ANALYSIS OF PRODUCE FLOWS TO WAKULIMA WHOLESALE MARKET NAIROBI

BY

KIMUREI ARAP MARITIM

A thesis submitted in part fulfilment for the Degree of Master of Science in the University of Nairobi.

1976

I, Kimurei Arap Maritim wish to declare that this Thesis is my original work and has not been presented for a degree in any other university.

Kimurei Arap Maritim

This thesis has been submitted for examination with our approval as university supervisors.

(1).....

Prof. G. Lorenzl

(2).....

Prof. E.T. Gibbons

TABLES OF CONTENTS

LIST OF TABLES

LIST OF MAPS

LIST OF GRAPHS

LIST OF APPENDIXES

ACKNOWLEDGMENT

The author wishes to acknowledge the following people and institutions, without which this research would not have been possible. First and foremost my first supervisor Professor Lorenzl whose constant encouragement, advice and constructive suggestions enabled me to produce this report in limited time available for the research, Mr. Bob Davis and his computer staff for their kind assistance, Mr. Quik, who played a key role as liason person between the University, the HCDA and Nairobi City Council, Mr. Karanga and his HCDA staff for allowing me use their price report files, Mr. C.N.W. Siganga, Director of Social Services and Housing, N.C.C., and his market staff notably Mr. M.M.R. Kamau, for allowing me use their unaudited cess receipts books, Mrs. Rosemary Abasa for her patient typing.

The author is also indebted to Dr. House and Dr. Withacre for their kind help in interpretation of the XDS3 computer output.

The author cannot find any suitable word to express his gratitude to Mr. Olof Hesselmark who worked with me, sometimes stealing into the early morning hours, and on a number of days opted to take his duties second to mine in an attempt to get the computer program running, the program that formed the core of this research.

This work is dedicated to Phelomena Chepkoros, Julius Kipchumba, Josephene Cherotich and Catherine.

SUMMARY

1. This thesis concentrates mainly on the produce flow to Wakulima Market. This market, since it was opened in 1967, has been beset by the problem of congestion and overcrowding. The former is caused by the fact that vehicles do not use the original parking bays for the intended use. These bays are now sales yard for certain commodities. The latter one is caused by the fact that it is possible in this market to obtain a commodity on retail basis. This acts as a magnet for the low income population of Nairobi who lives close to the market. Overcrowding also is worsened by the fact that traders scatter the produce allover the ground, thus leaving only a limited area for customers to move along.

The market is untidy, and there are no cold storage and conditioning facilities.

2. A number of persons have nippled the problem from various dimensions. Wilson in 1969, analysing a two week results came to the conclusion that a total of 38,365 tons was the volume handled in 1969. Heinrich, 1972, obtained 63,741 tons as the volume handled in 1972. Holsten in 1973 estimated the volumes handled in 1973 at 42,482 tons. Lorenzl and Quik, taking into account the quantities lost due to trimmings and spoilage, and the quantity taken outside Nairobi, adjusted Heinrich's retail survey figures and arrived at 82,666, 91,677, 95,066 tons as quantities handled in 1972, 1973 and 1974 respectively. In all these studies, potatoes, cabbages, maize and bananas predominate amongst the items being traded.

The study therefore set to analyse the produce flows within the following objectives.

- To determine the structure of traded commodities.
- To investigate the seasonal fluctuations of the traded commodities in this market.

3. A number of hypotheses were developed to be tested in the research.

3.1 That the turnover in this market exceeds 95,066 tons estimated for 1974 by 60%.

3.2 That Wakulima Wholesale Market is a market primarily for potatoes, cabbages, green maize and bananas.

3.3 That Tuesdays, and Fridays are relatively the busiest days in the market and that Saturdays and Sundays are the days with the lowest turnover in the market.

3.4 That the sales units are arbitrarily determined in the market.

3.5 That the various sales units of a given commodity do not vary in weight between various seasons.

3.6 That the price reporting system on Fridays of every week has no impact on quantities brought to the market on the following week.

Data to this research was collected from cess receipt books. A total of 40,200 receipts for the whole of 1975 was used. A sales unit survey was also conducted to ascertain the sizes and weights of various sales or carrier units used by traders in this markets.

The following limitations, however, were encountered in the research:-

- Cess receipt books do not record all the quantities that entered the market.
- Traders often resented to the weighing of their produce.

The data was analysed by the computer.

4. The results obtained revealed that:-

4.1 Most vehicles serving the market came only once to the market in the survey weeks of March/April, September and December 1975. This therefore let to the conclusion that using registration numbers and vehicular frequencies to the market as a code for produce identification throughout the year may not be possible for the vehicle that haunt the market, perhaps once and also the very large vehicles in excess of 3 tons tare weight.

4.2 Sales unit, surveyed four times during the research seems not to vary much over a given time horizon. And that the variations are due to overfilling of the container. In other cases, traders prefer to use bigger units. These bear low cess per kg.

4.3 A total of 50,400 tons was obtained from cess receipt books as purported to have been traded in the market. Deeper analysis revealed a 34% descrepancy between quantities recorded in the cess receipt books, and the observed quantity being unloaded from the vehicles. Some quantitieswere not even recorded in the cess receipt books. This made us adjust the above figures and arrive at a total of 71,568 tons as approximately the true quantity handled in 1975.

Among the major items traded are potatoes 33%, cabbages 18.5%, Sukumawiki 11.8% and bananas, and mangoes, had a combined market share of 74%, whereas in vegetables group, potatoes, cabbages, sukumawiki and maize had a combined market share of 88%.

4.4 On seasonal fluctuation, total produce does seem to fluctuate very little. However taken separately,

fruits display a marked seasonality patterns as compared to vegetables, and that mangoes display the highest volatility.

4.5 On weekly fluctuations, they all seem to be on even supply throughout the various days of the seek for the whole year.

4.6 Econometric analysis on quantity-price and price-quantity relationship revealed a number of things:-

- correlation analysis revealed low values of r, insignificant at 95% level of confidence.
- however, when quantity at time t, is correlated with quantity at time t-1, a significant correlation for most commodities was recorded.
- a regression analysis revealed insignificant values of b at 95% level of confidence for all the six fruits and five vegetables out of eighteen commodities considered in the analysis. And generally, all the six models gave low values of R^2 for all models where quantity at time t-1 was not used as a regressor.

4.7 Income index is not a good indicator of produce turnover development. This is because, it does not take into account the unrecorded produce.

5. On hypothesis testing, it became apparent that:-

5.1 The hypothesis which stated that the turnover in this market exceeds 95,066 tons for 1975 by 10% is rejected.

5.2 The second hypothesis which stated that Wakulima Wholesale Market is a market primarily for bananas, potatoes, cabbages, and green maize is accepted.

5.3 The third hypothesis stated that Tuesdays and Fridays are relatively the busiest days in the market and that Saturdays and Sundays are the days with lowest

turnover in the market is rejected.

5.4 the fourth hypothesis which stated that the sales units are arbitrarily determined in the market is accepted.

5.5 the fifth hypothesis which stated that the various sales units of a given commodity do not vary in weight between various seasons is also accepted.

5.6 the sixth hypothesis which stated that the price reporting system on Friday of every week has no impact on quantities brought to the market on the following week is accepted.

6. It is therefore recommended that:-

6.1 the present market should be reorganized.

6.2 the present cess system should be discontinued and a different system be instututed as a means of earning revenue.

6.3 produce inspectors should be given an inservice training.

6.4 the sales units should be defined with the whole purpose of standardizing them.

6.5 A huge balance be constructed at the entrance of the gate, in the event of building a new market. A summary cess per kg be instituted and the produce supplier be invoiced on those lines for using the wholesale facilities.

6.6 the present system of price reporting should be reviewed with the whole purpose of improving it.

6.7 the giant traders be encouraged to use Wakulima Wholesale Market so as to train the upcoming small business men.

CHAPTER I INTRODUCTION

This thesis deals with the analysis of produce flows to Wakulima Wholesale Market, Nairobi. The market was opened on January 1967 as a wholesale market for fruits and vegetables. It is operated by Nairobi City Council, which collects cess on produce as well as charges on vehicles. The Council is responsible for the maintenance, supervision and cleanliness of the market area.

1.1 LOCATION

As shown in map 1.1, Wakulima market is situated in the city centre, off Haile Selassie Avenue and near the railway marshalling yard. The upcountry bus terminal is less than one kilometre away from the market.

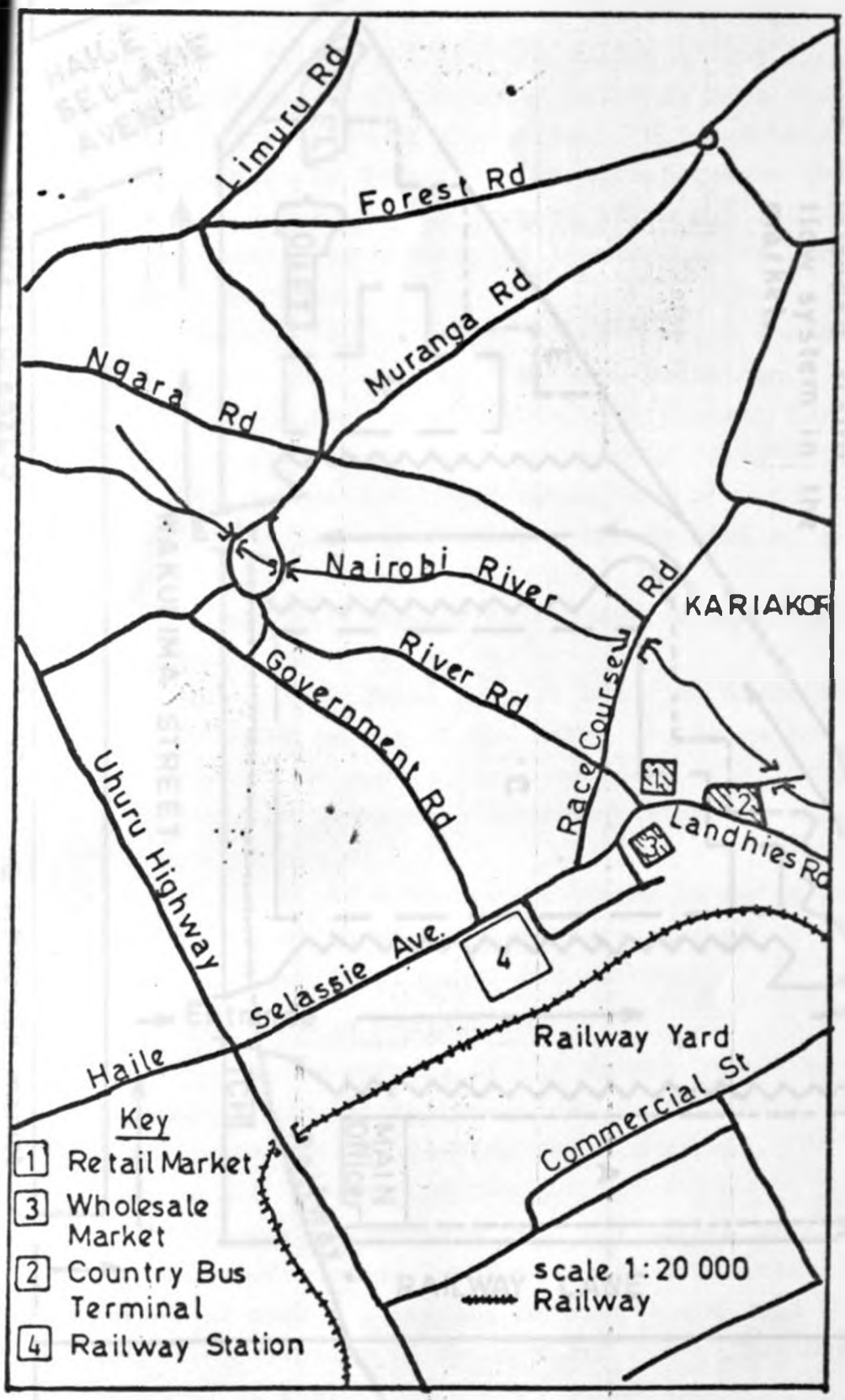
As shown on the map, Wakulima market is accessible by both road and rail. During the day time, buses unload the produce at the bus terminal from where it is transported by handcarts to the market. At night the produce may be unloaded within a few metres from the market entrance.

The residential areas of Eastlands, viz Pumwani, Kamukunji, Bondeni, Jericho, Shauri Moyo, Bahati, Eastleigh and Kariokor are also close to the market, about 5 km away. Less than a kilometre away from this market is the Landhies retail market, one of the nine retail markets operated by the Nairobi City Council.

1.2 THE LAY-OUT

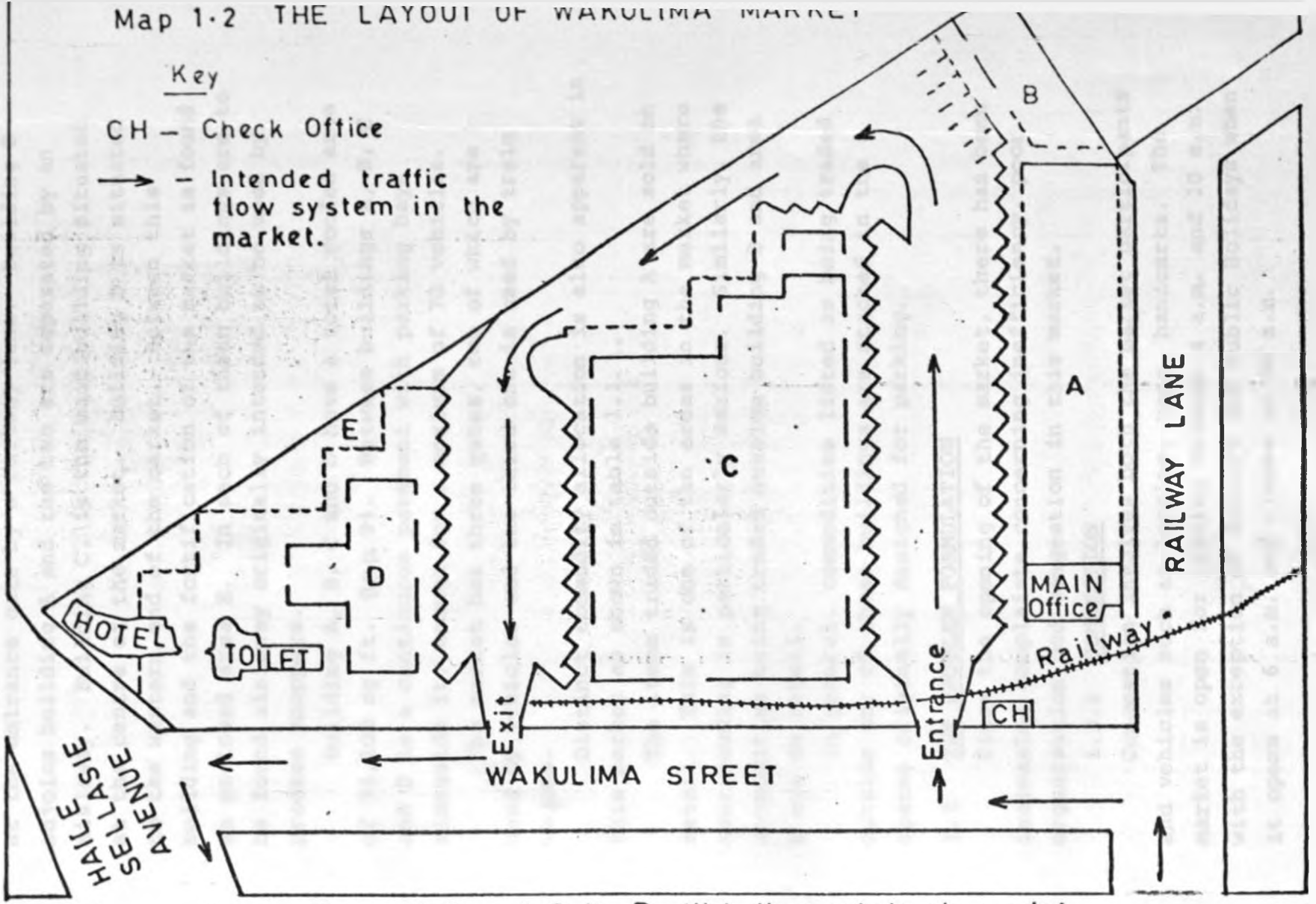
Map 1.2 shows the lay-out of the market, which covers an area of about 0.9 ha, with four buildings (designated as A, B, C, D) and an open enclosure (designated as E). Building A adjoins the main offices of the market and is separated from the record office

Map 1.1 Location of Wakulima market.



Source: National Atlas of Kenya page 79

Map 1·2 THE LAYOUT OF WAKULIMA MARKET



Source : Lorenzl, G and Quik, D, Wakulima wholesale market Nairobi, 1975 (Map 2).

at the entrance gate by a railway lane. Building B adjoins building A and the two are separated by an aisleway. Building C, is the main building situated at the centre of the market. Building D is situated to the western end of the market. Between this building and the fortification of the market is found an enclosed area E. In each of these buildings are to be found aisleway originally intended to be used by produce shoppers.

Building A, B, C and D have a total roofed area of 24,100 sg ft. (Op. 9). Between buildings A, B, C and D is a continuous pavement with parking bays alongside it, enough for a maximum of 70 vehicles.

The market has three gates, two of which are used by vehicles and the third one is used by train wagons.

Distinct commodity allocation is also apparent in this market as shown in table 1.1.1.

The items traded outside building A are sold on retail. This is one of the areas in the market where overcrowding is particularly serious. Similarly, the commodities being traded outside building D and area E are on retail.

In general, commodities listed as being traded outside any of these buildings are stacked in the spaces originally designed for parking.

1.3 THE PROBLEM FORMULATION

Since the opening of the market, there has been increasing complaints concerning inefficiency, poor organization and congestion in this market.

1.3.1 CONGESTION

Congestion involves both the market participants and vehicles such as lorries, vans, handcarts. The market is open for trading between 4 a.m. and 10 a.m. with the exception of Sundays and Public Holidays when it opens at 6 a.m. and closes at 10 a.m.

Table 1.1d. Space and commodity allocation in Wakulima Wholesale Market 1975

Building	Roofed area[2] in sq. ft.	Commodities traded inside the[1] building	Commodities traded outside the building
A	6,500	sukumawiki, maize, cassava, sweet potatoes, kunde, arrow roots, "Isakek"	lettuce, spinach, celery, danias
B	1,500	sugarcane	sugar cane
C	13,700	coconuts, avocadoes, ginger, pears, tomatoes, bananas, mangoes, tangarines, oranges, plums, pawpaws, pumpkins, brinjals, beans, capiscums, onions	potatoes, peas, asian vegetables, mangoes, bananas (cooking), tomatoes, mulberry, loquarts, pinapples
D	2,400	cabbages, carrots, rhubarb, spring onions, brussels sprouts, leeks, turnip	cauliflower, beetroot, spring onions, cabbages
Space E	-		leeks, spring onions, cabbages

Source: 1: Author's observation

2: Lorenzl and Quik, Wakulima Wholesale Market, Nairobi (table 1.1).

Produce is unloaded during the trading hours and thereafter until 5.30 p.m. On an average between 40 and 60 lorries or pickups with a similar number of handcarts serve this market every day.

As was stated earlier, the parking bays are now being used as sales yard for some commodities. Thus, owing to the shortage of parking space, vehicles are forced to unload on pavements. The unloading time vary according to how much produce the vehicle was carrying and also according to how many casual laborers the supplier contracts to facilitate the process.

Most suppliers only unload when they have obtained customers for their produce and when the deal of transaction has been reached. This sort of behavior has only worsened the problem of vehicular congestion. The vehicle in question has to stand in the middle of the pavement for as long as there are no customers forthcoming. It obstructs the other incoming vehicles and hinders the smooth traffic flows within the market. It forces the vehicles going out of the market to take exit via the entrance gate instead of going via the exit gate. This further blocks the incoming traffic.

At Wakulima Lane itself, the queue may stretch during the busy market days, from the entrance gate to Haile Selassie Avenue. Parking also along this lane is carelessly done and sometimes obstructs vehicles leaving the market.

Thus, at the entrance gate itself, can be seen those vehicles, handcarts inclusive, leaving the market, and those wanting to enter the market, together with the market goers wanting to get into or out of the market.

The second dimension of the problem is the overcrowding within the market. During the busy market days movement within the market is difficult. This problem is serious around building A.

Within the buildings themselves the aisleways originally designed as footpaths are now being used as "display windows" by the traders. The produce are randomly scattered all over the ground and this leaves little room for produce shoppers to move along, thus creating a concentration of market goers a long limited space.

The overcrowding is also worsened by the possibility of obtaining commodities on retail basis. This act as a magnet to low income consumers from the nearby densely populated areas of Eastlands.

1.3.2 SANITATION AND HYGIENE

The scattering of produce trimmings, spoiled produce and trash is a common sight in this market. The dust bins are few and are cited to the eastern side, at far end of each building. During the market hours, traders have little time to carry the trash and the trimmings all that far. This is therefore scattered all over the ground. It makes the market environment very untidy and slippery. During the rainy season, a pool of mud builds up in the unroofed areas of the market particularly along the originally designed parking bays and area E.

There is one small toilet too, to be used by an estimated 2000 market participants per day. This can be extremely dangerous during an epidemic outbreak

1.3.3 STORAGE AND CONDITIONING FACILITIES

After 10 a.m. the unsold produce is stacked and left in the market. Some traders leave certain marks so as to enable them to notice if their produce has been stolen.

Mysterious produce disappearences are common in the market, though no attention seems to have been given to this problem. This could be one of the reasons why traders or suppliers do not utilize the official

unloading hours.

Also of crucial nature is lack of cold storage and conditioning rooms. The highly perishable commodities such as mulbery, strawberry need such facilities. These commodities need to be harvested in their "green soft stage" and be conditioned in the market to ripen, and be sold.

At present the traders dealing with these commodities prefer to deal with retailers and possibly the ultimate consumers directly. They face the risk of losing the product completely if they try to reach the final consumer via Wakulima Wholesale Market. The danger lies in the fact that the products are harvested when they are ripe, brought to the market either that same day or the following day, and if this is not bought, it will not be sellable the following day. It will have deterioriated in quality.

1.3.4 GENERAL

In general, therefore, the present conditions in the market are not conducive for the development of an efficient wholesale market in this country. Lack of strictly wholesale trade, congestion problem, lack of standard wholesale units, lack of storage and conditioning facilities, prevalence of quality deception and such related unethical practices, do not create a good climate for an establishment of wholesale market. These act as a disincentive for certain traders to use the market. The market therefore has to be by-passed for sometimes until such time the situation is arrested. This incidentally has its own chain-effects. One of them is the fact that there will be no incentive to create and improve the marketing system, for instance, there will be no incentive to improve quality if it will perish on being stored at the market, or if rendered "unfit for sale!" by the dirty market environment.

CHAPTER 2: OBJECTIVES OF THE STUDY AND LITERATURE REVIEW

2.1 LITERATURE REVIEW

A chain of experience is now accumulating in this area of study.

2.1.1 Wilson observed that "although recently constructed, the market suffers from the acute problem of overcrowding and congestion" (15, p. 44). He recommended that the market must be expanded but before this is done a thorough study of the present market must be undertaken. This involves:-

> "Descriptive analysis of the present Mincing Lane market (Wakulima Market)----
> - Quantitative assessment of the market's throughput on crop by crop basis----
> - A critical analysis of the nature of constraints presently operating and in particular:-
>
> (a) The extent to which the new packaging and grading systems may either improve or worsen the apparent congestion problem in the market.
>
> (b) The possibility of restricting or reorganizing the present system within the market to eliminate some or all of the problems---" (15, p. 45).

He carried out a two week survey in March/April 1969 and arrived at a total estimated volume of 38,365 tons as the volume handled that year. From the produce structure given in table 2.11 it can be deduced that cabbages, potatoes and bananas are the most important commodities traded at this market. They accounted for 77.1% of the estimated volume in that year.

Table 2.1:1. An estimated annual throughput of selected commodities traded in the survey week of March/April 1969 at Wakulima Wholesale Market.

Crop	Quantity (ton)	%
Cabbages	14,284.6	37.3
Potatoes	8,859.5	23.1
Bananas	6,454.9	16.8
Pineapples	1,690.2	4.4
Mangoes	1,027.7	2.7
Tomatoes	1,008.6	2.6
Oranges	954	2.6
Lettuce	953.0	2.5
Sukuma Wiki	489.2	1.3
Cauliflower	330.2	0.9
Garden peas	285.1	0.7
Carrots	174.4	0.5
Celery	114.0	0.3
Others	397.0	1.0
TOTAL	38,365.1	100

Source: Wilson, F. The Marketing of Fruits and Vegetables in Kenya, Nairobi, 1969. (Appendix 1 of Sec. 2)

In the estimation of the total volume however, it must be understood that "there is likely to be a general bias towards under-estimation with these figures partly because lorry drivers are inclined to declare their load as smaller than it really is in order to pay lower fees on entering the market". (15, p. 49).

Wilson's study like similar studies done in March/April of the year must be interpreted with caution. During this time of the year, there is drought in the country, which is characterized by scarcity of vegetables especially. Therefore any investigation into the market at this time of the year is more likely to produce results which, unless handled with caution, can distort the picture concerning the supply conditions to the market. Moreover a two-week survey projected for the whole year assumes that the supply patterns throughout the year is constant. This is not a realistic situation for agricultural commodities in Kenya. The supply pattern is highly subject to changing weather conditions and factors such as diseases which are beyond the control of the farmers and traders.

Another descrepancy however lies in the fact that Wilson considered only 12 commodities out of 85 being traded in this market. Perhaps the picture will alter if all the commodities are included in the study. Moreover this study gives no indication as to the seasonality aspects of traded commodities.

A major discrepancy lies in the source of the data. These were from the cess books, a source that is not as accurate as it should be. Some produce infiltrate into the market without being recorded. This means therefore that whatever the cess books show, they do not include all the quantity that was actually taken into the market and traded. Wilson noticed this descrepancy when he remarked that "vehicles from Mombasa often arrived after the recorder had finished his days work" (15, p. 49).

2.1.2 It was between April 1972 and April 1973 that a thorough investigation was carried out at Wakulima Market by Heinrich (6). His investigations ran in two parallel directions, one using the cess books of City Council market authorities, for the whole of 1972, as a source of secondary data, and the other one was the obtaining of primary data through the "Gate-check" survey at the Wakulima Wholesale Market itself. This latter survey was conducted in two pieces, one in December 1972 and the other one in March/April 1973. In his March/April survey week Heinrich suceeded in interviewing a total of 417 lorry personnel and 360 handcart personnel.

Like most of the studies carried in this area of study the primary concern was to obtain:-

- Total volume traded in this market
- The structure of the traded commodities
- Seasonal fluctuations on the traded produce
- Whether vehicle numbers can be used as an index on interregional differences in commodity supply to the market.

Thus analysis of his data revealed a total quantity of 63,741 tons as having been traded in 1972. The results are presented in table 2.2 together with the results obtained by Wilson and Holsten.

On produce structure, Heinrich lists potatoes as accounting for 30% of the total volume traded in 1972, cabbages, 21.9%, bananas 17.7%, maize 8.2%, and sukuma wiki 7.7%. Altogether, these commodities accounted for 85.5% of the volume traded in that year. The remaining 37 other commodities had a total volume turn-over of 14.5% (7, table 1).

On seasonal fluctuations, Graph 2.1 below gives a summary for the most important commodities traded. Thus judging from the graph, seasonal fluctuation was

Table 2.1.2: A summary of estimates on quantities of fruits and vegetables supplied to Wakulima Wholesale Market 1969-1973

(tons)

	Wilson[1] 1969	Heinrich[2] 1972	Holsten[3] 1973
Fruit	-	16,108	16,834
Vegetable	-	47,633	25,648
TOTAL	38,365	63,741	42,482

Source 1: Wilson, F. The Marketing of Fruits and Vegetables in Kenya, Nairobi, 1969. (App. 1 of Sec. 2)

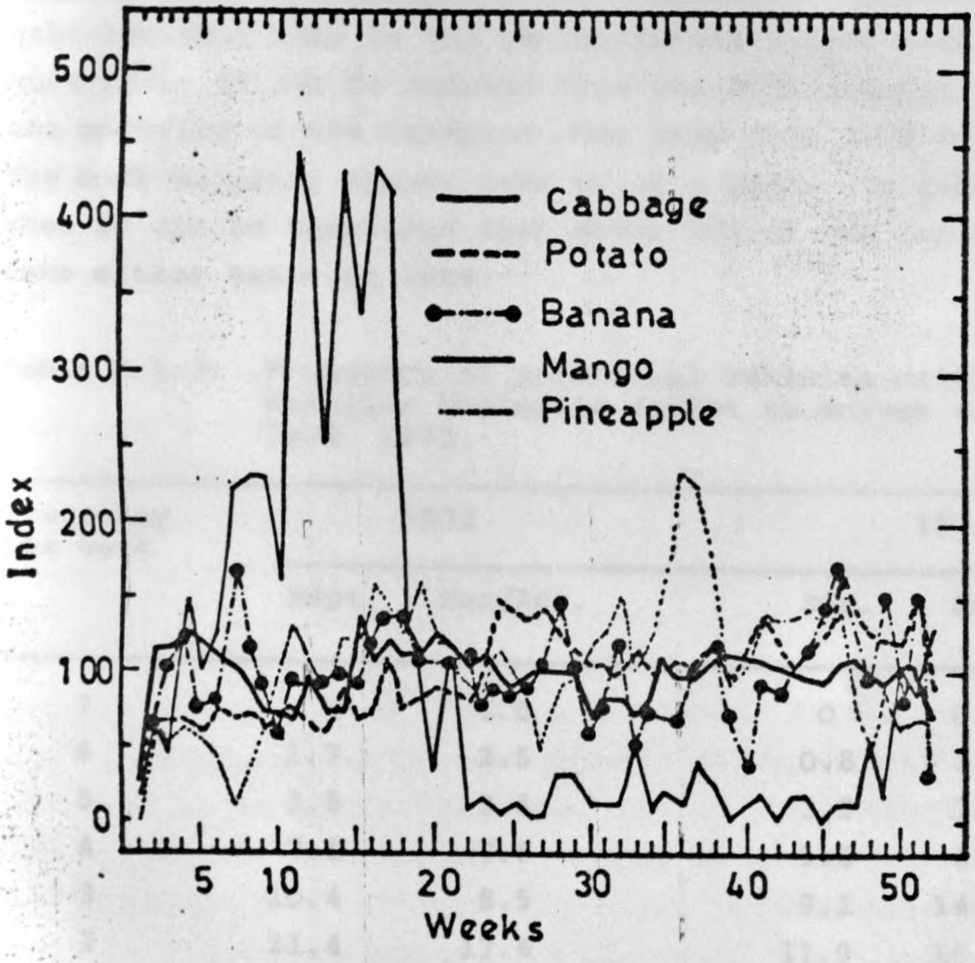
2: Lorenzl, G. and Quik, D. Wakulima Wholesale Market, Nairobi, 1975. (Table 3.1)

3: Holsten, G. Wakulima market survey, 1973, Unpublished Document.

not a serious problem for potatoes, cabbages and bananas. Pineapples and mangoes however, showed a well marked seasonality patterns. And that fruits in general are much more susceptible to seasonal fluctuations than vegetables.

Heinrich, introduced the idea of using vehicle registration numbers as indicators of interregional differences in commodity supply to the market. This let him to calculate the frequencies of the vehicles serving the market and came to the conclusion that "---the vast majority came at least once a week. This leads to the hope that a high percentage of the produce passing through Mincing Lane can be identified for the whole year as far as the area of origin are concerned". (6, p. 10). However, Heinrich's work, like all the other literature already cited or to be cited, the interviewing period was pretty short. Moreover, March/April is the beginning of the rainy season in Kenya. During this period, virtually the market is far

Graph 2.1: Weekly flunctuations of selected commodities traded at Wakulima market in 1972.



