Food and Nutrition Studies Programme

The Role of Urban Agriculture for Food Security in Low Income Areas in Nairobi

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THE ROLE OF URBAN AGRICULTURE FOR FOOD SECURITY IN LOW INCOME AREAS IN NAIROBI

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LIST OF ACRONYMS AND ABBREVIATIONS

ANP	Applied Nutrition Programme
ASC	African Studies Centre
CBS	Central Bureau of Statistics
CTA	Technical Centre for Agriculture and Rural Cooperation
CU	Consumer unit
ECSA	Food and Nutrition Cooperation Programme of East, Central and Southern Africa
FAO	Food and Agriculture Organisation
FNSP	Food and Nutrition Studies Programme
GDP	Gross Domestic Product
HA	Height-for-age
IDRC	International Development Research Centre
Kcal.	Kilocalories
Ksh.	Kenya shillings
NGOs	Non-Governmental Organisations
MPND	Ministry of Planning and National Development
UNDP	United Nations Development Programme
Unicef	United Nations Children's Fund
UNU	United Nations University
USUAP	Undugu Society Urban Agriculture Project
UA	Urban Agriculture
WA	Weight-for-age
WH	Weight-for-height
WHO	World Health Organisation

SUMMARY

This research, carried out in the City of Nairobi between June and October 1994, examined the role of urban agriculture in household food security among low income urban households. The objectives of the study were to determine the different strategies the low income population of Nairobi deployed in order to feed themselves and the extent to which the practicing of urban agriculture led to more food security and better nutritional condition in the households involved. These objectives were to be achieved by comparing food security aspects in low income households involved in urban agriculture with low income households not practicing urban agriculture. Two hypotheses were advanced, namely, (a) practicing urban agriculture leads to more food security and better nutritional status in low income urban households, and (b) low income urban households involved in urban agriculture and obtaining technical assistance from an organisation have even greater food security and better nutritional status compared to the rest of the low income households.

A total of 210 households were selected from two low income areas, locally referred to as slum areas, in the City of Nairobi. One low income area had households involved in an urban agriculture project organised by a non-governmental organisation, the Undugu Society Urban Agriculture Project (USUAP), while the other area (Korogocho) consisted of households either practicing urban agriculture on their own or not practicing any urban agriculture at all. With the use of an interviewer-administered questionnaire, and the female head in the household or her spouse (whenever the need arose) as the respondent, data were collected on the following: demography, household characteristics, agricultural activities in the urban areas, access to rural land, income-generating activities, household feeding patterns, food consumption, general food security and anthropometry and health of children aged six months to five years.

The results revealed that informal trading (mostly among the USUAP households) and the performance of casual labour (mostly in Korogocho) were major strategies employed by the urban poor for survival. Apart from urban agriculture, other strategies included informal manufacturing, domestic, social and personal services, as well as illegal trade and practices such as alcohol brewing and selling, prostitution and stealing. The estimated mean monetary monthly income for USUAP households was about one-and-a-half times higher than that of

the Korogocho groups. Generally, the USUAP households had better living conditions while the non-farmers faced the worst conditions.

Average kilocaloric intake in all groups was below 75% of the requirements. Although energy intake among the three groups was inadequate, differences were observed within the groups. Average daily energy intake per consumer unit per day among the Korogocho non-farmers was lower than that of the Korogocho farmers, while energy intake among both groups was substantially lower than that among the USUAP farmers. Since household food security is defined as the ability of the household to secure enough food to ensure adequate dietary intake for all its members, these results suggested that although energy intake was inadequate in all three groups, the USUAP farmers had a comparatively higher food security level than the Korogocho farmers, while the latter had a higher food security level than the non-farmers. Average protein intake seemed to be adequate for all the groups. However, the proportion of households consuming less than 75% of the recommended safe level was highest in the non-farming group, followed by the Korogocho farmers and lastly the USUAP farmers. These results tend to confirm the hypotheses as far as food security is concerned.

Nutritional status of children followed the same trend. Stunting and wasting were more prevalent among the non-farmers followed by the Korogocho farmers. There were no wasted children in the USUAP group and severely malnourished children were found only in the non-farming group.

In absolute terms the USUAP farmers purchased more of their energy and protein compared to the Korogocho groups. In addition, energy and protein consumed from own production and given as gifts was comparatively low for the USUAP farmers. This implies that the higher energy and protein intake among the USUAP farmers was solely caused by the high level of food purchases made possible by their higher level of cash income. Hence, their less unfavourable food and nutrition status was more related to their purchasing power than to urban agriculture. Their urban plots were much smaller and most of them planted crops such as maize which take long to mature and whose harvest is very modest on such small plots.

The higher energy intake level of the Korogocho farmers compared with the Korogocho non-farmers, however, can be related to the self-produced food by the former group.

Urban agriculture for this group is beneficial in two ways: directly because of a greater energy, intake and indirectly because it enables them to spend less money on food.

1 INTRODUCTION

Urbanisation is defined as the concentration of population in relatively permanent locations, within geographical boundaries, and is characterised by, among other things, crowding, a cash economy, a low level of physical activity in occupations, predominance of manufacturing, bureaucratic, and service activities, and some degree of organised public services (Viteri, 1988 as cited in von Braun *et al.*, 1993). Urbanisation has in the past been deemed as means and outcome of the process of modernisation and as an important phenomenon as far as regional development is concerned. However, the way in which urbanisation has taken place in developing countries over recent decades poses many new challenges. The unusually rapid growth of the urban population prompts concern about urban food security and nutrition policies both in terms of aggregate food supply and the ability of households to gain access to available food stocks (FAO, 1985).

The urban population depends on a high level of economic diversification; hence, employment and wages, along with prices and incomes play a central role in food security for urban populations. Low income urban households have to make their ends meet even in the midst of major fluctuations in these key variables (von Braun *et al.*, 1993). A majority of low income urban people have to create their own livelihood strategies of which food production within the city boundaries is one. It is the latter aspect that plays a central role in the study, the findings of which are presented in the report.

Urban agriculture is defined as any farming technique in an urban environment (Maxwell & Zziwa, 1992b). It involves food production (i.e. mainly food-crop cultivation and livestock production), forestry and flower production. However, this study focuses on the food component of urban agriculture.

In most cases, urban agriculture is an activity unplanned and uncontrolled by the state. Apart from farming in backyards (mainly by those with some unused land space on their compounds) it involves food production on idle and/or reserved land as a mode of

survival by many low income urban people. It is this latter type of urban agriculture that this study concerns itself. A third type of urban agriculture concerns farming (by those Memon & Lee-Smith (1993) term as traditional landowners or farmers) in (former) rural areas which became part of the urban area due to the expansion of the urban boundaries. As with the farming practices in backyards, this type of urban farming is not considered in the present study.

1.1 Statement of the Problem and Research Justification

Although there is a strong, positive relationship between urbanisation and economic development (Henderson, 1986 as quoted in von Braun *et al.,* 1993), African countries are substantially more urbanised than is probably justified by their level of economic development. The rapid process of urbanisation is taking place in the context of low, stagnant or even negative economic growth leading to minimal or no growth of employment opportunities and high levels of unemployment (World Bank, 1990). As a consequence, much of the urban growth has taken place in marginal areas of urban centres and has resulted in the build-up of spontaneous and shoddy dwellings (usually referred to as slums in Kenya) consisting of low income people (Khairuddin, 1984; Barba, 1990; Obudho, 1991; Drakakis-Smith, 1992). These are the areas that are referred to as low income in this study.

According to the 1993 World Bank Development Report, Kenya has slumped five places to rank 20th (using data for 1991) in the list of the world's poor states, with annual income per head dropping from 370 U.S dollars in 1980 to 340 U.S dollars (Redfern, 1993). The real Gross Domestic Product (GDP) growth rate fell from 5% in 1989 to 4.3% in 1990, a mere 2.2% in 1991 and 0.2% in 1993 (CBS, 1992 and 1994). Recent reports show that it improved to 3% in 1994 (CBS, 1995). Inflation increased significantly from 20% in 1991 to 28% in 1992, and 46% in 1993, the highest ever recorded since independence (CBS, 1993 and 1994). In addition, there has been lack of productive employment opportunities on farms and elsewhere in the face of rapid labour force growth. In 1991 the employment growth rate in the City of Nairobi grew by only 1.1 per cent while the total population growth rate was estimated at 4.9 percent (CBS, 1992). Unemployment has gone up in urban areas and real wages have gone down. Structural adjustment programmes such as exchange rate devaluation, trade liberalisation, financial liberalisation, public sector reform, tax reform, privatisation of public facilities, removal

of price subsidies and introduction of cost sharing programmes as pursued by the International Monetary Fund and the World Bank, have resulted in an escalation of prices of basic food stuffs and all kinds of other basic needs such as education and health services (World Resources Institute, 1992). With the combination of all these factors, the cost of living in Kenya has increased significantly implying an economic deprivation that creates difficulties, especially for the urban poor.

Slum population, the distinguishing manifestation of urban poverty, is growing faster than the established parts of the city. In the 1980s, the slum population of Nairobi was reportedly growing at 25-30% a year, compared with the city's total population growth rate of 6-8% a year (Hussain & Lunven, 1987, as in von Braun *et al.*, 1993). At the end of the 1980s, the incidence of poverty in the urban areas approached 30% (Kenya/Unicef, 1990). Kenya is thus facing the problem of ensuring food security for its urban population, not only in the face of the high population growth but also because the incidence of poverty has increased. The challenge is that as the urban population grows at high rates, it means that apart from social and health services, food marketing facilities and channels must also grow faster than overall population rates (FAO, 1985). For many developing countries, this is quite an expensive exercise and coupled with the impact of structural adjustment programmes, the result is high food prices, which leads to increased food insecurity, especially for the low income urban dwellers. Their food purchasing power is continually diminishing and problems of inadequate food in terms of quality and quantity are precipitated. It is no wonder that malnutrition is said to be often very intense in low income areas of cities. Studies have shown that the low income urban dwellers spend a very high proportion of their income on food and yet many of them are malnourished because their diets are poor, they live in poor sanitary environments and have high rates of infection (CBS, 1977; Khairuddin, 1984; Kakitahi, 1990; Maletnlema, 1990; Krhoda, 1991; Drakakis-Smith, 1992). Therefore, strategies that could lead to the enhancement of livelihood for the low income urban dwellers are crucial. They are the most disadvantaged of all groups with serious nutritional deficiencies, yet very few (if any) specific programmes in Kenya are targeted to improve their nutritional condition. Even famine relief efforts ignore them (Lamba, 1993).

Until recently, urban agriculture was believed to be an insignificant cultural practice carried over from the rural areas and was ignored by academics and planners. Recent research, however, suggests that urban agriculture is potentially a socio-economic survival and a livelihood-enhancing strategy for the low income urban dwellers (Sawio,

1993). Past studies on urban agriculture in Kenya have concentrated either on the urban agricultural activities of the urban population in general, i.e. in all segments of the urban population (Lee Smith *et al.*, 1987) or on urban producers only (Lado, 1990; Freeman, 1991). The latter studies focused on the characteristics of the producers (i.e. household and/or individual characteristics) and of the agricultural activities (i.e. types of crops, destination of the produce, land security, etc.). A more recent study in Kibera, another slum area in the City of Nairobi, by Dennery (1995) focused on factors affecting the decisions and actions of urban farmers. However, little is known about (a) the extent to which urban agriculture as a food source contributes to food availability, food consumption and nutritional status among low income urban populations, and (b) how the low income urban farmers compare with their non-farming counterparts in this respect. This study tries to bridge this gap and contributes to the existing knowledge concerning urban agriculture in at least four ways:

a) it focuses on poor households only;

b) it compares poor households engaged in urban agriculture with households not performing any type of agriculture within the city boundaries;

c) a group of households taking part in a special urban agriculture programme is included; and

d) it looks into agricultural urban-rural linkages, the access of the urban poor to rural food sources.

These characteristics make this study highly relevant for scientists, programmes oriented to food and nutrition and policy makers.

1.2 Research Objectives

The aim of this research was to assess the importance of urban agriculture in household food security for the urban poor. To be able to achieve this, information had to be collected that would give answers to the following questions.

a) What different food sources (direct or indirect) exist among the low income urban households in the City of Nairobi?

b) How do low income urban farmers compare with their non-farming counterparts in terms of household food security, food consumption and nutritional status?

c) Are those urban farmers who are assisted with acquiring land for farming as well as obtaining technical advice better off in terms of food security, food consumption and nutritional status?

