and vegetables. Transportation bottlenecks usually lead to high losses of these products.

The country in general has a good road system especially serving main urban areas. Some rural areas are impassable during the rainy seasons which is a constraint to production especially of the perishable products. Transportation is subject to harassment by police because of a governmental licensing system for transporting of food stuffs, particularly of maize, which it is intended shall only be traded in by licensed buying agents.

The storage of food like maize is at four levels i.e. producers, traders, NCPB depots and the millers. 49% of storage space is in the hands of the middlemen and farm storage accounts for only 33% of total storage space available in the marketing system (Maritim, 1982). These estimates, however, may underscore farm level storage due to the fact that small scale farmers sometimes store the produce in a corner of a house, or in the ceiling, and in certain cases in pots up in the ceiling.

The fore going has examined food marketing and distribution from a country-wide perspective. Let us now examine in more detail food marketing and distribution in Kangemi.

Kangemi as indicated in our description of the area has a substantial number of households who produce a significant amount of their food and even have surplus for the market especially vegetables. In increasing food production farmers have been encouraged to use pesticides without being warned of the damage it can have on their health and that of their children. Studies in other rural areas in the country on mercury poisoning has been attributed to pesticide use by small farmers (J.D. Brown, et. al 1982 and J.S. Meme et. al 1981). This would call for serious education of small farmers on side effects of chemicals being used in agricultural production in the country. The use of pesticides calls for increased need for food control.

As indicated earlier small farmers store their food practically anywhere ranging from simple grass thatched mud plastered structures to ceilings in their living mud huts. Generally small-farmers have poor on-farm storage facilities.

Losses in stored maize, are in general, the highest (G.G.M. Schutten 1982). Data on losses of roots and tubers are scarce, while for fruits and vegetables no data are given. Most estimates refer to storage losses. Information on losses in other components of the post-harvest system is very limited.

De Lima (1979) estimated the annual losses due to insects in the period 1973-1976 were, respectively, 4.98, 5.11, 3.53 per cent. The annual loss caused by rodents was estimated to be 1.45 per cent, making the combined loss to insects and rodents nearly 6 per cent. The storage period is usually up to 6 months.

Poor storage on the farms has resulted in mouldy food especially maize culminating with aflatoxin poisoning and deaths of the victims. (B.K. Johnson et. al 1981, and N. Muraguri et. al. 1981).

Kangemi has an open air market where all sorts of foods are sold. The open air market operates two days a week (Monday and Thursday). Adjacent to the open air market are stalls allocated to individuals. Foods are sold in these stalls the whole week through. Foods are cheaper on days the open air market is operating. Apart from the market, there are people who sell vegetables by the road side all over Kangemi.

All types of vegetables, fruits, maize, rice and legumes both dry and fresh are sold.

Dry groceries are available from shops and Kiosks that are scattered all over Kangemi and also packet milk from KCC. Meat is sold in four main butcheries and also from Kiosks which are estimated to be over twenty. The meat is mainly bought from a slaughter house at Dagoretti. Apart from fresh meat, roasted or boiled meat including internal organs and intestines are also sold to be carried away or to be eaten within the premises. Pork can also be purchased from some of the Kiosks and butcheries. The butcheries selling meat as well as the Kiosks lack in refrigeration. There are many food Kiosks which sell tea, snacks, and other cooked meals, where available menu depend on the management.

Foods that are sold in the market and by the road side Kiosks or in the open air come from the whole sale market situated in the city centre, the surrounding area of Kabete or from Kangemi farmers.

The open air market is owned by the Nairobi city council (NCC). It is of earthen floor and has little drainage, and no other amenities such as counters, electricity, piped water, refrigeration and has minimal sanitary facilities and rubbish disposal. The market is usually littered and very messy during rainy seasons. It is definitely a hazard to food safety. NCC charges a market cess to those who want to use the market. For example, one bag of cabbages is charged K.Shs. 3.50 while a crate of lettuce is charged K.Shs. 4.00. These charges are reviewed from time to time and NCC should be able to provide the lacking services to enhance food safety without resulting to subsidies. Anybody can sell their foods in this market as long as they pay the cess.