Source: Heinrich, F. Basic Data on the Domestic Horticultural Marketing System in Kenya 1972, tables 4, 5, 6, 9 and 11.

from being utilized to its full capacity. Heinrich incidentally noticed this for he remarked that it was "...in line with the general observations that the supply was below average. The market was far less congested than usually." (6, p. 8).

2.1.3 Lorenzl (11) was the next candidate in this area of study. In his unpublished work he collected the addresses of vehicle owners, and from this he computed the frequency at which vehicles visit the market and his results are reproduced in table 2.1.3 below. These figures are computed out of the "different" types of vehicles that come to the market in the survey week in question. It can be deduced from the four surveys that the majority of the vehicles came only once in a week. The next majority number came twice a week. In general then it can be concluded that about 70% of the vehicles came either twice or less.

Table 2.1.3: Frequency of individual vehicles entering Wakulima Wholesale Market in survey weeks 1972, 1973.

Frequency per week	1972		1973	
	Sept.	Mar/Apr.	Sep.	Dec.
7	0	1.0	0	0.9
6	2.7	2.5	0.8	3.3
5	3.8	3.5	3.2	3.8
4	7.1	7.5	5.5	8.1
3	10.4	8.5	9.1	14.1
2	21.4	17.6	11.9	16.1
1	54.4	59.3	69.6	53.1

Source: Lorenzl, G. Wakulima Market Survey 1974. Unpublished document.

Lorenzl's work like the rest of the literature quoted earlier, suffers from the small time devoted to the "field work". The short time period may not be possible to catch all the vehicles including those that may come once in the whole year. Inclusion of the latter group may change the frequency distribution.

2.1.4 Holsten(8)in the same year of July/August 1973 interviewed some traders and suppliers at Wakulima Market, for about a month and obtained a volume of 42,842 tons (Table 2.1.2) about 10% more than what Wilson had estimated for 1969, and about 30% less than what Heinrich obtained for 1972. This quantity was arrived at by computing the daily average deliveries and projecting it to cover the whole year. This is a more or less valid assmption due to the fact that during this period the supply to Wakulima Wholesale Market can be regarded as fair.

It must be understood, however, that during this time period, fruit contribution to the total volume is minimal and an investigation into the market at this time may produce results which tend to be biased towards vegetable quantities. However, judging from the table, the fruit volume is more or less the same as that obtained by Heinrich. The vegetable volume is however very low. This may have been caused by an estimation error. Holsten seems not to have interviewed all the traders in the market. He interviewed a figure of 279 traders engaged in the business as opposed to 380 obtained by Heinrich. Moreover asking the traders concerning the amounts sold per day is an exercise which if not handled carefully might produce poor results. Not many would like to reveal the volume of their business.

2.1.5 In their study entitled "Wakulima Wholesale Market, Nairobi, 1975", Lorenzl and Quik (10) estimated the quantities for 1972, 1973 and 1974 as follows:

1972 - 82,666 tons
1973 - 91,677 tons
1974 - 95,066 tons

These authors arrived at these figures by assuming "a positive correlation between quantities traded and the market revenue from cess and vehicle entrance charges" (10, p. 20). They took the following points into consideration:-

"that (a) 20% of all produce delivered to areas outside Nairobi.

(b) 5% of all produce is unsold due to spoilage and trimmings.

(c) 75% of all produce delivered is consumed in Nairobi (62,000 tons)" (10, p. 20).

On produce structure, however, these authors singled out potatoes, cabbages, green maize and bananas as the most important products traded.

However, it remains to be seen whether, income index is a useful tool kit in estimation of quantities traded. Deficiencies with this type of study include inaccurate data source, and the fact that the sales unit conversion factor surveyed only once, was used to project the same weight throughout the year.

2.2 OBJECTIVES OF THE STUDY

These are the objectives of the study:-

- To determine the structure of the traded commodities at Wakulima Wholesale Market
- To investigate the seasonal fluctuations of the traded commodities.

These objectives are somehow interlinked, but from simplicity point of view the commodity structure considers firstly all commodities together and aims at

depicting the major commodities that are traded in this market; secondly, subdivides these commodities into fruits and vegetables and looks at their composition.

The seasonal fluctuation on the other hand follows the same lines but incorperates the time element into the analysis.

2.2.1 COMMODITY STRUCTURE

About 85 individual commodities are being traded at this market. This is composed of 29 fruit and 56 vegetable varieties (see appendix 1). However, from the point of view of the present problem in this market, the following questions need to be answered:-

2.2.1.1 What is the yearly turnover in this market?

It is an important question vis-a-vis the problem. It is not clear whether the present problem ruling in this market is as a result of large volume turnover or as a result of ignorance on the part of the traders to utilize the available space properly.

Such a knowledge is of importance in designing any programmes aimed at bettering the present situation in this market. Moreover yearly volumes are themselves useful statistics in calculations of forecasts. It also helps those engaged in planning to design effective programmes aimed at advising traders and suppliers concerning their supply policies to this market.

2.2.1.2 What is the effect of price reports on quantities supplied to the market?

Horticultural Crops Development Authority, HCDA, broadcasts price reports every Friday of the week. The target market for these reports are the traders and suppliers of Wakulima Market.

It is assumed that traders make shipment to this market only after observing price movement, otherwise they are expected to make shipment to other alternative market outlets which offer the highest returns.

Thus an investigation on the role played by these price broadcasts in inducing supply to the market will be an important aspect in assessing the role played by this expensive exercise.

A positive and significant response means that farmers and traders are utilizing the information to their advantage.

2.2.1.3 What is the effect of varying quantities on prices?

This question is a follow-up of question 2.2.1.2. The point here is that the short run supply is inelastic. And in a situation where there are no other alternative outlets offering higher returns than Wakulima Wholesale Market, traders may chose to "dump" their commodities there.

Therefore an answer to such a question may throw light on price flexibilities.

2.2.1.4 What kind of sales units are used by traders in the market?

An answer to this question may lay a foundation stone to the proposed standardization of the sales units in the market. Traders use all sorts of sales units. In most cases the product to be marketed determines the kind of sales unit to be used. In some cases there may be other reasons for adopting a given sales unit.

2.2.1.5 What is the weight of this sales units in kg?

Sales in most of Kenyan local markets, particularly at wholesale level are never quoted in

kg. They are quoted in say bags, boxes, crates etc. The weights of these sales units, however, vary with the quantity of the produce packed into the given sales unit and also with the weight of the container itself.

2.2.1.6 Are there any seasonal differences on the sales units?

The answer to this question also may help when converting the given sales units to kg. If there is any seasonal variations on sales units, the appropriate weight factor will then be used to calculate the turnover in different seasons. Thus it may rid the present system of applying a constant weight factor throughout the year.

2.2.1.7 What is the size and weight of the container used?

Some traders may prefer certain container size due to certain reasons. Some prefer large containers, others medium, others still small ones. Whatever the reason, the size and weight of these containers are very important. It is particularly important when calculating the turnover of the produce. The container weight must be subtracted.

2.2.2 FLUCTUATIONS OF TRADED COMMODITIES

Kenya is a country astride the equator. It extends to 5° N. or S. of the equator. Elavation ranges from sea level to the top of Mr. Kenya, 17058 ft. above sea level (13, p. 1).

Physically the country forms the greater East African plateau stretching from Ethiopia down to southern Africa. In Kenya this plateau slopes to some 4000 ft. around the lake basin, while in the south-eastward direction, it slopes down to sea-level.

This plateau influences the climate very much. This in turn influences the rainfall patterns. The

coastal region for instance experiences tropical type of climate, whereas the rest of the country experiences pockets of varying climatology ranging from the desert type in the North-Eastern province to the cool temperate type up in Timboroa highlands, 9,002 ft. (2700 m). (14, p. 1).

The patterns of rainfall also change from the unimodal one in the highlands west of the Rift Valley via a bimodal type in Central Kenya to the erratic or uncertain rainfalls patterns of the districts in Eastern and North Eastern Kenya.

Generally speaking the rains start in March/April. In a bimodal rainfall areas, this forms the beginning of the long rains. In a unimodal rainfall areas, the rains continue to October/November with the peak around August/September. As for the bimodal rainfall areas the situation is slightly different. The long rains, with its peak in around May continue to June/July. The short rains with its peak in around November set in around September/October.

However, this pattern is only true for those areas commonly referred to as high potential areas[1] of Kenya. As for those areas which fall under medium and low potential areas of Kenya, the rainfall pattern is rather unique and unpredictable.

Similarly, local conditions may influence the rainfall patterns considerably. The case in point is Meru district which, though classified under the bimodal rainfall regions, the long rains set in, in August/September, while the short rains are expected in March/April.

---

[1] High potential land is classified as having an annual rainfall of 857.5 mm. or more (980 mm. coast province). Medium potential should have between 735 mm. -857.5 mm. (735-980 mm. in coast province, and 612.5-857.5 mm. in Eastern province). Low potential land has less than 612 mm. (5, p. 103).

The seasonal variation in rainfall affects the produce output from farms. The effect is more pronounced for the short term crops such as cabbages, carrots, onions, etc. than for the long term crops such as citrus fruits (oranges, lemons, limes, tangarines), pawpaw, etc. Immediately after the rains, a glut for these short term commodities is expected in the market. Shortly before the rains scarcity of the produce reigns in the market. Thus for a region with bimodal rainfall patterns, two gluts are expected in the market, one at the end of the long rains around June/July and the other one at the end of the short rains around December.

The situation for fruit is rather different. Some have one year's cycle, others are biennials. In order to flower regularly, some need constant moisture. The case in point is the citrus orange which tend to have irregular flowering patterns without a constant or regular moisture. This means then that under Kenya's environment where about 70% of the country receive erratic rainfall (1, p. 48) the flowering cycle for these fruit trees cannot be fully predicted. However, it can be said, only in general terms, that most begin flowering after the long rains. The fruit then are expected to arrive in the market in greater quantities 4-5 months i.e. January and February for those that flower in August/September e.g. mangoes, plums, and ovacadoes, and May/June for those that flower after the short rains i.e. December/January.

It must be emphasized at this point that Kenya has a complex ecological environments each with its

unique production seasons. Therefore the above generalization may be misleading. This then leads us to ask the following questions:-

2.2.2.1 What are the months with the largest and lowest turnover in terms of:-

(a) Total monthly volume?

(b) Total volume per commodity?

It is difficult at the moment to predict the months when a large or low volume is expected in the market. This is to say that it is not known whether the present problem ruling in the market is seasonal due to the fact that there is uneven commodity supply throughout the year.

The second part of this question calls for a crop by crop throughput analysis on monthly basis. The peak harvest season together with the months when scarcity of the commodity in question is recorded, are covered in this analysis.

This information is useful in designing:-

- price stabilization policies for horticultural commodities.
- technical facilities such as cold storage, conditioning or such other facilities.
- the plan for reorganization of the present market or the construction of a new one.

2.2.2.2 What is the market share of the various commodities traded in this market and how does the market share of different commodities supplied to the market changes over the year?

This information is useful in planning for such technical facilities as storage and conditioning rooms in accordance with the requirements of each commodity. It might not be an efficient utilization of the resources in

building very expensive conditioning rooms for a commodity that commands an insignificant fraction of the market share throughout the various months of the year.

2.2.2.3 How is the weekly turnover distributed on daily basis?

Some days of the week are expected to be busier than others. Knowledge on the mean daily delivery to this market will be of great importance in designing any improvement programmes aimed at riding the present congestion problem in the market.

CHAPTER 3: METHODOLOGY

3.1 HYPOTHESIS

The following are the set of testable hypotheses.

3.1.1 That the turnover in Wakulima Wholesale Market exceeds the 95,066 tons estimated for 1974 by Lorenzl and Quik.

This figure was arrived at using Heinrich's (1972) data which were obtained from the cess receipt books of City Council. This is not a source to trust. It is most likely to have underestimated the total volume turnover. It is perhaps due to the large volume turnover that the market cannot handle satisfactorily due to lack of space. This could have caused the current acute congestion problem observed in the market.

3.1.2 That Wakulima Wholesale Market is primarily a market for bananas, potatoes, cabbages and green maize.

This hypothesis assumes the observed figures of 1969 and 1973, respectively by Wilson and Heinrich as still valid for the present conditions. Thus judging from these figures, these four crops contributed about 86% of the total volume traded in 1973. This therefore means that any improvement programmes aimed at bettering the market conditions should concentrate on these four products.

3.1.3 That Tuesdays and Fridays are relatively the busiest days in the market, and that Saturdays and Sundays are the days with the lowest turnover in the market.

This hypothesis assumes that all the traders from all over the country use this market. And that on Mondays, they do the collection of the produce and for far traders, the shipment is done towards the late afternoon arriving at the market at night or early

morning the next day. On Tuesday then, they do the selling, and any left overs are sold on Wednesdays. On Thursdays, collection of the product is again done, to be sold on Friday at the market. On Saturdays and Sundays, the traders are expected to take the weekend rest.

This means that there is uneven product supply throughout the week, thus occassioning congestion on certain market days only.

3.1.4 That sales units are arbitrarily determined in the market.

That is a trader brings in his produce and when reaching the market, he can decide to sell in whatever sales unit he chooses himself without any interference from anybody or whatever quarters. This leads to the retailing of the produce instead of wholesaling as it should be, thus worsening the congestion problem in the market.

3.1.5 That there is no significant seasonal variation in weight for any given sales unit of any commodity traded in this wholesale market.

Thus this is tantamount to saying that the use of a constant conversion factor in transforming the sales units into Kg. is justfied.

3.1.6 That the price reports of every Friday of every week has no impact on the quantities brought to the market the following week.

This hypothesis assumes that in short run the supply is inelastic and as such price reports may not help to change the supply patterns in the market.

3.1.7 That market revenue indexes are sufficient indicators for turnover development in the market.

Thus rather than going through the 40,000 cess receipt books, coding them, computing them, a task

that requires about six months, it will be much easier and quicker to seek for other alternative indicators of produce development. If a positive and significant correlation is found between the income and the produce turnover, then this will have solved most of the problem. The income index can be used at least to give a rough estimate on how the produce turnover has been developing throughout the year, and how the various yearly produce turnover could possibly have been developing.

3.2 THE METHOD OF DATA COLLECTION

The following is an account of the data collection method.

3.2.1 THE CESS RECEIPT BOOKS

The City Council, market section, issues a receipt for every produce that enters the market. In this receeipt, the name of the produce owner, the vehicle registration number, the date, and the kind or kinds of produce together with the quantity the person is bringing are entered. When the trader has two or more products to enter the market, only one receipt is issued. The commodities however are specified in the sales/carrier unit form and not in terms of kilogrammes.

These cess receipt books formed the foundation stone for the research. The information extracted from 84 books each with 500 cess receipts thus totalling 40,200 of them,was the vehicle registration number, the kind of produce, and the date, month, and day such produce was delivered. This information was collected for the twelve months of 1975.

For December however an additional information concerning the place of origin of the produce was required. The produce inspectors were thus informed to incorporate the place of origin in the cess books during the whole of December.

3.2.2 SALES UNIT SURVEY

The sales unit survey was carried out between September and December 1975. It was done at the end of every month and of particular interest was the kind of the sales unit and its weight in kg. together with the weight and size of the containers.

The procedure was rather laborious. Two extra men were contracted. A strong rope, a spring balance capable of weighing up to 200 kg., and three bamboo poles were used. The bamboo poles were made into a tripod stand from which the spring balance hanged. The kind of sales unit was tied with the rope tightly and suspended between the tripod stand hooked to the scale. The weight was read.

A convenient sample of 10 was taken for every kind of sales unit for all products except in a situation where the required number could not be obtained. Thus giving a sample of about 40 weighings for every product.

The sampling was purely a convenient sampling. Other forms of sampling methods were inoperative out of the following reasons:-

(i) The congested nature of environment. This proved difficult to extract certain bags of boxes from the central point of the packed produce, because to do this one had to remove the upper portions of the sales units and place them elsewhere. But there was no space to stack them.

(ii) The traders did not like their produce to be weighed. They argued that their customers disliked the produce being weighed. But the author felt that the primary reason was that the customers would reject any sales unit that was light or if it was to be bought, it had to be priced low relative to the more heavy types of sales units.

(iii) In most cases it was found out that the ones that were accessible were the ones that commanded a good "sellability", and these were the ones the traders could only allow a limited number to be weighed.

(iv) In other cases even the required sample size could not be obtained. This was the case with a number of produce, for example mulbery, where only a total of seven small cartons could be obtained during the whole survey period.

On an average about 60 such sales units could be checked per day. This figure could shoot up to 80 when the market was less congested and when the less heavy types of sales units were being weighed e.g. bananas, small boxes, or crates. However, the figure dropped to 50 when huge bags eg. bags of potatoes, carrots, were being weighed. This figure was also typical of the busy market days when the operation had to be interrupted from time to time to allow the trader conclude a deal with his customers.

During all these surveys, non-structured disguised questionnaire type of approach was used in an effort to extract some information behind the use of the sales unit. This system was resorted to in an attempt to establish the rapport with the traders so as to allow continuation of weighing the sales units and at the same time extracting useful information.

This was necessary out of the reason that these traders have been instructed by City Council not to talk to any body who try to question them and at the same time taking notes.

3.3 LIMITATIONS IN DATA COLLECTION

3.3.1 The cess receipt books as a source of data collection has its own pitfalls. Not all produce that

enter the market is recorded. In most cases the quantities are underestimated because the produce inspectors must "help" the traders not to pay cess. This is a gross negligence which cannot be rid by imposing the experimental lay-out. It is a market measurement error that is difficult to get rid of . One recorder, a sincere one, told the author that "we are not honesty. You might not observe the truth by observing our cess receipt books. We know what we are doing. We record these things roughly."

3.3.2 Recording errors too crept in, as observed by the author, due to the fact that not only the produce inspectorate were involved in the recording but also the Askaris, people who are illiterate or semi-illiterate and highly susceptible to corruption and being cheated by the cunning traders. They too, like the produce inspectors, have their own "friends" whom they try to "help". A number of times, the author could observe some of these gate keeping Askaris, the people responsible for maintaining the law, and the traders sharing some money. These gate keeping askaris are not traders, or are not supposed to. So the money being shared remained a point of conjuncture to the author.

3.3.3 The most suspected form of limitation however was on the fact that the traders may declare a quantity much lower than what was actually carried. This is because there is no counter-checking mechanism to approve or disprove what the trader has declared. This therefore makes the information gathered through cess receipts less accurate than it should be. The author does not think of any method that could better the situation within the present market conditions without revolutionizing the whole market environment.

3.3.4 As for the modified cess receipt books, another limitation crept in. The produce inspectorate from time to time forgot to include the place of origin in the particulars of the cess receipts. Measures were taken to remind them of this, but these too had their limitation. The market starts at 4 a.m. The earliest time the author could reach the place during other days except the days when the sales units were being conducted was 6 a.m. Between 4 a.m. and 6 a.m. the majority of the vehicles had entered the market and this was one of the times when these produce inspectors could forget to include the places of origin in the cess receipt books.

3.3.5 When it came to sales unit survey, another human factor was encountered. Traders often resented to their carrier or sales units being weighed. Persuations sometimes did not work. Inducement in form of money also was not feasible because every trader would like to be given something before his produce was weighed. This situation became even worse when the rubbish i.e. trash which was being included in the produce was to be measured. An inducement of 10/- could not waive the trader to allow the measuring of trash alone from the real produce. Thus, an estimated trash weight had to be used. However this problem was not a generalized phenomenon.

3.3.6 The sales unit measurement also posed a slight problem. The case in mind are the cartons. The cartons that have been placed on the ground became wet and easy to tear. However well these are tied, they easily tear out. This problem however was overcome by first buying an empty container before embarking on measuring the sales units. This system worked well, and had no more problem with cartons thereafter, except that the exercise proved to be too expensive.

3.3.7 The total exercise of measuring the sales unit proved very unacceptable to the traders. They resented to it. It was even worse with the high valued commodities such as tomatoes, capsicums etc. The reason behind this was not made explicitly clear. The author suspected, however, that may be the customers were being "educated" and as such unethical practices such as cheating on the part of the traders may soon be discovered.

3.3.8 As for carrying out sales unit survey throughout the various seasons of the year i.e. from January to December, this could not be achieved due to the fact that time allowed for the research itself was short, only three months for the "field work".

3.4 DATA ANALYSIS

3.3.1 Data Coding

The data collected from the original and also from the modified cess receipts books was coded for computation. The coding format had the following column definitions: The first two colums accommodated the date which ran from 01 to 31 where applicable. This was followed by the month which too had two spaces allowed for it running from 01 for January to 12 for December. This too was preceeded by one column which was preserved for the year 1975, with only 5 recorded down the rest was skipped away. A filler followed then the vehicle registration number with two letters and a maximum of three digits. The letter K common for most of the vehicles in Kenya was skipped away. Handcarts took HC only, TR stood for trains, wagons etc. The produce code followed. Produce had been coded from 01 to 99. These were the estimated range of the products that were expected to be traded at Wakulima Wholesale Market. (Appendix 1). The quantity followed this and lastly the quantity code.

The vehicle registration number, produce code, quantity and quantiy code were repeated until column 70 is reached. At column 71 and 72 in the coding sheets, the day when such produce was brought was put in. This took the first two letters of the particular day e.g. Mo stood for Monday, Tu for Tuesday, Th for Thursday etc.

At times it became necessary to break down the quantity in one shipment so as to conform to the above coding. This situation arose in those cases where the train was used to transport the produce to the market. The coding sheets allowed a maximum of 999 in quantity column. A larger figure could have been taken, but the whole idea boiled down to trying to minimize the cost of this exercise.

3.4.2 DATA PROCESSING

3.4.2.1 When it came to the data processing itself, an unexpected problem cropped up. The diskfiles were not available for our use.

To get around the problem, a programme which could input the data on to a magnetic tape was written up. This programme had to be developed under George II Macrosystem. (ICL 1902).

3.4.2.2 To output the information held in the magnetic tape a third programme called SFPF was run. This programme is generally known as "survey-analysis" programme. It is a standard package which can tabulate one variable against another in two dimensions only. It has the following facilities.

(i) Multiple passes through the data which may be input on either cards or magnetic tape.

(ii) Regrouping of variable values to reduce the size of tables or distributions.

The output from SFPF registered an overflow for potatoes and cabbages figures together with the totals figures of all the products. This problem was difficult to ride off. So a cobol programme had to be written, developed and used. However, it was found out that this latter programme gave the same results as the former one except only on the totals, the point where the SFPF had registered an overflow.

CHAPTER 4: A DESCRIPTIVE ANALYSIS OF COMMODITY FLOW TO WAKULIMA WHOLESALE MARKET.

Over 80 types of commodities (Appendix 1) are traded in this market, most of them originate from the rural Kenya. They are delivered to this market by traders or growers themselves, using motor vehicles, handcarts or rail. The commodities entering the market by handcarts have been transported from the rural Kenya by public transport and unloaded at the country bus terminal from where they are shipped to the market.

> "By far the most important means of transport to deliver horticultural commodities to Wakulima market are lorries and pickups...over 85% of all commodities are transported by lorry/pickup while handcarts and railway transport only 8.8% and 5.3% respectively. The railway transports mainly fruits, particularly bananas from Uganda. Over 25% bananas are delivered by rail. All vegetables are transported by road, of which 91.5% enter the market by lorry/pickup and 8.5% by handcarts". (10, p. 24).

On entering the market the quantity is declared to the produce inspectorate on container basis, referred to in this text as the sales/carrier unit.

4.1 PRODUCE CATCHMENT ZONE

4.1.1 ORIGIN OF COMMODITIES

Heinrich's gate check in March/April 1973 provides an information concerning the loading of the commodities that entered Wakulima Wholesale Market. This is given in table 4.1.1.

The 1975 data is not available due to some problems with the computer programme.

Table 4.1.1 Origin of selected commodities entering Wakulima Market, March/April 1973.

%

Commodity	Origin	Share
Cabbages	Nyandarua	56
	Kiambu	34
Carrots	Kambu	100
Green maize	Kiambu	79
	Nyeri	15
Peas	Kiambu	60
	Nyandarua	30
Tomatoes	Kiambu	38
	Machakos	19
Bananas	Nyandarua	59
	Kisii	33
Mangoes	Machakos	88
Pawpaw	Machakos	72
Oranges	Mombasa	33
	Murang'a	55

Source: F. Heinrich, Basic Data on the Domestic Horticultural Marketing system in Kenya, 1972, Nairobi, Berlin, 1975, table 22.

As is evident from the table Nairobi gets most of the commodities in great demand from areas close to the city viz, the districts of Central Provice and Machakos. "As a result of their transport costs and longer transport time with consequent loss of freshness in the more perishable types of produce, areas removed from the city are at a considerable disadvantage as suppliers of Nairobi of almost all the items in greatest demand" (15, p. 55).

4.1.2 ORIGIN OF VEHICLES SERVING WAKULIMA MARKET

Heinrich, also found out during the same survey that 56% of the vehicles originated from Central Province with Kiambu commanding a share of 30%; 17% from Machakos. This brings a total of about 70% of the vehicles having been loaded from the areas near to the market. "The number of vehicles arriving at the market from different areas can be used as an indicator for regional differences of supplies to Wakulima Wholesale Market" (19 p. 32).

This therefore leads to the conclusion that the registration numbers can be used as a code for identifying the areas of origin of the commodities being traded in this market.

4.1.3 VEHICLE REGISTRATION NUMBERS AND FREQUENCY AS INDICATORS OF PRODUCE CATCHMENT ZONE

4.1.3.1 ADVANTAGES OF USING VEHICLE REGISTRATION NUMBERS AND FREQUENCIES AS A CODE FOR PRODUCE IDENTIFICATION

The use of vehicle registration numbers as a code for identifying the areas of origin of a particular commodity has the following advantages:-

- The major suppliers to this market can be identified easily.
- the exercise is easy to administer
- The present registration of motor vehicles in Kenya simplifies the excercise.

On the first point, important traders can be characterized on the basis of total quantity shipped to the market, and how often they come to the market (frequency). This identification can now lead to another subsurvey, that of interviewing them concerning their supply policies to the market. This latter subsurvey could not be done in this research due to time and financial limitation.

On the second point, the exercise is cheap in the sense that only one interview is necessary. This is the period when the addresses of these suppliers are being collected, after which the vehicle registration number can only be used as a code in identifying the place of origin of the produce.

On the third point, the present registration of motor vehicles in Kenya makes the whole exercise an easy one. For instance all vehicles with Kl-- have been registered in Nakuru or Eldoret those starting with KD--- have been registered in Kisumu or Kericho, those with KF or KE--- have been registered in Nanyuki, Embu or Meru, while those with KJ have been registered in Mombasa. The rest bear Nairobi registration numbers.

4.1.3.2 ASSUMPTIONS

The basic assumption underlying the use of vehicle registration numbers and vehicle frequencies to the market as an indicator for regional differences in commodity supply to the market is that traders operating in a given region, always tend to remain in that zone or operate along well defined routes. This is tantamount to saying that traders have a well defined "territories".

This seems a valid assumption. Local traders regent to any "external interference" from other

traders who do not originate from that region. Thus knowing the registration numbers of their vehicles and their frequency to the market, it may be much easier to identify their approximate catchment zone. Similarly, the type of commodities shipped from a particular area, together with total volume shipped can easily be worked out.

4.1.3.3 ANATOMY OF VEHICLE FREQUENCY TO WAKULIMA WHOLESALE MARKET.

During the 3 individual weeks in the months of March/April, September and December, a total of 1120 vehicles are registered to have brought produce to the market in 1975. The results are presented in table 4.1.2. Thus on an average about 53 vehicles appear in the market every day. However on individual observations, March/April and December survey weeks present more or less the same results. These are off season. September figures are however higher due to the fact that commodity supply to the market is fair. The frequencies to the market are given in table 4.1.3.

Table 4.2 Number of vehicles that entered Wakulima Wholesale Market in the "survey weeks" of Mar./Apr., September and December, 1975.

Day of the week	Mar./Apr.	Sept.	Dec.	Total
1	50	80	65	195
2	59	46	60	165
3	45	87	50	182
4	47	39	48	134
5	32	55	16	103
6	51	80	46	177
7	51	66	47	164
TOTAL	335	453	332	1120
Average	47.9	64.7	47.4	53.5

Source: Cess receipt books, Nairobi City Council 1975.

In each of the survey weeks, the registration number of the individual vehicles that entered the market in each of the days of the week were collected (Appendix 2). The total number of times a given vehicle appeared in the market in the survey period in question was calculated.

From this the percentages were computed as shown in the table. As is evident from the table on an average about 65% of the vehicles came only once in the survey weeks of 1975. On individual survey period, however the figure was 64% for March/April, 60% for September, and about 71% for December 1975.

The 1973 figures also, though slightly different from 1975, still portray the majority of vehicles coming once in the survey weeks. The

Table 4.3 Frequency and percentage distribution of individual vehicles that entered Wakulima market in the survey weeks of Mar./Apr., Sept. and Dec., 1975.

Times per week	Mar./ Apr.		Sept.		Dec.		Total	
	No.	%	No.	%	No.	%	No.	%
7	1	0.5[1] (1.0)[2]	0	0(0)	0	0(0.9)	1	0.1
6	3	1.5 (2.5)	5	2.0 (0.8)	1	0.5 (3.3)	9	1.3
5	4	2.0 (3.5)	6	2.4 (3.2)	6	2.7 (3.8)	16	2.4
4	10	5.1 (7.5)	20	8.0 (5.5)	8	3.6 (8.1)	38	5.8
3	17	8.6 (8.5)	24	9.6 (9.1)	10	4.5 (14.7)	51	7.6
2	36	18.2 (17.6	46	18.4 (11.9)	39	17.3 (16.1)	121	18.1
1	127	64.1 (59.3)	149	59.6 (69.6)	156	70.9 (53.1)	432	64.7
TOTAL	198	100	250	100	220	100	668	100
Produce Index	101.9		106.6		82.9			
Vegetable Index	79.8		117.6		88.9			

The bracketed information are the computed % for 1973

Source:
1. Cess receipt books, Nairobi City Council, 1975
2. Lorenzl,G. Wakulima Market, 1974.

stricking thing between 1973 and 1975 figures is that concerning the figures for those vehicles that come twice to the market. The two sets of data more or less give the same results except only for the September week. And comparing the two sets of data i.e. 1973 and 1975, it can be concluded that the vehicles serving this market are more or less constant in numbers and vary only within a limited range. This conclusion is arrived at by observing the frequency distribution within the classes, for instance an increase in the number of vehicles that came three times in 1973, was accompanied by a decrease in the numbers that came only once.

Superimposing vehicular frequency with the produce index, it can be observed from table 4.3 and graph 4.1 that in March/April week the produce index for 1975 was in one of its low coordinates, similarly December week portrays the produce index in its lowest point. It can therefore be deduced from this that the majority of the vehicles came only once probably because supply factors made it not possible to obtain the product to market. It is supported by the fact that this is a dry season in most parts of the country and as such the short term crops (vegetables) are in short supply. Vegetable index exactly suggest this. This leads us therefore to conclude that the majority of the vehicles trade in vegetables.

During the week of September, the produce index is declining but the vegetable index is in one of its highest coordinates. The proportion of vehicles that came only once to Wakulima Wholesale Market has also dropped to about 60%. It can therefore be concluded that about 40% of them could manage to come more than once because the product to market was easily obtainable.

4.1.3.4 LIMITATIONS ON THE USE OF VEHICLE REGISTRATION NUMBERS AND FREQUENCIES AS A CODE FOR PRODUCE IDENTIFICATION

The use of vehicle registration numbers as a code for identification of the produce as to the catchment zone has its limitation:-

4.1.4.1 For real traders, those who derive their living only from trading, the theory of "territorial claim" may not apply during the period of scarcity in their respective local areas. They have to "hunt" for the commodity in other areas.