The specific research objectives were to:
a) determine the different strategies the low income population of Nairobi deploy in order to feed itself;
b) determine the extent to which the practicing of urban agriculture leads to more food security and better nutritional conditions in the households involved. Sub-objectives for yje latter objective were to determine:

i) food consumption patterns in terms of food types, quantities and sources for low income households involved in the research;

ii) level of income generated from different sources and in how far this income is spent on food; and

iii) nutritional status of children aged 6-60 months in households involved in the study.

1.3 Research Hypotheses

The following two hypotheses were advanced:
a) Practicing urban agriculture leads to more food security and better nutritional conditions in low income urban households.
b) Low income households involved in urban agriculture and obtaining technical assistance have an even greater food security and better nutritional status compared to the rest of the low income households.

1.4 Outline of the Report

In Chapter 2 of this report, some background information and a literature review concerning urban agriculture in Nairobi is provided. Chapter 3 deals with the methodological aspects of the study. The results are presented in Chapter 4 and discussed in Chapter 5. The conclusions are found in Chapter 6. Finally, Chapter 7 contains some policy recommendations, which were formulated during a dissemination seminar held in Nairobi on October 9th, 1995, and in which academics, local and national government officials as well as representatives from non-governmental organisations working in the Nairobi slum areas took part.

2 URBAN AGRICULTURE IN NAIROBI

2.1 Food Sources of the Urban Poor

One particular characteristic that has an impact on the health and nutrition of anybody living in an urban environment is the ability to obtain an adequate monetary income. The low income urban populations of developing countries are faced with the problem of surviving in towns where income generation is difficult due to diminished employment rates, and urban living costs are relatively high. The families' ability to pay for food and health services is severely limited and unless the family can generate adequate funds, their dietary intake is limited not only in quantity but also in variety.

According to Drakakis-Smith (1992), the principal components in any urban food supply system for the poor are three-fold: urban subsistence, the petty commodity retail sector and the fully commercialised retail sector. The subsistence production emerges from house gardens of those fortunate to have some backyard gardens and stretches of illegal cultivation that are found along roads, railways, rivers, drains and in the peripheral areas of many cities in Africa. However, with rapid urban development, the amount of land available for subsistence food production keeps reducing and the poor are pushed into commercial food marketing systems.

In the present study, four different food sources for the urban poor are distinguished, notably urban agricultural activities, rural agricultural activities, purchases and food gifts. The study focuses on urban agriculture as a direct food source because it is hypothesised that most, if not all, urban low income dwellers do not have access to adequate rural land and/or adequately wage paying employment. In addition, food gifts are not popular in an urban setting especially now that the African society is tending away from attenuating care to extended families towards care being restricted only to the nuclear family.

2.2 Urban Agriculture

Even though den Hartog & van Staveren (1985) claim that (the element of) agriculture is negligible in modern cities, other literature reveal that it is increasingly a part of informal survival strategies of urban households in Africa since the 1980s (Sanyal, 1987; Lee Smith *et al.*, 1987; Tricaud, 1987; Rakodi, 1988; Freeman, 1991; Drakakis-Smith, 1992; Mlozi *et al.*, 1992; Gefu, 1992; Bibangambah, 1992; Maxwell & Zziwa, 1992a; Sawio, 1993). In most cases, it is an activity unplanned and uncontrolled by the state. Apart from farming in backyards (mainly by those with some unused land space on their compounds) it involves farming of idle and/or reserved land as a mode of survival by many poor urban people.

In a survey carried out among low income textile workers during the oil crisis of the 1980s in Nigeria it was found that 13% of the workers in Kano city against 30% of those in Kaduna city supplemented their wage income by agricultural work in the city. Land availability explained a large part of their different percentages (Andræ, 1992).

The potential contribution of urban agriculture to the food supply of the urban population, especially the urban poor who practice it as a survival strategy is revealed in various studies. Sachs & Silk (1990) cite several studies that highlight the importance of urban agriculture in several countries. For instance, urban agriculture has been used to improve vitamin A levels in diets in many Asian countries, as for example in Indonesia (Yeung, 1987), to obtain high yields from small urban gardening projects, as in the case of Argentina (Wade, 1987), and from livestock fed on the waste from the gardens.

In East and Central Africa, urban agriculture has been practiced since the late 1960s and early 1970s (Sawio, 1993). It has been officially recognised in Zambia but attempts to bar it surface from time to time (Sanyal, 1987; Rakodi, 1985 and 1988). Studies carried out in this region reveal that a majority of the farmers are women of low socio-economic class. Urban agriculture tends to be a livelihood strategy to supplement their inadequate incomes by producing food on any available land (Sanyal, 1987; Rakodi, 1988; Drakakis-Smith, 1992; Maxwell & Zziwa, 1992a). Crops produced include mainly vegetables and fruits plus some legumes and root crops (Mlozi, 1992 and Maxwell & Zziwa, 1992b). In addition, the element of livestock production can not be overlooked. In Tanzania, milk and poultry are reported to be produced in urban areas (Mlozi, 1992) while goats, rabbits

and poultry have also been reported in Kampala, Uganda (Maxwell & Zziwa, 1992b) and Harare (Drakakis-Smith, 1992).

2.3 Farming in the City of Nairobi

Nairobi, apart from being the capital city, is one of the eight provinces of Kenya. The 1989 census results show that its population increased from 828,000 persons in 1979 to 1,346,000, an inter-censal growth rate of 4.9% per annum. With 36%, Nairobi continues to have the largest share of the Kenyan urban population (CBS, 1991). An urban housing survey carried out in 1983 showed that out of 244,202 dwelling units in Nairobi, 55,194 (22.6%) were shanties representing the proportion of the urban poor households (CBS, 1986).

In 1985, a major study on urban agriculture was undertaken in six towns in Kenya. Out of 1576 households, 62% cultivated part of their food and 29% grew it in the urban areas while 17% kept livestock within the towns. The study revealed that about 30% of Nairobi households were engaged in agriculture within the city boundaries. Moreover, the large majority (82%) of these belonged to the low and very low income groups (Lee-Smith *et al.*, 1987).

Farming within Nairobi city is not a new phenomenon except that its intensity increased in the late 1980s. Food prices partly explained the rapid increase in the cultivation of open sites, backyards, river valleys, road and rail reserves in Nairobi and other urban areas in Kenya (Lee-Smith *et al.*, 1987). Freeman (1991) observed in 1987 that farmers growing crops had curved out irregular boundaries for their plots depending on who came first. Some operated on public land leased to them by 'land lords' at a rent as high as 1,000 Kenya shillings per annum (Gathuru, 1988). Another study revealed that the majority of such farmers are female, very poor, landless and subsistence dwellers while farming at the backyard of residential houses is a characteristic of a few middle and upper socio-economic groups as these can afford housing with unused land space (Lado, 1990).

Another survey carried out in Kiambu District[1], Kenya, indicated that such factors as family size, landlessness, unemployment, and the need to grow food crops for domestic

[1] Kiambu district borders Nairobi to the north.

consumption and for sale to obtain cash income motivated farmers (mainly females) to encroach on roadside reserves as a means of sustaining their livelihoods (Mutisya & Lado, 1991). It is worth noting here that the studies reveal problems of land tenure for the urban poor farmers. They 'illegally' farm on land that does not belong to them hence they are faced with problems of crop and/or livestock insecurity.

In Nairobi, an urban agriculture project exists (as part of a wider project on slum development) organised by the Undugu Society of Kenya for 'underprivileged' people living in the low income areas. The society started as a small parking boys (street boys) scheme launched in 1975/76. It has developed into an extensive low income development project. The Undugu Society Urban Agriculture Project (USUAP) started in 1988 and its aim was to provide household level food security for the urban poor. The initial targets area were three slum villages, Kitui-Pumwani, Kanuka and Kinyango on the eastern side of Nairobi, with a population of more than 45,000 persons. Plots with an area of 165 square metres (3x55 m) along the Nairobi river were allocated to 105 low income households through the local government. The individuals were given result demonstrations and assistance for a period of two years and left to continue on their own with only technical advice from the Society. The technologies offered are mainly bio-intensive including organic pesticide formulation (Personal communication, 1993). Crops grown were meant to be mainly vegetables for consumption and the surplus for sale.

According to the Nairobi City Council Public Health Prosecution Officer, crop farming is not allowed within the city boundaries because the crops encourage breeding of mosquitoes while tall crops, such as maize, are said to be hiding places for thugs (Personal communication, 1994). The farming that takes place within the city boundaries is illegal; hence, sometimes harassments occurred. According to the City of Nairobi General Nuisance By-Laws (1961), livestock is not allowed within the city boundaries as it causes a nuisance to other residents. The word nuisance refers to anything that interferes with the residents' peace, such as noise, foul smell, health hazard and disruption of other peoples rest. However, residents can keep animals as long as they obtain permission from the town clerk and keep them in a manner that the animals do not cause a disturbance of any kind to the residents (Personal communication, 1994). This implies that the livestock keeper must have enough (land) space, either on his compound or elsewhere, to ensure that the animals are securely kept. The urban poor are disadvantaged in that they are not in a position to have this kind of space. Nevertheless, it does not mean

that the poor of Nairobi do not keep livestock. Their goats and chicken can be seen roaming all over city markets during daytime searching for food and they retire to a safe place during the night. Sometimes, the animals are seized by the city council but this is not very common. It may seem as if the council has relaxed on this and thus recognises urban farming, but no policy or by-law has been passed in its favour. Hence the farming is not organised and harassment of informal farmers has been reported in several studies (Gathuru, 1988; Lado, 1990; Freeman, 1991).

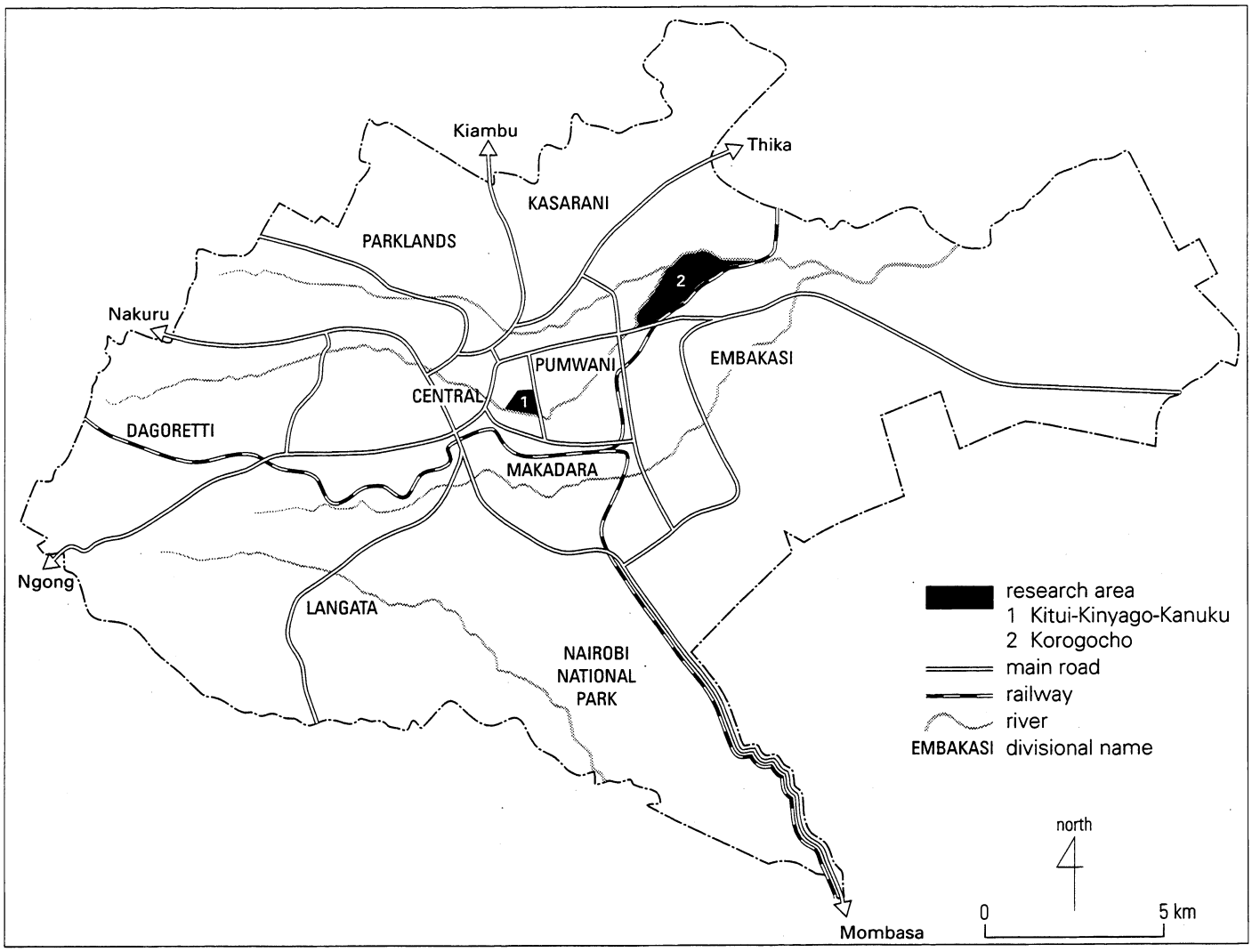
3 METHODOLOGY

3.1 Study Coverage

The study was conducted in the city of Nairobi and covered two cluster areas that had already been identified with poverty. The study areas included Korogocho in Kariobangi North Sub-location, Kitui in Pumwani Sub-location and Kanuku and Kinyago in Eastleigh Sub-location (See Map 1).