Kangemi has no self-service stores and shops serving the area include "duka" (which are small general stores), hawkers and peddlers and Kiosks.

"Dukas" are usually converted rooms with an enlarged front window and a counter area. Most of these are small and badly stocked with a limited range of domestic and food-stuffs, usually non-perishables (with exception of milk, eggs, and potatoes). A well-stocked duka might



contain such articles as beans, rice, sugar, tea, flour, cocoa, cooking fat, salt, chili and curry powder, jam, maize meal, milk, eggs, potatoes, onions, matches, kerosene, cigarettes, needles, thread, safety pins, aspirin, rubber, baby-bottle teats, soap, wicks for lamp, and wire wool. Few if any of the owners of these dukas keep accounts or have any precise idea of cash flow or costs of stocking. It is therefore difficult to obtain figures on relative profit margin.

Shops, restaurants, kiosks, butcheries and market stalls are licensed by NCC. The licence fee being K.Shs 500, K.Shs. 400 and K.Shs. 350 (butcheries and market stalls) respectively. NCC is also suppose to undertake inspection to enforce maintenance of hygiene standards in these premises. These establishment in most instances maintain low hygiene standards. It is normal to find meat being served on shelves that have not been properly washed. Shops sometimes keep their wares on the floor. Many of the kiosks and market stalls do not have piped water within. It is difficult for them in these circumstances to maintain a high level of cleanliness and hygiene.

There is little processing of food in Kangemi since most foods such as maize meal, milk, bread or wheat flour are brought to shops, already processed. Meat (beef) is an exception since the four butcheries in Kangemi are supplied by a slaughter house located in the vicinity at Dagoretti. The location of this slaughter house is usually affected by shortage of water. This slaughter house does not operate a grading system and in most instances does not meet the government's regulated standards for hygiene and humane killing. This is especially of great concern given the incidence of zoonoses particularly *Taenia saginata* in Kenya slaughter cattle (P.N. Nyaga and J.M. Gathuma, 1981).

The slaughter house is licensed by NCC at a rate of K.Shs. 2000 per annum. The maintenance of hygiene is enforced by NCC and the Ministry of livestock - mainly meat inspectors. The slaughter house is constructed under Meat Control (Local slaughter Houses) Regulations of 1973 and can operate under all weather conditions and is accessible under all weather conditions.

The four butcheries at Kangemi are not of high class and maintain low hygiene standards. They are not refrigerated and meat goes bad quickly

and it is normal practice for butchers to mix fresh meat with bad ones when serving customers. The butcheries also serve partly as eating houses for roast and boiled meat.

The majority of meat consumers do not differentiate between standards or grades, and slaughter house (except Kenya Meat Commission) do not grade meat. Some butchers are able to buy standard hind quarters and sell a large part of the meat as speciality cuts like fillet or sirloin. Given this practice and their low maintenance of hygiene some butchers are able to make high margins per kg. CDW. (See Table 15).

Table 15: Private Butchers' Costs and Margins for 170 Kg. steer sold in Nairobi, 1979.

	Total (Ksh.)	Ksh. per kg. CDW
Purchase Price	1500.00	8.82
Transport costs	51.25	0.30
Slaughter costs	30.00	0.18
Total costs to whole sale	1581.25	9.30
Carcass wholesale value	1450.00	8.53
Hide and offals whole sale value	170.00	1.00
Total wholesale value	1620.00	9.53
Wholesale Margin <sup>1</sup>	38.75	0.23
Meat retail Price	1751.00	10.30
Retail Margin <sup>1</sup>	131.00	0.77
Overall Margin (including by products)	339.75	2.00

<sup>1</sup>The Margin covers profit and overhead costs including wages.

SOURCE: McArthur, I.O. and Smith, C. 1979.

The restaurants and food kiosks serve a large number of Kangemi residents. Food handlers in other areas of the country have been found to be carriers of various diseases especially in areas with poor sanitary conditions such as Kangemi (J.N. Itotia, et. al., 1978). It is therefore evident that these are areas that would need food control and food safety emphasis, especially in conducting periodic screening of food handlers for enteric pathogens.