4.1.4.2 For those vehicles that come three or more times in a week, one can easily conclude that they come from areas close to the market. They do not travel far "hunting" for the commodity and therefore the use of the registration numbers may help in identifying the produce catchment zones. These groups formed about 17% of different vehicles in March/April 1973, the figure dropped to 10% in December week after attaining a figure of 22% in September week. It can be assumed that the frequency to the market goes up the nearer a given zone is to the market and also when the commodity to market is available. It can also be assumed that the farther away from the market, the lower the frequency of the visit. It is even lower in times of scarcity. During these times those traders, whose business is only trading, leave their home areas and visit other areas which are farther removed from the market. Personal experience with the vehicles trading with cabbages from Nyandarua has shown that these vehicles sometimes visit as far a field as Londiani in Kericho District about 100 km. away "looking" for the product to bring to Wakulima Market. This then casts doubt as to whether registration numbers can be useful

code to identify the place of origin of the particular produce. Similarly vehicles from Kiambu, frequent Kisii, a distance of about 350 km. to collect bananas. The vehicles from the district in question are a common sight in Ngong town about 30 km away, in search of produce to bring and sell in Nairobi. Generally speaking, the majority of the traders (about 90%)[1] are Kikuyu traders from Central Province and especially Kiambu who visit other districts, collect produce and channel them to Wakulima Wholesale Market.

The only place where registration numbers of the vehicles could act as a code for produce catchment zones, is with the small vehicles, pickups and up to 2½ ton vehicles. They tend not to operate far from their "home" area. And as such their operation are limited to one particular area, or within a limited circumference from the market area. But still these vehicles can visit other nearby areas different from their "home area". This group of vehicles formed about 7% of the total number of vehicles in September week 1972. The figure for March/April 1973 was about 6%, and for September week 1973 was about 5%. This rose up to about 28% for December week 1973.

The above figures must be interpreted with caution. The September week, 1972, the March/April and September weeks of 1973 register low figures. This could be caused by the fact that quite a number of vehicles, about 53% of the total vehicular population in those survey weeks have no tare weight capacity declared. The figure slightly decreased to 31% in December 1973

[1] City Council Market authorities conducted a survey late 1975 in an attempt to register the traders for space allocation, and the list of names shows about 91.5% are Kikuyu traders.

4.2 SALES UNITS

Confusion exist in this market as to what constitutes the sales unit. This entity exist in various dimensions and generally speaking one can recognize two divergent notions of this entity, the Carrier Unit (C.U) and Sales Unit (S.U.). Carrier Unit is the unit by which produce is brought to the market. It is the unit by which a supplier packages his produce, and is the one that will be cessed on arrival at the market. Inside the market, this carrier unit may be repacked to smaller units, or it could be sold in the form it was brought in. Here it becomes the proper sales unit. It is now the unit by which negotiations on terms of transactions will be carried on.

In this market, for most of the products CU and SU are identical for some products, however the sales unit may be different in both size and weight of the contents and container from the carrier unit, e.g. spinach are brought into the market in bags, but sold in bundles. Tomatoes too are brought in medium or large boxes, and sold in the market in smaller boxes of about 10 kg.

4.2.1 WEIGHT OF THE SALES OR CARRIER UNIT

A number of the sales/carrier unit, were surveyed. The results are in table 4.2.1 As is evident from the table, those units vary in size and according to the commodity. Certain commodities have more than one type of sales or carrier unit as seen in appendix 3. However, observation done on the mean weight obscures certain details. As seen from table 4.2.1, there is a greater variation particularly with those units using bags as the container and it is worse

Table 4.2.1: The net weights of sales/carrier units of selected commodities traded in Wakulima Market in 1975.
(kg)

Commodity	Unit	Mean	Minimum	Maximum
Beans, Fr.	Bag	47.3	41.0	55.0
Brinjals	Bag	41.6	36.0	49.50
	Box	50.0	42.5	61.50
Carrots	Bag	116.7	103.1	150.0
Cabbages	Bag	90.0	79.0	105.0
Capsicum	Box	43.2	36.0	50.0
	Bag	47.5	43.5	55.0
	Basket	21.2	13.0	32.0
Chillies	Bag	33.4	29.0	42.5
Lettuce	½Bag	64.9	42.0	80.0
	Crate	49.5	44.0	85.0
Maize	Bag	132.6	113.0	152.0
Onions red	Net	14.0	13.0	15.0
white	Net	10.4	9.0	11.0
	Bag	103.5	95.0	112.0
Peas	Bag	53.0	48.0	65.0
Potatoes red	Bag	106.1	96.0	121.0
white		105.1	91.0	110.0
Sukumawiki	Bag	54.2	48.0	83.0
	Basket	10.5	10.0	15.0
Tomatoes	SR Box	9.8	8.5	14.0
	Ordin. box	26.6	22.5	33.0
	Medium box	38.5	34.5	43.5
	Large box	79.6	88.0	73.0
Bananas	Bunch	14.9	9.0	31.6
Lemon	Bag	96.2	94.0	107.0
Mangoes	Bag	96.3	91.0	107.0
	Box	46.3	42.5	55.0
	Basket	13.6	8.0	32.5
Oranges	Bag	71.3	53.0	87.5
	Crate	54.9	47.5	64.0
	Box	35.2	32.0	40.5
Pawpaws	Box	55.1	44.0	63.5
Pineapples	Doxen	11.50	10.0	27.5

Ordin. = Ordinary box SR = Semiretail box

Source: Author's survey (Appendix 3)

for bulky commodities e.g. cabbages, carrots, and maize. The variation is due to overfilling of these containers as will be indicated in section 4.2.3 and as shown in table 4.2.3.

4.2.2 SEASONAL VARIATION ON WEIGHTS OF SALES/CARRIER UNITS

The sales/carrier unit survey was conducted for about a week at the end of every month from September to December. The results generally indicated that there were no variations in weights between the various time horizons. This conclusion is supported by the fact that the variation of mean weights between September and December were not statistically significant at 90% level of confidence. Table 4.2.2 below gives the summary of the results for the most important commodities, full information is found in appendix 3.

Table 4.2.2: Mean weights for various seasons for sales/carrier unit of selected commodities traded at Wakulima Wholesale Market in 1975.

COMMODITY	UNIT	SEPT.	OCT.	NOV.	DEC.	CONTAINER	
		kg				kg	%[1]
Bananas	Bunch	16.6[2]	12.0	15.7	15.3	-	-
Lemons	Bag	-	100.3	96.1	96.1	2.0	2.0
Mangoes	Bag	100.0	95.7	99.4	99.3	2.0	2.0
	Box	50.0	53.0	51.5	-	5.2	10.1
	Basket	8.6	-	21.0	-	1.2	8.1
Oranges	Bag	76.0	56.8	72.8	71.23	2.0	2.7
	Crate	-	58.0	54.7	56.7	1.5	2.7
	Box	-	35.8	35.1	35.2	5.2	14.8
Passion	Bag	47.7	49.0	49.7	49.3	2.0	4.1
Fruit	Box	110.9	113.0	111.7	110.6	9.0	8.1
Cabbages	Bag	91.1	93.0	92.4	92.0	2.0	2.2
Carrots	Bag	116.1	114.9	116.7	127.0	2.0	1.7
Maize	Bag	134.0	133.6	136.0	134.3	2.0	1.5
	Bag	70.0	68.5	74.2	75.8	2.0	3.8
Potatoes							
Red	Bag	103.5	105.1	114.0	105.2	2.0	1.9
White	Bag	101.1	103.6	105.6	104.2	2.0	1.9
Sukumawiki	Bag	56.5	56.2	54.2	37.7	2.0	3.7
	Basket	-	-	-	12.0	1.5	12.5
Onions Red	Net	14.3	13.9	14.0	14.0	-	-
White	Net	10.4	10.4	10.5	10.5	-	-
White Spring	Bag	104.0	105.2	101.8	104.3	2.0	2.0
	Bag	70.0	68.5	74.2	71.9	2.0	2.9
Tomatoes	Sem.R.						
	Box	14.8	-	-	-	5.0	35.7
	Ord.						
	Box	28.6	25.3	25.3	27.3	6.0	22.6
	M. Box	38.6	-	38.5	38.6	8.0	20.8
	L. Box	76.8	-	82.6	-	10.0	12.5

1. Share of container weight over gross produce weight.
2. The sample size for each time period was 10.

Source: Author's survey. (Appendix 3)

4.2.3 SIZE AND WEIGHT OF CONTAINER

For those commodities carried in bags, the weight of the bags as such is a predetermined parameter. They are determined in the factory. However, there was individual variation caused by the inclusion of trash, and sometimes, during a wet day, the soiling of these bags, but generally speaking the additional weight factor was not all that great to warrant concern. Table 4.2.3 gives a detailed account of these weight variations.

For the rest of the containers, there were little variation as to their weights. Their sizes however varied according to how the commodity is packaged. Generally speaking, the variation was much noticeable in maize, sukumawiki, cabbages, carrots and cauliflower. These commodities were being packaged to a certain height above the mouth of the container as shown in the table below. The City Council market section allows the packaging of the commodity 30 cm above the mouth of the container, but traders always ignored this rule. Fruits however, particularly those traded in boxes, were not overfilled. The same case applied to ginger, brinjals and passion fruit.

4.2.4 DIFFERENTIABLE FACTORS ACCOUNTING FOR ADOPTION OF VARIOUS TYPES OF SALES/CARRIER UNITS

Traders generally like certain types of carrier or sales unit as opposed to others. During the period when the sales unit survey was being conducted an informal type of inquiry was carried out. Nonstructured, disguised method of approach was used in an attempt to ascertain the problem behind the use of any of these carrier or sales units. In general, traders of vegetables such as cabbages, carrots, maize, sukumawiki, cassava, potatoes (Irish and Sweet) found

Table 4.2.3: Size and weight of containers for selected commodities traded at Wakulima Market in 1975

COMMODITY	CARRIER OR SALES UNIT	CONTAINER MEAN WT. Kg.	RANGE Kg.	MEAN SIZE
Potatoes	Bag	2.0	1.5-2.5	Normal filled No overvilling
Cabbages	Bag	2.0	1.5-2.0	50 cm. above the mouth, 160 cm. circumference of the mouth
Sukuma Wiki	Bag	2.0	1.5-2.5	40 cm. above mouth, 170 cm. mouth circumference
Maize	Bag	2.0	1.5-2.0	70 cm. above mouth. 170 cm. circumference at the mouth of the bag
Carrots	Bag	2.0	1.5-2.0	60 cm. above mouth and 140 cm circumference
Peas	Bag	2.0		
Tomatoes	Ordinary Box	6.0	5.5-7.0	27 x 55 x 27cm
	Medium	8.0	8.0-8.5	30 x 60 x 30cm
	Large box	10.0	10.0-10.5	42 x 42 x 68cm
Bananas	Bunch	-	-	12 - 22 doz. of bananas
Mangoes	Bag	2.0	1.5-2.5	Filled to the mouth of the bag
	Box	5.2	4.0-6.5	30 x 30 x 60 cm
	Basket (small & frequently used	0.5	-	20cm deep, 45cm mouth diameter, 30 cm deep
Lemons	Bag	2.0	1.5-2.5	No overfilling
Pawpaws	Box	12.0	9.0-13.0	35 x 50 x 80 cm
Passion	Box	9.0	8.5-10.5	Boxes are triply 50 x 60 x 50 cm
	Bag	2.0	1.5-2.0	Normally filled. No overfilling beyond the mouth

Source: Author's survey

"no other alternative" but to use bags as their only carrier and sales units. The products are bulky. They do not get damaged easily when packed in sacks for transportation. Similarly the traders of bananas and pineapples found "no other alternative" measure of facilitating the transaction but to use the quoted units.

As for the carrier units with more than one kind available to the traders, the objective was to establish the reason behind such variation. The answers varied. Some complained of transport problem. This was the case with tomato traders from Kiambu, sukumawiki traders and some fruit traders from the coast.

Transportation problem occupied most traders. Most of them do not own any means of transportation. Some rely on the hire services. Those who use public transport would like to have a carrier unit which is not too heavy to lift on to the racks of buses and yet robust to protect the produce from getting damaged in transit. The point is brought out clearly in the case of tomatoes. Traders from Machakos always thought the medium box was the most appropriate because it could easily fit in the public transport system.

For those traders who rely on hire services, they would like to have a sales unit big enough to justify the money paid for the hire services. The container must be light enough to reduce unnecessary carrying of "useless load". This is particularly the case with passion fruit traders from Murang'a and Machakos area.

For those traders who own the means of transport they prefered to trade in giant containers. The case in point is a group of Asian traders from

around Nairobi dealing in tomatoes who prefer to use large boxes. They argue that they would prefer to transport the commodity rather than "pieces of wood".

Apart from the transport problem, most traders thought cess was the most important factor in designing the type of carrier unit. This is justified in the sense that City Council market authorities have cess rates on container basis only, whether the container is big or small.

The cess rates, therefore, levies certain units more heavily than others when considered on per kg basis (see section 4.6) Traders, in an attempt to avoid this situation, have resorted to using big units and hence low cess per unit weight and after entering the market, the commodity is repacked to smaller units which constitute the proper sales units. Exception to this however are the bulkier commodities e.g. maize, carrots, cabbages and sukumawiki.

Certain products, notably, mangoes, oranges and tangarines use perforated medium boxes and not small boxes because of their low cess per unit weight while at the same time facilitates the transaction in the sense that the unit is still small enough as to be within the purchasing power of the customers. Similarly perforations make it possible for the customers to view the product before transactions are carried on.

Mango dealers, however, have an interesting explanation on the use of the small baskets. They argue that they buy mangoes expensively, and to package them in expensive containers reduces their margins (The medium box for instance costs five shillings to buy). To resolve this, they resorted to using reefed baskets, which are cheap, yet serves to

"transport" the commodity effectively.

In general therefore, a number of factors are involved when a sales unit is being decided upon. They range from the nature of the commodity, to the avoidance of cess.

4.3 COMMODITY STRUCTURE

4.3.1 TOTAL VOLUME

The information from the cess books reveals a total of 50,400 tons as the quantity traded in 1975 as shown in table 4.3.1. For comparative purposes, the estimated quantities for 1969, 1972, 1973, 1974 and 1975 are also included.

Table 4.3.1: Summary of various estimates of quantities of produce traded at Wakulima Wholesale Market between 1969-1975 (tons)

YEAR OF STUDY	ESTIMATE I	ESTIMATE II[1]	
1. 1969[2] (Wilson)	38,385	-	
2. 1972 (Heinrich)	63,741	-	
3. 1972 (adjusted from 2 (Lorenzl and Quik)[3]	82,666	-	
4. 1973 (projected from 3 (Lorenzl and Quik)[3]	91,677	67,777	
5. 1974 (projected from 4 (Lorenzl and Quik)[3]	95,066	71,371	
6. 1975 (Authors projections)[4]	104,573	70,332	
7. 1975 (Recorded)[5]	-	-	50,400.1[2]
8. 1975 Adjusted from 7.	-	-	71,568.2

1. Estimates arrived at by using rainfall figures.

Source:
2. Wilson, F. The Marketing of fruits and Vegetables in Kenya, Nairobi, 1969 Table 2.
3. Lorenzl, G. and Quik, D. Wakulima Wholesale Market, Nairobi, 1975, Table 3.5
4. Author's projection assuming 10% growth rate.
5. Cess receipt books of Nairobi City Council, Nairobi.

Thus as can be seen from table 2.1.2, recorded figures for 1975 represent a 20% drop over 1972 obtained by Heinrich and an increase of 18.6% over 1973 figures computed by Hoslten. But judging from table 4.3.1 the 1975 recorded figures represent a drop of 52% over the estimated quantity for the same year, while the adjusted quantity represents a 31.6% drop over the estimated quantity.

It must be realized that production estimates are "projected to grow at an annual growth rate of 18% for pineapples while other fruits and vegetables will increase at 10% (3, p. 241). This therefore means that the recorded quantities should depict a rising trend.

A number of factors however may be responsible for the apparent drop in the recorded quantities:-

- The weather condition for 1972 was different from that of 1975.
- May be 1974 figures were overestimated.
- Excessive cheating on the part of the suppliers could have made a lot of produce infiltrate into the market without the knowledge of produce inspectors.

Taking the first point, 1972 was a wet year with a total rainfall of 1193 mm. as compared to 1007 mm. for 1973 , 1030mm. for 1974 and an estimated 1015 mm. for 1975 (5, p.6 7).

The rains delayed in 1975, and most of the country experienced drought. The "Kenya Farmer," February issue described the situation as "Hot and dry throughout the country and that the fruits and vegetables were in scarce supply". (9, p. 4). The same situation reigned till May the time when the rains set in but there were "many products in short supply particularly green maize, bananas chillies, beans and potatoes" (9,p.4 June issue). The absence

of these commodities, particularly potatoes, bananas, and green maize, from the market by June could appreciably lower the total volumes traded considerably.

The estimated quantities for 1972, 1973 and 1974 as shown in table 4.3.1 could have overestimated the true picture. The 1975 estimates are extrapolated from the 1974 estimates. This assumes a constant weather condition from year to year, a case which is untrue under Kenya's environment.

The estimated quantities for the period 1973-75 using the appropriate rainfall figures for the various years are presented in table 4.3.1. These figures are arrived at by using the following formula:

$$Q_{ET} = Q_{72} \times \frac{RT}{R_{72}} = 82,666 \times \frac{1007}{1193} = 69,777 \text{ (for 1973)}$$

Where Q_{Et} = Estimated Quantity at time t.

Q_{72} = Estimated Quantity for 1972.

RT = Rainfall figures for time t.

R_{72} = Rainfall figures for 1972.

Thus, as can be seen from the table, these figures are lower than what Lorenzl and Quik estimated for the various years. The 1975 estimates using rainfall overscores the recorded figures by about 40%. But is lower than the estimates by Lorenzl and Quik by about 32%.

A number of factors could account for the high figures obtained by Lorenzl and Quik of which the following are of some importance:-

- There are no available statistics to judge the quantities lost due to spoilage and trimmings.
- No accurate statistics are available to help arrive at a correct figure for produce taken from Wakulima Market destined for other areas outside Nairobi.

As concerning the cheating on the part of suppliers, a mini survey was carried out in December without the knowledge of the produce inspectors as to how much of the load carried by traders is actually recorded. This exercise was conducted in a strict secret manner. A lorry or vehicle bringing the produce to the market was "followed" after declaring the quantity it was bringing to the produce inspectors. The quantity it unloaded, type of produce, and the registration number of the vehicle was recorded together with the date when such produce was delivered to the market. The results are summarized in table 4.3.2.

This survey was later abandoned because traders became suspicious of the whole exercise.

On an average, 34% of the produce was not recorded. A great descrepancy occured on produce carried by lorries. Handcarts and pick-ups tended to declare the true quantity.

Perhaps the sample size is too small as to bias the results, but at any rate, it shows that not all the produce is recorded. This leads us to arrive at an estimated quantity for 1975 as 71,568 tons. This quantity is arrived at by using the following formula:

$$Q_t = 50400 + E = 50400 + \frac{134}{100} \times 50,400 + 53 \times 76 = 71,568.2$$

Where Q_t = Estimated quantity

E = an error, and has two components

Table 4.8.2. Sample of total quantities recorded in cess books and the total observed quantities being unloaded from the vehicles at Wakulima Market, Dec. 1975.

Product	Recorded Sales/ carrier unit	Observed Sales/ carrier unit	%[1]	No. of Observation
Potatoes	91	120	31.9	4
Sukumawiki	57	87	52.6	5
Cabbages	117	155	32.5	5
Carrots	30	40	33.3	2
Maize	96	129	34	5
Tomatoes	54	67	24	5
Oranges	70	91	30	1

1. Differences of the two figures as % of the quantities recorded in cess receipt books.

Source: Author's survey.

(1) the unrecorded produce which in this case is 34% of the total quantity.
(2) the estimation of quantities which did not enter into computation and yet was seen being traded. These are all Asian fruits, and vegetables e.g. Kharlela, mooli, okra etc., and such commodities as brussels sprouts, and loquarts.

The latter three items were being traded during each of the survey weeks in quantities estimated at a total of 76 tons per week. This of course under-estimates the true situation out of the fact that this period was more or less an off season. The market was not very congested as normally observed during the other busy seasons.

4.3.2 MOST IMPORTANT COMMODITIES TRADED

Table 4.3.3 below gives the total quantities and market shares of the most important commodities being traded in this market. As can be noticed here, 14 commodities accounted for 96% of the total volume. Thus leaving only 4% of the volume to be shared by the rest 54 commodities.

Potatoes, cabbages, sukumawiki, bananas and maize commanded a total share of 80.2 with the first two commodities contributing about 50% of the total volume traded.

Lorenzl and Quik had also observed that "Wakulima Market is basically a potato, cabbage and banana market". (10, p. 15). In 1972, potatoes commanded 30% of the market share of the total produce. Cabbages had a share of 21.9% by volume of the total produce, while green maize slashed 7.2 and bananas

4.3.3. Important commodities traded at Wakulima Wholesale Market in 1975.

Product	Recorded Quantity	Adjusted Quantity	Share	Cumulative Share
	(tons)	(tons)	%	%
Potatoes	16,621	23,602	33.0	33.0
Cabbages	9,346	13,271	18.5	51.5
Sukumawiki	5,927	8,417	11.8	63.3
Bananas	5,329	7,567	9.9	73.1
Maize	3,662	5,200	7.3	80.2
Mangoes	2,343	3,328	4.7	85.0
Tomatoes	1,865	2,648	3.7	88.7
Oranges	1,193	1,694	2.4	91.1
Carrots	889	1,263	1.8	92.9
Lemons	569	809	1.1	94.0
Peas	560	795	0.9	95.3
Pass fruit	20.	285	0.4	96.7
Pawpaws	192	273	0.3	96.0
Pineapples	161	228	0.3	96.3
Others	1,535	2,180	3.7	100.0
TOTAL	50,400	71,568	100	100

Source: Author's survey (Appendix tables 4 and 5)

17.7% by volume of the total produce.

These five products are the staple food crops of the greater populace, particularly the low and middle income population of Nairobi. For instance bananas is the staple food in form of "Matoke". This is the cooking bananas which after conditioning in the market become ripe bananas.

Maize, potatoes and cabbages are always mixed to form the Kikuyu food called "irio", the main stay of the bulk of the low income population, which, as was pointed out earlier, are just close to the market.

Sukumawiki, too forms a food suppliment for the low income group of the population. It is cooked and eaten with "Ugali," a substance made out of ground maize meal, which is a staple food for most of those population originating from Western Kenya such as the Kisii, Luos, Baluhya, and Kalenjin.

Most of the other products such as celery, spinach, cucumber etc. only serve a limited market. They don't enter into any diet of most of the lower income population of Nairobi.

4.3.3 FRUITS

Sixteen tribes of fruits were included in the analysis as shown in appendix 1. Table 4.3.4 below gives the structure of important fruits.

Thus, as can be seen from the table, fruits contributed 10,295.6 tons to the recorded volume at Wakulima Market. This is equivalent to 20.4% of the total volume recorded for that year.

The adjusted quantity takes into account the unrecorded quantities in the market. This brought an estimated total quantity of 14,619.6 tons, a 42% increase over the recorded figures.

Table 4.3.4: The quantities and market shares of various fruits traded at Wakulima Wholesale Market in 1975.

Product	Quantity recorded	Adjusted quantity	Share	Cumulative share
	(tons)	(tons)	%	%
Bananas	5,329.2	7,567.4	51.7	51.7
Mangoes	2,343.7	3,328.1	22.7	74.4
Oranges	1,193.6	1,694.9	11.6	86.0
Lemons	569.7	809.0	5.5	91.5
Passion fruit	201.1	285.6	2.0	93.5
Pawpaw	192.7	273.6	1.9	95.4
Pineapples	161.2	228.9	1.6	97.0
Plums	111.0	157.6	1.1	98.1
Peaches	109.4	155.4	1.1	99.2
Grape fruits	34.8	49.4	0.3	99.5
Avocadoes	16.4	23.3	0.2	99.7
Coconuts	6.6	9.4	0.1	99.8
Melons	5.2	7.4	0.1	99.9
Limes	4.3	6.1	0.0	99.9
Others	8.7	12.4	0.1	100.0
TOTAL	10,295.5	14,619.6	100.00	100.0

Source: Author's survey (Appendix table 4)

As can be seen from the table, bananas contributed about 52%, mangoes about 23% and oranges 11.6% and that all these three commodities contributed a total of 86.2%, thus leaving the remaining 13 types of fruit to share only 13.8% of the total volume.

Heinrich using the 1972 figures found out that bananas commanded a share of 70% of the fruit volume, mangoes had a share of 10.3% and pineapples 7.7%. Thus mangoes and bananas combined market share for 1975 was 74.6% (7 table 1).

It can therefore be concluded that bananas, mangoes, oranges and lemons are the most important fruit commodities traded in this market.

4.3.4 VEGETABLES

Over 30 types of vegetables were considered in the analysis as shown in appendix 1. Table 4.3.5 below gives the results of 38 of these. As can be observed from this table, potatoes, cabbages, sukumawiki, green maize, tomatoes and carrots are the most important ones. They account for 95% of traded volume in 1975, with potatoes alone slashing 41% of the total volume of vegetables, cabbages 23.3%, sukumawiki 14.8% and green maize 9.1%.

Potatoes and cabbages together accounted for 64.7% of the total vegetable share, thus leaving only 35.3% of the total volume to be shared by the rest.

In 1972 Heinrich (7, tables 4,5,6,8,9 and 11) also found out that potatoes accounted for 40.1% of total vegetable volume. Cabbages was second with 29.2%, followed by green maize with 10.9%. This gives the combined market share of potatoes and cabbage to be 69.3% which is not far from 64.7% of 1975.

Table 4.3.5 Total quantities and market shares of vegetables traded at Wakulima Wholesale Market 1975.

Product commodity	Recorded quantity	Adjusted quantity	Share	Cumulative share
	(tons)	(tons)	%	%
1. Potatoes	16,621	23,602	41.3	41.3
2. Cabbages	9,346	13,271	23.2	64.5
3. Sukumawiki	9,928	8,417	14.7	79.2
4. Maize	3,667	5,200	9.1	88.3
5. Tomatoes	1,865	2,648	4.7	93.0
6. Carrots	890	1,263	2.2	95.2
7. Peas	560	795	1.4	96.6
8. Onions	243	344	0.6	97.2
9. Brinjals	197	279	0.5	97.7
10. Arrowroots	172	244	0.5	98.2
11. Ginger	124	175	0.3	98.5
12. Cauliflower	102	144	0.3	98.7
13. Chilies	65	91	0.2	99.0
14. Sweet potatoes	66	93	0.2	99.2
15. Cucumber	59	83	0.2	99.4
16. Beans	33	47	0.1	99.5
17. Lettuce	34	48	0.1	99.6
18. Others (21)	144	204	0.4	100
TOTAL	40,105	56,948	100	100

Source: Author's survey (Appendix table 5)

4.4 SEASONAL FLUCTUATIONS OF TRADED COMMODITIES

4.4.1 MONTHLY FLUCTUATIONS OF TOTAL TRADED VOLUMES

The following table gives a breakdown of total monthly volume of commodities traded at Wakulima Wholesale Market in 1975 and 1972.

Table 4.4.1: The monthly produce turnover by volume traded at Wakulima Wholesale Market in 1972 and 1975.

Month	1975[1]			1972[2]	
	tons		%	tons	%
	Recorded	Adjusted			
January	4,432	6,294	8.8	4,768	7.5
February	4,434	6,296	8.8	4,305	6.8
March	4,279	6,077	8.5	5,013	7.9
April	3,604	5,118	7.2	5,378	8.4
May	4,204	5,972	8.3	5,201	8.2
June	4,398	6,245	8.7	5,805	9.1
July	5,060	7,184	10.0	5,331	8.4
August	4,529	6,431	9.0	5,490	8.6
September	4,475	6,355	8.9	5,322	8.3
October	3,660	5,198	7.3	5,522	8.7
November	3,841	5,455	7.6	6,132	9.6
December	3,482	4,944	6.9	5,474	8.6
TOTAL	50,400	71,568	100	63,741	100

Source: 1. Author's survey (Appendix tables 4 and 5)
2. Lorenzl, G. and Quik, D., Wakulima Wholesale Market, 1975, table 3.4.

Thus, as is evident from the percentage column, there was a more or less even out supply throughout the year 1975. Lorenzl and Tui, on price analysis also noted that "Seasonal fluctuations are a problem for only few products at Nairobi markets due to interregional substitution of supply"; (12, p. 28).

The 1972 figures display a more or less similar pattern as the 1975 data. One interesting piece of information however is the fact that the lowest produce turnover occured in February in 1972 whereas for 1975, it occured in December. February is a dry season in the country. December on the other hand is also the beginning of the dry season. This therefore leads us to endorse that the lowest volume is recorded in the dry season. The peak harvest season for 1972 however occured in November, the period when the areas experiencing bimodal rainfall patterns are having their second peak rains. As for the 1975 data, this occured in July. This almost coincided with June, the second peak harvest season for 1972. This therefore leads us to conclude that the peak harvest season occurs after the long rains. But sometimes it depends on which one was more effective. If the short rains are more effective and spread over a longer period than the long rains then the biggest harvest would be recorded in this period.

In table 4.4.2 two sets of data are portrayed. One column shows the computed percentages of each commodity group over that commodity group's total yearly volume. Another set of data designated in column A and B, shows computed share of either fruit or vegetables on total monthly turnover in 1975.

Thus as judged from column A and B, the greatest share of the total monthly turnover is taken by vegetables, whereas fruits commanded a relatively low percentage.

Except for January, February and March, the months that can be called the off season for vegetables, the vegetable contributions in all the other months is more than 75%.

It can be concluded, as judged from table 4.4.2, therefore that vegetables taken together do not fluctuate very much. This could spell out a coordinated produce supply which Lorenzl and Tui calls "interregional substitution of supply" (12, p. 28).

Computed indexes for fruit, vegetable and total produce are shown in table 4.4.3 in this table are the total produce index for 1972. The information is plotted on graph 4.1.