Korogocho area was intentionally selected from a list of already identified poor urban zones in the City of Nairobi. Its selection was based on the fact that there was an adequate number of households practicing urban agriculture. It served as a typical low income area without any agricultural influence from NGOs and its agricultural activities were purely self-initiated. The area is located about eight kilometres from the city centre, towards the north-east. It borders Mathare/Githurai river and Kirindundu Estate to the north, Kariobangi North Estate to the west, Nairobi river and Dandora Estate to the south and east. Korogocho is made up of eight villages with a population estimated at 75,000 in 1990 (World Vision International, 1990). Among the poor districts of Nairobi, Korogocho has been shown to have the lowest monthly income of Ksh. 1213 per household head (compared to the mean of Ksh. 1711 per household head) (Kenya/Unicef, 1990). Only 11% of the household heads in Korogocho were on permanent employment. The well-known Mathare slum had a better income of Ksh. 1967 per household head and one-quarter of the heads were on permanent employment.

The Kitui, Kanuku and Kinyago area is situated three kilometres from the city centre. It borders California Estate and Pumwani Hospital to the north, Nairobi river and Shauri Moyo Estate to the south, Eastleigh Estate to the east, Gorofani and Gikomba Market to the west and Starehe on the northwest. The combined villages were estimated to have



Map1 Nairobi *Source:* Matrix Development Consultants, 1993

10,000 households with more than 40,000 people. These villages are involved in the Undugu Society Urban Agriculture Project.

3.2 Sampling Method

Out of the eight villages in Korogocho, one (Ngomongo village) was found to be different in that housing structures were made of stone walls while the rest had mainly mud walls. This indicated that probably the village was occupied by people of different socio-economic status compared to the rest; hence, it was excluded from the study.

The Korogocho area provided two types of households namely low income urban households which did not practice urban agriculture and poor households with self-initiated urban agriculture. Three villages were randomly selected from the seven villages and all the households in these villages were listed. It was found that 30% of the households were urban farmers while 70% did not do any urban farming.

Considering the relatively short time span within which the project had to be completed, and the fact that these households were so close together that a very large sample would not make much difference, a total of 140 households were selected from Korogocho area where 70 households were randomly selected from each category. For the same reasons, 70 households involved in the USUAP were randomly selected. The total sample size was therefore 210 households.

Due to drop outs and unreliable responses the final number of households involved were 62 households from the USUAP, 48 Korogocho urban farmers and 67 Korogocho non-farmers. Quite a number of households in the Korogocho farming group had to be dropped afterwards because it was found that some of them had only a few poultry (less than 5) and no form of urban cultivation. The final sample size was therefore 177 households.

3.3 Data Collection

An interviewer-administered questionnaire was pre-tested in the selected low income areas but in a village not selected for the main study. Following this, changes on the questionnaire were made where necessary.

With the use of the questionnaire and the female head[2] in the household as the main respondent (the male household head was required to respond whenever necessary), data was collected on the following.

Demography: For each of the selected households, the household profile was recorded in terms of names of household members, sex, age, relation to household head, marital status, level of education, occupation and the migration history of the household head and his/her spouse.

Household characteristics: Types of materials used to construct the roof, walls and floor of the house were recorded. In addition, information was sought on the different types of items owned by members of the household.

Agricultural activities: Households were asked whether they had access to farming land, either in their rural homes or within the urban area and in how far the land was a food and/or income source to them. Land size, its location and ownership, types of crops planted the previous year and farming regularity, as well as types and numbers of livestock kept the previous year and their purposes were recorded. Information was sought on the types of agricultural inputs employed (i.e. seed, fertilizers, pesticides, livestock feeds and drugs), amount of produce harvested and its destination; if consumed, the period the household fed on the produce; amount sold and income generated over the previous year. Difficulties encountered in urban agriculture were also recorded.

Income-generating activities: All types of economic activities involving each household member were recorded. Financial investment on each activity, earnings and the proportion of earnings spent on food for the past one year were also recorded.

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[2] The female head was selected as the main respondent because she is usually responsible for food preparation in African households; hence, she is the best respondent especially in household food preparation and consumption issues.

Household feeding patterns: Frequencies and amounts of types of food prepared and consumed in the household for the previous seven days were recorded. Food consumed away from the household by individual household members was not considered. The eating/feeding behaviour in households may change sporadically depending on the time of the month (for example, at end-month when people have just earned a salary, the feeding behaviour may be different from any other time of the month) but this was taken care of by the fact that data collection took slightly over one month for each group of households.

General food security: General food security information such as the most important food sources, importance of urban agriculture to the household, when shortages were experienced, how shortages were coped with and whether urban agriculture had improved the food situation in the household was obtained from the respondents.

Nutritional status of children aged between 6 and 60 months: Weights and heights of under-five year old children, found in the sampled households, were measured and recorded. Measurements of mid-upper arm circumference of the children were also taken as a confirmatory measure of the nutritional status. Their ages were also established and recorded.

3.4 Data Analysis

Data was entered and cleaned using the Forms programme on Apple Macintosh and analysis was done using Systat 5.2.1. All variable frequencies were run and tabulated. Data on all foods consumed, harvested, purchased and received as gifts were translated into kilograms of edible portions and into kilocalories and grams of protein per consumer unit[3] using food composition tables for foods commonly eaten in East Africa, prepared by Technical Centre for Agriculture & Rural Development (CTA) and the Food and Nutrition Cooperation Programme of East, Central and Southern Africa (ECSA) (West, 1987). The children's weight, height and age data were converted into anthropometric indicators namely weight-for-age (WA), weight-for-height (WH) and height-for-age (HA).[4] The WHO (1983) reference values were used to determine the nutritional status of the children. HA values of less than 90% of the reference value were generally

[3] For a note on consumer units, see Appendix 2.
[4] See Appendix 3.

regarded as evidence of stunting while WH values below 80% of reference value were regarded as evidence of wasting. WA values of less than 80% of reference value were regarded as generally malnourished and those below 60% were regarded as severely malnourished.

4 RESULTS

4.1 Demographic Characteristics

Selected characteristics that constitute the composition of the study population are shown in Appendix 1, Table A1. Household members included the nuclear family of parents and children, and any other persons such as relatives, friends, and workers living and eating in the homestead who were considered by the respondent to be members of the household.

In Table 1 (next page), some selected household characteristics are presented. Households were somewhat larger in the two farming groups. The number of full-time household residents, sons and daughters followed the same trend. However, there were more children aged less than 5 years in the non-farming households. These findings seem to be in line with the data concerning the age of the household heads: the heads in the non-farming households had a younger average age. In other words, the non-farming households were less far in the 'family life cycle' which is also indicated by the average number of grandchildren (see Table A1).

Although in all groups studied most households were male-headed, female-headed households were more common among the farming households than among the non-farming households.

Results on educational level of household heads and their spouses are also presented in Table 1 and in Appendix 1, Table A2. In general, the highest average level of education was found among the Korogocho non-farmers as the large majority of them had at least upper primary school level of education. The female heads among the non-farmers were also better educated than the rest since 14% of them had attained post-primary school

Table 1 Selected household and household head characteristics by study group.

	Korogocho farmers (N=48)	Korogocho non-farmers (N=67)	USUAP farmers (N=62)
• mean household size*	6.9 (2.7)	5.6 (2.3)	6.8 (3.0)
• household members 6-60 months of age	1.3	1.7	1.0
• mean age of household head in years*	39 (11)	32 (7)	45 (17)
• % female-headed households	35	21	39
• % household heads with at least upper primary school level of education	69	85	48

* Standard deviations are put in parenthesis.
Source: Appendix 1, Tables A1 and A2.

education compared to 5% among the urban farming households. Even though the (few) heads with post-secondary school education were all found in the USUAP group, one-third of the heads in this group had received no education at all.

Table 2 presents a summary of the migration history of the household heads (see also Appendix 1, Table A3). The results indicate that USUAP farmers had stayed the longest in the city. Almost all USUAP and two-thirds of the Korogocho urban farmers' heads who were born elsewhere had been at least 15 years in Nairobi. The heads of the non-farming households, however, arrived generally later, one-third of them after 1986. To look for work was mentioned most frequently as the reason for moving to Nairobi. This applied to all groups.

Table 2 Migration characteristics of household heads by study group

	Korogocho farmers (N=48)	Korogocho non-farmers (N=67)	USUAP farmers (N=62)
• % household heads not born in Nairobi	89.6	77.6	72.6
• % household heads at least 15 years in Nairobi*	62.8	38.5	84.5
• % household heads who moved to Nairobi mainly to look for work*	58.1	61.5	44.4

* Only those not born in Nairobi.
Source: Appendix 1, Table A3.

Table 3 Household heads: ethnic background by study group (%)

	Korogocho farmers (N=48)	Korogocho non-farmers (N=67)	USUAP farmers (N=62)
• Kikuyu	47.9	28.4	90.3
• Luo	33.3	61.2	-
• Akamba	14.6	7.4	8.1
• Others	4.2	3.0	1.6
Total	100	100	100

In Table 3, the ethnic background of the household heads is presented. The Korogocho urban farmers' heads were mainly Kikuyu and Luo while the majority of the non-farmers were Luo. Almost all USUAP household heads were Kikuyu.

4.2 Living Conditions

4.2.1 Housing conditions

In both Korogocho and the USUAP areas, most households lived in closely built one-room houses. However, the housing structures were more crowded and appeared to be smaller in Korogocho than among the USUAP group. Selected characteristics that describe housing conditions included type of building materials for floors, roofs and walls, whether there was a different cooking place other than the room in which the household members lived and whether the household had access to a latrine. The basic results are presented in Appendix 2, Table A4.

In all groups, most houses had corrugated iron sheet roofs and mud floors. Walls in the USUAP villages were of better building material (one-third compared to less than 10% in Korogocho were cement plastered) and more often households had their own or communal latrine. Very few of the USUAP households had neither own nor communal latrine compared to one-quarter of the Korogocho households. For those who had access to a latrine, almost all latrines were either at home or within a ten minutes walk. Only seven households had their latrine situated within a distance of 11-30 minutes walk. Most households had no separate cooking place, be it that among the Korogocho farmers about one-quarter had.

4.2.2 Cooking fuel and drinking water

In all three groups, three-quarters of the households reported to use charcoal and/or kerosene as cooking fuel, while one-third of the households used fuelwood. Three Korogocho urban farming households reported to use wood waste or saw dust for cooking. Two others from the Korogocho non-farmers used a mixture of charcoal dust and soil while from the USUAP farmers one household used gas and another one used electricity for cooking. All types of fuel were reported to be purchased, apart from fuelwood, soil and charcoal dust which were collected. Charcoal and wood waste/dust were sometimes given free while fuelwood was sometimes purchased.

A rather positive finding was that all households in the three groups had access to and used tap water. The only draw-back was that few individuals in the settlements had metred tap water and it is from these individuals that other settlers bought their water, measured in 20 litre cans. These watering points were found within a walking distance of 5-10 minutes for all the households. Rain water was reported to be sometimes used, especially for laundering purposes so as to cut down water expenses.

4.2.3 Welfare level

Data on the mean number of household items owned per household by study group are shown in Appendix 1, Table A5. In general, such items as beds, mattresses, radios and bicycles were more common in the USUAP households than in the Korogocho households, especially compared with the non-farmers. For the USUAP farmers, the mean number of beds owned per household was equal to the mean number of mattresses owned while in Korogocho mattresses were fewer than beds, indicating that some individuals among the Korogocho households used beds without mattresses. Television, motorcycle, car and sewing machine were found among the USUAP farmers but not among the Korogocho households.

Based on the ownership of three of these items — bicycle, radio and sofa-set — a Welfare Index[5] was constructed, ranging from "low" to "high". The distribution of the households over the three index categories is shown in Figure 1. Almost all Korogocho non-farmers were found to be of low welfare level as opposed to about two-thirds and half of the Korogocho farmers and the USUAP farmers, respectively. The trend is such

[5] See Appendix 4 for the construction of the welfare index.