The other foods like maize meal and milk are obtained in Kangemi in processed form and already packaged mainly from millers and KCC in Nairobi where these bodies comply with hygienic requirements and food manufacturing practices aimed at preventing contamination, it is not however, uncommon to find cases of contamination especially in regard to aflatoxin poisoning (N. Muraguri, et. al, 1981). These establishment should be inspected from time to time to ensure maintenance of high hygiene standards.

Kangemi lacks in good storage facilities. Foods like vegetables are sold fresh and here there is a danger of them getting contaminated especially when sellers try to keep green leafy vegetables fresh and green by dipping in water most likely collected from a drain or stream which are sewer outlets.

Families are faced with the same storage problem at home. In away they are lucky because vegetables are available in Kangemi on daily basis but as mentioned earlier they cost more on non-market days. Limited and expensive availability of water could be having a significant effect on food safety. For example, vegetables and fruits which could be contaminated might not be washed before eating or cooking. People could avoid washing hands before eating in order to save water. It should be noted that eating using hands is very common.

Extraction of orange juice need hygienic conditions to avoid contamination. If the hands of the person squeezing the juice out are contaminated then this is going to contaminate the juice and this is made worse if the water used is already contaminated.

Sanitary conditions in Kangemi are such that food safety is most likely unattainable, with flies as a medium of contamination. Kogi (1980) found that stools of 30.7% of children (sample size 255) had gastro intestinal parasitic infestation. This then means that their stools, whose disposal is indiscriminate are contaminated.

Food is usually transported to Kangemi in public vehicles (buses, lorries or 'matatu'), bicycles, on human backs and hand carts. The vehicles are usually multi-purpose and not specifically licensed to transport food.

The vehicles' standards of cleanliness leave a lot to be desired and easily act as a source of food contamination. Vehicles transporting meat are specifically licensed by the Ministry of Livestock Development under the Meat Control Act and Regulations. The standard of cleanliness of these vehicles is also deplorable. KCC has special trucks supplying milk in the area but their low standard of cleanliness is evident from the soiled tetrapaks that consumers have to wash first before removing the milk.

Fruits and vegetables are usually transported by buses and trucks/matatu from the city market and human backs and hand carts from farms in Kangemi to the market. These modes of transport are not designed to transport these perishable products and cases of spoiled are many and common.

There is stiff competition in transportation of food stuffs to Kangemi area and the market in particular and transport costs are reasonable. As shown in Table 15, the cost of transporting one Kg. of beef meat was Ksh. 0.30, in 1979.

The Ministry of Transport and Communication licenses vehicles described as public service vehicles as long as they are road worthy. There is no barrier of entry into transportation business. Since these vehicles are not licensed specifically to transport food, their control is vital and should rate high in improving food safety.

Except for milk and maize meal which are already prepacked in  $\frac{1}{2}$  litre tetrapaks and 2 kg. packets respectively most of other foods are packed by retailers as they sell them (adulteration here is common). The packaging materials range from old newspapers to brown paper bags which might have contained something else like cement. Most foods in Kangemi are sold in loose form.

These packaging materials at retail level can easily be the source of food contamination. This is especially so with vegetables and meat. The costs of the above packaging materials are usually minimal and in some instances retailers just use their old newspapers either from themselves or friends or old material that was used to package their other merchandise.

V: FOOD DISTRIBUTION AND FOOD SAFETY

In Part IV of this paper, we have pointed out various factors that affect food safety in the study area. We also pointed out that data from food control authorities or food inspection statistics are hard to come by. Data on diseases related to food were presented in the introductory section of this paper.

In this part of the paper we shall attempt to identify the major problem areas relating to food safety as observed in Part IV of the paper. We shall use milk as an example.

The distribution of milk faces contamination at various levels: farm level, processing level, distribution level and at consumer level.