Table 4.4.2. Monthly turnover by volume of fruits and vegetables traded at Wakulima Market in 1975

Month	FRUITS				VEGETABLES				A+B%
	Quantity (tons)		% of total fruit volume	A. %computed on total monthly turnover	Quantity(tons)		%on total yearly vol. of Vegetab.	B. %computed out of total monthly turnover	
	Recorded	Adjusted			Recorded	Adjusted			
Jan.	1256.7	1784.5	12.1	28.8	3175.4	4509.1	7.9	71.6	100
Feb.	1636.0	2323.1	15.9	36.9	2798.0	3973.2	8.0	63.1	100
Mar.	1613.2	2290.5	15.7	37.7	2666.1	3785.9	6.7	62.3	100
Apr.	883.4	1254.4	8.6	24.5	2720.6	3863.3	6.7	75.5	100
May	1044.2	1482.8	10.1	24.8	3161.7	4489.6	7.9	75.2	100
Jun.	670	952.5	6.5	15.3	3727.1	5292.5	9.3	84.7	100
Jul.	735.7	1044.7	7.1	14.5	4324.0	6140.1	10.8	85.5	100
Aug.	458.5	651.1	4.5	10.1	4070.4	5780.0	10.2	89.9	100
Sept.	544.1	772.6	5.3	12.2	3928.7	5578.8	9.8	87.8	100
Oct.	451.3	640.8	4.4	12.4	3205.0	4551.1	8.0	87.6	100
Nov.	482.3	684.9	4.7	12.5	3356.1	4765.7	8.4	87.4	100
Dec.	509.3	723.2	5.0	14.7	2971.4	4219.4	7.4	85.3	100
Total	10295.5	14619.6	100	20.4	40104.5	56,948.4	100	79.6	100

Source: Author's survey (Appendix tables 4 and 5)

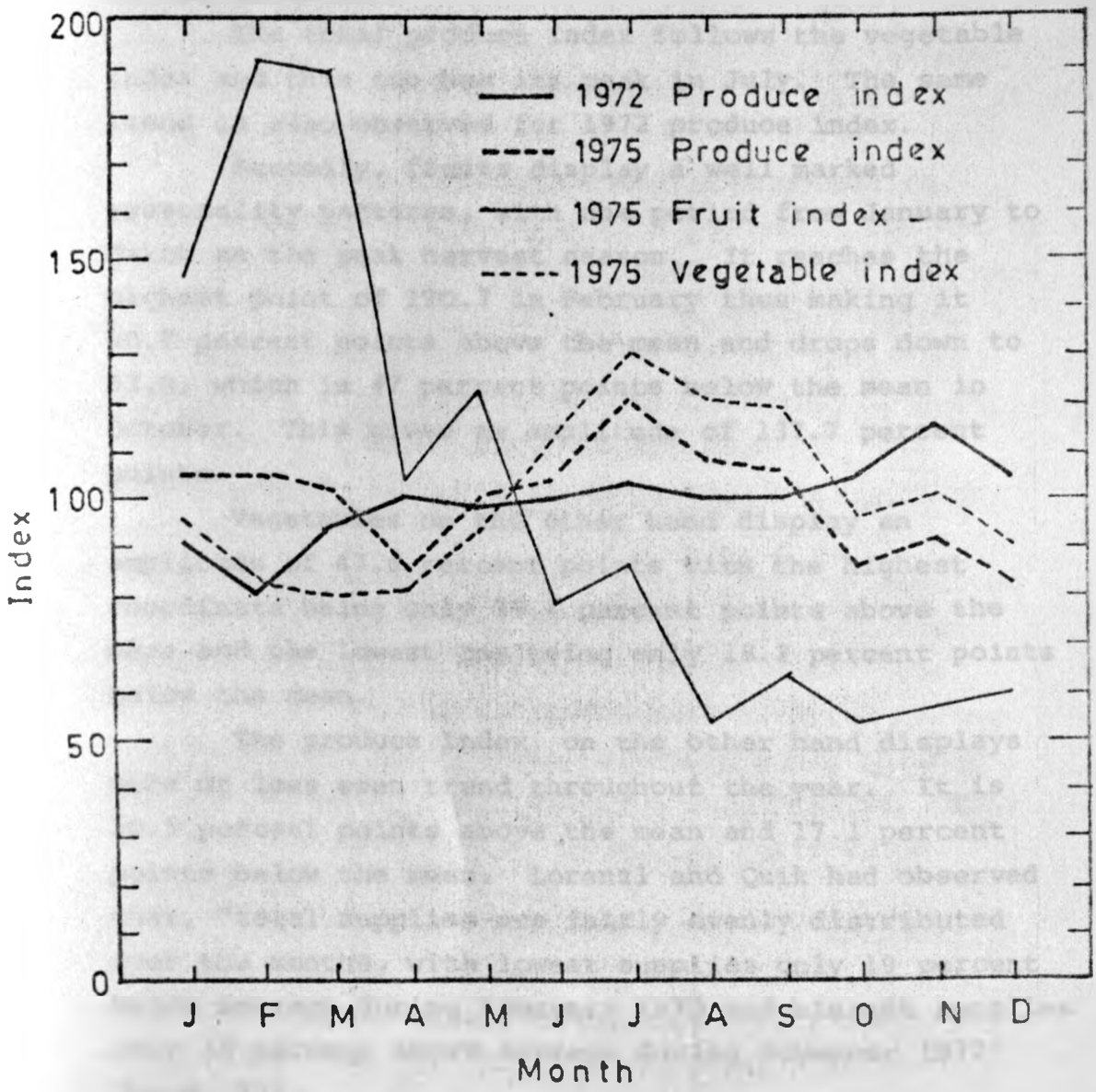
Table 4.4.3. The monthly indexes of traded fruit, vegetables and total produce for 1972 and 1975 at Wakulima Wholesale Market.

	1975[1]			1972[2]
Month	Fruit index	Vegetable index	Total Produce index	Total Produce index
Jan.	146.5	95.0	105.5	89.7
Feb.	190.7	83.7	105.6	81.0
Mar.	188.0	79.8	101.9	94.4
Apr.	103.0	81.8	85.8	101.2
May	121.7	94.6	100.1	97.9
June	78.2	111.5	104.7	109.3
Jul.	85.7	129.4	120.5	100.3
Aug.	53.4	121.8	107.8	103.3
Sept.	63.7	117.6	106.6	100.2
Oct.	53.0	95.9	87.2	104.0
Nov.	56.6	100.4	91.5	115.4
Dec.	59.5	88.9	82.9	103.0
Monthly Mean	100	100	100	100

Source: 1 Authors survey (Appendix tables 4 and 5)

2 Lorenzl and Quik, Wakulima Wholesale Market 1975. Table 3.4.

Graph 4.1: Monthly produce fruit and vegetable indexes for 1975 and produce indexes for 1972.



Source: table 4.4. 3

Thus, the information learnt from table 4.4.3 and graph 4.1 portrays a number of things.

First, during the time when the fruit index is at its highest in February/March the vegetable index is at its lower most point. As the fruit index begins to drop, the vegetable index begins to rise reaching its highest coordinate in July, then begins to show a downward sloping trend but with a gentle gradient.

The total produce index follows the vegetable index and this too has its peak in July. The same trend is also observed for 1972 produce index.

Secondly, fruits display a well marked seasonality patterns, with the period from January to March as the peak harvest season. It reaches the highest point of 190.7 in February thus making it 90.7 percent points above the mean and drops down to 53.0, which is 47 percent points below the mean in October. This gives an amplitude of 137.7 percent points.

Vegetables on the other hand display an amplitude of 47.6 percent points with the highest coordinate being only 29.4 percent points above the mean and the lowest one being only 18.2 percent points below the mean.

The produce index, on the other hand displays more or less even trend throughout the year. It is 20.5 percent points above the mean and 17.1 percent points below the mean. Lorenzl and Quik had observed that, "total supplies are fairly evenly distributed over the months, with lowest supplies only 19 percent below average during February 1972 and highest supplies only 15 percent above average during November 1972" (10, p. 17).

Comparing the 1975 and 1972 produce indexes it can be deduced that both are similar, although the 1972 produce index displays a more or less a

limited amplitute between April and October, suggesting that the product supply to the market in 1972 fluctuates very little in this period. Similarly, it can be observed from the graph that the 1975 vegetable index tends to move in the same direction with the 1972 produce index also. This therefore leads us to conclude that in 1972 vegetables accounted for a bigger proportion of the quantity traded as compared to 1975. This is expected due to the fact that 1972 was generally a rainier year than 1975 and as was shown earlier, potatoes, cabbages, and green maize accounted for about 60% of the total volume traded.

Generally speaking, the scarce period for vegetables steadily sets in from December, the end of the short rains in a bimodal rainfall areas, and the beginning of the dry season in the whole country. This dry season reaches its peak in February/March. Towards the end of March and the beginning of April, rains set in in most parts of the country. The supply pattern also begins to change from April/May onwards.

In a bimodal rainfall areas, the dry spell of July/August sets in and this temporary spell also affects the supply patterns for vegetables. The already ripe vegetables predominate slightly during this temporary short spell, and then begin to show a downward slopping curve due to drought effect. This accounts for the drop in the supply curve which proceeds to the end of the year.

The situation changes slightly in November the time when the bimodal rainfall areas are receiving their peak short rains. This is indicated by a kink in the index curve both for total produce and also for vegetables.

The situation for fruits however is different. These have a longer fruiting cycle. The onset of the rains, marks the beginning of the vegetative season. Towards the later, part of the year, growth stops, and flowering is induced.

In a unimodal rainfall pattern, the dry spell of October/February now forms the ideal ripening conditions. In a bimodal rainfall areas, the dry spell of July/August forces somewhat flowering, and by the setting in of the major dry season in December/ January, the fruits starts arriving into the market in plenty.

4.4.2 THE MONTHLY FLUCTUATIONS OF INDIVIDUAL FRUIT COMMODITIES

Table 4.4.4 gives the monthly indexes for selected fruit commodities traded in 1975. These accounted for over 90% of the total fruit volume. The information for the most important commodities are plotted in graph 4.2.

As is evident from the table and graph each of these crops displays its unique production season. This could be due to a number of reasons:

- Fruit trees are grown in a well defined ecological zones, dictated mainly by climate e.g. rainfall and temperatures and soils. Thus interregional substitution in supply in the case of fruits is rather limited. For instance, most of tropical fruit trees e.g. coconuts, perform well only at the humid environment while temperate fruits e.g. pears and plums do well in the temperate Limuru area of Kiambu District.

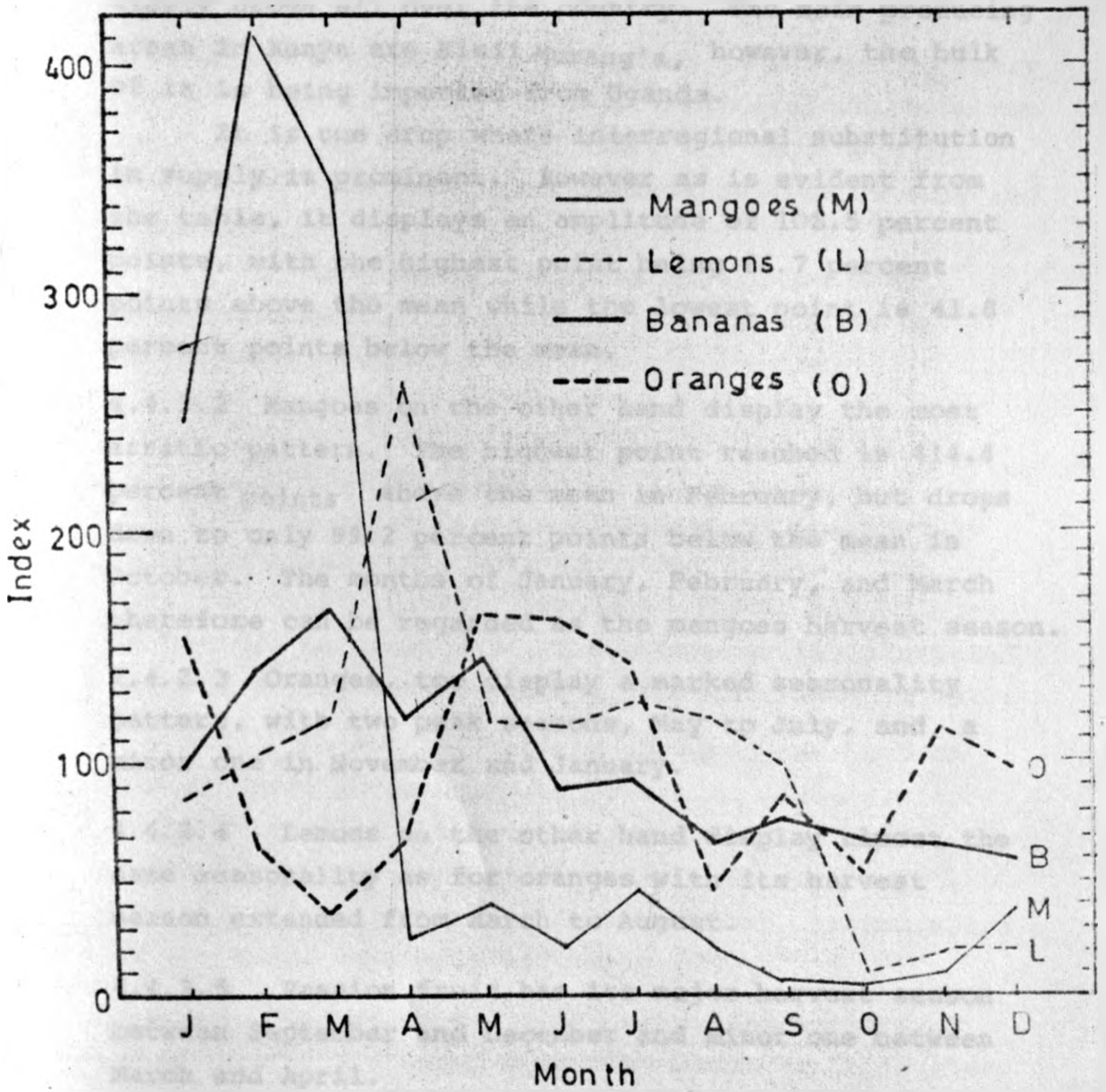
- Most farmers have not taken seriously the planting of horticultural produce as part of their farming enterprises. This is particularly the case with

Table 4.4.4. Monthly indexes of selected fruit commodities traded at Wakulima Wholesale Market, 1975

	Bananas	Mangoes	Oranges	Lemons	Passion fruits	Pawpaws	Pinea-pples
January	99.5	245.8	154.1	84.9	71.1	105.8	112.8
February	140.6	414.4	84.1	103.1	37.7	112.2	151.0
March	166.7	347.8	38.6	116.9	134.3	104.2	153.7
April	121.0	21.5	65.9	263.4	214.6	67.9	77.8
May	157.4	39.7	156.5	115.5	16.1	64.2	85.7
June	89.7	17.5	163.4	114.1	1.4	26.3	95.9
July	91.7	43.5	140.0	134.8	1.7	61.7	165.6
August	66.6	18.1	45.2	113.3	5.7	67.9	108.7
September	76.6	4.2	86.9	92.8	122.9	182.0	91.4
October	65.9	0.8	54.3	8.1	346.4	199.5	60.4
November	66.1	8.6	113.8	18.4	137.4	110.3	52.7
December	58.2	38.0	97.3	34.6	110.7	98.0	44.4
Monthly Mean	100	100	100	100	100	100	100

Source: Author's survey (Appendix table 4)

Graph 4.2 : Seasonal flunctuations of selected fruit traded at Wakulima market in 1975.



Source: Table 4.4.4.

the fruit trees which take too long to yield any harvest. This has precipitated patchy areas producing these commodities and when there is scarcity in these isolated environments, shares drops considerably in the market.

4.4.2.1 Bananas however, do not follow the commonly observed patterns. This is because this commodity is widely grown all over the country. The main producing areas in Kenya are Kisii, Murang'a, however, the bulk of it is being imported from Uganda.

It is one crop where interregional substitution in supply is prominent. However as is evident from the table, it displays an amplitude of 108.5 percent points, with the highest point being 66.7 percent points above the mean while the lowest point is 41.8 percent points below the mean.

4.4.3.2 Mangoes on the other hand display the most erratic pattern. The highest point reached is 414.4 percent points above the mean in February, but drops down to only 99.2 percent points below the mean in October. The months of January, February, and March therefore can be regarded as the mangoes harvest season.

4.4.2.3 Oranges, too display a marked seasonality pattern, with two peak seasons, May to July, and, a minor one in November and January.

4.4.2.4 Lemons on the other hand display almost the same seasonality as for oranges with its harvest season extended from March to August.

4.4.2.5 Passion fruit has its major harvest season between September and December and minor one between March and April.

4.4.2.6 Apart from oranges, it can be generalized that all the fruits have their major harvest season just after the major dry season of February. This is true with bananas where the months of February, March, April, and May contributed 48.6% to the total banana volume, grape fruit where the months of January to March contributed 100% of the total grape fruit volume traded; mangoes with 83% on the months of January to March. Mallimow, oranges, passion fruits, pears, pineapples and plums all obey this generalized pattern. The only fruits among the ones considered which do not obey the above generalized order are avocadoes and tangarines with their peak harvest seasons in July and August.

It can also be generalized that for most fruit commodities, interregional substitution of supplies at wholesale level is not prominent.

4.4.3 MONTHLY MARKET SHARES OF THE MOST IMPORTANT FRUIT COMMODITIES

Table 4.4.5 gives a breakdown of the monthly market shares of the most important fruits. The information for bananas, mangoes, lemons and oranges is plotted on graph 4.3. These commodities accounted for 90% of the total volume of fruits traded in 1975.

4.4.3.1 Bananas for instance commands the highest market share throughout the year. In January, it contributed 35% to the total fruit volume. This share goes up to about 67% in May. It can be generalized that from April to December, banana share of the total volume is more than 50%.

4.4.3.2 Mangoes on the other hand, had a share of about 38% of the total volume in January. This rises to being the first overall in February with a share of about 49% of the total volume, then drops

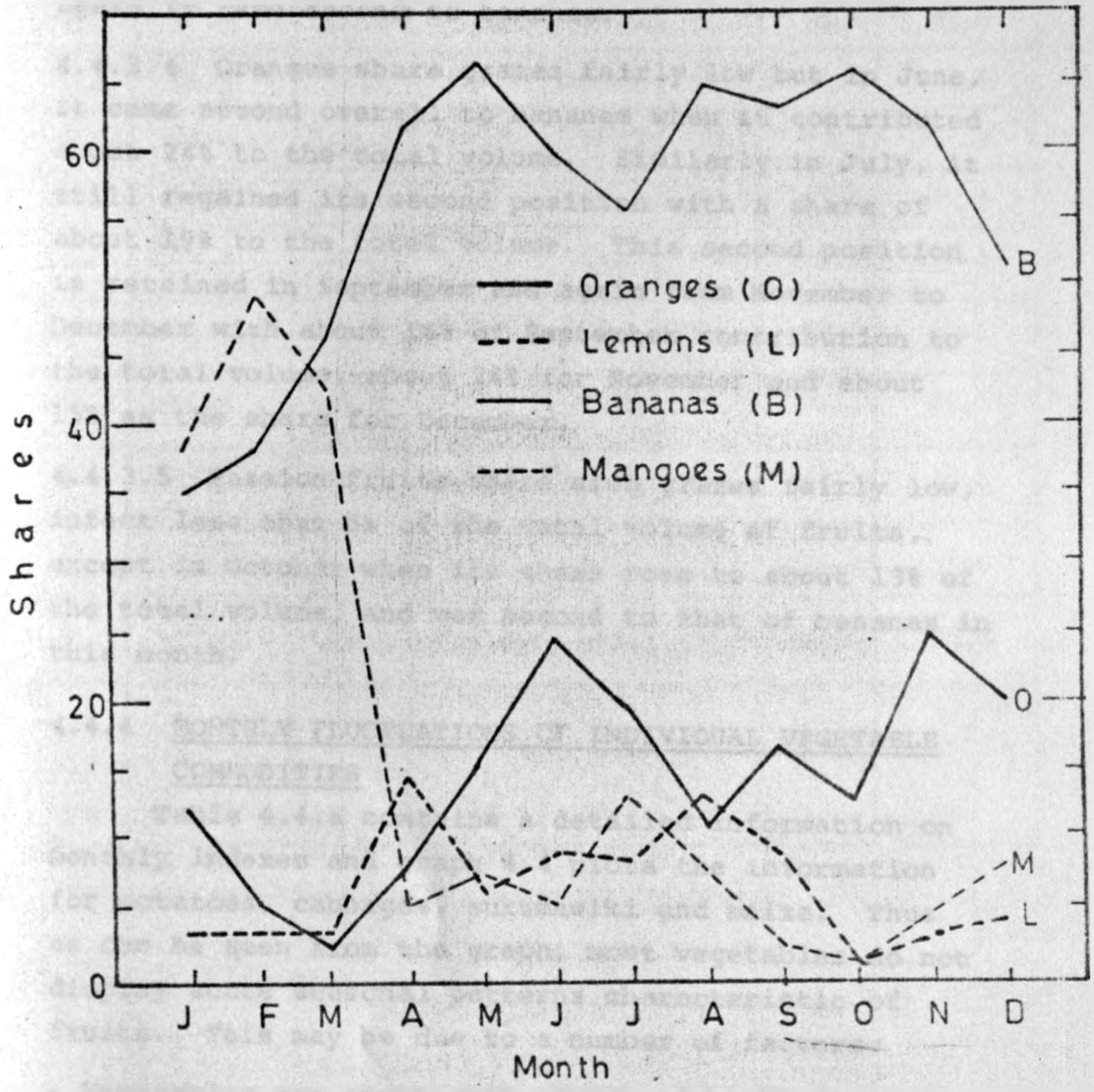
Table 4.4.5. Monthly Market shares of fruits traded at Wakulima Wholesale Market in 1975.

(%)

Month / Commodity	Jan.	Feb.	Marc.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Bananas	35.15	38.15	45.90	60.83	66.94	59.37	55.37	64.47	62.22	64.34	61.03	50.75
Mangoes	38.21	49.48	42.11	4.75	7.42	5.10	11.56	7.72	1.52	0.33	3.51	14.57
Oranges	12.20	5.11	2.38	7.42	14.91	24.23	18.92	9.81	15.88	11.97	23.51	19.01
Lemons	3.21	3.00	3.44	14.16	5.25	8.07	8.07	11.73	8.10	0.85	1.82	3.23
Pass, fruit	0.95	0.39	1.40	4.07	0.26	0.04	0.04	0.21	3.79	12.76	4.78	3.64
Paw paw	1.35	1.10	1.04	1.23	0.99	0.63	1.35	2.38	5.57	7.10	3.68	3.09
Pineapples	1.21	1.24	1.28	1.18	1.00	1.92	3.02	3.19	2.26	1.78	1.47	1.17
Plums	4.95	0.98	0.15	0.04	0.04	1.03	-	-	-	-	-	4.52
Peaches	0.07	0.38	1.62	5.75	2.29	0.07	0.01	-	-	-	0.19	-
G. fruit	2.12	-	0.50	-	-	-	-	-	-	-	-	-
Avocadoes	0.06	0.05	0.08	0.10	0.13	0.17	0.80	0.36	0.32	0.13	0.05	
Others	0.52	0.12	0.10	0.47	0.77	0.38	0.08	0.02	0.07	0.06	0.16	0.02
Total	100	100	100	100	100	100	100	100	100	100	100	100

Source: Author's survey (Appendix table 4)

Graph 4.3 : Monthly shares of selected fruits traded at Wakulima market wholesale market in 1975.



Source: table 4.4.5

steadily to about 0% in October.

4.4.3.3 Lemons market share grazed fairly low but jumps up at two points, one in April, with a share of 14% of the total volume of the traded fruits. This is the period when it was second to bananas. Another jump is seen in August with a share of about 12% and again it came second to bananas.

4.4.3.4 Oranges share grazes fairly low but in June, it came second overall to bananas when it contributed about 24% to the total volume. Similarly in July, it still regained its second position with a share of about 19% to the total volume. This second position is retained in September and again from November to December with about 16% of September contribution to the total volume, about 24% for November and about 15% as the share for December.

4.4.3.5 Passion fruits share also grazes fairly low, infact less than 5% of the total volume of fruits, except in October when its share rose to about 13% of the total volume, and was second to that of bananas in this month.

4.4.4 MONTHLY FLUCTUATIONS OF INDIVIDUAL VEGETABLE COMMODITIES

Table 4.4.6 contains a detailed information on monthly indexes and graph 4.4 plots the information for potatoes, cabbages, sukumawiki and maize. Thus as can be seen from the graph, most vegetables do not display acute seasonal patterns characteristic of fruits. This may be due to a number of factors:

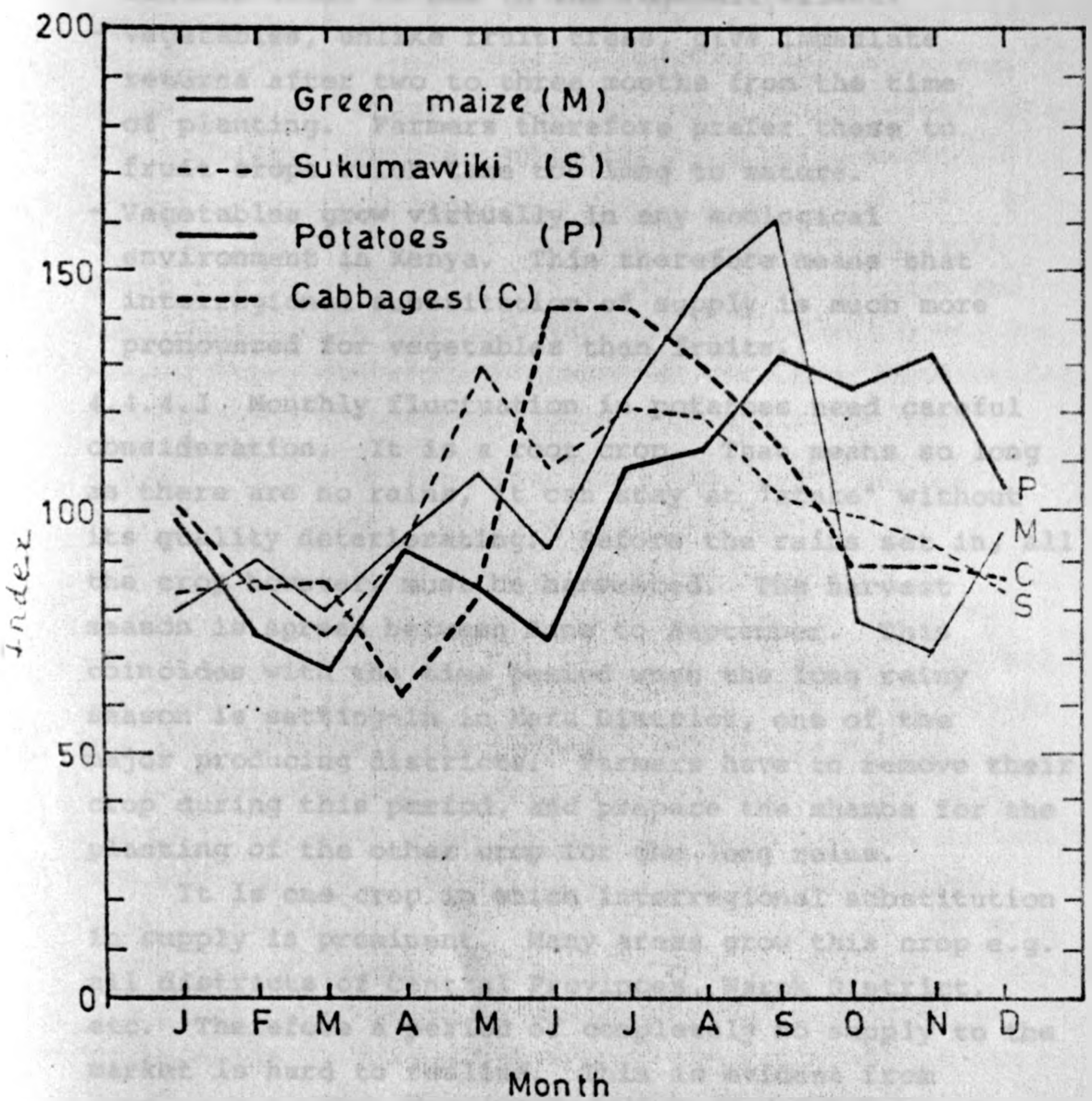
- Vegetables are short term crops, with the onset of the rains, the commodity is in the market in a matter of 2-3 months. In regions of bimodal rainfall patterns therefore no severe shortages of these commodities can be recorded as observed during the dry

Table 4.4.6. Monthly index of selected vegetables traded at Wakulima Market in 1975.

	Potatoes	Cabbages	Sukuma wiki	Maize	Carrots	Pea	Onions	Tomatoes
Jan.	100.5	98.2	83.2	79.0	90.6	164.6	86.4	94.5
Feb.	84.3	73.9	84.8	88.7	69.1	58.3	58.4	126.8
Mar.	85.3	67.4	73.4	79.7	99.9	61.4	70.4	97.6
Apr.	62.2	91.5	93.5	93.5	103.5	52.6	71.6	122.9
May	81.6	84.0	129.8	106.9	130.3	38.2	89.1	105.9
Jun.	142.1	73.8	107.8	91.6	119.0	55.9	54.8	99.5
Jul.	141.9	107.6	120.2	121.5	91.8	204.3	74.7	157.1
Aug.	128.8	111.7	119.4	137.4	137.1	195.1	146.6	68.5
Sept.	113.6	132.3	101.4	158.9	84.6	116.3	159.1	80.7
Oct.	86.6	125.3	98.9	76.7	100.8	85.3	140.4	74.1
Nov.	87.9	132.0	102.9	71.1	129.2	95.1	124.2	101.6
Dec.	85.1	103.5	84.3	94.8	44.2	72.7	124.4	70.9
Monthly MEAN	100	100	100	100	100	100	100	100

Source: Author's survey (Appendix table 5)

Graph 4.4 : Seasonal flunctuations of selected vegetables traded at Wakulima market in 1975.



Source: table 4.4.6

season in regions of unimodal rainfall pattern

- Most vegetables can be grown satisfactorily in irrigated river basins. This tends to release a more or less constant stream of the commodity to the market. The slight hump over and above this minimum level is due to the rainfall effect.
- Vegetables, unlike fruit trees, give immediate returns after two to three months from the time of planting. Farmers therefore prefer these to fruit crops which take too long to mature.
- Vegetables grow virtually in any ecological environment in Kenya. This therefore means that interregional substitution of supply is much more pronounced for vegetables than fruits.

4.4.4.1 Monthly fluctuation in potatoes need careful consideration. It is a root crop. That means so long as there are no rains, it can stay at "stake" without its quality deteriorating. Before the rains set in, all the crop however, must be harvested. The harvest season is spread between June to September. This coincides with the time period when the long rainy season is setting-in in Meru District, one of the major producing districts. Farmers have to remove their crop during this period, and prepare the shamba for the planting of the other crop for the long rains.

It is one crop in which interregional substitution in supply is prominent. Many areas grow this crop e.g. all districts of Central Provinces, Narok District, etc. Therefore a period of completely no supply to the market is hard to realize. This is evident from table 4.4.6. The highest coordinate is only 42 percent points above the mean, and the lowest one is only 37.8 percent point below the mean.

4.4.4.2 Cabbages have a peak harvest season in September to November, these seasons are not markedly different from the rest. This may be due to the fact that during off seasons, this crop can be seen growing in river valleys under irrigation.

The river valley agriculture is a common sight in practically all districts of Central Province. It is, nonetheless, prevalent during the dry season and crops commonly observed growing under such environments are cabbages, carrots, maize and sukumawiki among others.

As can be observed from table 4.4.6 the highest point was only 32.3 percent points above the mean and the lowest point was only 32.6 percent points below the mean. This, therefore suggests an effective interregional substitution in commodity supply at wholesale level.

4.4.4.3 Maize on the other hand has a peak season in July to September. This is justified knowing the fact that in Kenya, three series of Maize varieties are grown. One, the Katumani composite, with a maturing period of three months and grown in dry areas, does not find its way to Nairobi markets. The other two tribes, the Embu series, and the Kitale series are hybrid maize developed for different ecological zones. The Embu series, with a maturing period between 4-5 months, are designed for the medium altitude areas of Kenya. This is widely grown in Central Province, Meru and Embu Districts of Eastern Province. This is the one important tribe of maize commonly sold in Nairobi as green maize. It is planted when the rains set-in in March/April, and is expected to be in the market

between June/July as green maize.

The last tribe of maize which sometimes is also called the "green maize" is the Kitale series of hybrids. These have a maturing period of 5-6 months. They are developed for high altitude areas of Kenya e.g. Kitale, Uasin Gishu, Nandi, Kerichc etc. They too are planted in March/April and are expected to be in the market between August/September.

Maize therefore, unlike the other 'temporary' crops show a marked planting season. If rains fail as they have done in 1976, they may be planted late in April/May and to reach the milk stage, the period when it is called "green maize", takes one to two months for Katumani composite, three to four months for hybrids developed for medium altitudes (The Embu Series), and four to five months for Kitale Series, the hybrids developed for high altitude areas of Kenya. Judging from the peak "harvest" season therefore, Katumani composite, the varieties developed for dry areas seem not to find their way to the market. If they do, then the majority planting seasons of March/April.

It therefore leaves the Embu and Kitale Series to be the major components of the "Green Maize" population traded in the market. The production calendar for these two series, tends to support the observed pattern of the "peak harvest" season. It must be emphasized that if all the maize was being grown on natural rains, there would be a distinct seasonal patterns in supply. However observations on the produce delivered to the market shows that some maize (green) is being traded every month in this market. This suggests that some may be are being grown in river basin or swampy areas in the off season. This

is the only possible source, for irrigation facilities at the moment are not used to any greater extent in Kenyan agriculture apart from isolated cases in rice production areas of Mwea-Tebere, Kano/Nyando Basin and the Yala Swamp.

As can be observed from graph 4.4., the index for maize does seem to fluctuate much as compared to the other vegetables. Perhaps, interregional substitution in supply is not as effective as in the other vegetable commodities.

4.4.4.4. Sukumawiki, as already mentioned, is also grown in irrigated river basins. This accounts for the greater proportion of the off season production. As for the peak harvest season of May to August, it can only be explained from the fact that with the onset of the rains many farmers join in the planting and since it is a crop requiring a short period of less than two months, the peak harvest season is reached very early in the rainy season; and due to the spread-planting, the peak season lasts for a fairly long period.