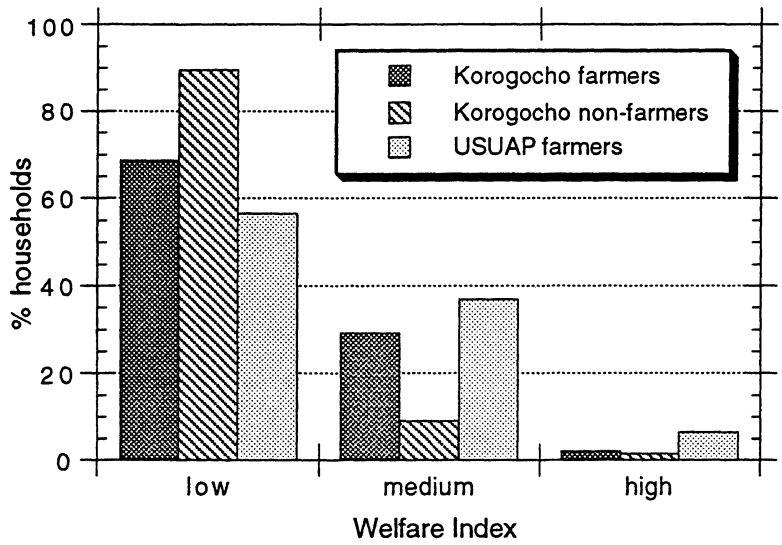

Figure 1
Welfare index by study group (%)
(Source: Appendix 4, Table A15)

that comparatively more farming households than non-farming households were in the medium and high welfare levels.

4.3 Income Generation

4.3.1 Sources of income

The present study distinguishes ten categories of income-generating activities in which the urban poor are engaged. Table 4 shows the percentages of all household members involved in each of these activities. In all groups, most household members were involved in informal trade and food selling. This consisted of street hawking and kiosk and market selling of raw and cooked foods, new and second hand clothes, other household items, collecting and selling of urban waste for recycling (e.g. waste paper, empty bottles, old plastics, shoe soles, etcetera) and shoe repair. In all groups, this was the most frequently mentioned income-generating activity, but more particularly so in the

Table 4 Income-generating activities in 1993 (all household members, %)

	Korogocho farmers (N=103)	Korogocho non-farmers (N=106)	USUAP farmers (N=104)
• Formal employment	14.6	6.0	24.2
• Casual labour	58.3	43.3	19.4
• Urban agriculture	39.6	-	16.1
• Rural agriculture	2.1	-	-
• Informal manufacturing	8.3	20.9	8.1
• Informal trade & food selling	60.4	44.8	85.5
• Informal transport	2.1	-	-
• Informal domestic, social and personal services	12.5	12.9	48.4
• Illegal trade and practices	10.4	23.9	1.6
• Others	6.3	6.0	4.8

USUAP households. Among the Korogocho groups, casual labour was the second important activity, while for the USUAP group informal domestic, social and personal services ranked second. This category involved activities like general housework, community leadership and laundering, among others.

Few household members had found employment in the formal sector, especially in the non-farmers' group. Most formally employed persons were from the USUAP group, although no more than one-quarter of the adult population. Informal manufacturing (carpentry, metal work and handicraft) and illegal trade and practices were more common among the non-farmers as compared to the farmers. Illegal trade and practices included activities like manufacture and selling of alcoholic brews, prostitution, street begging and stealing. Finally, urban farming was also mentioned as a source of income, especially in the Korogocho farming households. For the USUAP households, urban farming was quite marginal as an income source.

4.3.2 Household income

Using the monetary income generated from activities in which household members were involved in 1993, monthly household income could be estimated. It was not possible for some household members to correctly estimate what they had earned and those who were involved in illegal activities such as prostitution and stealing were not willing to give an estimation of the amount of money they earned from these activities. Hence, the figures

presented cannot be used conclusively but only as pointers to the direction of what monthly income was like in the different groups.

The kind of income-generating activities the household members were practicing were not very rewarding. The large majority (85%) of the individuals earning a cash income in 1993 had an average monthly income of less than Ksh. 3000. Only such activities as illegal alcohol brewing and selling, trading in used clothes and informal manufacturing seemed to be more promising, but few people had an income out of that. As a result, the average household income was also low. However, the groups differed substantially in this respect: with about Ksh. 2700, the average monthly income in the USUAP group was almost 40% higher than in the Korogocho groups (about Ksh. 2000). A look at the income distribution shows that the percentage of households with very low incomes was by far the highest among the non-farmers (Figure 2).

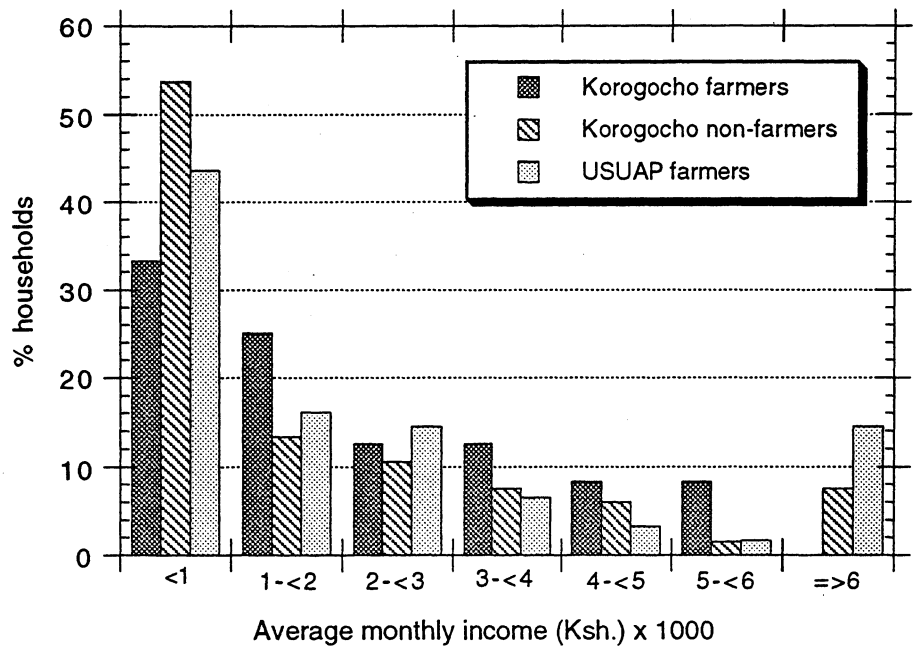

Figure 2
Average monthly household income by study group (%)

Table 5 Part of income (%) spent on food, by study group (%)

	Korogocho farmers (N=48)	Korogocho non-farmers (N=67)	USUAP farmers (N=62)
• <25%	20.8	20.9	17.7
• 25-< 50%	23.0	4.5	4.8
• 50- <75%	20.8	28.4	41.9
• =>75%	35.4	46.3	35.5
Total	100	100	100

In all groups, a substantial part of the household's income was spent on food. Among the non-farmers and, surprisingly, the USUAP farmers, three-quarters of the households spent at least 50% of the income earned on food purchases (Table 5). For the Korogocho farmers this proportion was somewhat lower.[6]

4.4 Urban Food Production

4.4.1 Access to urban farming land

The main results on urban farming plot locations and plot sizes are presented in Table 6 (the basic data are in Appendix 1, Table A6). Most Korogocho farmers had their plots located at Kasarani, more than three kilometres to the north-east. There was no farming land available in their residential area. As a result, the large majority of the farmers walked for more than half an hour (with almost half of them walking for more than one hour) to their plots. Most USUAP farmers, on the other hand, had their plots along the Nairobi river, adjacent to their area of residence; hence, almost all plots were at a distance of not more than 30 minutes walking, with two-thirds being at a distance of not more than ten minutes.

Most USUAP farmers' plots were located along the river side where the plots were allocated to them through a project. Locations for the Korogocho farmers were either a river side, a road side or in a residential estate Other plot locations included the railway

[6] In order to avoid the influence of different levels of average monthly incomes, a sub-analysis was done using only the very poor households, i.e. with an income of less than Ksh. 2500 per month (see Appendix 4). This did not lead, however, to significant differences in the proportion of income spent on food by group.

Table 6 Urban plots: Selected characteristics by study group

	Korogocho farmers	USUAP farmers
Location of plots	**N=58**	**N=99**
• % plots located at a river side	43.1	85.9
• % plots located at a road side	31.0	7.1
• % plots located at >30 minutes' walking	82.8	6.0
Urban land size holding (square metres)	**N=48**	**N=62**
• Average household holding	3197	1391
• % households with land size >2500	39	16

side and in an industrial area. Thus, some USUAP households cultivated other plots besides the ones allocated by the project.

On average, the total urban land holding by Korogocho farmers was more than twice that of USUAP farmers. Moreover, two-and-half as many of the Korogocho farmers held plots of more than 2500 square metres.

Except for one plot owned by a relative, all land cultivated by the USUAP farmers was reported to belong to the government. As for the Korogocho farmers, most of the cultivated land (two-thirds of the plots) was known to belong to the government while 10% belonged to a private owner who had not put the plot to use. Other kinds of ownership included relatives and the church, while some of the farmers did not know who the owners of the land on which they cultivated were. None of the farmers paid any monthly rent for the land except that three Korogocho plots had been 'bought' from previous cultivators at different prices ranging from Ksh. 200 to Ksh. 1,000.

Asked why they practiced urban agriculture, all urban farmers in both groups, except one in the Korogocho group, replied that they were in need of food. Another reason mentioned by about one-third of the farmers was that they needed income.

The non-farmers were asked why they did *not* practice urban agriculture. Nearly all of them (90%) said they had no access to farming land, one-third also mentioned lack of capital, while almost one-quarter mentioned other reasons such as lack of labour, busy

with other things, "urban agriculture not worthwhile", harassment, "had access to rural land", and health problems.

4.4.2 Crops cultivated and livestock reared

Data on the types of crops grown in 1993 are presented in Appendix 1, Table A7. The results show that crops cultivated by both the USUAP and the Korogocho farmers were similar, except for sorghum and finger millet which were grown only among the Korogocho farmers, and green grams and egg plants only among the USUAP farmers.

In both groups, most farmers planted maize and beans (Table 7). Kale was the third important type of crop in both areas. In Korogocho, cow peas, tomatoes, Irish potatoes and arrow root were the next in importance in that order, and for the USUAP farmers, bananas, amaranth, tomatoes, sweet potato, Irish potato and arrow root. Besides these, several other crops were cultivated, be it by few households only. Eight farmers cultivated napier grass, mainly to prevent soil erosion although it was also sold as fodder to those who had livestock. Bananas and arrow root were grown especially along the river to prevent flooding by taking in the excess water and at the same time serve as food for the household and/or generate a monetary income through sales.

Table 7 Major crops cultivated and harvested in 1993 by study group (%)

	Korogocho farmers (N=48)		USUAP farmers (N=62)	
Type of crop	% Planting	% Harvesting	% Planting	% Harvesting
Maize: Dry	70.8	47.9	96.8	40.3
Green	-	52.0	-	85.5
Beans: Dry	70.8	58.3	72.6	45.2
Green	-	29.2	-	41.9
Kales	35.4	35.4	72.6	72.6

Source: Appendix 1, Table A7

More than half (56%) of the Korogocho farmers and 40% of the USUAP households had some livestock in 1993. Table 8 shows the distribution of these households by the type of livestock reared. The table shows that larger livestock (cattle, sheep, goats) were more frequently found in Korogocho while smaller ones (chicken, ducks, rabbits, doves) were common in both areas. The numbers of small livestock were small. Eighty (Korogocho) to 95% (USUAP) of the farmers kept less than twenty animals.

Table 8 Type of Livestock kept in 1993 by study group (%)

	Korogocho farmers (N=27)	USUAP farmers (N=25)
• Cattle	7.4	-
• Sheep	11.1	8.0
• Goats	25.9	12.0
• Chicken	70.4	68.0
• Ducks	11.1	44.0
• Rabbits	11.1	4.0
• Doves	7.4	-

There were differences regarding the purposes of keeping animals. In both areas, the large animals were kept for both own consumption and selling. The majority in Korogocho with small livestock kept these animals also for both own consumption and selling, but most of the USUAP farmers reared small livestock only for own consumption.

4.4.3 Farming and livestock inputs

Labour inputs came mainly from the adult women in the households. In 80-85% of the households, they were responsible for the urban farming activities.

Data on the use of farming and livestock inputs in 1993 are presented in Tables 9 and 10, respectively. There was more use of chemical fertilizer and improved seeds/seedlings in Korogocho as compared to USUAP. In addition, there were more improved breeds and use of feed supplements in Korogocho compared to USUAP. On the other hand, use of natural pesticides was more widespread among the USUAP households.