The contamination of milk at the farm level is mainly due to environmental hygiene i.e. milkers do not maintain a high degree of cleanliness, cows' udders are not properly washed before milking, and milking utensils are not properly washed and if washed in most instances it is with cold water. Storage at farm level also exposes milk to contamination mainly due to inappropriate storage facilities which usually lack in cooling system and other instances milk containers are not covered. The vehicles transporting milk at farm levels are also inappropriate and are usually a source of contamination.

The processing of milk at KCC plants has also faced problems and a substantial amount of milk has been going bad even after processing especially at Kiganjo and Nyahururu plants, and not to mention the problems KCC has been having with school milk feeding program. The main cause of contamination at the processing level would appear to be lack of proper hygienic practices culminating in microbiological contamination.

Milk is distributed in the study area mainly by KCC trucks. As noted in Part IV of this paper, these trucks and their containers would appear to be a source of contamination. The tetrapaks are sometimes soiled and leaking. In this case if the consumer does not wash the tetrapaks properly and boil the milk, contamination is most likely to occur. The chances of contamination are even higher in the study area where it was

noted that sanitary conditions facing consumers are far from satisfactory.

At the retail level, the shops and food kiosks selling milk lack in general cleanliness and maintain low hygienic conditions especially due to lack of water. Milk handlers at this level are bound to be sources of contamination.

The farmers' efforts to maintain milk safety standards are mainly frustrated by lack of environmental hygiene especially due to lack of piped water in their home steads. Water in some instances is fetched far from home and whatever little water there is, is used sparingly at the expense of maintaining milk safety standards. At the processing level KCC is making major efforts to maintain high milk safety standards. KCC has even invested in a laboratory for analysing milk samples. Major efforts, however, should be directed towards maintaining high standards of cleanliness for its trucks and their containers used for milk distribution. At the retail level little is being done by operators to maintain milk safety standards because operators are more interested in making money than maintaining standards in general.

The government ministries concerned with food production, distribution and safety include the Ministry of Agriculture, Ministry of Livestock Development, Ministry of Health, Ministry of Industry and Ministry of Commerce. The country has a comprehensive Food Acts and Food related Acts which also fall under the jurisdiction of the ministries mentioned above.

Safeguards have been taken under these Acts to see to it that the producer, manufacturer, processor, distributor and retailer takes the necessary action to ensure foods he produces, manufactures, processes, distributes or retails are of the right quantity and quality and that they are safe to use.

The Acts include:

- 1) The Public Health Act: this Act falls under the Ministry of Health and is basically concerned with hygiene of food products and premises where food is processed and stored. This Act has special emphasis on meat products as well as emphasis on food colours and preservatives.

- 2) Food, and drugs and chemicals substances Act: this Act also falls under the Ministry of Health and is supplementary to the Public Health Act. The Act aims at prevention of adulteration of food, including the protection of the consuming public against health hazards and fraud in the sale and use of foods.
- 3) Standard Act: this Act falls under the Ministry of Industry and administered mainly by the Kenya Bureau of Standards. This Act ensures that manufacturers and processors produce food of the right quality.
- 4) Weights and Measures Act: this Act under the Ministry of Commerce ensures that foods mostly packed ones are of the right quantity.
- 5) Agriculture Produce Ordinance: this falls under Ministry of Agriculture and ensures that agricultural products are properly graded and standardized.
- 6) Dairy Industry Act: this Act is under the Ministry of Livestock Development and is concerned with Regulations for milk standards i.e. butter fat content and solids content in milk.
- 7) Meat and Meat Inspection Act: this Act under the Ministry of Livestock Development ensures that meat processed and retailed is of the right quality.
- 8) Plant Protection Order: this order falls under the Ministry of Agriculture and relates mainly to exports and imports of plants and planting material.
- 9) Canning Crops Ordinance: this ordinance falls under Ministry of Agriculture and ensures that canned food is of the right quality.

From the above review of laws and regulations related to food safety it is clear that the Ministry of Health (MOH) has the main mandate of ensuring food safety and food control in the country as well as the co-ordination of the activities of other ministries concerned with food safety and control. The MOH operates mainly in rural areas and leaves the urban areas to urban authorities. The Ministry's field staff consist of public health technicians at location level, public health officers at division level and medical officer of health at district level. The field staff inspects food in rural markets, to monitor quality and safety; advises on storage of food and inspects premises that have something to do with food.