4.4.4.5. It can be concluded therefore that whereas all vegetables display an effective interregional substitution in commodity supply to the wholesale level, seasonal fluctuations are still noticeable.

4.4.5 MONTHLY MARKET SHARES OF IMPORTANT VEGETABLES

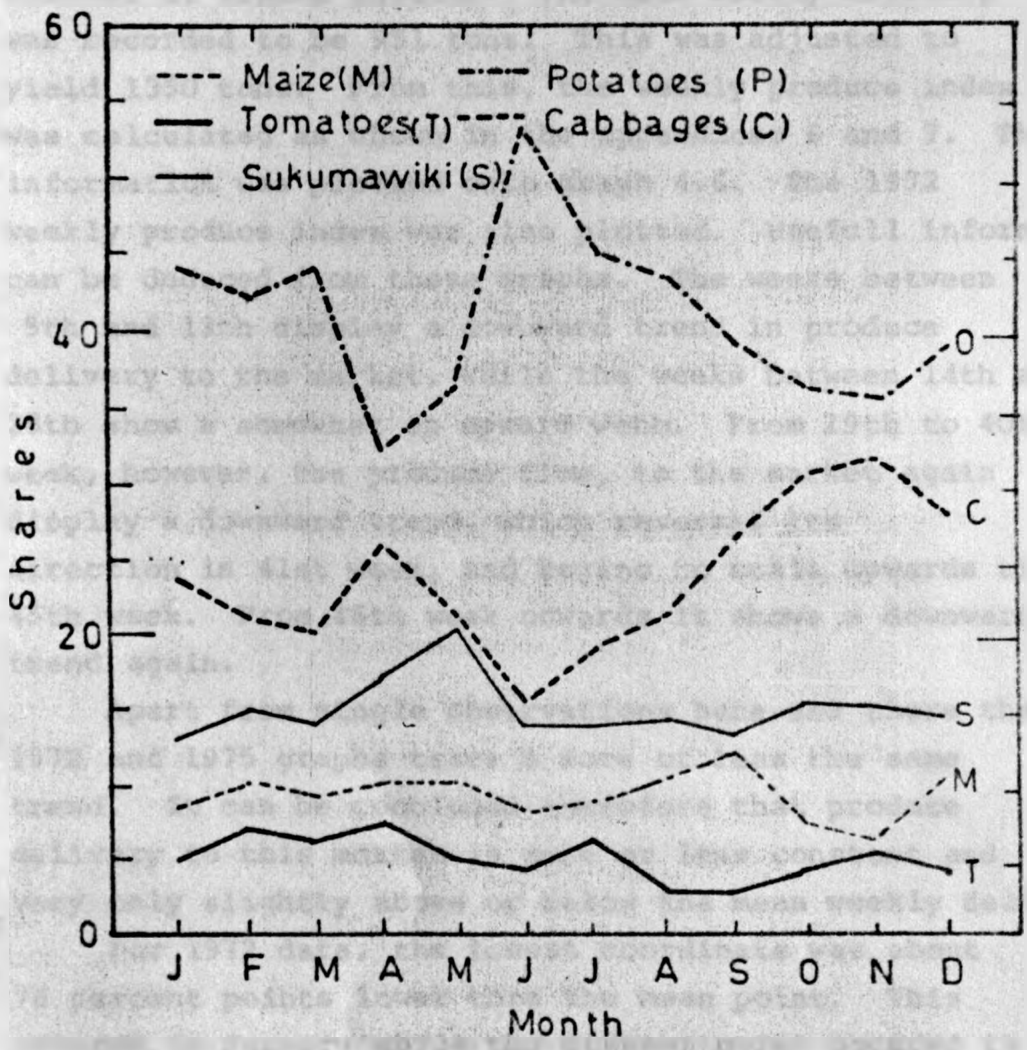
The market shares of these vegetables are given in table 4.4.7 and plotted in graph 4.5. As is evident from the table and the graph, most of these vegetables display more or less constant market shares. Potatoes and cabbages at any given month, except on April and May, accounted for over 60% of the total volume traded. Taken together the most important

Table 4.4.7. The monthly market shares of the most important vegetables traded at Wakulima Wholesale Market in 1975.

Month / Crop	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Potatoes	43.86	41.71	44.30	31.66	35.73	52.83	45.46	43.84	40.06	37.43	37.29	39.68
Cabbages	24.09	20.56	19.68	26.20	20.68	15.21	19.38	21.37	26.22	30.46	30.62	27.13
Sukuma wiki	12.94	15.40	13.60	16.97	20.28	14.29	13.72	14.49	12.74	15.33	15.14	14.01
Maize	7.60	9.68	9.13	10.49	10.32	7.50	8.58	10.30	12.35	7.31	6.47	9.73
Tomatoes	4.63	7.04	5.69	7.02	5.21	4.15	5.65	2.62	3.19	3.59	4.71	3.71
Carrots	2.11	1.83	2.78	2.82	3.06	2.37	1.57	2.50	1.60	2.33	2.86	1.10
Peas	2.42	0.97	1.08	0.90	0.56	0.70	2.21	2.24	1.38	1.24	1.32	1.14
Others	2.40	2.80	3.76	3.94	4.16	5.95	3.43	2.64	2.46	2.31	2.59	3.50
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100

Source: Author's survey (Appendix table 5)

Graph 4.5 : Monthly market shares of selected vegetables traded at Wakulima market in 1975.



Source: table 4.4.7

products - potatoes, cabbages, sukumawiki, maize, tomatoes, and carrots, - at any given month accounted for over 90% by volume of the traded vegetables in this market in 1975.

As can be observed from the graph, these commodities tend to display constant shares, throughout the year.

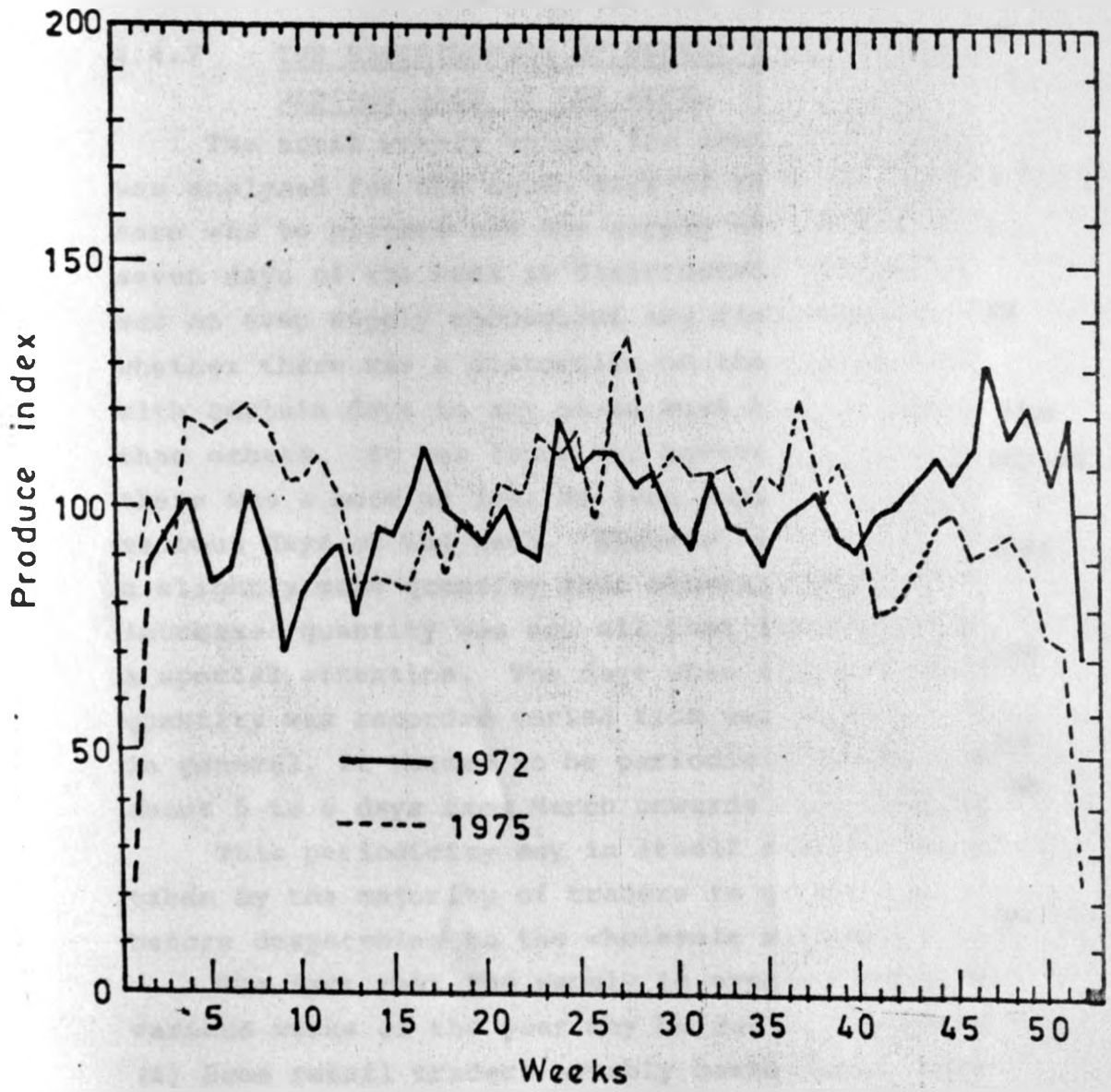
4.4.6 WEEKLY FLUCTUATIONS OF TRADED VOLUMES

In appendices 6 and 7 is to be found total weekly volumes of traded produce. The mean weekly delivery was recorded to be 951 tons. This was adjusted to yield 1350 tons. From this, the weekly produce index was calculated as shown in the appendices 6 and 7. The information was plotted onto graph 4.6. The 1972 weekly produce index was also plotted. Usefull information can be deduced from these graphs. The weeks between 5th and 13th display a downward trend in produce delivery to the market, while the weeks between 14th and 28th show a somewhat an upward webb. From 29th to 40th week, however, the produce flow, to the market again display a downward trend, which reverses its direction in 41st week, and begins to scale upwards till 45th week. From 46th week onwards it shows a downward trend again.

Apart from single observations here and there the 1972 and 1975 graphs trace a more or less the same trend. It can be concluded therefore that produce delivery to this market is more or less constant and vary only slightly above or below the mean weekly delivery.

For 1972 data, the lowest coordinate was about 78 percent points lower than the mean point. This occured in January while the highest point occured in December and was 32 percent points higher than the mean.

Graph 4.6 : Weekly index for total produce traded at Wakulima market in 1972 and 1975.



Source: Appendix 6 and 7

This gave an amplitude of 110 percent points. The 1975 data on the other hand had a bigger amplitude. Though the lowermost point was only 76 percent points or rather 2 percent points higher than 1972, the uppermost point which occured around July, was 35 percent points greater than the mean. This gave an amplitude of 114 percent points which is 4 percent points more than in 1972. This is not a big gap, and leads us therefore to conclude that the weekly fluctuations were more or less similar in the two years.

4.4.7 THE DISTRIBUTION OF WEEKLY TOTAL VOLUMES ON VARIOUS DAYS OF THE WEEK.

The total weekly volume for each of the 53 weeks was analysed for the seven days of the week. The idea here was to picture how the supply throughout the seven days of the week is distributed; whether there was an even supply throughout any given week or whether there was a distortion on the supply pattern with certain days in any given week bearing heavy load than others. It was found out however, that in general there was a more or less an even supply throughout the various days of the week. However, some days recorded a slightly more quantity than others, though the increased quantity was not all that large to warrant a special attention. The days when a slightly higher quantity was recorded varied from week to week, and in general, it tended to be periodic occuring after about 5 to 6 days from March onwards till December.

This periodicity may in itself reflect the time taken by the majority of traders to gather the produce before despatching to the wholesale market.

The fact that the supply is evenly distributed throughou various weeks of the year may be due to the fact that:

(i) Some retail traders notably hawkers etc. buy from

the wholesale point only enough quantities that could be sold for that day or at most for two days. They have no cold storage to store excess produce that might be bought within a given time period.

(ii) The wholesale market is supposed to cater for a constant stream of essential items throughout the week. Most families served by this market have no cold storage facilities like refrigerators to store any produce that is not immediately used. Therefore they have to rely daily on the market. Moreover most customers of this market have a low purchasing power. They cannot afford to buy in great bulk.

(iii) Similarly, agricultural products are highly perishable. The produce collected at the catchment zones must be channelled to the market immediately, if to avoid the loss on quality deterrioration. This must be done irrespective of whether the day is Sunday or not.

This therefore suggests that the busy day in the market is more or less caused by the time the majority of the traders take to gather produce and deliver to the market rather than by observance of any particular day in the week.

However, since traders may change from visiting one area and decide to go some other places, the particular busy market day may change due to the fact that for those traders who collect their produce from the trading or local markets they have to visit these places at specified days in the week. Rural markets are known to operate at particular days only.

For those traders who collect their produce from farm[1] directly, their supply patterns also change during the rainy season due to the fact that on the day a heavy rainfall is recorded, roads become muddy and the lorries might not visit the farms to collect the produce. They have to wait until the ground is firm again before visiting these places.

(iii) Thirdly, the busy market day may depend on the availability of the produce in the supply zone. Farmers, or at least producers of horticultural products are not so to speak specifically engaged in the production of these commodities. They occupy an insignificant position in their farm enterprises. Therefore the little that is grown, highly fluctuates in both quantity and quality in the production zone, and sometimes traders may take long to gather enough to channel to the market. This being the case then, the busy market day is not a predetermined parameter. It shifts in relation to the supply forces.

4.5 ECONOMETRIC ANALYSIS ON QUANTITIES AND PRICES OF SELECTED COMMODITIES TRADED IN 1975.

Various statistical methods were applied on time series of 52 weeks for 6 fruits and 12 vegetables.

Prices data were obtained from HCDA files. This body records prices for 54 products at Wakulima Market every Wednesday. They record the lowest and highest price levels only. From this price range, the mean was calculated thus obtaining the weekly average wholesale

---

[1] Lorenzl and Quik calculated the quantity shipped from farms directly to this market as 74% (10, p. 34). The busy market day in this market occurs about 5-6 days after the onset of the rain in March/April.

price for each individual commodity to be used in the analysis.

The data on quantities, recorded from the cess receipts were converted to kgs. and aggregated on weekly basis for each individual commodity.

The data has some shortcomings:

- It was observed that the prices recorded frequently did not represent truly the real price level of that market day. Information on systematic bias could not be obtained.
- As mentioned earlier, the cess books records only a market share of about 60% of the total traded volume. This therefore leads us to work on the assumption that the share of the nonrecorded quantities is equal for each commodity and constant over all the weeks.

In this type of computation, correlation analysis was first carried out as a precheck mechanism to enable us identify which factors to include in the next type of anylysis, the regression analysis.

4.5.1 CORRELATION ANYLYSIS

Table 4.5.1 gives the results of correlation analysis. As is evident from the table, the values of r when tested at 95% level of confidence and 50 degrees of freedom between prices at time t and quantities also at time t,were insignificant except in the case of beans, cabbages, maize, peas, tomatoes and pawpaws.

Similarly the value of r between prices at time t-1 and quantities at time t, at the said level of confidence and degrees of freedom, are statistically insignificant exept in the case of cabbages, chillies, carrots, onions, peas, tomatoes, and pawpaws.

In general, the value of r for fruits were all statistically insignificant at 95% level of confidence and with 50 degrees of freedom. Pawpaws was the only

4.5.1: Correlation Matrix between Quantity and Price of selected commodities traded at Wakulima Market in 1975.

(r)

Commodity	Prices at time t	Prices at time t-1	Quantity at time t-1
Beans	- 0.27	- 0.17	0.47
Brinjals	- 0.19	- 0.17	0.28
Cabbages	- 0.48	- 0.55	0.49
Carrots	- 0.21	- 0.31	0.73
Capsicums	0.26	- 0.11	0.43
Chillies	0.13	- 0.31	0.30
Lettuce	0.05	0.14	0.14
Maize	- 0.44	- 0.12	0.43
Onions	- 0.17	- 0.29	0.22
Peas	- 0.60	- 0.56	0.63
Potatoes	- 0.14	- 0.19	0.51
Tomatoes	0.34	0.35	0.36
Bananas	- 0.15	- 0.20	0.49
Lemons	- 0.06	- 0.17	0.58
Mangoes	0.03	0.04	0.89
Passion fruit	0.25	- 0.12	0.43
Pawpaws	- 0.35	- 0.34	0.47
Pineapples	- 0.03	0.12	0.89

Source: Author's survey

exception to the rule.

Similarly it can be generalized that the values of r between quantities at time t and prices at time t and t-1 are negative, as one would expect if the trade is fairly competitive. A rise in quantity to the market, should be accompanied by a fall in price. They move in the opposite directions. However, observations on the values of r for lettuce when prices are considered at time t, and t-1, though statistically insignificant, are positive. Similarly for capsicum, the value for r though statistically insignificant, when prices are considered at time t has a positive sign. The same applies to tomatoes when prices are considered at time t and time t-1. But for tomatoes, the values are statistically significant at 95% level of confidence.

Amongst the fruits, the values of r for passion fruit, when prices are considered at time t and time t-1 have positive signs, though these are statistically insignificant.

This then means that they are moving in the same direction, and an increase in quantity coming to the market is accompanied by an increase in price. This violates the established theories

of price determination through the normal forces of supply and demand. However, since most of them are statistically insignificant, except in the case of tomatoes, one cannot really say much about them. Whether they are positive or negative does not matter, for the coefficients of correlations are not statistically different from zero. As for tomatoes however, one can conclude from this results that the trade is not competitive. Lorenzl and Quik (10 p36) found out for 1972 September week that 12 traders supplied tomatoes to Wakulima Wholesale Market, and the share of the biggest 10% which was one supplier in this case controlled 60% of the volume.

When the quantities at time t-1 is correlated with quantities at time t as shown in the table, the coefficients of correlations were all positive, and for fruits they were all statistically significant at 95% level of confidence, with mangoes and pineapples having a very high r of 0.9, lemons 0.6, bananas, pawpaws, with r of 0.5 and passion fruit with r = 0.4.

As for vegetables, the r coefficients also became statistically significant at 95% level of confidence. It was only lettuce, and onions whose value of r was not statistically significant at this level of confidence.

As one would expect for agricultural commodities, when the harvest season comes, the product is "dumped" into the market. This explains the high and significantly positive correlation between the quantities at time t and time t-1.

It must however be understood that the low coefficient of correlation between quantity and prices should not be interpreted to mean that there is no relationship at all. There could be a relationship, which is non-linear. This cannot be ascertained from the above analysis. Time allowed for this research could not allow for the testing of other non-linear models.

4.5.2. REGRESSION ANALYSIS

4.5.2.1. QUANTITY-PRICE RELATIONSHIP

Regression analysis was carried with quantity as dependent variable and prices as independent variable. The following models were developed and tested:

(i) $Q_t = a + b_1 P_t + e$

(ii) $Q_t = a + b_2 P_{t-1} + e$

(iii) $Q_t = a + b_1 P_t + b_3 Q_{t-1} + e$

(iv) $Q_t = a + b_2 P_{t-1} + b_3 Q_{t-1} + e$

Where:- Q_t = Quantity of Commodity I at time t.

P_t = Price of Commodity I at time t.

Q_{t-1} = Quantity of Commodity I at time t-1.

P_{t-1} = Price of Commodity I at time t-1.

I in this case stands for a given commodity e.g.- cabbages, potatoes, etc.

The first model was a general model. It assumed that the total quantity brought to the market at any given week is a function of the price currently ruling at that particular week. This is rather a valid assumption in the sense that prices are recorded on a Wednesday and reported on Friday. The traders who were present on a Wednesday and had observed a "good" price, could be tempted to bring more in the subsequent days of the week and vice versa. This is only true of those traders that deliver the produce to the market more than once in a week. It forms about 36% of the total suppliers.

The second model is more or less the same as the first model except that the previous weeks prices are considered in the analysis. It is assumed that the quantities channelled to the market is as a result of the influence of the previous week's price broadcasts or as was observed by those traders that were in the market that week.

Assuming this model however to be true,

it therefore follows that the price reports by HCDA (Horticultural Crops Development Authority) do help in inducing the traders to ship their commodities to the market when they are aware of the price levels or at least the expected price.

In the third model, the previous quantity is taken also into consideration together with prices at time t. This assumes that traders who come to this market are fairly constant in numbers. Thus, when they go home after the days activity in the market, they already know how much quantity is still in the market and as such will not bring in any quantity until the already available stock clears in the market.

This is valid assumption noting the fact that about 64% of the vehicles came only once to the market.

Model four, however, incorporates the previous time period quantity and prices in the analysis. It is a distributed lag model, though not the classical Nerlovian type of distributed lag, which seems not to be applicable to Kenya's agricultural sector (13, p. 183).

Since about 64% of the vehicles only bring produce once in a week, it is possible that the quantities they brought the previous week, together with previous weeks prices can induce them to bring more or less the following week.

4.5.2.2. ASSUMPTIONS

The following are the assumptions underlying the model structure:

- that price-quantity relationships exist in a linear manner.
- that traders are exposed to the communication media.
- that alternative shipment points are available and known to the traders.
- that no barriers exist in the industry.

The first assumption is straight forward. If there was no assumption on the relationship between the items under investigation then it would be absurd to carry out the investigation. The only problem however which is still unclear is whether the relationship is linear or non-linear. The models outline earlier depict a sort of linear relationship.

The second assumption is a vital one to the analysis. The HCDA employs. "The Standard", and the "Kenya Farmer", as their media for propagating

the price reports.

These papers are written in English and their effective circulation in the rural areas, where the bulk of the farming community live and where traders originate, is still unknown. The "Kenya farmer", for instance is a monthly magazine, and is supposed to serve the interests of the large scale farmers. The effectiveness of these media in conveying the message has not been reviewed.

The second assumption is tantamount to saying that the plan of the media strategy is optimal. This is not true. The majority, if not all the traders currently visiting Wakulima Wholesale Market are either illiterate or semi-illiterate. The semi-illiterate, however, are quite often, at Wakulima Wholesale Market seen reading the "Taifa Leo". No price reports are quoted in this paper.

However, the assumption is still not invalid due to the fact that price reports are also broadcasted over the radio on every Friday evening. The number of unduplicated audience however is still unknown, and the intrusiveness of this media is still unknown.

The third assumption is tantamount to saying that there is a market transparency. Traders only make shipment to any given market when they are

already aware of the prices. The assumption is not valid in a as far as Kenyan case is concerned. Not many other alternatives exist. The few that exist are not all that known to the majority of traders. The barriers exist in form of dissemination of information. The HCDA, a body responsible for doing such things has not all that matured in its deliberations. So one can generally conclude that alternative market outlets do not exist as such. Therefore Wakulima Wholesale Market is and will continue to be the only major outlet for horticultural commodities in this country.

However, the assumption is still retained due to the fact that certain commodities notably tomatoes from Machakos, plums and pears from Limuru, vegetables from Taita-Taveta have other alternative outlets. Tomatoes from Machakos, and vegetables from Taita-Taveta are sometimes shipped to Mombasa. Similarly, plums and pears from Limuru have another sink in Kitale and Kisumu.

As to the fifth assumption, it is difficult to quantify the state of barriers to entry into the business. At least, it is now known that most traders rely on hiring vehicles to ship their commodities (15, p. 6, also 6, p. 9). The cost of

hiring a vehicle must be met from the sale of the produce. If the commodity prices are noted to be high in the market, and the commodity is available in the local centres and yet there is no vehicle to carry the produce to the market, then it simply means that the price reporting system would do very little to correct the situation.

4.5.2.3 POSTMORTEM OF THE REGRESSION FIT

Table 4.5.2 below gives the coeeficient of regression and the resultant values of R^2.

As is evident from this table, the results are rather disappointing especially the values of R^2 as a diagnostic instrument between a good or bad fit. The figures under the column R^2 are obtained by the following formula:

$$R^2 = \frac{E\ (\hat{Y}_i - \bar{Y})^2}{E\ (Y_i - \bar{Y})^2} = \frac{\text{Explained variation of Y}}{\text{Total variation of Y}}$$

Thus, as can be noticed from the table, the first and second equations gave low R^2 value, for all commodities thus showing that a great propotion of variation in quantity at time t is not explained by prices. The values for Durbin Watson statistic were also low, thus signalling a warning on autocorrelation (Appendix 10f.). The low value of R^2 should be expected from the fact that the correlation figures themselves between prices and quantities did not portray good results.

In the third and fourth models, the values of R^2 were raised significantly. Incidentally the values of the Durbin Watson statistic were also improved to near 2 (their optimal value). Since

Table 4.5.2: Coefficients of regression of selected commodities for various models tested where quantity was dependent variable.

	MODEL 1		MODEL 2		MODEL 3			MODEL 4		
Commodity	$Q_t = a+b_1P_t + e$		$Q_t = a+b_2P_{t-1}+e$		$Q_t = a+b_1P_t + b_3Q_{t-1}+e$			$Q_t = a+b_2P_{t-1}+b_3Q_{t-1}+e$		
	b_1	R^2	b_2	R^2	b_3	b_1	R^2	b_2	b_3	R^2
Bananas	-1.27	0.0225	-4.6	0.0400	0.5	0.8	0.2304	0.5	3.0	0.2500
Lemons	0.0002	0.0036	-	0.0289	0.6	-0.003	0.3364	-.6	0.1	0.3481
Mangoes	0.18	0.0009	-	0.16	0.9	0.6	0.8100	0.1	0.1	0.4225
Passion Fruit	-0.01	0.0625	-0.004	0.0144	0.4	0.01	0.2304	0.01	0.2	0.2304
Pawpaws	-0.02	0.1225	-0.02	0.1156	0.40	0.01	0.2601	0.41	0.01	0.2500
Pineapples	-0.02	0.0009	0.07	0.0144	0.5	0.09	0.2704	0.51		0.2601
Cabbages	-0.1	0.2401	0.10	0.3025	0.3	-0.06	0.3025	0.27	-0.07	0.3600
Carrots	0.1	0.04	0.6	0.0961	0.79	-	0.5329	0.78	0.03	0.5625
Maize	0.002	0.1936	-0.01	0.0144	0.43	-	0.1936	0.4		0.1936
Onions	0.05	0.0289	-0.1	0.0841	0.21	-0.04	0.0729	0.17	0.07	0.1089
Peas	0.01	0.6400	-0.01	0.3136	0.4	0.01	0.5329	0.45	-0.01	0.4489
Potatoes	-0.2	0.0196	-0.02	0.0361	0.58	-	0.2601	0.56	-0.09	0.2704
Tomatoes	1.27	0.1156	1.3	0.1225	0.31	1.1	0.2025	0.28	0.97	0.1849

however, Durbin Watson statistic is not strictly relevant test for the presence of autocorrelation when a lagged dependent variable is used as a regressor (2, p. 372). This statistic will be ignored in a discussion involving the values of dependent variables used as a regressor.

The raising of the values of R^2 when the lagged variable of the dependent variable is used as a regressor supports what was already noticed in the coefficients of the correlations. However, as can be seen from model three, mangoes had the highest value of R^2, with 81% of the total variation being explained by the fit. Carrots and peas were second with about 53% of the variations being explained by the fit. The rest however had their values of R^2 very low, e.g. lemon, about 0.336 or 36.6%, bananas about 23.% etc.

In general, model three and four had a more or less the same results for most commodities, except in mangoes where the R^2 value dropped from 0.81 in model three to 0.422 in model four.

4.5.2.4 THE INFLUENCE OF QUANTITIES ON PRICES

An investigation of the role played by various weekly quantities on the determination of the price level was also carried out. The following models were developed and tested, subject of course, to the same limitations as outlined earlier in section 4.5.

(i) $P_t = a + b\,Q_t + e$

(ii) $P_t = a + b\,Q_{t-1} + e$

The first model assumes that the prices at time t, for given commodity, is a function of the quantities at that time period, plus an error term e.

The second model still incorporates prices at time t, but assumes that the quantities at time t-1 affects the price at time t. This can be a very important fact to note when analysing a commodity that

is not highly perishable such as maize and potatoes.

The analysis showed that, out of the considered 13 commodities, cabbages, peas, lemons, and tomatoes were the only ones whose coefficient of regression, for the first model, was statistically significant from zero, at 95% level of confidence and with 50 degrees freedom. As for the rest, the coefficients regression were not statistically significant at the said level of confidence and degrees of freedom.

Turning to the second equation, it was found out that the coefficient of regression in pawpaws, lemon, peas, potatoes and cabbages, was statistically significant from zero at 95% level of confidence and with 5o degrees of freedom. However, the values of R^2 as shown in table 4.5.3 indicate that a great variation in prices might be explained by some other variables excluded from the regression set.

Table 4.5.3: Coefficients of regression of selected commodities for various models where prices was used as dependent variable.

	$P_t = a + b_1Q_t + e$		$P_t = a + b_2Q_{t-1} + e$	
	b_1	R^2	b_2	R^2
Cabbages	2.50	0.2401	-2.9	0.3025
Carrots	12.10	0.0784	-1.22	0.0400
Maize	0.34	.0004	-2.48	0.0289
Onions	-0.57	0.0289	-	-
Peas	-24.1	0.2601	-	-
Potatoes	-0.50	0.1089	-2.2	0.0529
Tomatoes	-0.58	0.1024	0.05	0.0400
Bananas	-	0.0016	1.62	0.484
Lemons	-	0.0000[1]	7.62	0.1024
Mangoes	-	0.0000	-	.0000
Passion Fruit	-	0.0000	-	0.0000
Pawpaws	-5.91	0.1225	-6.81	0.1600
Pineapples	-	0.0000	-0.23	0.484

1. Figure was smaller than 4 dec. plac.

Source: Authors survey (Appendix table 14 and 15).

For those products whose coefficients of regression were not statistically significant from zero, the role played by quantities in determining the price level at any given week is rather marginal. It therefore means that prices are probably determined through some other mechanism which the equation never considered.

What is even amazing is the fact that a situation of price interrelationships between various commodities is apparent in this market. This price interrelationship is more strong amongst those commodities that can be regarded as complementary goods e.g. cabbage, beans, maize, potatoes, tomatoes, carrots and peas. These commodities as was stated earlier forms the "irio"", the stable food for the low income population of Nairobi. A good example is displayed by cabbage prices, which at time t, is influnced by peas prices, by as much as 84%; maize or potato prices by as much as 80% if the influence of other variables are excluded from the analysis.

Similarly, carrot prices is influenced by maize prices to the tune of 56%, and tomato prices by 55% both at time t.

It can therefore be concluded from this analysis that trade in this market is not all that

competitive. Traders probably collude to raise or lower the prices. Temu and Alvis, in 1968 noted that in Nairobi, "some retailers believed wholesalers exerted monopoly control over potato prices and used this control to maintain excessively high wholesale prices (1, p. 177). However, in analysis of supply concentration, Lorenzl and Quik observed that "the concentration ratios are in general fairly modest...except of the low volume commodities such as carrots, pawpaws and mango (which showed a high concentration ratios). This supports a fairly competitive supply situation." (10, p. 36).

However, on the analysis of the market share handled by the 20 biggest traders in the market, they came to the conclusion that "with Irish potatoes, the 20 percent "biggest" sellers which are 7 in number carry 56 percent of the total sales, whereby the remaining 30 traders have to share 44 percent of the total volume traded (in July/August). Nearly the same situation was found in banana trade. Green maize experienced an even higher concentration ratio of 66 percent carried by only 4 traders..." (10, p. 40).

This therefore leads us to question the whole exercise of price reports by HCDA. It must be understood that price reports will not help correct the market imperfections if these already existed.

4.6. INCOME INDEX AS AN INDICATOR OF PRODUCE TURNOVER DEVELOPMENT IN THE MARKET.

4.6.1 CESS ON PRODUCE

City Council cesses produce entering the market. This cess is rated on produce type and on container basis. Table 4.6.1 gives the breakdown of the cess structure at this market over the last 3 years. As is evident from this table, the sales/carrier units of 1974 and 1975 are much heavier as compared to 1973. This may be a reaction by traders as a result of cess increase towards the later half of 1974. As far as cess per kg is concerned, the cess per kg of 1975 registers a slight increase over 1974 figures for most products. This , as can be seen from the table, is due to a decrease in the weight of the cessable unit. This does not mean that the traders have stopped overfilling their containers. The reason for the apparent drop is due to the fact that in July 1974, the City Council issued a warning to the traders concerning the overfilling of the containers. For those commodities carried in bags, the allowed height above the mouth of the bag was 30 cm. However, the use of larger containers was not prohibited.