Table 9 Type of farming inputs used in 1993 by study group (%)

	Korogocho farmers (N=48)	USUAP farmers (N=62)
• Chemical Fertilizer	29.3	1.6
• Manure	48.8	49.2
• Improved seeds/seedlings	51.2	29.5
• Local seed/seedlings	85.4	86.9
• Crop residue and/or urban waste	51.2	59.0
• Chemical pesticides	17.1	24.6
• Natural pesticides	31.7	55.4

Table 10 Type of livestock inputs used in 1993 by study group (%)

	Korogocho farmers (N=27)	USUAP farmers (N=25)
• Improved breeds	25.9	4.0
• Veterinary drugs	22.2	24.0
• Feed supplements	48.2	16.0
• Natural herbs	55.6	64.0
• Crop residue and/or urban waste	92.6	92.0
• Human medicine	11.1	-

4.4.4 Farming production and its destination

Data on the harvest and the destination of the cultivated crops are given in Appendix 1, Table A8. A substantial part of the cultivated maize, beans and garden peas was already harvested before the crops were fully mature (i.e. while the crops were still green), apparently to prevent theft. This applied especially to the USUAP farmers (see also Table 7).

Among the Korogocho farmers, more than half of the harvested crops were for at least 50% used for own consumption. Of only three crops (cow peas, pigeon peas and sugar cane), at least half of the harvest was sold, the quantities being very modest, however. For the USUAP farmers, only one-quarter of the crops were mainly used for home consumption, while four crops (dry garden peas, cow peas, sugar cane and napier grass) were primarily sold. On the whole, then, selling was more common among the USUAP farmers.

Of most harvested crops, small proportions were used to give out to relatives or other persons. Only of cabbage (both groups), tomatoes (Korogocho farmers) and egg plants (USUAP farmers), more substantial quantities were donated to others. Finally, the portions of the harvested crops used for seed were negligible, except beans among the Korogocho farmers.

4.4.5 Problems faced with urban agriculture

Table 11 shows the main problems farmers faced while practicing urban agriculture. Theft of crops was the major problem as it was mentioned by a large majority in both groups. The second important problem concerned pests and diseases, while lack of

Table 11 Problems faced with urban agriculture by study group (%)

	Korogocho farmers (N=48)	USUAP farmers (N=62)
• Theft of crops	81.3	93.5
• Pests/diseases	58.3	53.2
• Lack of capital	29.2	16.1
• Plots used for toilets	-	30.6

capital and use of the plots as toilets was the third important problem faced by the Korogocho and the USUAP farmers, respectively. Many other problems were mentioned but by small proportions of the farmers.

Most urban farmers had not experienced evictions from an urban plot during the previous five years. Only 10% of the USUAP and 27% of the Korogocho farmers reported evictions. In the USUAP area, most evictions had been effected by the Nairobi City Council (5 out of 6), while in Korogocho, most evictions had been effected by people cultivating neighbouring plots (5 out of 13), followed by the Nairobi City Council (4 out of 13) and legal land owners (3 out of 13). One case was evicted by the police and another because of flooding of the plots during rainy seasons.

4.5 Agricultural Urban-Rural Links

4.5.1 Access to rural land

More than half (56%) of all the study households had access to some rural land. This proportion was particularly high among the non-farmers (75%), followed by the Korogocho farmers (50%) and lastly the USUAP households (40%). Not surprisingly, the location of the land the respondents had access to, was related to the ethnic background as outlined in Table 3

Most Korogocho non-farming households with access to rural land had plots in Nyanza Province, the Korogocho farmers in Nyanza and Central, while most of the USUAP households had plots in Central and Eastern Provinces (See Appendix 1, Table A9). For all three groups, about half of the rural plots were owned by the Nairobi households and the other half by relatives or parents.

Table 12 presents some data concerning the site of the land in the rural areas. The average rural plot size for the USUAP households was about twice as high as for Korogocho farmers and non-farmers. About half of the rural plots belonging to the two Korogocho groups were one acre (4000 square metres) and smaller while about half of the USUAP households fell in the 1-5 acres category. Out of each eight non-farmers with access to rural land, one had access to at least five acres. However, in all three groups, most of the plots were smaller than 3 acres.

Table 12 Size of rural land by study group*

	Korogocho farmers (N=24)	Korogocho non-farmers (N=50)	USUAP farmers (N=25)
• Average (acres)	3.0	2.8	5.2
• Distribution (%)			
=<1	45.0	53.7	25.0
1 - 3	35.0	24.4	45.9
>3	20.0	22.9	29.1
Total	100	100	100

* Only households with access to rural land.

4.5.2 Use of rural land as a food source

In Table 13, data on how rural land is used are presented. Most of the Korogocho non-farmers used the rural plots neither as a food source nor as a source of income. On the other hand, almost two-thirds of Korogocho farmers and half of the USUAP farmers used the rural plots as a food source and/or a source of income.

Table 13 Use of rural land by study group (%)*

	Korogocho urban farmers (N=24)	Korogocho non-farmers. (N=50)	USUAP farmers (N=25)
• Food and/or income source	62.5	38.0	52.0
• Neither food nor income source	37.5	62.0	48.0
Total	100	100	100

* Only households with access to rural land.

4.6 Food Consumption

4.6.1 Type of foods consumed

Using the seven day food frequency recall method and estimating the food ingredients consumed for the seven days in kilograms, it was found that the diet for all the groups was more or less similar. In other words, the types of foods consumed in the three groups were the same. The only difference was the level of consumption in terms of frequencies and amounts.

Data on food ingredients consumed by study households during the seven days prior to the interview are presented in Appendix 1, Table A10. In Table 14, the per capita food consumption (in grams) is summarised in terms of food groups. The table shows that, in absolute terms, the farmers consumed more food than the non-farmers. Maize (particularly in the form of maize meal) was the most important ingredient as it was consumed by all households except two. If measured by weight, maize alone contributed up to three-quarters of the cereals and cereal products consumed by the Korogocho farmers and two-thirds in the USUAP households. Other cereal foods included wheat, rice, sorghum and millet. Of the starchy roots, Irish potato was the most popular one contributing up to more than half of all starchy roots consumed among the Korogocho farmers, three-quarters among the non-farmers and two-thirds in the USUAP households. Arrow root, sweet potato and cassava consumption was common among the farming groups and to a lesser extent also among the non-farmers.

Table 14 Per capita food consumed (grams per week), by food group and study group*

	Korogocho farmers (N=48)	Korogocho non-farmers (N=67)	USUAP farmers (N=62)
• Cereals and/or cereal products	1800	1600	1200
• Starchy roots	600	400	800
• Legumes and nuts	400	200	300
• Meats, fish and eggs	200	200	100
• Milk	400	200	500
• Sugar	200	200	200
• Fats and oils	80	60	90
• Vegetables	300	400	500
• Fruits	200	100	200
• Others	6	-	1
Total	4186	3360	3891

* Seven day recall.

In regard to the total legumes and nuts consumption, dry beans contributed by far the most, particularly among the USUAP farmers. Additional legumes consumed (more commonly among the farmers as compared to the non-farmers) included pigeon peas, cow peas and green grams.

Kales were the most popular leafy vegetable since it was consumed in about 80-90% of the studied households. Other vegetables included spinach, amaranth, cow pea leaves and other green leafy vegetables (such as *sageti* and *managu*), especially among the farmers, as well as cabbage, tomatoes and carrots.

Animal products like beef, fresh and dried fish were consumed by less than half of the households in all three groups. In only one-third of the non-farming households beef was eaten during the week before the interview. For those who did consume animal products, fish constituted the larger proportion of this food group among the Korogocho households (50% for the Korogocho farmers and 70% for the non-farmers) followed by beef. In the USUAP area, beef was more important (60% of all animal products).

4.6.2 Energy and Protein Intake

Since food ingredients differ in their nutrient composition (i.e. water content, energy content, mineral content, protein content and so on), they are converted into nutrient equivalents for assessment of the quantity of nutrients consumed. In addition, household nutrient requirements vary since households differ in size, sex and age distribution and other factors that influence their nutritional needs. Therefore, for analysis of survey findings, the household size is standardised. Thus in the following section of this chapter, the foods consumed are expressed in kilocalories and in grams of protein per consumer unit (see Appendix 2).

Intake levels

Table 15 provides a summary of the estimated daily energy and protein intake per consumer unit (using the seven day food frequency recall information).[7] Energy intake among the USUAP farmers was higher than that of the Korogocho farmers by 250 kcal

[7] To ensure that the results were not influenced by income outliers, analysis of energy and protein intake was also done using only the households with a monthly income of less than Ksh. 2500. The data was also analysed for only those households with a low welfare index (see Appendix 4). In both cases, the trend was the same; hence, the original results are presented.

per consumer unit. On the other hand, energy intake in the Korogocho farmers' households was higher than that of the non-farmers by 100 kcal per consumer unit.[8] Compared with an estimated energy requirement of 2960 kcal per consumer unit[9], the average energy intake in the three groups was less than 75% of the requirements; among the non-farmers even less than 60%.

An amount of 50 grams per consumer unit was used as the aggregate safe level of protein intake.[10] Table 15 shows that in all study groups, the average daily protein intake per consumer unit was higher than the safe level. However, the proportion of households with an intake of less that 75% of the safe level was highest among the non-farmers and lowest in the USUAP households.

Table 15 Daily energy and protein intake per consumer unit by study group

	Korogocho farmers (N=46)	Korogocho non-farmers (N=67)	USUAP farmers (N=61)
Average household size in cu's	4.8	3.7	4.3
Energy Intake (kcal/cu/day)			
• Average intake	1904	1804	2151
• % of requirements*	64.3	60.9	72.7
• % households with intake<75% of requirements	70	67	64
Protein intake (gr/cu/day)			
• Average intake	61.6	61.1	66.2
• % of recommendation*	123.2	122.2	132.4
• % households with intake<75% of recommendation	22	30	18

* Energy requirements are estimated at 2960 kcal/day per consumer unit. A safe level of protein intake is estimated at 50 grams per consumer unit per day. (for calculation, see Appendix 5).

[8] It has been shown that there is a negative relationship between household size and energy intake per consumer unit, i.e. the larger the household the lower the energy intake (see e.g. Niemeijer *et al.*, 1991, pp. 35-36). If the figures in Table 15 would be corrected for household size, however, the major result would be that the energy intake in the non-farmers households would be even lower.

[9] Based on WHO/FAO/UNU 1985,133.

[10] Based on WHO/FAO/UNU 1985 (see Appendix 5).

Sources of energy and protein intake

Three sources of energy and protein intake are distinguished: own production from urban agriculture, gifts from others and purchases. The percent contribution of each source is presented in Figure 3. It is quite clear that in all three groups most of the energy and protein are derived from purchased food. It implies that also among the USUAP households, own-produced food plays a marginal role in the households' energy intake. As for the Korogocho farmers, own production contributed about 14%. Protein intake showed the same picture.

Food sources as perceived by the respondents

Table 16 shows the most important food sources during the past three years, as reported by the respondents. On the basis of the seven day recall, one would have expected food purchases to be important for a bigger proportion and own production to be important for a smaller proportion of households than what is shown in the table (this applies especially to the USUAP farmers' group). This may be due to several factors (see Chapter 5), but it nevertheless indicates that urban food production was the second important food source among the urban farmers. For the non-farmers, food donations seem to be of some importance as a food source.

Table 16 "Most important food source during past three years" by study group (%)

	Korogocho farmers (N=48)	Korogocho non-farmers (N=67)	USUAP farmers (N=62)
• Purchased food	66.7	82.1	67.7
• Own urban production	25.0	-	16.1
• Donations/gifts	4.2	11.9	1.6
• Own rural production	-	6.0	3.2
• Both purchased & urban production	4.2	-	9.7
• Both rural and urban production	-	-	1.6
Total	100	100	100

Another indication of the importance of urban agriculture as a food source for the urban cultivators is the fact that half of the Korogocho urban farmers stated that at least 50% of the food consumed during the past three years was derived from their own production. This applied to 40% of the USUAP farmers.