The public health staff in the MOH are a mere 2500 for the field as well as the Ministry headquarters. This small number of public health

workers is thinly spread on the ground so they cannot be expected to implement the laws discussed above effectively.

The area of our study falls under Nairobi city council. The council has 37 public health officers. A public health officer is responsible for every health aspect including food control. Food control includes: Inspection of shops (premises and products), food factories (premises and products), food kiosks (premises and products) and open air markets. He/she is responsible for prosecutions. These 37 public health officers are expected to cover 684 sq. Kms. which is the area of the city of Nairobi or 18 sq. Kms per public health officer. Given the population of Nairobi (830,000), the public health officer resident ratio is 1:22,432.

The City of Nairobi is divided into five districts and a district is in turn sub-divided into subdistricts, of which there are 23. Each sub-district is manned by one public health officer.

The council has a small monitoring laboratory which is used mainly for analysing milk and milk products and water samples. Samples for other food products are sent for analysis either at National Public Health Laboratory at Kenyatta National Hospital or at the Government Chemist Laboratory located at the same place. The city council laboratory is manned by a team of five people - two senior health technicians; two health technicians and one laboratory technician.

The MOH has a public health education unit but rarely if ever organizes courses or talks to food processors or distributors on food safety but uses the unit to organize courses or talks to the whole country if there is a general health problem.

The NCC has a small health education and information unit. The unit is manned by five health officers allocated from the total staff of 37. The unit has been giving lectures and talks to food processors and food handlers. The unit is in the process of producing pamphlets on food hygiene but is highly constrained by lack of financial and manpower resources. The unit has equipments for showing films and depends on borrowed films especially on cholera outbreak from the British Council. The unit has only one vehicle. Due to the constraints facing the unit the lectures and talks it conducts are rare and are held on the basis of management through crisis.



VI: POSSIBLE FOOD SAFETY IMPROVEMENTS BY PRIVATE FOOD PROCESSORS AND DISTRIBUTORS

Private food processors and distributors can only undertake substantial food safety improvements if the marginal revenue of that undertaking is greater than the marginal cost. The objective here being to maximize their profits from such undertakings. This in turn is only possible if they are able to pass the increased cost to consumers in form of higher prices.

In Kenya as noted earlier in this paper food processors and distributors cannot automatically pass their increased costs to consumers in form of higher prices because most of the important foods such as maize and maize meal, milk and milk products, beef and other meats, other produce such as beans etc. have their prices rigidly fixed by state from the farmer through processing, wholesaling and retailing. Only a handful of products such as the highly perishable fruits and vegetables, poultry and eggs are not under any state intervention.

The rationale for intervention is partly historical but also includes the need to reduce erratic price movements, stabilize farmers' income and thus reducing uncertainty. In addition the need to limit 'exploitation' of small producers by more organized middlemen in the market and also the need to keep the cost of living within reasonable levels in order to accelerate structural transformation could be added. Another reason for intervention is to provide a buyer of last resort who will buy all produce offered at given prices and thus eliminate the possibility of glut, for instance NCPB and KMC.

Given the rigid price control in the country, processors and distributors will not find investing in food safety improvements attractive. But on the other hand one can argue that if some of them reallocated their current high advertisement budgets, they can still invest in food safety improvements and maintain their current levels of profit. This, however, will come about through increased emphasis on importance of food safety by the state and stepped up effort to improve health education at all levels of food processing, distribution and consumption.

As observed in our area of study most of the measures that can be taken by processors and distributors at this stage of development to improve food safety will involve little if any investment in financial resources. This will be mainly in the area of personal hygiene especially for food handlers. The management will only need to emphasize the importance of cleanliness, educate workers on why for example, it is important to wash hands when processing or distributing food.

The cleanliness of the premises where food is processed and stored in our study area can be improved without extra investment in manpower. For example the cleanliness of the slaughter house, butcheries and meat transporting vehicles can be enhanced without extra financial commitment. But even if extra financial commitment is called for, the private slaughter houses and butcheries are making huge margins which will not be significantly reduced if investment is made into improving meat safety. This also holds in the case of milk.