Table 4.6.1 also gives the ratio of cess to the mean price as a percentage for the important commodities. Thus as can be seen from this table, fruits are cessed heavily as compared to vegetables. Tomatoes appears to be an exception to this rule, but as shown in table 4.6.1 tomatoes have other sales/carrier unit whose mean price is higher, and therefore cess as percentage of the mean price would be much lower than shown here.

Table 6.4.2 gives the total monthly cess and vehicle charges to the City Council. Also given in this table is cess per unit ton at any given month. For comparative purposes, the fruit contribution to the total volume is presented here also. The total cess for

Table 4.6.1 Wakulima Wholesale Market cess on individual produce 1973-1975.

Commodity	Cess unit	Weight per unit (kg)			Cess/unit (sh)		Cess/kg (cts)				
		1973[1]	1974[1]	1975	1973[1] upto July 1974	August[2] 1974 to 1975	1973	1974	1975	Mean[a] price 1975	% Cess on price
Beans (French)	Bag	47.0	47.6	47.0	1.50	2.50	3.2	4.2	4.3	-	-
Brinjals	Crate	36.0	46.5	49.3	1.00	1.50	2.8	3.2	3.0	-	-
Cabbages	Bag	71.0	96.2	90.0	1.00	1.50	1.4	1.6	1.7	58.92	2.5
Carrots	Bag	100.0	130.1	118.0	1.00	1.50	1.00	1.2	1.3	78.96	1.9
Maize	Bag	110.0	133.0	133.0	1.00	2.00	0.9	1.5	1.5	70.32	2.8
Onions (spring)	Bag	50.0	-	70.0	0.25	1.50	3.0	-	2,1	-	-
Peas (French)	Bag	53.0	55.1	53.0	1.50	2.00	2.8	3.6	3.8	120.49	1.7
Poratoes (Irish)	Bag	105.0	105.3	103.0	1.00	1.50	1.0	0.9	1.5	68.65	2.2
Sukumawiki	Bag	47.0	-	54.0	1.00	1.50	2.1	-	2.8	-	-
Tomatoes	Boxsm[b]	13.0	11.9	10.0	1.00	1.50	7.7	12.6	15.0	15.28	9.8
	BoxmD	-	-	38.5	1.00	1.50	-	-	4.0	-	-
	BoxLR	-	-	79.5	1.00	1.50	-	-	1.9	-	-
Bananas	3bunc	60.0	-	45.0	1.00	2.00	1.7	-	4.4	10.30	19.4
Lemons	Bag	77.0	80.0	96.0	0.25	1.50	0.3	1.9	1.6	45.18	3.3
Mangoes	Bask.	45.0	-	14.0	0.25	2.00	0.6	-	1.4	60.00	3.3
Oranges	Bag	77.0	-	71.3	0.25	1.50	0.3	-	2.1	-	-
Pawpaws	Crate /Box	31.0	61.7	43.0	1.00	2.00	3.2	3.2	4.7	50.0	4.0
Pass.fruit	Box	20.0	53.0	102.0	1.00	1.50	5.0	2.8	1.5	-	-
Pineapples	Dozen	19.0	-	11.50	1.00	1.50	5.3	-	1.3	-	-

a. Mean price is calculated out of the 52 weekly price, and the exercise is only done for the most important commodities. Sukumawiki prices are not recorded by HCDA.

b. SM = small box, MD = medium box LR = Large box.

Source:

1. Nairobi City Council, Department of Social Services and Housing.

2. Lorenzl and Quik, Wakulima Wholesale Market, Nairobi, 1975 (Appendix 4 table 3.5 and 9.1).

Table 4.6.2. Monthly quantities, income and indexes recorded in Wakulima Wholesale Market in 1975.

Month	Absolute quantity (tons)	Quantity index	Absolute Income (shs)	Income index	Cess-per Unit Quantity. shs/ton	Market share of fruits %
Jan.	4432.1	105.5	109,691	108.1	24.7	28.
Feb	4433.9	105.6	108,143	106.6	24.4	37.
Mar.	4279.3	101.9	108,401	106.8	25.2	38.
Apr.	3603.9	85.8	92,415	91.1	25.6	24.
May	4205.9	100.1	116,442	114.7	27.7	24.
Jun.	4397.9	104.7	103,700	102.2	23.5	15.3
Jul.	5059.6	120.5	117,390	115.7	23.2	14.5
Aug.	4528,9	107.8	97,253	95.8	21.5	10.1
Sept.	4475.4	106.6	100,699	99.2	22.5	12.2
Oct.	3660.2	87.2	83,746	82.5	22.9	12.4
Nov.	3841.3	82.9	89,666	88.4	23.5	12.6
Dec.	3481.6	82.9	90,162	88.9	25.9	16.6
Monthly Mean	4200.0	100	101,475.7	100	24.2	24.2

Source: Author's survey

1975 was £60,885.6 and an average cess per ton was shs 24.2. As is seen from this table, it is only the months of March, April, May and December that cess per ton was higher than the average, and in the months of January and February, cess per ton was just about the average. As for the other months, cess per ton was below average. The lowest coordinate is achieved in August.

As can be judged from this table, the fruit contribution to the total volume is very low also during the months when the cess per ton is below average. The reverse is true of vegetable contribution to the total volume. It is also of interest to note that the lowest cess per ton occured in the month when the total produce index was 7 per cent points above the mean, whereas the highest cess per ton is recorded in May when the total produce index in only 0.1 per cent points above the mean but the income index was 14.7 per cent points above the mean.

One can therefore deduce from this that the total produce quantity and total cess has no bearing on one another. It appears as though fruit contribution to the total cess is rather high as judged by the fact that in January to May, the period that can be described as an off season for vegetables, the cess per ton is above average. Similarly as can be seen of December, the period when the dry spell is setting in and also the time when fruits begin to appear in the market at an increasing quantity, the cess per ton is also increasing.

This being the case therefore, total income to the City Council may not reflect the true situation as to the total quantities of items being traded. A number of factors could be responsible for this:-

- On comparative weight basis, fruits are cessed highly.
- The unrecorded quantity may vary with seasons.

The first point is a straight forward. It simply compares the fact that most fruit boxes which are on an average about 40 kg are cessed infact more as compared to the giant maize bags. This tends to give rise to a high percentage when cess is expressed as a ratio of the mean selling price.

As to the second point, right now, we have assumed a constant percentage of the unrecorded quantities. It might be that during the glut, the percentage goes up due to the fact that the market is very busy, the produce inspectors have no time to inspect every individual vehicle.

4.6.2 CORRELATION BETWEEN QUANTITIES TRADED AND INCOME

A correlation analysis was carried out between the total monthly quantities, the monthly income to the market, the monthly total fruit quantities and total monthly quantities for vegetables traded in 1975. The results are in table 4.6.3.

Table 4.6.3: Correlation matrix between income, vegetable, fruit and total quantity.

(r)

	FRQTY	VEQTY	INCOME	TOQTY
FRQTY	1.00			
VEQTY	-0.63	1.00		
INCOME	0.51	0.11	1.00	
TOQTY	0.18	0.58	0.79	1.00

FRQTY = Monthly fruit quantiy

VEQTY = Monthly vegetable quantiy

TOQTY = Monthly total quantity

As is evident from the table there is a very low correlation between income and monthly vegetable quantities of 0.11 whereas the correlation between income and monthly fruit quantities was 0.51, which is statistically significant at 90% level of confidence. This supports our earlier conclusion that most of the variation in income is from fruit. The correlation between total quantity and income was 0.79, which is statistically significant at 90% level of confidence.

It must be realized however that:-

- at 99% level of confidence the correlation between produce quantities and income is not statistically significant.

- at 95% level of confidence the correlation between total quantities and total vegetable quantities or total fruit quantities are statistically insignificant, whereas between total quantities and income are statistically significant.
- At 90% level of confidence, the relationship between income and fruit quantities is statistically significant whereas the relationship between income and vegetable quantities are statistically insignificant, and yet these account for about 80% of the total quantities traded.

This therefore cast doubts as to the usefulness of income index as an indicator of produce turnover development in the market. Using the 1975 income index to estimate the quantities traded in 1975, a figure of 47,698 tons is obtained. This figure is arrived at by using the following formula:-

$$\text{Estimated Produce 1975} = \text{1972 Quantity} \times \frac{\text{1975 Income}}{\text{(estimate) 1972 Inco}}$$

As can be seen from this figure, it comes close to 50,400 tons recorded for 1975, a figure that has been shown to underestimate the total turnover. It can therefore be concluded that income index is no good indicator for produce turnover due to the fact that:-

- It never takes into account the unrecorded quantities.
- When cess is increased, the traders react to this by overfilling the containers.

CHAPTER 5: HYPOTHESIS TESTING AND ANSWERING QUESTIONS RAISED EARLIER

This chapter concentrates on testing the workable hypothesis and attempts to throw light to questions raised earlier.

5.1 The first hypothesis stated that the turnover in this market exceeds the 95,066 tons for 1975 by as much as 10%.

The 10% used here is the expected annual growth rate. This hypothesis therefore expects the 1975 figures to be in the region of 104,506 tons. The analysis of the cess receipts for 1975 however reveals a quantity of 50,400 tons only as having been traded in this market. This is 31.6% less than the estimated volume for 1975. From this ground alone, the hypothesis is rejected, at a risk of committing type 1 error. It is apparent that the quantities recorded in the cess receipt books underestimates the true situation by as much as 42%. The preliminary checks during the survey week of December revealed a descrepancy of about 34% between the recorded volumes in the cess receipt books and the observed quantities being unloaded from the trucks. This too tends to underestimate the true quantities traded. The informal discussions with the produce inspectors at Wakulima market admitted that whatever figures are being recorded in the cess receipt books are not as accurate as one would like them to be.

Question 2.2.1.1 in chapter two incidentally may not get a satisfactory answer. The true yearly total volume traded in 1975 lies

between the adjusted figure of 71,568 tons and 104,506 tons estimated for 1975. The exact coordinate is difficult to locate from the available information.

5.2 The second hypothesis stated that Wakulima Wholesale Market is a market primarily for bananas, potatoes, cabbages and green maize.

The market shares of these commodities are given in table 4.3.3, together with the share of sukumawiki, which is third overall, in as far as market-share basis is concerned. These five products had a total market share of 81.2%. This leads us therefore to conclude that the market serves mainly these five commodities.

The hypothesis is therefore accepted, but sukumawiki must also be added to the list to complete the picture.

5.3 The third hypothesis stated that Tuesdays and Fridays are relatively the busiest days in the market and that Saturdays and Sundays are the days with lowest turnover in the market.

The already discussed results in chapter four however tends to show that at least there is one busy day on the market.

The mean daily delivery was found to be about 137 tons. The calculated standard deviation was 14.6 tons. This gave a range from 122.4-151.6 tons as within the statistical limits by which the daily quantities fluctuated. As was shown in chapter four, this encloses the observed range of the daily quantities computed from the analysis. This therefore leads us to conclude that the busy day, however does

not carry that "heavy" produce to be significantly different from the rest.

The interesting thing about these observation is that during the dry months of January/February, Tuesdays and not Fridays, was indeed the busy day in the market.

It was observed, however, the "busy" day in the market tends to be periodic after March occuring about 5-6 days; and that a volume turnover during this "busy" day is not all that large to warrant a special attention.

This therefore leads us to conclude that generally speaking there is no well defined day when the market is supposed to be very busy or less busy. The above hypothesis is therefore rejected. This conclusion provides an answer to question 2.2.2.3 raised earlier.

5.4 The fourth hypothesis stated that the sales units are arbitrarily determined in the market. At present in this particular market, there are two types of sales units operating. One that can be termed the carrier unit and the other one which can be termed as the sales unit.

The traders use the carrier unit as sales unit wherever there are customers to buy the product in bulk. If a trader is interested in a small quantity he can still get it. The carrier unit can be subdivided or re-packaged to various sales units convenient for each customers needs. Certain commodities however are not repackaged. This is the situation for those commodities carried in boxes notably mangoes, oranges, and limes, others still are sold on retail basis. This is the case with sukumawiki, leeks, spring onions,

lettuce and spinach. So far these commodities, notably lettuce, the sales unit is a piece, and for spring onions, spinach, rhubarb, leeks etc. is a bandle.

This leads us therefore to accept the hypothesis but with reservation. The carrier unit is not arbitrarily determined. They are dictated by the commodity and other factors as already pointed out in chapter four.

The testing of this hypothesis however, provides an answer to question 2.2.1.4 concerning the kind of sales unit used by traders in the market. Complete explanation is found in section 4.2 of chapter 4.

5.5 The fifth hypothesis stated that the various sales units of a given commodity do not vary in weight between various seasons.

Table 4.2.1 gives a list of various sales units together with their weights in Kg. The various seasons between September and December are covered, as shown in table 4.2.2 and the results, though varying slightly, are more or less, the same in all the four months surveyed. September had the produce index 6 percent points above the monthly mean, while December had the produce index 17 percent points below the monthly mean, and yet the weights of the various "sales/carrier units" are more or less the same throughout these months.

The hypothesis therefore is accepted, and this in turn makes it possible to give answers to questions 2.2.1.5 concerning the weights of the sales unit, and question 2.2.1.7 concerning the seasonal differences in the sales unit. The full list of this sales units for various commodities over the various seasons are given in Appendix 3, Their weight in Kg. together with the weight of the container

are also given. From these observations therefore it is concluded that there is no variations in the weights of these sales units between various seasons of the year.

Similarly, the results concerning the size and weight of the container for selected commodities, are given in table 4.2.3. This provides an answer to question 2.2.1.7.

5.6 The sixth hypothesis stated that the price reporting system on Fridays of every week has no impact on quantities brought to the market the following week.

This hypothesis revolved around the testing of the model:

$$Q_t = a + bP_{t-1} + e$$

and that:

$$H_o;\ b = 0$$

$$H_1;\ b_1 \neq 0$$

The results are in Appendix 10-13. All fruit commodities, except pawpaws, and avocadoes gave the result for b which was not statistically significant at 95% level of confidence and with 50dF. For vegetables however, out of the 13 types considered, six gave values of b which were not statistically significant from zero. These were red and white potatoes, beans, brinjals, capsicums and maize.

And for all commodities, the R^2 value was very low, suggesting that the observed variation in quantities are not accounted for by prices alone. This low R^2 values were also confronted with the problem of serial correlation in the data. From the basis of this knowledge, the above hypothesis is acceptable when fruit commodities are investigated

alone. As for vegetables, the situation is a bit complex. A few are not statistically significant at 95% level of confidence. But in general, 11 commodities out of the 18 considered in the analysis gave values for b which were statistically insignificant at 95% level of confidence. This leads us therefore to accept the hypothesis only at a risk of commiting type two error.

For most products, the effect of price on supply, is rather marginal. The variations in quantities do not explain fully the variation in prices as observed by R^2. This leads us therefore to conclude that there are other "hidden" factors behind the analysis. Similarly, the effect of quantities on prices was only significant in cases of cabbages, peas, tomatoes, and lemon. As for the rest, the results indicate a situation of statistical insignificance at 95% level of confidence.

5.7 That income indexes are sufficient indicators for turnover development.

The correlation analysis revealed an r value of 0.79 between income and quantity figures, and a value of 0.51 between income and fruit quantity, while an r value of 0.11 between income and vegetable quantity was recorded. Tested at 95% level of confidence revealed a significant and high correlation between either income and quantity, or income and fruit quantity.

Since it is already apparent from chapter four that the unrecorded quantities in this market could be high, and since income index cannot reveal this, the hypothesis is rejected.

CHAPTER 6: CONCLUSION

This chapter crystalizes the highlight of the research findings.

6.1 The market at present is faced with the problem of overcrowding and congestion. The congestion problem is brought about by lack of parking spaces since the originally designed parking spaces are now sales yards for certain commodities. This forces the incoming vehicles to stop at the middle of the pavement, and just trade, which in turn blocks other incoming vehicles. These congestion problem is also worsened by an increase in volume turnover which the market cannot cope with under the present organisation. There are far too many vehicles which participate in the delivery of the commodity than was anticipated.

Overcrowding is caused by the fact that the product can be acquired on retail basis. This is within the purchasing power of the low income group of Nairobi residents, who live just close to the market.

The present market premises also has no cold storage and conditioning facilities, no sufficient dustbins and the few there are, are in a "wrong" position; it has only one toilet to serve all the market participants estimated at 2000 per day, or sufficient parking bays for vehicles, handcarts and train wagons; there is also no good traffic flow system.

6.2 Analysis of vehicle frequency to the market in various survey weeks shows that about 65% of them come only once to the market, and that the majority of them trade in vegetables.

It is concluded however, that vehicle registration numbers are not useful indicators for produce catchment zone in the case of those vehicles in excess of 2.5 tons tare weight. These keep on haunting various catchment zones "hunting" for the commodity to market.

6.3 As for the sales/carrier unit, it is concluded that a number of factors are responsible for adoption and the use of the various units. These factors, among others include the kind of the commodity, transport means and cess consideration.

The sales/carrier units however do not vary in weight considerably between seasons, so long as cess per unit remains stable.

6.4 Analysis of produce flows to the market reveals an adjusted turnover of 71,568 tons. This figure is lower than the estimated figure of 104,506 for 1975 by about 32%. This adjusted figure however, may have underestimated the true quantity traded out of the fact that the exact quantity which is not recorded . . may be higher than the apparent 42% observed in this research. It is suspected that the unrecorded percentage could be pretty high in the glut period as opposed to the season the present investigation was carried out.

6.5 The produce structure reveals that a few commodities account for the highest share of the total volume traded in 1975. These are potatoes 33%, cabbages 18%, sukumawiki 11%, bananas 9.9% maize 7%, mangoes 4.7%, and tomatoes 3.7%. Together they account for a total of 87.5% of the volume traded.

6.6 Seasonal fluctuations is only a problem for most fruits and those vegetable commodities traded in

low volumes. As for important vegetable commodities seasonal fluctuation is not a serious problem. Inter-regional substitution in supply is more prominent at the wholesale level for these commodities.

6,7 On the analysis of weekly fluctuations however, the data reveals that all days are more or less utilized more evenly.

This leads us to conclude that the traders haunting this market are more or less constant in numbers, and a slight increase in percentages handled in any one week could be as a result of most of them converging in the market.

6.8 It is concluded that prices do not influence the quantities channelled to the market. This therefore leads us to assert that the market is not functioning perfectly. Imperfections exist. Their magnitude however have not been ascertained fully. The price reports by HCDA therefore, is an exercise that is not achieving its objectives that of making the market transparent and increasing competition.

6.9 Income index cannot be used as adequate indicator for produce turnover development in the market, due to the fact that:-

- when cess is increased, traders react to this by overfilling the containers.
- The share of the quantities by passing the inspectorate is rather high and not exactly known and might change frequently.

CHAPTER 7: RECOMMENDATIONS

The following are the recommendations indented to better the present conditions in the market.

7.1 The present market must be reorganized or a new one built if possible. It cannot handle the trade in an efficient way. The wuantities coming in are at an increase since 1972.

The organization should include the "clearing" of the originally designed parking bays from being used as sales yards. However, it is realized that even if this is done, the spaces available for this type of use are only 70, and yet motor vehicles together with handcarts number about 120 on an average at any given day. This therefore calls for a construction of a new market, or an extended portion of the same market.

Construction of storage rooms, cold or otherwise must be given serious thought. This facility will enable most traders unload their produce using the official unloading hours and come to sell the following day only.

Provision of adequate litter bins closeby must also be considered. The adequate number in the author's point of view represent one litter bin to be used by about 5 traders. Of equal importance also is the provision of toilet and other facilities such as credit. These are a must if this market is to offer the highest standards of a good wholesale market in this country.

7.2 The cess as a means of earning revenue to the City Council must be done away with. This system, though cheap to administer is partly responsible for the

present mess in the market. It is recommended that all market participants must pay for the use of the market. This will mean that even the consumers and the small retailers who visit the market will have to pay for the facilities offered by the wholesale market. The present system of letting only the suppliers pay for the market facilities is rather unfair. After all if the ultimate consumers are removed from visiting this market, the present problem may be lessened.

Tentative charges should run as follows:-

- All vehicles in excess of 3 tons, carrying produce into the market, have to pay a fixed entrance fee of Ksh. 60/- on entering. Motor vehicles with tare weight less than this will pay Ksh. 35 on entering. This charge will rule whether it is carrying one box of tomatoes or one hundred.

This will force most traders to use bigger lorries. It is hoped that those traders who rely on hiring transport will have to pool together when shipping their commodities to this market.

- Handcarts have to pay Ksh. 10 on entering the market. It is rather expensive for them but since these too are partly responsible for the present congestion problem, they have to pay for it. Similarly, it is reckonned that the users of pickups etc. may deliver their produce within the premises and then "ferry" it to the market using handcarts.
- As for empty lorries, and handcarts entering the market, the matter is left to the City Council to decide on the sort of charges to adopt.
- All human beings entering the market have to pay

something. A generalized fee of Ksh. 1.00 is offered as a tentative charge per day. This figure should be increased if consumers, particularly those who enter the market to buy in small retail quantities are not deterred from using this market.

The computed target revenue is given in table 7.2.1.The implementation of this system will require a minor alteration on the present market premises. A place for issuing the receipts to vehicles should be separated from the place of issuing the receipts to the pedestrians. This should not take place at the entrance gate. It is a minor point that the City Council Market authorities can decide themselves.

Similarly, when this system is implemented, another variable may also be introduced. That of allowing the vehicles only time to unload in the market. Time schedule should be drawn as to the maximum number of minutes a vehicle should take unloading. Any minute afterwards over and above this allowed time should be paid for. This will help to reduce the number of vehicles which unload in the market, and then parked, until the trader has finished his day's activity. The market should not be used as a parking ground. Sometimes a carelessly parked vehicle obstracts other incoming vehicles and causes unnecessary congestion.

The advantages of the new system are:-

- the time for checking a vehicle will, hopefully decrease considerably. This in turn reduces the queue and thus lessens vehicular congestion.

Table 7.2.1 Proposed charges on market participants at Wakulima Wholesale Market

ENTRANCE	MEAN ENTRANCE	SUGGESTED RATE (SH)	MEAN DAILY REVENUE (SHS)	TOTAL ANNUAL REVENUE (SHS)
Vehicles g.t.[1] 3tons	20	60	1200	438,000
Vehicles 1 t[2] tons	30	35	1050	383,250
Handcarts	40	10	400	146,000
People	1000	1	1000	365,000
Total new system			3650	1,332,250
Total current system			3,336	1,217,12

1. g.t. greater than
2. l.t. Less than

- easy control of the market environment. The careless drivers who park their vehicle carelessly, thus preventing the smooth traffic flow in the market will be eliminated.
- consumers who cause overcrowding in the market will, hopefully be eliminated from the market.
- the practice of overfilling containers, hopefully, will decrease.
- with implementation of the system, the manpower employed to carry out the duty of issuing and checking the tickets will be reduced.
- with effective countercheking mechanism, it will be difficult for market participants to use the market without paying for it. This means that the market revenue collection will improve.

The shortcomings also must be realized:-

- the system might act as an incentive for most commodities to bypass the market. Suppliers may try to shunt the channel length.
- the traders may resent to this system due to the fact that the wastage of commodities may increase. This could be caused by the fact that the ultimate consumers are eliminated from the market. These in most cases, buy the commodity left over by the retailers and also such commodities as sukumawiki.

A number of authors have suggested rent on stalls i.e. stalls are to be allocated - the traders have to pay rent according to how much space he rents. This is a sound suggestion. But noting seasonality patterns of certain products, mangoes plums, grapefuits, mallimow, oranges etc. which, show marked seasonal patterns, it may mean that a trader who deals only on these commodities have to be seasonal renter of the stall. If he is forced to rent the stall for the whole year, it will mean that during certain season, he will have to be paying rent when he is not actually using the stalls. This problem must be fully understood before such action is taken. At the moment, in Kisumu Municipal Market, "New traders" find it

impossible to enter the business because the traders who already rent the stalls do not want to release them even if they have no commodities to sell. The renting of stalls will mean that any "new comer" in future into the business will find the road blocked. It will be good for those traders who are already in business, but young and upcoming business men will find the barriers impermeable

7.3 The produce inspectors should be given a basic training on produce normenclature. The majority of these produce inspectors do not know the names of the produce they are supposed to cess. This could be one of the reasons why potatoes, cabbages, etc. tend to feature most because these are known to them. The "low volume" commodities are not accurately recorded because these produce inspectors do not "recognise" them very quickly. One produce inspector infact admitted that they "approximate the names of the products" when the owner declares it. They do not check them! The majority of the traders themselves are semi-illiterate. It is very possible that they do not know the English names or the Kiswahili names of the commodities they are trading with. They are however aware of the vernacular names. The produce inspectors have to baptise these products with their respective English names.

7.4 Sales units should be defined. It serves no useful purpose to have very many types of sales units or carrier units for one commodity. The sales units must be standardized. Before doing this, thorough study should be carried out concerning the most important factors that may influence the adoption of a given carrier/sales unit.

It is therefore recommended that small sales unit such as basket, ½ bag, and such "uneconomical" units be got rid of. There are two methods of doing this:-

- by highly cessing this units as is the case with tomatoes. The high cess will force most traders to use a bigger unit which is acceptable to wholesale requirements.
- by confiscating any unit smaller than the required sales unit. This method may not work out of the simple fact that traders may be more cunning than those who are supposed to enforce such a law. The produce inspectors on their own part may sometimes relax their stringent duties and ignore the whole exercise. In short this exercise may flope. Therefore the first recommendation may be the only acceptable temporary measure. But this too has its own loop holes--traders may "hide" the smaller units and get into the market with it. This therefore calls for thorough checking of the vehicles which is impossible unless too many produce inspectors are employed.

The author calls for a very different solution to the problem.

7.5 In the event of the recommendation 7.2 not getting implemented, a different approach to the problem is sought. A huge balance, capable of measuring the whole vehicle together with its produce will have to be constructed. The total produce it is carrying less the weight of the empty vehicle will now be recorded. A summary cess per kilo should be arrived at, which should decrease as the load increases and the trader in question be invoiced on these lines. If an

automatic line printer be put so that the weights are automatically done, it will make the fidling of the data by produce inspectors impossible.

A trader will find no reason in bringing a basket or such a smaller unit for it will be relatively expensive.

7.6 The present system of price reporting must be reviewed with all the objective of improving it. Analysis of available data indicates that the system of acquiring information is not a suitable one and a new order must be constituted aimed at bettering the present system. An authoritative arm must be used to gather this information. The data must also be handled by good hands to avoid typing and other errors polluting it.

Analysis of the data indicates that prices alone is not very important. Infact the quantities traded every day or week must be reported. This has been shown to affect the following weeks quantity much more than the price reports.

This calls for HCDA to have a permanent representative at Wakulima Wholesale Market who collects the data, codes them, and makes it available for computation.

Experience shows that on an average about 7 cess receipt books are used every week. With experienced person, this can take two days to code them, 2 days punching and 15 mins. of computer time and the results are out, as neat as possible ready to be desiminated for the respective consumers.

This is one area that HCDA should consider seriously. At the moment it might be taken as a "waste of money". But since this body is a public body,

financed by the public, it should consider this as a matter of top priority in serving the young but dynamic industry.

7.7 To fulfill its function as the training ground for enterpreuneurship, it is recommended that all giant traders be induced to participate in the wholesale market so that the upcoming traders be offered an opportunity to learn.

At present there is a tendency for the progressive traders - K.H.E., E.A.G/Maya Ram, H.C.U. etc. to set up their own go-downs rather than use Wakulima Wholesale Market. In other words they are about to set up their own "Mini-Wholesale yard" to cater for their needs. This will mean that they will now compete with Wakulima Wholesale Market and any measures which need to be enforced might not fruitify because of the competitive nature of the wholesale trade. Whether this will be of any advantage, remains to be seen.

On line with this enterpreneunial training, it is recommended that the Government and the City Council should encourage those progressive traders offering them seminars and any other necessary help such as offering them credit, first on preferential basis.

This will accelerate the growth of this sector of the economy.

At present it seems like a neglected subsector and traders engage in it never consider themselves as playing a major role in the society.

1. Alvis, Q. and Temu, P. The Marketing of Staple Foodstuffs in Kenya. West Virginia University 1968.

2. Atkins, M.H., "Price Quantity relationship within the British Butter Market" Journal of Agric. Economics, Vol. XXIV' (2) 1974, page 370-382.

3. Government of Kenya, Development Plan (1974-1978 Part 1, Government Printer, Nairobi.

4. Government of Kenya, Horticultural Development in Kenya. A final report of the Horticulatural Working Party, June 1970.

5. Government of Kenya, Statistical Abstract 1974, Government Printer, Nairobi.

6. Heinrich, F. The Marketing of Fruits and Vegetables in Kenya. A preliminary report, Nairobi March 1973.

7. Heinrich, F. Basic Data on the Domestic Horticultural Marketing System in Kenya, 1972, Nairobi Berlin 1975.

8. Hoisten, G. Wakulima Market Survey, 1973 (Unpublished)

9. Kenya Farmer, The Market for Fruits and Vegetables (12 issues in 1975).

10. Lorenzl G. and Quik, D. Wakulima Wholesale Market Nairobi; a description of wholesaling of fruits and vegetables in Nairobi, Kenya, Nairobi, June 1975.

11. Lorenzl, G. Wakulima Wholesale Market 1974 (Unpublished).

12. Lorenzl, G. and Tui, L. The price information system for Horticultural Industry in Kenya; UNDP Horticultural Development Project, FAO of United Nation, Ken. 528/71 HCDA of Kenya, Dec. 1974.

13. Maitha, J.K. "A Note on Distributed Lag Models of Maize and Wheat production response - the Kenyan case" in Journal of Agric. Economics Vol. XXV (2) 1974. page 183-188.

14. Ogendo, O. Kenya, A study in Physical and Human Geography, E.A.P.H., Nairobi, 1972.

15. Wilson, A.F. The Marketing of Fruits and Vegetables in Kenya, an economic assessment of the structure and efficiency of the marketing systems, Nairobi, August 1969.

APPENDIX 1: List of traded commodities at Wakulima Wholesale Market 1975.

FRUITS

1. Apples (local)
2. Avocadoes
3. Bananas (cooking)
4. Bananas (ripe)
5. Coconuts
6. Grapes
7. Grape fruit
8. Guavas
9. Lemons
10. Limes
11. Loquarts
12. Mangoes
13. Melons (sweet)
14. Melons (water)
15. Mulbery
16. Oranges (mallimow)
17. Oranges (ordinary)
18. Oranges (Washington navels)
19. Passion fruit (yellow)
20. Passion fruit (purple)
21. Pawpaws
22. Pears(local
23. Pears (imported)
24. Peaches
25. Pineapples
26. Plums
27. Strawberries
28. Tangarines
29. Mixed fruits

VEGETABLES

1. Artichokes
2. Asparagus
3. Arrow roots
4. Beans (broad)
5. Beans (french)
6. Beetroots
7. Brinjals
8. Cabbage (white)
9. Cabbage (red)
10. Carrots
11. Capsicums
12. Cassava
13. Celery, short
14. Celery, long
15. Chillies (hot paper)
16. Cowpeas (kunde)
17. Cucumber
18. Ginger
19. Leeks
20. Lettuce
21. Marrow (Indian)
22. Maize (green)
23. Okra
24. Onions (dry red)
25. Onions (dry white)
26. Onions (spring)

APPENDIX 1: cont.