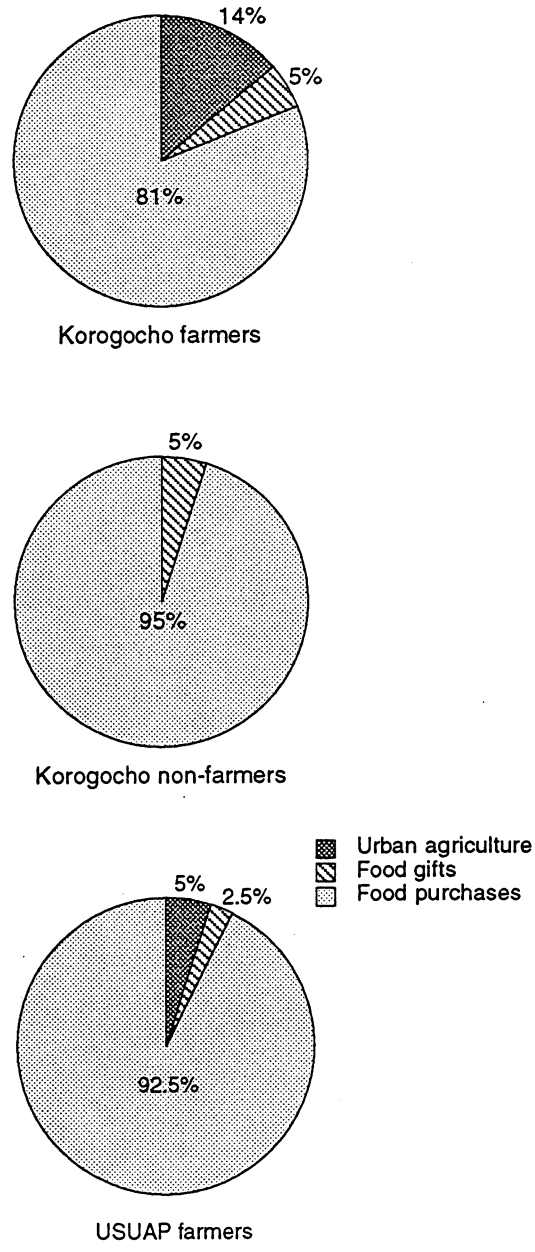

Figure 3
Proportion of energy from
different sources by study group

4.7 Food Security Issues

Several questions of a more general nature were asked in order to assess the food security situation in the households involved: the general food availability, periods of food shortages, strategies performed to cope with these shortages, and possible interventions.

Food availability

Table 17 shows the answers to the question whether the households always had enough food available. According to 70% of the respondents in the USUAP households, they had either always or most of the time enough to eat. The comparing figures of the Korogocho households are much lower (25-35%). Moreover, about 30% of these two groups had only now and then, or even never, sufficient food at their disposal.

Table 17 Food availability by study group (%)

	Korogocho farmers (N=48)	Korogocho non-farmers (N=67)	USUAP farmers (N=62)
• Always enough to eat	18.7	11.9	37.1
• Most of the time	16.7	13.4	33.9
• Half of the time	35.3	43.3	24.2
• Now and then	27.3	25.4	4.8
• Never	2.0	6.0	-
Total	100	100	100

Table 18 presents the period (in months) the households faced a food shortage in 1993. After what has been said so far, it is not surprising that the USUAP households experienced on average much less months of food shortage (2.2) than the Korogocho households (5.5). What is surprising, however, is that the non-farmers had a shorter period of food shortage (5.1 months) than the Korogocho farmers (5.9 months). This may be due to the very bad harvest in 1993. On the other hand, the table shows that almost one quarter of the non-farmers experienced a food shortage (nearly) the whole year through.

Coping with Food Shortages

Asked how they coped with food shortages, almost half of the USUAP farmers claimed that they never experienced drastic food shortages to warrant a change of behaviour while

Table 18 Months of food shortage in 1993 by study group (%)

	Korogocho farmers (N=48)	Korogocho non-farmers (N=67)	USUAP farmers (N=62)
• 0	8.3	10.5	41.9
• 1-3	18.8	34.3	27.5
• 4-6	33.4	26.9	25.8
• 7-9	25.0	6.0	3.2
• 10-12	14.6	22.4	1.6
Total	100	100	100

this proportion was smallest for the non-farmers (see Table 19). However, for those USUAP households who did face food problems, buying food on credit was the most important strategy. The Korogocho farmers employed a wide range of strategies. The non-farmers, however, had to rely mainly on such poverty-indicating strategies as going for donations and hawking.

Table 19 Strategies employed to cope with food shortages by study group (%)*

	Korogocho farmers (N=67)	Korogocho non farmers (N=62)	USUAP farmers (N=48)
• Always has enough food	10.4	7.5	44.6
• Buys on credit	16.7	16.4	27.4
• Goes for donations	18.8	41.8	12.9
• Hawking	12.5	23.9	11.3
• Opts for casual labour	20.8	20.9	11.3
• Intensifies urban farming	12.5	-	-
• Others	22.9	23.9	12.9

* Totals are more than 100 because more than one answer was possible.

On evaluating their food situation before and after joining USUAP, 70% of the USUAP farmers reported that participation in the programme meant an improvement of their food situation. More than one-quarter of them stated even that their food situation had "improved very much".

Table 20 shows the answers to the question what the respondents thought should be done to improve their food situation. For all groups, cash assistance to start a business and

Table 20 Answers to the question "What should be done to improve your food situation?", by study group (%)*

	Korogocho farmers (N=48)	Korogocho non farmers (N=67)	USUAP farmers (N=62)
• Nothing	12.5	6.0	27.4
• Cash for business	58.3	77.6	46.8
• Land to cultivate	35.4	54.2	32.3
• Employment	27.1	31.3	16.9
• Other answers	16.7	7.5	9.7

* Totals are more than 100 because more than one answer was possible.

provision of land to cultivate stand out. The percentage of respondents stating that employment should be available was surprisingly low in all groups. Perhaps this is a sign that the (very) poor in Nairobi do not consider this anymore as a realistic option (see also Chapter 5).

4.8 Nutritional Status

Anthropometric measurements of children aged between 6 and 60 months were expressed as weight-for-age (WA), height-for-age (HA) and weight-for-height (WH) (see Appendix 3). Cut-off points for WA, HA and WH were set at 80%, 90% and 80% of reference values, respectively. Severe malnutrition cut-off point was set at 60% of reference WA. The results are shown in Table 21. As far as the average values are concerned, the difference between the three groups were rather small.[11] However, the average WA and WH tended to be lower among the Korogocho non-farmers while average HA was higher among the USUAP farmers. The distribution shows that the proportion of underweight, wasted and stunted children was highest among the non-farmers and lowest among the USUAP households. There were no wasted children in the latter group.

Despite these general observations regarding the nutritional condition of the young children in the three study groups, it should be stressed that when looking only at the

[11] Usually the averages are influenced by the age distribution of the children. Childen aged 1-2 years usually tend to have a poor nutritional status compared to the rest due to the effect of weaning. For purposes of verification, the results were corrected for age distribution in each group but the trend was even more magnified. The original results were thus presented.

Table 21 Nutritional status of children aged 6-60 months by study group

	Korogocho farmers (N=35)	Korogocho non-farmers (N=84)	USUAP farmers (N=30)
Weight-for-Age (WA)			
• Average*	85.7 (14.5)	83.7 (14.9)	87.0 (11.2)
• % WA<80%	37	42	27
• % WA<60%	-	4.8	-
Weight-for-height (WH)			
• Average*	96.3 (10.6)	94.0 (11.0)	94.1 (7.8)
• % WH<80%	2.9	8.3	-
Height-for-Age (HA)			
• Average*	92.5 (5.5)	92.6 (7.8)	95.3 (4.9)
• % HA<90%	31	38	17

* Standard deviations enclosed in parentheses.

height-for-age data (i.e. at the long-term nutritional status of the children), the difference between the Korogocho farmers and the Korogocho non-farmers is negligible: average height-for-age is the same, while in both groups the prevalence of stunting is very high.

It is conspicuous that severe malnutrition, wasting and stunting were all more prevalent among the boys than the girls, at least in the group of non-farmers (sub-groups are too small in the other groups; see Appendix 1, Table A11).

5 DISCUSSION

5.1 Food Security

Food security is basically defined as access by all people at all times to the food required for a healthy life. At the household level, it is the ability of the household to secure enough food to ensure adequate dietary intake for all its members (von Braun *et al.*, 1993). Therefore, adequate dietary intake by all household members is an indicator of household food security.

Results on energy and protein intake revealed that on average, all three groups involved in the present study had inadequate energy intake. Average kilocaloric intake was below 75% of the requirements. Average protein intake, on the other hand, seemed to be adequate for all the groups although as much as 30% of the households among the non-farmers had an intake of less than 75% of the recommended safe level. These results are closely in line with what has been found in other cities in developing countries. Alarcon & Rivera (1993), studying the impact of changes in purchasing power on food consumption of an urban population in Guatemala City, found that the mean energy intake for households with lowest income ranged between 70% and 78% of the recommendation while protein intake ranged between 92% and 106% of the recommendation, although 39% to 54% of the households did not meet the recommended protein intakes. Atuanya (1987), when carrying out a dietary survey of the urban poor in Benin City, Nigeria, found that, on average, daily individual calorie intake was only about 75% of the requirement. It should be noted that Atuanya included also what was consumed outside the household while the present study only looked at what was prepared within the household. Average protein intake in Atuanya's study was less than the recommended safe level of 50 grams.

Although energy intake among all three groups is inadequate, differences were observed between the groups. Average daily energy intake per consumer unit per day for the non-farmers was 100 kcal less than that of the Korogocho farmers, and average energy intake for the Korogocho farmers was 250 kcal less than that of the USUAP farmers. Since household food security is defined as the ability of the household to secure enough food to ensure adequate dietary intake for all its members, these results suggest that comparatively, the USUAP farmers had a higher food security level than the Korogocho farmers while the Korogocho farmers had a higher food security level than the non-farmers.

Average protein intake for the three groups was above the recommended safe level. This finding should not be a surprise since other studies, especially among the rural poor, have shown that despite low caloric intakes among poor households, average protein intakes were higher than the recommended safe level (e.g. Foeken & Tellegen, 1992; Hoorweg *et al.*, 1991). The proportion of households consuming less than 75% of the recommended safe level was highest in the non-farming group, followed by the Korogocho farmers and lastly the USUAP farmers.

These results confirm the first hypothesis of the present study, i.e. poor households involved in urban agriculture have a higher level of food security than non-farmers, and poor households involved in urban agriculture and obtaining technical assistance from an organisation have an even higher level of food security compared to their counterparts. One should bear in mind, however, that the findings apply only to the short-term period over which food intake data were collected.

From the results on food security in general, which give an indication of the food security situation in the long-term, the above hypothesis was also confirmed. Almost three-quarters of the households in the USUAP group, more than one-third in the Korogocho farming group and about one-quarter in the non-farming group claimed to have enough food in the household either always or for most of the time. In fact, the proportion of households in the USUAP group not requiring anything to be done for them in order to improve their food situation (27%) was more than twice that in the Korogocho farming group and more than four times the proportion in the non-farming group. Results on strategies employed to cope with food shortages revealed that many USUAP farmers never experienced drastic food shortages to warrant a change of behaviour while this proportion was smallest for the non-farmers. In fact, many of the non-farmers went for food donations in case of food shortages. Buying food on credit was more common

among the USUAP farmers, implying that they are optimistic about obtaining some monetary income later on to pay the debts. Opting for casual labour was more common among the Korogocho farmers.

In first instance it was surprising that the proportion of households facing more than six months of food shortage in 1993 was somewhat higher among the Korogocho farmers than among the non-farmers. However, general discussions with the Korogocho farmers revealed that 1993 was rather different compared to other years. Most Korogocho farmers are reliant on rainfall for their crops. The year 1993 and many parts of the year in which the survey was carried out (1994) had experienced long spells of dry weather such that most of the crops failed. It is likely that their responses were influenced by the experiences of the droughts and the fact that they lost most, if not all, they had invested in urban agriculture that year.

5.2 Nutritional Status

The average weight-for-age (WA), weight-for-height (WH) and height-for-age (HA) in the three groups were above the cut-off points. However, there appeared to be a trend similar to that in food consumption. Average WA and WH among the Korogocho non-farmers were lower and average HA among the USUAP farmers was higher.

The differences between the groups were more pronounced when the proportions of malnourished, wasted and stunted children were considered. Using any of these indicators showed that the nutritional status of the children in the non-farming households was the worst and in the USUAP group the best. And although the difference between the proportion of underweight children among Korogocho farmers and among non-farmers was small, the fact that 5% of the children among the non-farmers were severely malnourished gave the farmers a better stand. Again, these results tend to confirm the hypothesis that in terms of nutritional status poor households involved in urban agriculture are better off than non-farmers and that urban poor households involved in urban agriculture and obtaining technical assistance from an organisation are "best off".

The observed prevalence of malnutrition is within the range that was revealed by several sample surveys conducted in 1990-1992 in low income areas of Nairobi. These surveys showed that the prevalence of wasting among children aged six to sixty months ranged

between 5% and 13% (3% to 9% in the present study) and stunting between 10% and 57% (17% to 38% in the present study). Moreover, the level of wasting among the Korogocho farmers was the same as that estimated for Kawangware (8.3%, another low income area to the south-west of Nairobi) in 1992 (Kenya/Unicef, 1992).