The critical thing for the society at this stage is to emphasise the importance of food safety, which at this stage ranks low in relation to emphasis on increased production. The acceptance of importance of food safety by private food processors and distributors is the major prerequisite towards improving food safety. If the society can be able to sell this idea to them the social gains will outweigh social costs in terms of lives saved. Thus, at this stage of development what is critically lacking is commitment towards improving food safety rather than lack of resources (financial, manpower or foreign exchange). The current margins being made private processors and distributors can comfortably allow for modest investments that are required to improve food safety at processing and distribution levels. This will basically involve stepped up emphasis on health education with special regard to cleanliness of workers, premises, packing material and vehicles transporting food.

VII: PUBLIC INTERVENTION IN THE FOOD PROCESSING DISTRIBUTION SYSTEM TO IMPROVE FOOD SAFETY

At this stage of development it was indicated in part VI of this paper that the investment to be undertaken by private processors and distributors to improve food safety are not substantial and will not warrant any subsidisation by the government.

The environmental problems however, cannot be solved by investment of private processors and distributors. These environmental problems have important implications on food safety. The open air market at the study area has earth floor, poor drainage, no running water in the market stalls and most of food kiosks, few pit latrines, and irregular refuse collection. The general hygiene situation is very unsatisfactory for food safety.

The investment by NCC to improve this situation would include cementing the market floor, provision of running water, improvement of drainage, provision of more pit latrines, increased manpower and refuse collection trucks. The estimated costs of these improvements could be in the region of Kshs. 20 million as capital expenditure and Kshs. 2 million as recurrent expenditure.

The other area where the NCC should invest in order to enhance food safety is in trained manpower especially food technologists. The slaughter house and butcheries and other food kiosks in the area do not maintain food standards as required by the law because the NCC is short of manpower to implement the law. The 37 public health officers employed by the NCC cannot be expected to effectively implement the law. The investment here should mainly include sponsoring students to institution of higher learning and sending those already employed for specialised courses. An annual budget of Kshs. 1 million for training should be enough to cover training expenses.

The NCC has a small food laboratory. This laboratory should be improved especially in provision of sophisticated scientific equipment for analysing food samples. The investment is estimated to be in the region of Kshs. 10 million.

The movement of staff is also badly hampered by lack of transport and yet it is vital that staff should be able to move fast and regularly to be effective in implementing and monitoring food standards. Currently, staff depend on their own vehicles because there are no vehicles specifically allocated to public health Inspectorate section. The investment here would be in the region of Kshs. 2 million to enable the section to purchase 10 small cars and about Kshs. 1 million for their annual running and maintenance expenses.

The NCC can raise money for these investments from direct rates paid by households and enterprises in the city and also through indirect taxes mainly from licences and cesses. The council can also raise money through loans and grants.

The likely benefits from these investments will be improvement of environment in which food is passed before it gets to consumers and will result in reducing food-borne diseases which as we saw in part I of this paper result in substantial loss of life. The beneficiaries will be both processors, distributors and consumers all of whom are exposed to environmental hazards discussed above.

The laws and regulations relating to food safety were reviewed in Part V of this paper. It was indicated that the country has comprehensive laws and regulations related to food safety. The foods laws in the country are appropriate but need constant modifications to deal with new developments especially given the fact that our food laws are inherited from U.K.

Reviewing food laws in Kenya one notices quite a lot of overlap. For example, Agricultural Produce Ordinance can be covered under the Standard Act and quality of raw materials of respective products. Dairy Industry Act can be covered or is covered under the Public Health Act. Thus, even if the food laws are appropriate there is need for their harmonisation.

The effectiveness of these food laws has been hampered by insufficient implementation. This has been mainly due to lack of resources - qualified manpower, transport, laboratory space and scientific equipment and lack of

general education on food safety to manufacturers, processors, distributors, retailers and consumers. For example, the Public Health Act demands that food handlers be examined regularly in a government or local authority institution and be issued with a certificate. But this is rarely done because available medical facilities cannot cope basically because of lack of X-rays, laboratories, doctors and medical technologists. Yet, this is an area where dangers to food needs no emphasis. But due to the constraints faced the approach is to deal with crisis only-again "management through crisis".