VEGETABLES

27. Peas (fresh)
28. Peas (chick)
29. Peas (pegion)
30. Potatoes (red)
31. Potatoes (white)
32. Potatoes (sweet)
33. Pumpkins
34. Rhadish
35. Rhubarb
36. Spinach
37. Sprout (brussels)
38. Sukumawiki
39. Swedes
40. Tomatoes
41. Turnips
42. Yams
43. Mixed vegetables

ASIAN VEGETABLES

1. Baragi
2. Chira
3. Dania
4. Gunda
5. Gisoda
6. Galori
7. Kothnir
8. Kharlela
9. Papdi
10. Papri
11. Turia
12. Tindora
13. Valor

Source: HCDA, Market information

APPENDIX 2: Vehicle registration numbers and their frequency to the market in March/April, September, and December survey weeks, 1975.

Reg. No.		1	2	3	Reg. No.		1	2	3
1.	BQ187	-	4	-	31.	HM199	-	-	3
2.	BQ339	5	3	4	32.	HL605	2	-	-
3.	CP172	1	2	2	33.	HS419	-	4	-
4.	CT459	-	-	2	34.	HS423	-	4	2
5.	CY175	3	-	-	35.	HV621	2	-	-
6.	CZ518	-	4	-	36.	HW610	4	-	-
7.	DK428	-	5	4	37.	HW915	2	-	-
8.	DP52	-	4	6	38.	HX176	6	-	3
9.	DP498	-	4	2	39.	JJ552	-	-	2
10.	DP513	2	2	-	40.	JP293	2	-	-
11.	DR422	-	2	-	41.	KD344	-	3	-
12.	DR977	-	-	2	42.	KE100	2	-	-
13.	DS825	-	-	2	43.	KE843	-	4	-
14.	DT188	-	2	2	44	KF123	-	2	-
15.	DT842	2	-	-	45.	KG224	-	4	-
16.	FS520	3	-	-	46	KH845	-	3	2
17.	FS599	-	2	-	47.	KK812	-	2	-
18.	FY632	-	-	4	48.	KL840	6	3	4
19.	GB600	-	3	-	49.	KP586	-	2	2
20.	GD516	-	2	2	50.	KQ764	-	3	-
21.	GD600	-	-	5	51.	KR479	-	4	-
22.	GP543	-	6	3	52.	KR543	-	3	-
23.	GR73	-	2	3	53.	KS625	5	3	2
24.	GR96	-	-	2	54.	KS970	3	2	-
25.	GR543	-	-	2	55.	KT104	-	4	-
26.	GS750	2	-	2	56.	KY166	-	2	2
27.	GT189	-	6	3	57.	KY296	2	-	2
28.	GT409	-	-	2	58.	KZ256	-	4	-
29.	GT892	2	-	-	59.	KZ780	2	-	-
30.	GW140	-	2	-	60.	KZ839	4	3	-

Source: Cess receipt books, Nairobi City Council

N.B. Only vehicles that came twice or more are listed.

APPENDIX 2: cont.

Reg.	No.	1	2	3	Reg.	No.	1	2	3
61.	LA121	4	-	-	92.	NA77	-	5	3
62.	LA856	2	-	-	93.	NB844	2	-	-
63.	LB458	3	-	-	94.	ND73	-	2	-
64.	LD299	-	2	-	95.	ND704	-	2	-
65.	LD751	2	3	-	96.	NE183	-	2	-
66.	LL939	-	2	-	97.	NF289	2	-	2
67.	LQ651	-	2	-	98.	NG623	2	-	-
68.	LS942	-	3	-	99.	NL865	2	-	-
69.	MA735	2	-	-	100.	NM434	3	-	-
70.	MD120	6	6	5	101.	NM938	3	3	2
71.	ME527	-	4	-	102.	NN2	-	-	4
72.	MF582	-	2	-	103.	NN177	2	-	-
73.	MF778	2	-	-	104.	NN716	3	-	-
74.	MH413	5	5	4	105.	NP53	2	-	-
75.	MM41	-	2	-	106.	NP82	-	5	-
76.	MM572	-	3	-	107.	NP399	-	6	-
77.	MM911	-	2	-	108.	NR16	-	4	3
78.	MP201	-	3	-	109.	NR47	-	-	2
79.	MP399	-	3	-	110.	NR214	2	2	-
80.	MR649	2	-	-	111.	NR928	-	4	2
81.	MR929	3	-	-	112.	NS466	-	-	2
82.	MS197	-	2	2	113.	NS858	3	-	-
83.	MS498	-	2	-	114.	NS948	-	4	4
84.	MT545	-	2	-	115.	NT225	3	-	-
85.	MW147	-	2	-	116.	NU717	-	3	-
86.	MW465	-	4	2	117.	NY225	-	3	5
87.	MW585	-	2	-	118.	PA348	-	2	-
88.	MW847	-	-	2	119.	PB424	-	2	-
89.	MW869	2	-	-	120.	PB513	3	-	-
90.	MX386	-	3	-	121.	PD639	4	-	-
91.	MX529	5	-	5	122.	PD646	-	3	-

APPENDIX 2: cont.

Reg. No.	1	2	3	Reg. No.	1	2	3
123. PD847	3	-	-	153. PY160	-	2	-
124. PE203	4	4	2	154. PY647	4	-	-
125. PE323	2	5	-	155. PY812	3	2	-
126. PE682	2	-	2	156. PZ82	-	2	-
127. PF811	4	-	-	157. PZ228	-	-	3
128. PF861	2	-	-	158. PZ422	-	-	-
129. PH355	-	2	-	159. QB187	-	-	4
130. PK260	4	6	4	160. QC454	2	-	-
131. PK262	3	3	2	161. QD881	-	2	-
132. PK517	-	2	-	162. QG224	-	-	2
133. PL510	2	-	-	163. QJ429	-	3	2
134. PN903	-	4	2	164. QK689	-	3	2
135. PN984	-	2	-	165. QK979	-	2	-
136. PP434	2	-	-	166. QN128	-	-	2
137. PP811	2	-	-	167. QN307	-	-	2
138. PQ61	2	-	-				
139. PQ266	3	6	5				
140. PR290	7	5	2				
141. PR446	3	3	-				
142. PR540	3	-	-				
143. PR791	-	4	2				
144. PS218	-	2	-				
145. PS520	-	2	-				
146. PS605	2	-	-				
147. PU747	4	-	-				
148. PU931	-	2	-				
149. PX160	-	4	2				
150. PY038	-	2	-				
151. PY145	-	2	-				
152. PY146	-	4	-				

APPENDIX 3 Sales units survey results September-December 1975

Product	Unit Considered	Mean Wt.	Weight of container	Net Weight	Total Sample Size
Arrowroots	Bag	99.7	2.0	97.7	40
Beans	Bag	49.3	2.0	47.3	40
Beetroots	Bag	87.0	2.0	85.0	30
Brinjals	Box	50.5	8.5	41.6	20
Brinjals	Bag	43.6	2.0	41.5	20
Carrots	Bag	118.7	2.0	116.7	40
Cabbages	Bag	91.97	2.0	89.97	40
Capsicum	Box	42.6	9.6	33.0	20
Capsicum	Bag	49.5	2.0	47.5	20
Capsicum	Basket	21.7	0.5	21.2	20
Cassava	Bag	105.95	2.0	103.95	20
Cauliflower	Crate	46.2	4.0	42.4	40
Celery	½ bag	53.7	1.2	52.5	10
Cowpeas (kunde)	Bag	23.7	2.0	21.7	10
Chillis	Bag	35.4	2.0	33.4	30
Cucumber	Small box	15.3	4.6	10.7	30
Cucumber	Large box	66.9	10.0	56.9	20
Cucumber	Bag	73.5	2.0	71.5	20
Ginger	Bag	69.8	2.0	67.8	30

Source: Author's survey results

APPENDIX 3 cont.

Product	Unit Considered	Mean Wt.
Ginger	Box	72
Leeks	Bag	57.9
Leeks	Bundle	23.5
Lettuce	½ bag	65.9
Lettuce	Crate	55.7
Maize	Bag	143.6
Onions red	Net	14.0
Onions W	Net	10.4
Onions W	Bag	103.5
Onions S	Bag	71.9
Peas	Bag	55.0
Potatoes R	Bag	107.1
Potatoes (sweet)	Bag	98.7
Potatoes W	Bag	103.6
Pumpkin	Bag	69.4
Spinach	Bag	60.1
Sukumawiki	Bag	56.2
Sukumawiki	Basket	12.0
Turnips	Bag	92.8

Weight of container	Net Weight	Total Sample Size
9.5	67.5	20
2.0	55.9	30
-	23.5	20
1.0	64.9	30
6.3	49.4	40
2.0	132.6	40
-	14.0	40
-	10.4	40
2.0	101.5	40
2.0	69.9	40
2.0	53.0	40
2.0	105.1	40
2.0	96.7	40
2.0	101.6	40
2.0	67.4	30
2.0	58.1	30
2.0	54.2	40
1.5	10.5	10
2.0	90.8	30

APPENDIX 3 cont.

Product	Unit considered	Mean Wt.
Rhubarb	Bundle	29.2
Tomatoes	Small box	14.8
Tomatoes	Ordinary box	26.6
Tomatoes	Medium box	38.55
Tomatoes	Large box	79.7
Mixed Veg.	Bag	50.2
Dania	Crate	31.5
Pinda	Carton	41.5
Turia	Box	46.6
Avocadoes	Bag	88.5
Avocadoes	Crate	52.5
Bananas	Cooking-bunch	15.95
Bananas	Ripe-bunch	13.93
Coconuts	Bag	56.87
Grapefruits	Bag	91.00
Lemons	Bag	98.2
Lime	Bag	85.1
Lime	Carton	32.3
Loquarts	Box	80.8

Weight of container	Net Weight	Total Sample Size
-	29.2	30
4.8	10.0	20
6.0	20.6	20
8.0	30.5	20
10.0	69.6	20
2.0	48.2	10
1.5	30.0	10
3.1	38.4	10
16.6	30.0	10
2.0	86.5	10
1.5	51.0	10
-	15.95	40
-	13.93	40
2.0	54.87	40
2.0	89.0	10
2.0	96.2	20
2.0	83.1	30
3.1	29.2	30
10.2	70.6	10

APPENDIX 3 cont.

Product	Unit considered	Mean Wt.	Weight of container	Net Weight	Total Sample Size
Mangoes	Bag	98.3	2.0	96.3	30
Mangoes	Box	51.5	5.2	46.3	20
Mangoes	Small basket	14.8	1.2	13.6	20
Mangoes	Large basket	31.7	1.5	30.2	10
Melon	Bag	55.96	2.0	53.96	30
Oranges	Bag	73.33	2.0	71.33	40
Oranges	Crate	56.4	1.5	54.90	20
Oranges	Box	35.2	5.2	30.0	30
Millimow oranges	Bag	75.0	2.0	73	10
Passion fruit	Box	110.6	9.0	101.6	40
Passion fruit	Bag	49.3	2.0	47.3	40
Pawpaw	Box	55.1	12.0	43.10	30
Peaches	Box	27.8	5.2	22.6	10
Pineapples	Dozen	14.8	3.3	11.50	40
Plums	Bag	92.0	2.0	90	10
Plums	Box	83.3	9.0	74.3	10
Plums	Carton	43.1	3.1	40.0	10
Tangarines	Box	37.0	5.2	31.8	40
Tangarines	Crate	54.9	1.5	53.40	30

APPENDIX 4: Monthly quantities of fruits traded at Wakulima Market, 1975, kg.

(%)

	Bananas	Mangoes	Oranges	Lemons	Passion Fruit	Pawpaws	Pineapples
JAN	441732 (8.3)	480146 (20.5)	153281 (12.8)	40305 (7.1)	11926 (5.9)	16983 (8.8)	15150 (9.4)
FEB	624269 (11.7)	809414 (34.5)	83622 (7.0)	48965 (8.6)	6312 (3.1)	18016 (9.4)	20280 (12.6)
MAR	740389 (13.9)	679279 (29.0)	38347 (3.2)	55498 (9.7)	22519 (11.2)	16724 (8.7)	20644 (12.8)
APR	537397 (10.1)	41937 (2.0)	65537 (5.5)	125057 (22.0)	35966 (17.9)	10907 (5.7)	10455 (0.5)
MAY	698983 (13.1)	77451 (3.3)	155668 (13.0)	54834 (9.6)	2692 (1.3)	10302 (5.4)	11512 (7.1)
JUN	398249 (7.5)	34189 (1.5)	162549 (13.6)	54158 (9.5)	236 (0.1)	4225 (2.2)	12882 (8.0)
JUL	407355 (7.6)	85031 (3.6)	139223 (11.7)	63973 (11.2)	285 (0.1)	9913 (5.2)	22245 (13.8)
AUG	295572 (5.6)	35378 (1.5)	45000 (3.8)	53772 (9.4)	958 (0.5)	10903 (5.7)	14607 (9.1)
SEP	340127 (6.4)	8282 (0.4)	86395 (7.2)	44057 (7.7)	20602 (10.2)	29225 (15.2)	12272 (7.6)
OCT	292861 (5.5)	1484 (0.1)	54011 (4.5)	3846 (0.7)	58062 (28.9)	32023 (16.6)	8111 (5.0)
NOV	293758 (5.5)	16899 (0.7)	113171 (9.5)	8752 (1.5)	23028 (11.5)	17710 (9.2)	7076 (4.4)
DEC	258471 (4.9)	74181 (3.2)	96804 (8.1)	16445 (2.9)	18560 (9.2)	15727 (8.2)	5971 (3.7)
TOTAL	5329163 (100)	2343671 (100)	1193608 (100)	569662 (100)	201146 (100)	192658 (100)	161205 (100)

Source: Cess receipt books, City Council of Nairobi

APPENDIX 4: : continued \

	Avocadoes	Plums	Peaches	Grape fruit	Coconut	Lime
JAN	693 (4.2)	62266 (58.1)	924 (0.8)	26700 (76.7)	-	-
FEB	866 (5.3)	16050 (14.5)	6191 (5.7)	-	548 (8.3)	788 (18.3)
MAR	1298 (7.9)	2386 (2.2)	26054 (23.8)	8099 (23.3)	1589 (24.0)	-
APR	866 (5.3)	372 (0.3)	50815 (46.5)	-	1151 (17.4)	2410 (56.0)
MAY	1386 (8.5)	6910 (6.22)	23931 (21.9)	-	110 (1.7)	-
JUN	1126 (6.9)	-	462 (0.4)	-	2576 (38.8)	-
JUL	5887 (36.0)	-	92 (0.1)	-	548 (8.3)	-
AUG	1644 (10.1)	-	-	-	110 (1.7)	-
SEP	1731 (10.6)	-	-	-	-	1080 (25.1)
OCT	606 (3.7)	-	-	-	-	29 (0.7)
NOV	261 (1.6)	-	924 (0.8)	-	-	-
DEC	-	23040 (20.8)	-	-	-	-
TOTAL	16364 (100)	111024 (100)	109393 (100)	34799 (100)	6632 (100)	4307 (100)

APPENDIX 5: Monthly quantities of vegetables traded at Wakulima Market in 1975, kg (%)

Month/Crop	Beans	Brinjal	Cabbages	Carrots	Capsicum	Cassava	Cellery	Chillies	Cucumber
JAN	1372 (4.1)	13560 (6.9)	764808 (8.1)	67158 (7.6)	242 (1.0)	728 (2.5)	211 (3.9)	5677 (8.8)	485 (1.4)
FEB	2605 (7.8)	16044 (8.2)	575291 (6.1)	51246 (5.8)	685 (2.7)	1976 (6.7)	106 (2.6)	5945 (9.2)	1967 (3.3)
MAR	1560 (4.7)	15016 (7.6)	524781 (5.6)	74061 (8.3)	2273 (9.0)	1768 (6.01)	683 (6.6)	4441 (69)	4251 (7.2)
APR	3218 (9.7)	20142 (10.2)	712848 (7.6)	76752 (8.6)	1939 (7.7)	2912 (9.9)	106 (2.6)	3542 (5.5)	8685 (14.7)
MAY	2270 (6.8)	11353 (5.8)	653943 (7.0)	96642 (10.9)	2783 (11.0)	5304 (18.0)	159 (2.6)	6778 (10.5)	4295 (7.3)
JUN	5253 (15.8)	11358 (5.8)	566809 (6.0)	88218 (9.9)	2553 (10.1)	1768 (6.0)	1419 (35.9)	11756 (18.2)	14830 (25.2)
JUL	2792 (8.4)	31419 (16.0)	837959 (8.9)	68094 (7.7)	8003 (31.6)	3744 (12.7)	1155 (29.3)	8549 (13.3)	6588 (11.2)
AUG	3598 (10.8)	19100 (9.7)	869797 (9.3)	101673 (11.4)	3377 (10.3)	3016 (10.3)	105 (2.6)	3604 (5.6)	2002 (3.4)
SEPT	378 (1.1)	16118 (8.2)	1030080 (11.0)	62712 (7.1)	998 (3.9)	7488 (25.4)	683	2371 (3.7)	2004 (3.4)
OCT	2366 (7.1)	14950 (7.6)	976220 (10.3)	74763 (8.4)	626 (2.5)	104 (0.4)	105 (2.6)	1402 (2.2)	203 (0.3)
NOV	7429 (22.3)	15964 (8.11)	1027734 (11.0)	95823 (10.8)	666 (2.6)	416 (1.4)	210 (3.9)	3369 (5.2)	2043 (3.5)
DEC	426 (1.3)	11790 (6.0)	806022 (8.6)	32760 (3.7)	1182 (4.7)	208 (0.7)	-	7045 (10.9)	11201 (19.0)
TOTAL	33267 (100)	196814 (100)	9346292 (100)	889902 (100)	25327 (100)	29432 (100)	4942 (100)	64479 (100)	58914 (100)

Source: Cess receipt books, City Council of Nairobi.

APPENDIX 5: continued

	Maize	Onions	Spring onions	Peas	Potatoes	Pumpkins	Spinach
JAN	241262 (6.6)	17479 (7.2)	-	76860 (13.7)	1392663 (8.3)	1685 (10.5)	118 (3.7)
FEB	270788 (7.4)	11821 (4.9)	-	27240 (4.9)	1167093 (7.0)	2022 (12.6)	117 (3.7)
MAR	243390 (6.6)	14229 (5.9)	70 (2.1)	28680 (5.1)	1180998 (7.1)	472 (2.9)	235 (7.4)
APR	285418 (7.8)	14479 (6.0)	-	24540 (4.4)	861286 (5.1)	135 (0.8)	646 (20.4)
MAY	326382 (8.9)	18024 (7.4)	-	17820 (3.2)	1129601 (6.7)	-	940 (29.6)
JUN	279699 (7.6)	11078 (4.6)	1049 (31.9)	26100 (4.7)	1968845 (11.8)	4987 (31.1)	59 (1.9)
JUL	370937 (10.1)	15111 (6.2)	699 (21.3)	95400 (17.0	1965549 (11.8)	2627 (16.4)	646 (20.4)
AUG	419349 (11.5)	29643 (12.2)	-	91080 (16.3)	1784475 (10.7)	1145 (7.1)	59 (1.9)
SEP	485051 (13.2)	32188 (13.3)	-	54300 (9.7)	1573840 (9.4)	67 (0.4)	352 (11.1)
OCT	234213 (6.4)	28399 (11.7)	-	39840 (7.1)	1199641 (7.2)	-	-
NOV	217056 (5.9)	25132 (10.4)	699 (21.3)	44400 (7.9)	1218078 (7.3)	1280 (8.0)	-
DEC	289275 (7.9)	25171 (10.4)	769 (23.4)	33960 (6.1)	1179041 (7.0)	1618 (10.1)	-
TOTAL	3662820 (100)	242764 (100)	3286 (100)	560220 (100)	16621110 (100)	16038 (100)	3172 (100)

APPENDIX 5: continued

	Sukumawiki	Tomatoes	Sweetpotatoes	Arrowroots	Cauliflower	Leeks	Lettuce
JAN	410862 (6.9)	146960 (7.9)	6183 (9.4)	16222 (9.4)	4111 (4.0)	448 (3.5)	2922
FEB	418910 (7.1)	197102 (10.6)	4216 (6.4)	21007 (12.2)	2925 (2.9)	2337 (18.4)	660
MAR	362722 (6.1)	151685 (8.1)	11244 (17.0)	27358 (15.9)	3855 (3.8)	430 (3.4)	225
APR	461646 (7.8)	190969 (10.2)	10684 (16.2)	9381 (5.5)	9961 (9.8)	2474 (19.5)	1037
MAY	641183 (10.8)	164631 (8.8)	7777 (11.8)	19639 (11.4)	13905 (13.7)	230 (1.8)	5178
JUN	532537 (9.0)	154684 (8.3)	2905 (4.4)	5274 (3.1)	17425 (17.1)	416 (3.3)	4023
JUL	593595 (10.0)	244141 (13.1)	375 (0.6)	15437 (9.0)	22047 (21.7)	1671 (13.2)	12394
AUG	589939 (10.0)	106505 (5.7)	11993 (18.2)	8012 (4.7)	9156 (9.0)	1088 (8.6)	1665
SEP	500667 (8.5)	125376 (6.7)	1968 (3.0)	6451 (3.8)	4881 (4.8)	504 (4.0)	1559
OCT	491361 (8.3)	115173 (6.2)	5718 (8.7)	11333 (6.6)	5299 (5.2)	1213 (9.6)	1194
NOV	508259 (8.6)	157908 (8.5)	937 (1.4)	12117 (7.0)	5556 (5.5)	56 (0.4)	1554
DEC	416268 (7.0)	110249 (5.9)	1969 (2.7)	19933 (11.6)	2712 (2.7)	1837 (14.5)	2028
TOTAL	5927949 (100)	1865383 (100)	65969 (100)	172164 (100)	101833 (100)	12704 (100)	34439 (100)

APPENDIX 6 Weekly quantities of fruits traded at Wakulima 1975 (kg)

Week	Avocadoes	Bananas	Grapefruit	Lemon	Lime	Mangoes	Melon	Oranges	Passion fruits
501	-	72146	-	9425	-	20037	-	10787	1734
502	-	134475	-	11351	-	61600	-	37223	3413
503	260	120618	-	5966	-	58551	-	36212	4535
504	433	64727	-	6830	-	198874	-	54566	1734
505	-	90563	26700	10485	-	236809	-	26220	983
506	-	218154	-	9908	-	160197	54	30769	3774
507	606	157790	-	12987	-	179968	486	22809	-
508	173	148538	-	15392	788	224072	108	10715	843
509	87	124864	-	8369	-	261449	-	13901	1625
510	433	173854	2670	11445	-	196746	-	7602	5730
511	-	245049	2670	10771	-	152263	324	10763	5369
512	-	154709	-	13370	-	137422	-	12670	6327
513	865	100903	2759	18469	-	80851	54	1013	4590
514	606	118100	-	35016	-	17047	-	12264	9965
515	-	163143	-	20105	83	6146	54	7820	9659
516	260	97285	-	28570	2327	18699	162	11006	10646
517	-	147545	-	33766	-	45	216	23094	5699
518	866	121004	-	12121	-	8474	54	33144	237
519	260	90849	-	18375	-	43337	324	26788	874

Source: Cess receipt books, City Council of Nairobi

APPENDIX 6 : cont.

Week	Avocadoes	Bananas	Grapefruit	Lemon
520	-	170516	-	9716
521	87	188994	-	10582
522	173	138944	-	16065
523	606	156019	-	11255
524	260	107355	-	15776
525	260	96583	-	5482
526	-	38292	-	17605
527	1473	82518	-	19338
528	1125	129258	-	12026
529	1385	69569	-	9042
530	1039	100069	-	16064
531	1384	49201	-	16642
532	173	44282	-	7694
533	-	67989	-	11447
534	-	72012	-	13852
535	952	88476	-	12602
536	606	98057	-	30016
537	1125	63892	-	2308
538	-	77139	-	3269

Lime	Mangoes	Melon	Oranges	Passion fruit
-	17856	108	3577	911
-	1910	-	42528	102
-	6146	-	30232	568
-	9782	-	16073	236
-	15606	-	59007	-
-	3354	-	43946	-
-	5175	108	42075	-
-	15171	648	25071	-
-	27429	-	28769	-
-	20384	-	34777	95
-	19062	486	33665	-
-	9506	-	24139	190
-	14796	-	9070	-
-	7490	54	22722	-
-	4840	270	1448	-
-	2511	216	4562	958
-	38526	-	15639	5088
1080	2793	378	10624	6265
-	289	-	29237	3337

APPENDIX 6: cont

Week	Avocadoes	Bananas	Grapefruit	Lemon	Lime
539	-	93887	-	6348	-
540	346	52850	-	2115	-
541	87	67005	-	962	-
542	173	13589	-	577	-
543	-	141075	-	288	-
544	-	25196	-	865	29
545	87	63356	-	289	-
546	87	63521	-	2308	-
547	87	123239	-	3270	-
548	-	50466	-	2789	-
549	-	50064	-	2115	-
550	-	74441	-	4424	-
551	-	56740	-	5481	-
552	-	43629	-	1443	-
553	-	27624	-	2886	-
TOTAL	16364	5329163	34799	569662	4307
Weekly Mean	308.75	100550.24	656.58	10748.33	81.26

Mangoes	Melon	Oranges	Passion fruit
578	-	25827	5205
-	-	17082	4181
-	270	7530	6470
45٦	-	6660	16139
187	-	14915	10158
1252	-	21575	23637
578	-	22733	6028
6787	54	31493	8668
963	-	10860	5300
8667	702	39397	1216
3659	-	33739	5610
91	-	28892	2856
32549	108	25631	4488
32109	-	5068	4586
5677	-	3474	1020
2343671	5238	1193608	201146
44220.21	98.83	22520.91	3795.21

APPENDIX 6: cont.

Week	Pawpaws	Pears	Pineapples
501	992	-	1829
502	906	-	1576
503	3189	924	2659
504	9784	-	5440
505	3233	-	4267
506	4569	-	5153
507	5085	185	8581
508	5517	1109	2611
509	4354	8038	6638
510	5130	462	8280
511	2802	3974	5083
512	3534	7483	1818
513	2628	10994	3139
514	2543	17093	3301
515	2844	10532	1415
516	907	14136	3174
517	3276	8130	1932
518	2328	4620	3267
519	905	5729	3381

	Coconuts	Plums
	-	24122
	-	23634
	-	9147
	-	4248
	-	2155
	-	7357
	-	5126
	548	2081
	-	446
	-	1114
	-	642
	-	630
	1589	-
	-	372
	-	-
	1151	-
	-	-
	-	-
	-	223

APPENDIX 6: cont.

Week	Pawpaws	Pears
520	3061	9147
521	4612	5359
523	1465	462
524	1035	-
525	1078	-
526	647	-
527	2543	-
528	2328	-
530	2932	92
531	1594	-
532	1466	-
533	2370	-
534	1681	-
535	4223	-
536	2069	-
537	5992	-
538	9181	-
539	10905	-
540	6033	-

Pineapples	Coconuts	Plums
2185	-	-
1285	110	6687
1093	274	-
2657	-	-
4589	2247	-
4543	55	-
6130	-	-
5694	548	-
4256	-	-
3450	-	-
3129	-	-
5498	-	-
1537	-	-
2323	110	-
3301	-	-
3646	-	-
1518	-	-
3531	-	-
2048	-	-

APPENDIX 6: cont.

Week	Pawpaws	Pears	Pineapples	Coconut	Plums
541	9826	-	2232	-	-
542	12543	-	1990	-	-
543	2889	-	1381	-	-
544	3921	924	1956	-	-
545	7756	-	1806	-	-
546	2585	-	115	-	-
547	3103	-	1518	-	-
548	2370	-	2832	-	-
549	4438	-	564	-	-
550	2973	-	1208	-	-
551	6118	-	667	-	1940
552	1164	-	1932	-	9070
553	64	-	1024	-	12030
TOTAL	192658	109393	161205	161205	111024
Weekly Mean	3635.06	2064.02	3041.6	125.13	2094.79

APPENDIX 7: Weekly quantities of vegetables traded at Wakulima Market, 1975.

(kg)

Week	Beans	Brinjals	Cabbages	Carrots	Capsicum	Cassava	Celery	Chillies	Cucumber
501	95	1606	176072	24570	99	520	-	534	-
502	-	3130	150093	8892	-	-	-	1469	-
503	426	5013	167051	18018	48	208	-	1303	439
504	237	3265	187254	13572	95	-	-	2037	135
505	614	1554	162631	5382	95	-	211	401	271
506	1373	3994	194018	11817	238	520	106	1336	621
507	578	3058	130429	18486	-	-	-	3541	1110
508	285	4456	102197	6552	114	1456	-	67	236
509	189	4176	104990	14040	238	-	-	1201	1825
510	189	4536	113924	16965	869	416	420	601	346
511	331	4475	144769	16497	752	1352	210	467	1436
512	378	3285	138185	15561	132	-	53	1269	72
513	662	2072	93267	22113	520	-	-	1837	572
514	568	3312	164164	14274	96	208	-	1404	2639
515	95	4824	151174	5850	380	1248	53	568	3972
516	804	3227	143688	19422	1046	624	-	668	2074
517	1467	7627	184278	27378	132	832	53	902	-
518	709	3565	172099	22932	285	416	106	2404	429
519	331	1555	173094	11466	570	-	-	934	135

Source: Cess receipt books City Council of Nairobi

APPENDIX 7: cont.

Week	Beans	Brinjals	Cabbages	Carrots
520	379	1728	134218	47736
521	1088	2057	130064	14976
522	662	3642	130698	9360
523	662	2614	133584	14274
524	1089	352	132681	22230
525	1420	2531	138636	14742
526	1467	5819	145222	37674
527	1136	6110	256348	9360
528	946	11789	184008	37089
529	142	5838	184820	7722
530	236	5258	149371	11583
531	710	5626	171020	1638
532	473	3516	143507	36153
533	948	5990	191406	31356
534	615	1440	191944	12519
535	1184	4952	265639	23283
536	189	7464	185271	29484
537	-	4320	278807	8424
538	-	2125	168670	9009

Capsicum	Cassava	Celery	Chillies	Cucumber
523	832	-	1102	708
238	3120	-	668	2428
2023	1456	53	1670	595
841	520	1314	1069	7522
428	416	-	4575	2858
475	312	-	4542	3531
238	-	105	1570	919
2026	-	210	2371	1200
2299	312	735	2338	2170
1426	1352	-	2037	2315
874	312	210	1169	696
1723	1768	-	1301	448
936	1976	105	1401	286
951	624	-	802	135
812	208	-	-	678
333	208	-	676	662
760	936	105	1035	278
95	2392	315	835	358
95	-	105	67	286

APPENDIX 7: cont.

Week	Beans	Brinjals	Cabbages	Carrots	Capsicum	Cassava	Celery	Chillies	Cucumber
539	47	2001	328690	12987	48	4160	-	234	1082
540	142	4694	222882	13923	-	104	105	167	-
541	284	5706	157846	10764	198	-	-	-	-
542	1041	618	220357	23634	380	-	-	267	-
543	852	3564	206915	o7433	48	-	-	1001	169
544	899	1864	351145	18369	-	-	-	501	34
545	2744	2778	326344	32643	-	-	-	1302	72
546	2792	1621	233975	18837	190	416	-	333	309
547	805	6594	143510	21411	-	-	-	701	1155
548	378	4187	242726	14976	476	-	210	732	507
549	189	2542	230914	7020	666	-	-	433	215
550	-	3725	173092	14391	-	-	-	1670	716
551	-	2950	146481	11115	-	208	-	3475	879
552	95	1565	148288	-	231	-	-	1068	9391
553	142	504	43836	-	285	-	-	333	-
TOTAL	33267	196814	9346292	889902	25327	29432	4942	64479	58914
Weekly mean	627.8	3713.5	176,345.1	16790.6	477.9	555.3	93.2	1216.6	1111.6

APPENDIX 7: cont.