5.3 Urban Agriculture and Food Security

Results on reasons for practicing urban agriculture imply that urban poor households produced mainly for home consumption since most farmers reported to have taken to urban agriculture because they needed food, while about one-third needed both food and income. These two aspects for an urban dweller are interrelated in that if people produce their own food they can spend less income on food and use it for other needs. In addition, the surplus of the produced food can be sold to generate income. It is shown in this study that, despite having larger household sizes, the Korogocho farmers spent less on food purchases than the non-farmers. This seems to support what Dennery (1995) found in Kibera (Nairobi) where she hypothesises that households with relatively large food needs try to increase food supply (by own production), thus decreasing food costs. Most of the food harvested by the urban cultivators was consumed within the household. This again is similar to Dennery's (1995) finding that Kibera producers do not grow food for sale and only the surplus is sold or sales are made when there is a crucial need for cash.

Purchased food is by far the most important food source, not only for the non-farmers but also for the urban farmers since most of the consumed energy and protein was purchased. Nevertheless, differences between the study groups regarding the proportion of purchased energy and protein consumed could be observed. Energy intake among the Korogocho farmers was 100 kcal per consumer unit per day higher than among the non-farmers, despite lower purchases in the former group. Since the absolute level of food given to them by others was the same, the conclusion seems justified that this higher energy intake is the result of the Korogocho farmers' own production. The same applies to the intake of proteins. In other words, for the Korogocho farmers, urban agriculture appears to be beneficial in two ways: directly because of a greater energy and protein intake and indirectly because it enables them to spend less money on food (at least during a given period of the year since the data collected apply to only a short time span).

The higher energy (250 kcal per consumer unit per day) and protein intake in the USUAP households compared with Korogocho farmers cannot be explained in the same way. The absolute levels of own-produced energy and proteins in the former group were much lower, which is related to the fact that their plots were much smaller. The conclusion is that the higher energy and protein consumption among the USUAP farmers was solely caused by the fact that they purchased more food.

Although most USUAP farmers were quite positive about the impact of the urban agriculture programme on their food situation, it is rather out of line in the face of their very low level of food self-sufficiency as contributed by urban agriculture. One aspect to be noted is that the urban agriculture programme also incorporates other income generating activities such as soap and candle making. The programme also comes hand in hand with the shelter improvement project within the Undugu Society and this probably earns the society a good name. It is possible that the respondents were influenced by the other activities that the Society has introduced in the low income area. However, not all households were so positive about the urban agriculture programme. They complained of biased selection of who benefited from the other components of the project.

5.4 Urban Farming Practices

Access to urban farming land

While many poor urban dwellers would like to involve themselves in urban agriculture, they face certain constraints which are not within their control. One most important necessity for urban agriculture is the farmers' access to urban land. Size and location of the land in terms of convenience and water availability are also important. Urban food production is an endeavour contrasting with the current mode of most city augmentations in developing countries. Cities in the Third World are perceived as solidly built up with no farming space to spare and the use of a land area inside or at the edge of a city for agricultural purposes is seen as an interim activity. As such, access to farming land in the city, especially for the urban poor is a major constraint. It is no wonder that more than 80% of the non-farmers did not practice urban agriculture because they did not have access to farming land. Studies carried out in Kenya show that most poor urban farmers have no security of land tenure as they farm on land that does not belong to them and once the owner of the land is ready to put up buildings, sometimes even the crops are

destroyed and the farmer looses everything (Gathuru, 1988; Freeman, 1991; Dennery, 1995).

About one-third of the farmers held more than one plot. Dennery (1995) reports that having more than one plot is common for the long established Kibera producer as form of insurance against eviction. In other words, if the owner of one plot decides to develop it, the farmer can continue cultivating the other plots since all plots cannot be developed at the same time. Whether this is the same case with the Korogocho and USUAP farmers, one cannot tell since this was not investigated. However, the researcher's impression is that holding more than one plot is primarily for more production.

Land cultivated by the Korogocho urban farmers is further from the city centre (towards the outskirts of the city) than that cultivated by the USUAP farmers. In addition, the total urban land holding by Korogocho farmers was on average about three times that of the USUAP farmers. This implies that bigger pieces of free land are found further away from the city centre and one has to move to city fringes to get access to a sizeable piece of farming land or, alternatively, hold many small plots in different areas of the city. In any case, the plot sizes are too small, especially among the USUAP farmers, to secure an amount of food for a reasonably long period. Apart from a few crops such as arrow root, kales, spinach and other leafy green vegetables, most of the produce was consumed within eight to twelve weeks.

Labour

In general, urban agriculture involved more women than men. This is in line with Lee-Smith *et al.*'s (1987) finding although, in their study, the extent to which women were involved was less than in the present study. It should be noted that in their study, the Nairobi sample also included households from the middle and high income strata, although the large majority (82%) were in the low and very low income groups. The former income groups could afford to hire labour and since the majority of hired labour were men, this influenced the outlook of who was involved in urban agriculture with regards to sex.

Crops grown and livestock kept

Like in Lee-Smith *et al.*'s (1987) study, crops grown were predominantly the basic food-stuffs such as maize and beans. An important vegetable concerned kale (*sukuma wiki)* which are usually consumed together with *ugali*, a thick paste made from maize meal.

Potatoes and arrow root also appear to be important root crops. Most of the produce was consumed at home; hence, urban agriculture may be said to be mainly for own consumption. This, also, is in line with Lee-Smith *et al.*'s (1987) finding that 90% of Nairobi urban farmers consumed the crops they produced, and only 21% sold any part of their produce.

Livestock rearing did not appear to be very important. Only a few individuals had some cattle, sheep and goats, poultry and rabbits, mainly for home consumption. The major hindrance was the lack of space for keeping animals. Housing units were so squeesed together that there was no space for even children to play, leave alone keeping livestock. In Lee-Smith *et al.*'s (1987) study, livestock rearing also did not appear to be important. They found that only 7% of the Nairobi households reared some livestock and the major constraint was also lack of access to land space.

Inputs and problems faced

Despite the urban agriculture project launched by the Undugu Society, the use of modern inputs among the USUAP farmers was less common than among the Korogocho farmers. There was more use of chemical fertilizer, improved seeds/seedlings, improved breeds and use of feed supplements in Korogocho. Use of natural pesticides was more common in the USUAP group. This may be because the Undugu Society advocates a bio-intensive kind of agriculture (i.e. where urban waste is recycled and used as fertilizer, pesticides and even as seedlings). Another reason may be, as Lee-Smith *et al.* (1987) point out, that many urban plots are too small to justify use of modern inputs. In their study, most of the farmers who used inputs tended to have larger plots than those who did not. The same tendency appears in the present study since the Korogocho farmers tended to have bigger plots than the USUAP farmers.

The major problem faced by urban farmers was theft. General discussions revealed that a substantial proportion of the maize and beans were harvested and consumed or sold before they were fully mature to avoid loss through theft. Thus, theft is very important in that it forces the cultivators to harvest crops with low caloric value. This finding contrasted what Lee-Smith *et al.* (1987) found. In their study, the most important problem was that the crops were destroyed by animals. The explanation for this may be that at the time (mid-1980s) Lee-Smith and her colleagues carried out their study, the economic situation in Kenya was stable and better. The recent declining economic situation in Kenya may have escalated the problem of poverty and hunger in the urban

areas such that the problem of theft has out-grown the problem of animals destroying the crops. Eviction, like in Lee-Smith *et al.*'s (1987) study, did not appear to be a major problem.

5.5 Access to Rural Land

More Korogocho non-farmers compared to the Korogocho and USUAP farmers claimed to have access to rural land. Nevertheless, the rural land was neither a food nor an income source for many households, especially among the non-farmers. The land was either in the hands of relatives who farmed it for themselves or was left idle. These results are comparable to Andræ's (1992) who found that 80-90% of low income Nigerian textile workers who had access to rural land used it neither as a food source nor as an income source and the land was mainly in the hands of relatives who farmed it. The explanation for this was not established but it is likely that distance and land size have a bearing on it. The land may be too small to live on and/or very far such that it may not be profitable to travel that far to cultivate. This is especially applicable to the two Korogocho groups in which most of the households had their plots far away (Nyanza Province) and average rural land size was about half that of the USUAP group. In their study, Lee-Smith *et al.* (1987) found that 60% of Nairobi households did not grow food on the land they had access to because the land was far away at home. Another possibility could be that the land is still in the hands of the parents and not legally sub-divided among the sons (and, even if it were sub-divided, it would still be too small since in Kenya rural families are known to be large).

5.6 Household Welfare

Several data pointed to a higher welfare level in the USUAP households than the Korogocho groups. Results on housing quality revealed a slightly better quality among the USUAP farmers compared to the other two groups. Walls were of better building material, more often households had their own or communal latrine. Housing conditions for the two Korogocho groups were more or less the same. General discussions with some of the respondents revealed that most Korogocho dwellers rented their rooms from landlords who did not bother to improve their conditions. On the other hand, many USUAP households owned the shelters in which they lived and, with the help of the

Undugu Society, they improved them from time to time. In addition, results on cooking fuel indicated a situation where the USUAP households were more modernised (gas and electricity reported), while particularly the non-farmers showed signs of more poverty (e.g. use of charcoal dust and soil reported).

The differences in welfare level seem also to be reflected in the type of employment of the head of the household as well as other household members. Formally employed household members were more found among the USUAP households and least among the non-farmers. The same applied to informal trading and food kiosks. However, the trend is the opposite as far as illegal trade and practices and casual labour were concerned. Formal employment implies a regular cash income for the household and there is the surety of a cash income at the end of the month. Although, on the other hand, trading is an uncertain venture, legal trade is a much more certain income-generating activity than illegal trade as the risks involved are fewer. Hence, it is not surprising that when asked to say what should be done to improve their food situation, most respondents wanted money to start a business or land to cultivate. Those asking for employment were few in all three groups and it appears like they understand that formal employment opportunities are scarce and the most probable ways of improving their food situation is other legal means of obtaining cash income and/or self-production of food.

Korogocho farmers and non-farmers seemed to differ less as far as cash income is concerned but they did differ concerning material welfare level (items owned). The Metropolitan Household Survey (1989) showed Korogocho to be the poorest among the poor areas of Nairobi in terms of monthly income of the household head (Kenya/Unicef, 1990). This seems to be reflected in the household items owned but differences are also evident within the area as the farmers seem to own more than the non-farmers, thus strengthening the hypothesis that the non-farmers are poorer. This may partly be attributed to urban agriculture among the urban farmers because they buy less food hence can spend more money on non-food items including such things as sanitation and health which is beneficial for the children's nutritional condition. In fact, the results showed that the Korogocho farmers spent less of their income on food compared to the USUAP farmers and the Korogocho non-farmers. This indicates that urban agriculture plays a more important role in the food supply of the Korogocho farmers than for the USUAP farmers. On the other hand, USUAP households had a greater purchasing power, which was likely to result in a higher level of food consumption and better nutritional condition of the children.

5.7 Household Composition

The results revealed a distinct ethnic clustering among the groups. Reasons for the differences in ethnicity of the three groups were not investigated during the study. However, in general the USUAP area is predominantly occupied by people of the Kikuyu community while Korogocho is much more mixed in this respect, with a majority of both Kikuyu and Luo and a substantial proportion of other ethnic groups such as Luhya, Akamba and Somali. Most of the inhabitants of the USUAP villages are Kikuyu who have been in Nairobi for a longer time than their Korogocho counterparts. Although the ability to acquire urban land for farming seems to be influenced by the length of stay in the city, even those who may not have stayed in Nairobi for a long time, may acquire plots through ethnic acquaintances. On certain occasions in the Korogocho fields, it was said that if a Kikuyu wanted to stop tilling a certain plot, it would be 'sold' to somebody of the same ethnic group as the outgoing farmer. If in any case the plot was passed on to somebody of different ethnicity, sometimes the new individual would be phased out by those farming the surrounding plots by digging into the plot from all sides. Although this is not representative of all the farmers, it has some bearing as to why mostly Kikuyu are urban farmers. A Luo non-farmer in Korogocho complained to have been phased out in this manner.

The results showed that more farming households compared to non-farming households were female-headed. The results further showed that in the large majority of the farming households, the people responsible for urban farming were women. This confirms the findings by Freeman (1991) and Lee-Smith *et al.* (1987) that women constitute the majority of urban producers in Kenya and that most of the food is for subsistence rather than for sale.