Given the harmonisation of the existing food laws, their effective implementation will depend on the amelioration of the constraints discussed above which will in turn call for a substantial financial commitment on the part of the government and NCC.

There are two areas that currently need new laws: The first is in the area of proliferating fish and chips kiosks in most urban areas. The current laws do not adequately cover these new food processors and yet there has been hue and cry from consumers who have suffered from food poisoning originating from these kiosks. The new law or modification of the existing ones will benefit consumers who have been suffering from food poisoning, the society at large has been losing production because of absence from work by people suffering from food poisoning; the processors will gain from increased consumption of their products if people are not suffering as a result of consuming their products.

The second law that is called for urgently is to cover comprehensively the area of chemical contaminants especially pesticides residues. The negative side effects of pesticide residues was indicated in Part IV of this paper. The Kenya Parliament has just enacted a law to cover pesticides but it has not been implemented yet. The law should be modified to cover all chemical contaminants. The farmers and their families will benefit from this law as well as society at large, because pesticides are important in increasing agricultural production. The marketing operators will benefit from increased sales if farmers realize that the pesticides are safe to use.

The other area that will need further investigation in view to introducing new law or modifying the existing ones is in food preservatives. Currently, the use of sulphur dioxide in food preservatives is being questioned and yet it is still recommended in our case.

VIII:

CONCLUSIONS

The food systems described in this paper indicate the important role the government or local authority is expected to play during a major part of the transformation of a country like ours. The consumers face high risk in their buying processes. The major risk enhancing structural features include lack of quality control in manufacturing and processing, the equally striking lack of safe and adequate transportation and storage facilities especially for fresh foods. Relatively few foods are pre-packaged and packaged ones are sometimes adulterated.

At the farm level where food is produced, food safety is not enhanced because of environmental problems as well as the danger of the inputs being used by farmers such as pesticides and general lack of health education.

The markets where foods are sold lack necessary facilities for enhancing food safety such as piped water, proper toilets, floors, drainage and refuse disposal system.

There is little incentive for processors, distributors and retailers to invest in food safety improvements especially due to their inability to pass their costs directly to consumers. Infact, these people have shown remarkably little voluntary restraint in selling unsafe or unhealthy foods.

The country on the whole has comprehensive food laws but what lacks is effective implementation of these laws. Some of these laws also need harmonisation and constant review so as to modify them or introduce new ones to deal with new developments such as the current proliferation of fish and chips kiosks.

Implementation and enforcement of existing food laws is mainly hampered by lack of adequate qualified manpower, transport, laboratory space and scientific equipment. The government or local authority must invest in these areas if food safety is to be enhanced. The standards of sanitation of markets and food stores can also be improved by government or local authority investing in improving general infrastructure of these facilities such as in provision of water, drainage, toilets and refuse disposal services.

These measures, however, will not be effective if health education and information on food safety is lacking. The government or local authority will have to step up their efforts on improving health education and provision of information on food safety at all levels to cover farmers, manufacturers, processors, distributors, retailers and consumers. There is also lack of research-based data on food safety and this will need emphasis.

The above would indicate a need for a national food quality committee (non-existent at present). This committee should be composed equally of representatives of government, farmers, manufacturers, processors, distributors, retailers and consumers. The committee should be charged with the responsibility of formulating standards as regards quality and food safety, review existing food laws, recommend need for modification or introduction of new food laws and generally advise government on measures to be taken to enhance food safety.

This committee should also be responsible for research on food contaminants and food related diseases as well as the training of various cadres of manpower responsible for food safety. The training of manpower is especially critical for various specialized fields. At present health officers are widely based from food to drainage i.e. 'Jack of all trades and master of none'.

These measures, one hopes, will go a long way to enhance food safety and have the net result of reducing the incidence of food related diseases in the country. Thus, the investments in food safety improvements by the governments by the government or local authority will have high pay offs for the society at large in the long-run.

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