Week	Leeks	Lettuce	Maize	Onions
501	-	402	57057	2815
502	-	-	34846	2539
503	336	530	45885	5062
504	56	1635	63175	4364
505	56	592	72352	3541
506	-	-	67697	2222
507	-	423	75943	2089
508	2337	-	60515	5019
509	94	-	56791	3363
510	112	65	42028	5018
511	-	-	58653	2201
512	224	65	58653	3186
513	-	95	61845	2110
514	1422	94	35910	7355
515	327	99	83657	1646
516	510	714	50806	2429
517	215	130	90573	1622
518	-	816	44555	1794

Spring onions	Peas	Potatoes	Pumpkin
-	9840	316107	539
-	14520	380585	-
-	27180	210944	674
-	17700	322905	472
-	7800	296331	2022
-	10740	273259	-
-	7620	332484	-
-	5820	315592	-
-	3660	244728	-
-	7620	289636	472
70	4620	266255	-
-	11580	227630	-
-	4080	264298	-
-	4200	234737	-
-	2940	170465	-
-	7080	177057	-
-	7800	217021	139
-	10140	226394	-

APPENDIX 7: cont.

Week	Leeks	Lettuce	Maize	Oninons
519	-	649	71421	1893
520	103	799	98154	5121
521	71	1891	90839	7483
522	56	1023	75278	3160
523	-	644	108395	1379
524	56	1715	64904	3803
525	192	284	21147	1966
526	280	1380	55860	3930
527	560	1152	71820	3200
528	727	9176	72086	3954
529	80	1707	72485	2602
530	24	312	123956	1294
531	168	387	85785	7462
532	304	616	120498	11800
533	448	319	80864	6713
534	168	390	118370	3131
535	168	-	62111	6072
536	280	260	104804	9471

Sprin oninos	Peas	Potatoes	Pumpkin
-	4980	258221	-
-	3060	178293	-
-	720	283456	-
-	1440	352878	2359
-	1620	488014	-
-	4140	432806	2426
-	5580	562689	-
1049	14760	380585	202
-	10080	531995	539
-	29580	465457	134
699	16140	394902	1887
-	30720	366989	67
-	29700	449286	404
-	33120	416841	-
-	19440	437956	674
-	10800	355659	67
-	7620	387795	-
-	9120	336192	-

APPENDIX 7: cont.

Week	Leeks	Lettuce	Maize	Onions	Spring onions	Peas	Potatoes	Pumpkins
537	224	779	141113	4161	-	15540	471225	67
538	-	520	125153	10542	-	18480	302099	-
539	-	-	87248	5350	-	8460	340312	-
540	71	-	86051	2030	-	8940	354629	-
541	1118	-	48279	2067	-	8160	261105	-
542	-	679	50540	12903	-	7380	283662	-
543	-	515	34779	10285	-	10200	243080	-
544	24	-	34580	2314	-	11160	292829	-
545	-	190	51471	4799	-	14580	297200	-
546	56	579	59719	5876	699	10860	252968	-
547	-	331	63973	9314	-	11460	297155	1078
548	47	454	43225	5315	-	4980	313326	202
549	-	-	100149	9641	-	5520	301996	270
550	112	260	67431	1530	280	9840	304262	809
551	280	-	55062	6255	489	6060	195494	539
552	1398	1119	43491	6459	-	7680	248745	-
553	-	649	10640	1114	-	3360	645881	-
TOTAL	12704	34439	3662820	242764	3286	560220	16621110	16038
Weekly mean	239.7	649.8	69,109.8	4580.5	62.00	10570.2	313605.9	302.6

APPENDIX 7 : cont.

Week	Rhubarb	Spinach	Sukumawiki	Tomatoes
501	-	-	62193	24025
502	-	-	86679	20765
503	-	-	85574	28070
504	58	59	114469	52713
505		59	109535	34524
506	-	117	82282	40196
507	-	-	117622	43425
508	-	-	95834	88314
509	-	-	98954	38695
510	-	-	75310	31915
511	-	-	75396	23960
512	29	-	109203	41241
513	-	235	75443	27904
514	-	-	90600	37032
515	29	-	106327	43130
516	-	-	132915	51345
517	-	587	103027	47956
518	-	59	102171	30056
519	-	59	153176	30739

Sweet Potatoes	Turnips	Arrow roots	Couliflower	Punda
281	-	5765	551	-
2623	-	5180	211	-
1218	-	2736	806	-
749	-	977	1653	-
1312	91	2737	1314	-
843	-	4299	1272	-
2436	-	5667	551	-
187	-	5472	509	-
1406	-	5862	593	-
2718	1816	4299	42	-
1218	-	3322	763	-
2623	-	7132	1779	-
4029	-	11139	847	-
2531	-	293	2204	-
4685	-	2541	1653	-
1031	-	1955	2628	-
2437	-	3908	2671	-
2342	-	2735	1908	-
2250	-	4594	2205	-

APPENDIX 7: cont.

Week	Rhubarb	Spinach	Sukumawiki	Tomatoes
520	-	59	125247	43195
521	29	-	159087	47337
522	-	822	156565	28071
523	-	-	110024	23179
524	-	59	139133	30838
525	-	-	128639	52487
526	-	-	128455	44919
527	234	470	120081	51023
528	-	-	160353	79868
529	58	-	117589	42668
530	-	-	145117	54771
531	-	176	123900	32567
532	88	-	141361	22298
533	117	-	124789	21356
534	116	59	137867	30121
535	116	-	126135	17734
536	-	352	116809	33739
537	-	-	109922	32960

Sweet Potatoes	Turnips	Arrow roots	Cauliflower	Punda
1124	-	2246	4239	-
937	-	10357	1780	-
1124	-	1367	4705	-
937	-	1172	5259	-
1687	-	684	7248	-
281	-	488	2968	-
-	-	1954	1823	-
375	-	2247	4877	-
-	-	6254	5681	-
-	-	3516	4239	-
-	-	2541	6191	-
7965	-	977	2755	-
1311	-	3029	1356	-
2530	-	2150	2078	115
-	-	1466	2034	77
187	-	1269	2374	-
1312	-	2150	892	-
-	-	-	935	-

APPENDIX 7: cont.

Week	Rhubarb	Spinach	Sukumawiki	Tomatoes	Sweet Potatoes	Turnips	Arrow roots	Cauliflower	Punda
538	29	-	152175	35826	-	-	391	679	-
539	-	-	90057	18582	656	-	3226	1696	-
540	-	-	132686	39738	-	-	5472	890	-
541	88	-	128993	27905	2812	-	879	933	-
542	-	-	83041	14507	375	-	2246	1610	-
543	-	-	120767	-	-	-	1172	1866	-
544	88	-	69622	36087	3000	-	5669	806	-
545	29	-	119961	41298	187	-	3811	1399	-
546	-	-	118850	29895	-	-	880	1358	-
547	29	-	127466	38175	281	-	1556	1781	-
548	-	-	119369	29144	-	-	2149	763	-
549	-	-	73720	14180	562	-	6351	297	-
550	58	-	100558	30188	-	-	196	636	-
551	-	-	114363	32075	1407	-	12800	500	-
552	-	-	82457	26602	-	-	391	805	-
553	-	-	42081	6617	-	-	195	170	-
TOTAL	1195	3172	5927949	1865383	65969	1907	172164	101833	192
Weekly mean	225	59.9	111848.1	35195.9	12444.7	36.0	3248.4	1921.4	3.6

APPENDIX 8: The total weekly quantities and percentages of produce traded at Wakulima Market n 1975, distributed on daily basis, kg

(%)

Day / Week	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.	Sun.	Total Quantity	Index
1.	100479 (12.19)		101137 (12.27)	158771 (19.26)	152885 (18.55)	204228 (24.79)	106643 (12.94)	824143 (100.00)	86.7
2.	118212 (11.99)	249147 (25.28)	118844 (12.06)	149884 (15.21)	134900 (13.69)	129291 (13.12)	85432 (8.67)	985710 (100.00)	103.7
3.	78382 (9.22)	162288 (19.09)	119568 (14.06)	141687 (16.67)	114996 (13.53)	114998 (13.53)	118233 (13.91)	850152 (100.00)	89.4
4.	204304 (18.00)	154811 (13.64)	166095 (14.63)	172770 (15.22)	122701 (10.81)	177158 (15.61)	137326 (12.10)	1135165 (100.00)	119.4
5.	130495 (11.79)	207453 (18.74)	141162 (12.75)	145332 (13.13)	156539 (14.14)	190627 (17.22)	135199 (12.22)	1106806 (100.00)	116.4
6.	143600 (12.63)	146700 (12.90)	149548 (.3.15)	184781 (16.25)	178799 (15.73)	155349 (13.66)	178108 (15.67)	113885 (100.00)	119.6
7.	173568 (15.14)	174797 (15.25)	154511 (13.48)	202543 (17.67)	142183 (12.41)	147445 (12.86)	151066 (13.18)	1146113 (100.00)	120.5
8.	144777 (13.00)	201938 (18.13)	166835 (14.98)	151685 (13.62)	128769 (11.56)	206195 (18.51)	113663 (10.20)	1113862 (100.00)	117.1
9.	154104 (15.21)	187986 (18.55)	90228 (8.90)	168113 (16.59)	120890 (11.90)	154923 (15.29)	137044 (13.52)	1013288 (100.00)	106.6

Source: Cess receipt books, City Council of Nairobi

APPENDIX 8 cont.

Week Day	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.	Sun.	Total Quantity	Index
10.	158157 (15.62)	223773 (22.09)	111936 (11.05)	137179 (13.59)	123238 (12.17)	148052 (14.62)	110448 (10.91)	1012783 (100.00)	106.5
11.	205686 (19.48)	156645 (14.84)	155647 (14.74)	51280 (4.86)	188361 (17.84)	206117 (19.53)	91912 (8.71)	1055648 (100.00)	111.0
12.	110659 (11.50)	117605 (12.22)	133843 (13.90)	137219 (14.25)	166787 (17.33)	120319 (12.50)	176174 (18.30)	962606 (100.00)	101.2
13.	71837 (8.95)	182176 (22.71)	122656 (15.29)	100736 (12.56)	83759 (10.44)	117156 (14.60)	123907 (15.45)	802227 (100.00)	84.4
14.	123970 (15.13)	178581 (21.80)	107051 (13.07)	104384 (12.74)	94111 (11.49)	109902 (13.41)	101351 (12.37)	819350 (100.00)	86.2
15.	128969 (15.85)	117126 (14.39)	99572 (12.24)	97524 (11.99)	110505 (13.58)	174441 (21.44)	85551 (10.51)	813688 (100.00)	85.6
16.	124921 (15.82)	141792 (17.96)	80484 (10.20)	878084 (11.12)	105453 (13.23)	104423 (18.31)	144549 (18.23)	789431 (100.00)	84.0
17.	108545 (11.62)	126591 (13.55)	125941 (13.48)	181254 (19.40)	170589 (18.26)	118835 (12.72)	102708 (10.99)	934463 (100.00)	98.3
18.	138786 (17.00)	135221 (16.57)	102763 (12.59)	100893 (12.36)	104264 (12.77)	130043 (15.93)	104196 (12.77)	816166 (100.00)	85.8
19.	140663 (15.11)	156401 (16.77)	121168 (12.99)	123996 (13.29)	130110 (13.95)	133014 (14.26)	127359 (13.56)	932709 (100.00)	98.1
20.	170073 (18.93)	112737 (12.55)	143802 (16.01)	122469 (13.63)	105085 (11.70)	80161 (8.92)	164009 (18.26)	898336 (100.00)	94.5

APPENDIX 8 cont.

Week Day	Mon.	Tue.	Wed.	Thur.	Fri.	Sat.	Sun.	Total Quantity	Index
21.	123259 (12.07)	141105 (13.82)	155963 (15.27)	168677 (16.52)	123884 (12.13)	163017 (15.96)	145364 (14.23)	1021269 (100.00)	107.4
22.	55660 (5.6)	168329 (17.19)	180463 (18.43)	154680 (15.80)	110287 (11.27)	161664 (16.51)	147953 (15.11)	979036 (100.00)	103.0
23.	152048 (13.81)	186596 (16.94)	146194 (13.28)	165877 (15.06)	141390 (12.84)	177350 (16.10)	131766 (11.97)	1101221 (100.00)	1159
24.	161967 (15.19)	143704 (13.48)	140749 (13.20)	125602 (11.78)	191104 (17.92)	176893 (16.59)	12625 (11.84)	1066278 (100.00)	112.1
25.	156908 (14.25)	131787 (11.97)	150898 (13.70)	151387 (13.75)	143299 (13.01)	205102 (18.63)	161791 (14.61)	110172 (100.00)	115.8
26.	133197 (14.19)	103720 (11.05)	197518 (21.04)	164029 (17.48)	117020 (12.47)	97146 (10.35)	126016 (13.43)	938646 (100.00	98.7
27.	206919 (16.78)	189953 (15.4)	123232 (9.99)	147337 (11.95)	143215 (11.61)	238344 (19.33)	184276 (14.94)	1233276 (100.00)	129.7
28.	244185 (18.95)	1690191 (13.12)	139655 (10.84)	147301 (11.43)	173824 (13.49)	215015 (16.68)	199818 (15.50)	1288889 (100.00)	135.5
29.	164735 (16.38)	145816 (14.50)	165075 (16.41)	102440 (10.19)	147550 (14.67)	96515 (9.60)	183588 (18.25)	1005719 (100.00)	105.8
30.	160603 (14.80)	175905 (16.21)	168520 (15.53)	174825 (16.11)	129277 (11.91)	161518 (14.89)	114448 (10.55)	1085096 (100.00)	114.1

APPENDIX 8 cont.

Week Day	Mon.	Tues.	Wed.	Thur.
31.	127465 (12.35)	146369 (14.18)	128959 (12.50)	167245 (16.21)
32.	129481 (12.65)	163872 (16.01)	162098 (15.83)	136116 (13.29)
33.	138466 (13.16)	171984 (16.34)	172565 (16.40)	152646 (14.50)
34.	99649 (10.33)	156268 (16.21)	158184 (16.41)	162672 (16.87)
35.	130332 (12.66)	142288 (13.82)	153553 (14.92)	158174 (15.37)
36.	105301 (10.52)	134255 (13.43)	156583 (15.65)	196381 (19.63)
37.	165622 (14.15)	132615 (11.33)	19540 (16.70)	197684 (16.89)
38.	133742 (13.84)	123487 (12.78)	127385 (13.18)	112235 (11.61)
39.	136008 (12.89)	128024 (12.14)	189679 (17.98)	157226 (14.90)
40.	112043 (11.70)	152451 (15.92)	129296 (13.50)	172987 (18.07)

Fri.	Sat.	Sun.	Total Quantity	Index
146658 (14.21)	153768 (14.90)	161496 (15.65)	1031960 (100.0)	108.5
162891 (15.91)	139201 (13.60)	130182 (12.72)	1023841 (100.00)	107.7
123549 (11.74)	166682 (15.84)	126568 (12.03)	1052460 (100.00)	110.7
145276 (15.07)	130323 (13.52)	111832 (11.60)	964204 (100.00)	101.4
190925 (18.55)	135259 (13.14)	118383 (11.54)	1029369 (100.00	108.2
111485 (11.14)	210827 (21.07)	85663 (8.56)	1000495 (100.00)	105.2
165589 (14.15)	163375 (13.96)	150259 (12.84)	1170604 (100.00)	123.1
181606 (18.79)	140146 (14.50)	148029 (15.31)	966630 (100.00)	106.6
209252 (19.83)	169406 (16.06)	65375 (6.20)	1054970 (100.00)	110.9
133339 (13.93)	124249 (12.98)	132969 (13.89)	957337 (100.00)	100.3

APPENDIX 8 cont.

Week Day	Mon.	Tues.	Wed.	Thur.
41.	136932 (18.22)	98149 (13.06)	95115 (12.66)	120081 (15.98)
42.	29637 (3.91)	98419 (12.99)	127358 (16.81)	135684 (17.91)
43.	126357 (14.98)	166437 (19.73)	79704 (9.45)	99375 (11.78)
44.	167717 (18.30)	140091 (15.29)	122906 (13.41)	106584 (11.63)
45.	92729 (9.70)	150638 (15.76)	154654 (16.18)	156377 (16.36)
46.	115871 (13.54)	153232 (17.90)	96871 (11.32)	128513 (15.02)
47.	92619 (10.55)	136567 (15.56)	188783 (21.50)	125840 (14.33)
48.	157393 (17.57)	102734 (11.47)	103297 (11.53)	105921 (11.83)
49.	87437 (10.22)	115578 (13.51)	212145 (24.81)	117872 (13.78)
50.	83552 (10.13)	191110 (23.18)	107322 (13.01)	123483 (14.97)

Fri.	Sat.	Sun.	Total Quantity	Index
109454 (14.57)	81231 (10.81)	110469 (14.70)	751431 (100.00)	79.0
157622 (20.81)	118036 (15.58)	90745 (11.98)	757501 (100.00)	79.7
125766 (14.91)	128144 (15.19)	117602 (13.94)	843385 (100.00)	88.7
133288 (14.55)	142938 (15.60)	102764 (11.22)	916288 (100.00)	96.4
120350 (12.59)	158437 (16.58)	122615 (12.83)	955800 (100.00)	100.5
103867 (12.14)	132217 (15.45)	125287 (14.64)	855858 (100.00)	90.0
134228 (15.29)	108299 (12.34)	91599 (10.43)	877935 (100.00)	92.3
91963 (10.27)	147195 (16.43)	187181 (20.90)	895684 (100.00)	94.2
132338 (15.47)	114473 (13.38)	75400 (8.82)	855237 (100.00)	89.9
40546 (4.92)	186572 (22.63)	92018 (11.16)	824603 (100.00)	86.7

APPENDIX 8 cont.

Week Day	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.	Sun.	Total Quantity	Index
51.	127985 (17.66)	91048 (12.56)	136976 (18.90)	119316 (16.46)	90277 (12.46)	79733 (11.00)	79331 (10.95)	724666 (100.00)	76.2
52.	128832 (18.65)	95746 (13.86)	186989 (27.07)	44040 (6.38)	35222 (5.10)	110842 (16.05)	88997 (12.89)	690668 (100.00)	72.6
53.	-	98043 (42.81)	130957 (57.19)	-	-	-	-	228997 (100.00)	24.1
TOTALS	6,914,838	7,187,654	7,397,894	7,218,916	6,901,259	7,656,593	6,527,991	50,400,056	5300
Mean	148900.7	138224.1	139582.9	138825.3	132716.5	147242.2	125538.3	135849	100

APPENDIX 9: Weekly mean quantities and prices of selected commodities traded at Wakulima Wholesale Market in 1975.

Product	Mean Quantity[1] kg		Mean Wholesale Price[2] Shs/sales unit	
	Q_t	Q_{t-1}	P_t	P_{t-1}
Potatoes	325761	323974	81.50	83.10
Maize	172983	178343	59.62	59.64
Carrots	46928	45243	79.94	80.00
Peas	10558	10444	120.49	120.27
Onions	4624	4536	39.64	39.50
Beans	684	697	83.67	83.50
Tomatoes	35178	36261	15.39	15.39
Bananas	101999	101185	10.24	10.32
Lemons	10938	11068	45.18	44.94
Mangoes	46848	47710	15.92	15.92
Passion F.	4226	4633	58.78	60.14
Pawpaws	3629	3709	50.20	50.38
Pineapples	3062	3114	17.73	17.32
Avocadoes	527	527	61.99	62.05
Brinjals	3749	3779	33.24	33.46
Capsicum	562	581	37.90	38.02
Lettuce	839	853	56.61	58.22
Chillies	1779	1288	52.93	42.99

Source: 1. Cess receipt books, Nairobi City Council
2. HCDA Market information.

APPENDIX 10: Model 1 $Q_t = a + b_1 P_t + e$

Commodity	a	b		Partial Cor.	R^a	DW
		value	t-value			
Beans	23.2 (4.5)[1]	0.001 (0.201)	2.02	- 0.27	0.27	1.002
Brinjals	119.9 (26.9)	-0.1 (0.1)	1.17	- 0.16	0.16	1.24
Cabbages	2531.0 (163.0)	-0.1 (0.02)	4.02	-0.49	0.49	1.55
Capsicums	1.3 (8.3)	0.004 (0.002)	2.01	0.27	0.27	1.02
Carrots	97.2 (26.9)	0.01 (0.003)	2.1	0.28	0.28	1.87
Chillies	53.8 (10.8)	-0.004 (0.002)	1.66	--0.23	0.23	1.57
Maize (green)	509.0 (71.8)	0.002 (0.01)	0.16	0.02	0.02	1.05
Onions	570.5 (164.7)	-0.1 (0.04)	1.21	-0.17	0.17	1.67
Peas	325.0 (34.1)	0.01 (0.003)	4.28	-0.51	0.51	0.93

1. Bracketed information in this and subsequent models are standard errors.

a. To obtain R^2, the value in this and subsequent models should be squared.

APPENDIX 10; cont.

Commodity	a	b	
		value	t-value
Potatoes	4623.3 (621.7)	-0.2 (0.1)	2.52
Tomatoes	1575.6 (782.3)	1.27 (0.5)	2.56
Bananas	9576.8 (3716.1)	-1.27 (2.01)	0.63
Lemons	113.1 (15.3)	0.0002 (0.002)	0.14
Mangoes	1174.1 (1249.5)	0.18 (0.76)	0.24
Passion fruit	220.6 (93.6)	-0.01 (2.02)	0.43
Pawpaws	187.8 (39.5)	-0.02 (0.01)	2.68
Pineapples	307.6 (238.0)	-0.02 (0.13)	0.18

	Partial Cor.	R	DW
	-0.33	0.33	1.02
	0.34	0.34	1.32
	-0.09	0.09	1.09
	-0.02	0.02	0.84
	0.03	0.03	0.22
	-0.06	0.06	0.65
	-0.35	0.35	1.29
	-0.03	0.03	0.97

APPENDIX 11: Model 2. $Q_t = a + b_2 P_{t-1} + e$

Commodity	a	b_2	
		value	t-value
Beans	20.0 (4.8)	0.001 (0.001)	1.24
Brinjals	90.3 (5 7)	-	-
Cabbages	2523.4 (1237.8)	0.1 (0.07)	4.17
Capsicums	17.1 (1.9)	-	-
Carrots	749.6 (146,2)	0.06 (0.02)	4.82
Chillies	60.1 (8.9)	-0.1 (0.002)	2.27
Lettuce	-	0.003 (0.0004)	4.92
Maize (green)	585.6 (63.4)	-0.01 (0.01)	0.88
Onions	1317.3 (703.7)	-0.08 (0.03)	2.14

Partial Cor.	R	D-W
-0.17	0.17	1.06
-	-	-
-0.55	0.55	1.66
-	-	-
-0.56	0.56	0.91
-0.31	0.31	1.50
0.57	-	-
-0.12	0.12	1.12
-0.29	0.29	1.63

APPENDIX 11: cont.

Commodity	a	b_2	
		value	t-value
Peas	344.8 (29.4)	-0.01 (0.002)	4.82
Potatoes	3247.5 (145.7)	-0.02 (0.01)	1.37
Tomatoes	1491.1 (679.4)	1.3 (0.43)	2.61
Bananas	11950.7 (3253.1)	-4.6 (3.1)	1.48
Lemons	111.7 (11.9)	-	-
Mangoes	1521.7 (326.1)	-	-
Passion fruit	68.7 (26.1)	-0.004 (0.004)	0.89
Pawpaws	183.0 (39.8)	-0.02	2.54
Pineapples	136.7 (146.3)	0.07 (0.1)	0.88

Partial Cor.	R	D-W
-0.56	0.56	0.91
-0.19	0.19	0.91
0.35	0.35	1.36
-0.20	0.20	1.07
-	0.04	0.83
-	0.001	0.21
-0.12	0.12	0.99
-0.33	0.34	1.29
0.12	0.12	1.03

APPENDIX 12: Model 3. $Q_t = a + b_3 Q_{t-1} + b_1 P_t + e$

Commodity	a	b_3		Partial Cor
		value	t-value	
Beans	13.3 (4.3)	0.44 (0.11)	3.4	0.44
Brinjals	64.6 (12.1)	0.28 (0.12)	2.05	0.14
Cabbages	1648.4 (327.1)	0.31 (0.12)	2.24	0.30
Capsicums	-	0.41 (0.10)	3.37	0.43
Carrots				
Chillies	26.9 (5.6)	0.30 (0.12)	2.19	0.30
Lettuce	14.6 (3.6)	0.14 (0.12)	1.01	0.14
Maize (green)	297.2 (60.7)	0.43 (0.11)	3.4	0.43
Onions	477.4 (150.3)	0.21 (0.12)	1.11	-0.16

	b_1		Partial Cor.	R	D-W
	value	t-value			
	0.001 (0.00004)	1.30	0.18	0.50	1.68
	-	-	-	0.28	1.66
	-0.06	3.16	-0.3	0.55	2.30
	0.003 (0.001)	3.66	0.46	0.05	-
	-	-	-	0.30	1.97
	-	-	-	0.14	1.06
	-	-	-	0.44	2.19
	-0.04 (0.03)	-	-	0.27	1.91

APPENDIX 12: Model 3 cont.

Commodity	a	b_3		Partial Cor.	b_1		Partial Cor.	R	D-W
		value	t value		value	t-value			
Peas	209.7 (44.0)	0.43 (0.10)	3.46	0.44	-0.01 (0.002)	2.29	-0.39	0.70	1.63
Potatoes	1316.8 (374.6)	0.58	4.19	0.51	-	-	-	0.51	1.81
Tomatoes	719.9 (714.6)	0.31 (0.12)	2.31	0.31	1.08	2.18	0.30	0.45	1.83
Bananas	5127.4 (3543.4)	0.48 (0.13)	3.77	0.46	-0.70 (1.78)	0.47	-0.07	0.48	2.11
Lemons	59.0 (50.1)	0.58 (0.12)	5.01	0.58	-0.003 (0.01)	0.26	-0.04	0.58	2.36
Mangoes	-429.7 (686.0)	0.87 0.08	15.18	0.89	0.45 0.41	0.77	0.11	0.85	1.69
Passion fruit	-4.9 (23.9)	0.42 (0.13)	3.31	0.42	0.01 (0.004)	1.36	0.19	0.46	2.06
Pawpaws	108.04 (45.6)	0.40 (0.13)	2.97	0.39	-0.01 (0.01	1.48	-0.2	0.51	2.06
Pineapples	-40.0 (221.8)	0.53 (0.13)	4.24	0.51	0.09 (0.12)	0.76	0.11	0.515	2.22

APPENDIX 13: Model 4. $Q_t = a + b_3 Q_{t-1} + b_2 P_{t-1} + e$

Commodity	a	b_3			b_2			R	D-W
		value	t-value	partial cor.	value	t value	partial cor.		
Beans	7.41 (2.4)	0.49	3.81	0.47	-	-	-	0.47	1.72
Brinjals	64.6 (14.3)	0.28 (0.1)	2.05	0.28	-	-	-	0.28	1.66
Cabbages	1844.3 (355.6)	0.26 (0.13)	3.08	0.28	-0.08 (0.01)	3.11	-0.41	0.60	2.12
Capsicums	22.5 (8.0)	0.49 (0.13)	3.78	0.48	-0.004 (0.002)	1.77	-0.25	0.49	1.99
Carrots	354.7 (165.9)	0.76 (0.1)	7.16	0.72	-0.03 (0.02)	1.74	-0.24	0.75	1.94
Chillies	47.4 (0.12)	0.25 (0.13)	1.87	0.26	-0.004 (0.004)	1.97	-0.27	0.39	1.93
Maize (green)	297.7 (7.5)	0.43 (0.12)	3.41	0.43	-	-	-	0.44	2.19
Onions	600.7 (177.2)	0.17 (0.14)	1.19	1.17	-0.07 (0.04)	1.85	-0.25	0.33	1.91

APPENDIX 13: Model 4. cont.

Commodity	a	b_3		
		value	t-value	partial cor.
Peas	189.2 (54.5)	0.45 (0.13)	3.49	-0.06
Potatoes				
Tomatoes	989.2 (817.9)	0.28 (0.14)	1.98	0.27
Bananas	6887.3 (3222.7)	0.47 (0.13)	3.68	0.46
Lemons	99.1 (49.4)	0.57 (0.11)	5.00	0.58
Mangoes	-	-	-	-
Passion fruit	64.3 (23.3)	0.48 (0.13)	3.76	0.47
Pawpaws	105.7 (44.5)	0.41 (0.13)	3.09	0.40
Pineapples	127.3 (38.2)	0.51 (0.12)	4.19	0.51

b_2			R	D-W
value	t value	partial cor.		
0.003 (0.002)	2.36	-0.32	0.67	1.64
0.97 (0.52)	1.87	0.26	0.43	1.78
-3.02 (2.8)	1.07	-0.15	0.50	2.08
-0.01 (0.01)	1.14	-0.16	0.59	2.33
0.92 (17.7)	17.7	0.93	-	-
-0.01 (0.004)	1.76	0.24	0.48	2.1
-0.01 (0.77)	1.46	0.20	0.50	2.10
-	-	-	0.50	2.16

APPENDIX 14: Model 5. $P_t = a + b\,Q_t + e$

Commodity	a	b	
		value	t-value
Beans	9334.7 (666.8)	-71.7 (35.4)	2.02
Brinjals	3614.0 (252.2)	-2.9 (2.5)	1.17
Cabbages	10745.0 (1273.0)	2.5 (8.6)	4.02
Capsicums	3467.0 (199.4)	17.2 (8.6)	2.01
Carrots	6098.2 (970.1)	12.1 (5.8)	2.10
Chillies	4775.5 (395.7)	-13.7 (8.2)	1.66
Maize (green)	6858.2 (1170.7)	0.34 (2.1)	0.16
Onions	4168.8 (208.3)	-5.7 (0.47)	1.21

	R	D-W
Parial cor.		
-0.27	0.27	0.65
-0.16	0.16	0.82
-0.49	0.49	0.86
0.27	0.27	1.99
0.28	0.28	0.60
-0.23	0.23	1.06
0.02	0.02	1.04
-0.17	0.17	0.66

APPENDIX 14: Model 5. cont.

Commodity	a	b_1			R	D-W
		value	t-value	partial cor.		
Peas	16282.5 (1287.9)	-24.1 (5.6)	4.28	-0.51	0.51	0.89
Potatoes	8395.6 (635.4)	-0.50 (0.2)	2.52	-0.33	0.33	0.46
Tomatoes	6517.4 (822.4)	-0.58 (0.25)	2.58	0.34	0.32	0.37
Bananas	1023.9 (21.5)	-	-	-	0.04	2.03
Lemons	4625.5	-	-	-	0.00	1.14
Mangoes	1591.6 (60.8)	-	-	-	0.00	1.77
Passion fruit	5878.4 (2.1)	-	-	-	0.00	1.57
Pawpaws	5518.4 (236)	-5.91 (2.2)	2.66	-0.35	0.35	1.15
Pineapples	1772.7	-	-	-	0.000	1.43

APPENDIX 15: Model 6*. $P_t = a + b\ Q_{t-1} + e$

Commodity	a	b			R	D-W
		value	t-value	partial cor.		
Cabbages	11703.5 (1299.1)	-2.9 (1.3)	4.63	-0.55	0.55	0.80
Carrots	8465.8 (567.9)	-1.22 (0.82)	1.48	-0.20	0.20	0.79
Maize (green)	8621.7 (1187.7)	-2.48 (1.17)	-1.18	-0.16	0.17	0.47
Onions	3964.4 (115.3)	-	-	0.11	0.11	0.62
Peas	17079.9 (1342.2)	-25.5 (5.5)	4.66	-0.55	0.55	0.61
Potatoes	14987.0 (4273.7)	-2.2 (1.3)	1.66	-0.23	0.23	2.11
Tomatoes	1340.4 (148.3)	0.05	1.43	0.20	0.20	0.64
Bananas	1095.0 (48.9)	0.01 (10.01)	1.62	0.22	0.22	2.02

* A number of commodities which gave low values of b for model15 were dropped out in this analysis.

APPENDIX 15: Model 6. cont.

Commodity	a	b_2			R	D-W
		b_2	t-value	Partial cor.		
Lemons	4736.9 (479.1)	7.62	2.23	0.30	0.32	0.85
Mangoes	1591.7 (60.1)	-	-	-	0.00	1.77
Passion fruit	5878.4 (172.1)	-	-	-	0.00	1.55
Pawpaws	5066.7 (235.9)	-6.81 (2.21)	3.09	-0.40	0.400	1.48
Pineapples	1835.6 (46.3)	-0.23	1.58	-0.20	0.22	1.44