In general, it appeared that the non-farmers' households were 'less far' in the family life cycle: parents were younger, they had comparatively more young children and households were smaller. The higher educational level of the household heads (and their spouses) did not, however, give them access to reasonable jobs. Most of them were involved in casual labour which means that their wage earnings were very low and irregular. It is therefore quite in line with Hunter's (1974) hypothesis that their general movement from the rural areas to the city is not to a specific industry but for the opportunity of finding wage employment. There being scarce employment opportunities,

they have to involve themselves mostly in casual labour and, to some extent, illegal trade and practices such as prostitution, begging and stealing until such a time that they are able to get formal employment or establish bases for trading and even may get access to urban land for farming. Their average length of stay in Nairobi was shortest which is in line with the notion that the households were younger. They are probably less 'settled' than those who have stayed longer in the city, which is, for example, shown by the fact that they mainly depend on casual labour for their livelihood and that, apparently, they have had less chances of access to urban farm land.

In this study, it seems that there is a relationship between access to land and length of stay in the city. The results show that the non-farmers are of young households, their average length of stay in Nairobi is shorter, and so they are probably less settled than those who have stayed long in the city. They need to establish acquaintances and personal relations in order to get access to urban land. Another explanation may be that new migrants do not move to the city to practice agriculture but rather to look for formal employment. Practicing of urban agriculture only comes in after the individual realises that chances of employment are few and the salary obtained from casual work is not enough to make a living.

6 CONCLUSIONS

In general, low income households in Nairobi are unable to adequately feed themselves on their earnings. Hence, many of them try to supplement their food supply by growing subsistence food. However, for many of these households this option is out of reach because of the lack of access to urban land. Unlike the middle and upper income groups (who can very easily feed themselves on their earnings), the low income groups have no backyards. The high densities and overcrowded conditions they live in do not leave them with space to cultivate and/or to keep livestock. They are therefore more often found farming vacant public or private land, without any form of security. The plots are too small, however, and the farmers may have to move from one plot to another once the rightful owners decide to develop them.

The study indicates that the length of stay in the city plays a role as far as purchasing power and food security of the low income households are concerned. The longer the households have been in the city, the more possibly they establish ways and means of obtaining income and food for survival. For instance, they may acquire formal employment, land to cultivate and may establish good income generating activities. It is conspicuous that education seems to play no role (anymore) in this, since the best-educated group (the non-farmers) was also the group with the lowest percentage of persons in formal employment and with no access to urban land.

Compared with the non-farmers, the Korogocho farming households were somewhat better off in terms of food security. Their urban farming activities contributed to this in the sense that the self-produced food was mainly meant for home consumption. In addition, it enabled these households to spend less money on food purchases and more on other daily needs. This resulted in generally better living conditions than among the non-farmers, be it not in a better long-term nutritional condition of the children. Nevertheless, in explaining the somewhat higher livelihood level of the Korogocho farmers, as com-

pared with the Korogocho non-farmers, urban agriculture certainly plays a role. And noting that these urban farmers rely on rainfall, have no technical agricultural and livestock keeping advice and are faced with problems of theft of crops, it appears that there is more potential in terms of food production through urban agriculture.

The households practicing urban agriculture with assistance from an organisation had a higher level of food security and a better nutritional condition than those farming on their own initiative. They appeared to have a more diversified kind of farming and sold more of their produce. However, due to their very small plots their level of food self-sufficiency was quite low. Apart from food production, these households also benefitted from other income-generating activities as well as the shelter improvement project that came along with the urban agriculture project. Hence, their living conditions were better and they had a higher purchasing power compared to the non-farmers and the farmers not involved in any project. It could be shown, however, that their higher livelihood level was not due to their urban farming practices.

7 RECOMMENDATIONS

The urban planning policies and acts governing land acquisition in Kenya do not take urban farming into account. Generally, it is not legal to practice urban farming according to the by-laws, although it is tolerated to some extent. These policies need to be reconsidered in the light of the hardship the low income urban households face. Because there appears to be great potential in urban agriculture for the purpose of improving food security and reducing the problem of malnutrition among the poor urban populations policies of "allotments" which have been used and succeeded in other countries (e.g. Europe, Malawi) in encouraging urban agriculture could be reviewed and modified for adoption in Kenya. This would also assure rights to for instance government agricultural extension services and advice on what to grow where.

There is need for urban extension programmes in support of urban agriculture among low income households. These programmes could focus on better crop practices and inputs which the households can afford and from which they could not only produce for own consumption, but also make some income through sales. Since the majority of urban farmers are women, the urban extension programmes would have to be specifically targeted to female farmers if they are to effectively reach the majority.

There is need for an organisation representing the interests of urban farmers of the low income group using public land in Nairobi. Since they do not have a "voice" to present and defend their interests, they need some protection and support both from the public and from a representational organisation. This is because pressures on land use have caused the urban farmers to generally have small pieces of land or they have to farm very far away, on the fringes of the city. To avoid this problem in other growing towns, developmental plans and local laws should therefore be updated to support a planned approach to land use such that there is suitable land left for urban agriculture within the urban limits.

Of course there is the issue of safety of the produce for human consumption but this can be taken care of by the government by exorting more control over use of urban waste and environmental management and, in collaboration with the communities and any other organisations, by dealing with the question what land should be used for food production. At the same time, however, since there is concern about the frequent use of sewage water in urban agricultural practices, there is need for further research into the quality (and its improvement) of urban food and livestock production.

It is true that urban malnutrition and food insecurity among the urban poor has a complex etiology and no one strategy can do away with this problem. Own food production is just one of the strategies that can be employed. Of course, sustained economic growth is the single most determinant of poverty alleviation but this cannot be achieved by one single strategy. There is therefore need for collaboration between government ministries, community-based organisations, non-governmental organisations and donors for the sake of poverty alleviation.

APPENDICES

APPENDIX 1: Basic Data

Table A1 Household composition by study group

	Korogocho farmers (N=48)	Korogocho non-farmers (N=67)	USUAP farmers (N=62)
• Household size	6.85	5.61	6.76
• No. of full residents	6.42	5.19	5.50
• No. of offspring	3.81	3.36	3.58
• No. of grand children	0.58	0.06	1.15
• Other people in the household	0.81	0.39	0.44

Appendix 1, continued

Table A2 Household heads: selected characteristics by study group (%)

	Korogocho farmers (N=48)	Korogocho non-farmers (N=67)	USUAP farmers (N=62)
Sex			
• Male	64.6	79.1	61.3
• Female	35.4	20.9	38.7
Total	100	100	100
Age			
• <20 years	-	1.5	-
• 20-29 years	18.8	32.8	23.3
• 30-39 years	43.8	50.7	16.7
• 40-49 years	16.7	10.5	26.7
• >=50 years	20.8	4.5	33.3
Total	100	100	100
Marital status			
• Married mono-gamously	47.9	64.2	56.5
• Married polygamously	14.6	14.9	6.5
• Single, divorced, separated/widowed	37.5	20.9	37.0
Total	100	100	100
Level of education			
• None	16.7	11.9	33.9
• Lower primary (1-4 yrs)	14.6	3.0	17.7
• Upper primary (5-8 yrs)	45.8	55.2	25.8
• Secondary	22.9	29.9	21.0
• Post secondary	-	-	1.6
Total	100	100	100
Occupation			
• Self-employed	41.7	29.9	51.6
• Casual labourer	31.3	53.7	6.5
• Unemployed	16.7	6.0	22.6
• Regularly employed	8.3	7.5	16.1
• Temporarily employed	2.1	3.0	-
• Training	-	-	1.6
• Too old	-	-	1.6
Total	100	100	100

Appendix 1, continued

Table A3 Household heads: migration characteristics by study group (%)

	Korogocho farmers (N=48)	Korogocho non-farmers (N=67)	USUAP farmers (N=62)
• % not born in Nairobi	89.6	77.6	72.6
When head moved to Nairobi*			
• Before 1981	62.8	38.5	84.5
• 1981 - 1985	16.3	26.9	13.3
• 1986 - 1990	16.3	26.9	-
• After 1990	4.7	7.7	2.2
Total	100	100	100
Why head moved to Nairobi*			
• To look for work	58.1	61.5	44.4
• Had relatives	25.6	19.2	26.7
• Other reasons	16.3	19.3	28.9
Total	100	100	100

* Only those not born in Nairobi.

Appendix 1, continued

Table A4 Housing conditions by study group (%)

	Korogocho farmers (N=48)	Korogocho non-farmers (N=67)	USUAP farmers (N=62)
Building material			
• Iron sheet roofs	91.7	97.0	87.1
• Mud walls	75.0	64.2	48.4
• Plastered walls	8.3	9.0	33.9
• Mud floor	72.9	55.2	79.0
• Cemented floor	27.1	43.3	21.0
Other housing conditions			
• Separate cooking place	27.1	10.5	9.7
• Own latrine	12.5	1.5	3.2
• No latrine	27.1	22.4	3.2

Appendix 1, continued

Table A5 Mean number of selected items owned per household by study group

Items owned	Korogocho farmers (N=48)	Korogocho non-farmers (N=67)	USUAP farmers (N=62)
• Bed	1.8	1.2	2.1
• Mattress	1.7	1.0	2.1
• Radio	0.4	0.2	0.5
• Sofa	0.3	0.2	0.4
• Bicycle	0.1	0.03	0.1
• Television	0.0	0.0	0.03
• Motorcycle	0.0	0.0	0.02
• Car	0.0	0.0	0.02
• Sewing machine	0.0	0.0	0.03

Appendix 1, continued

Table A6 Urban plots: selected characteristics by study group

	Korogocho farmers	USUAP farmers
Number of plots held	**(N=48)**	**(N=62)**
• 1	68.3	62.9
• 2	24.4	22.6
• 3	4.9	6.5
• 4	2.4	8.1
Total	100	100
Total size in square metres	**(N=48)**	**(N=62)**
• =<200	19.5	50.0
• >200 - =<400	4.9	17.7
• >400 - =<600	2.4	1.6
• >600 - =<800	-	1.6
• >800 - =<1000	-	-
• >1000 - =<1200	9.8	6.5
• >1200 - =<1400	2.4	3.2
• >1400	61.0	19.4
Total	100	100
Plot location	**(N=58)**	**(N=99)**
• River side	43.1	85.9
• Road side	31.0	7.1
• Railway side	-	3.0
• In an estate	17.2	3.0
• In industrial area	6.9	1.0
• Amidst other plots	1.7	-
Total	100	100
Walking distance to plot	**(N=58)**	**(N=99)**
• <10 minutes	3.4	67.7
• 10 - 30 minutes	13.8	26.3
• 30 - 60 minutes	37.9	4.0
• >60 minutes	44.9	2.0
Total	100	100

Appendix 1, continued

Table A7 Crops cultivated and harvested in 1993 by study group (%)

	Korogocho farmers (N=48)		USUAP farmers (N=62)	
	% Planting	% Harvesting	% Planting	% Harvesting
Maize: Dry	70.8	47.9	96.8	40.3
Green	-	52.0	-	85.5
Beans: Dry	70.8	58.3	72.6	45.2
Green	-	29.2	-	41.9
Garden peas: Dry	4.2	-	8.1	1.6
Green	-	4.2	-	6.5
Cow peas	33.3	33.3	24.2	24.2
Pigeon peas	6.3	6.3	-	-
Green gram	-	-	1.6	-
Sorghum	10.4	10.4	-	-
Finger millet	2.1	2.1	-	-
Irish potato	22.9	22.9	25.8	25.8
Sweet potato	16.7	16.7	29.0	29.0
Arrow root	20.8	20.8	25.8	25.8
Cassava	12.5	12.5	8.1	8.1
Kales	35.4	35.4	72.6	72.6
Cabbage	2.1	2.1	3.2	3.2
Tomatoes	22.9	22.9	30.6	30.6
Onion bulbs	4.2	4.2	11.3	11.3
Leafy onion	10.4	10.4	24.2	24.2
Spinach	8.3	8.3	12.9	12.9
Egg plant	-	-	1.6	1.6
Amaranth	16.7	16.7	35.5	35.5
Bananas	16.7	16.7	46.8	46.8
Pumpkin	10.4	10.4	22.6	22.6
Sugar cane	4.2	4.2	12.9	12.9
Napier grass	2 1	2.1	11.3	11.3

Table A8 Destination of harvest by crop type and study group (%)

	Korogocho farmers (N=48)					USUAP farmers (N=62)				
	Harv. (Kg)	Cons. (%)	Sales (%)	Given (%)	Seed (%)	Harv. (Kg)	Cons. (%)	Sales (%)	Given (%)	Seed (%)
Maize: Dry	101.2	78.0	12.8	5.0	4.2	55.4	82.9	4.0	7.4	5.8
Green	39.1	41.9	49.1	9.0	-	22.8	64.0	25.0	11.0	-
Beans: Dry	25.2	16.6	2.0	6.3	25.4	18.5	73.5	16.2	3.2	7.0
Green	16.0	55.6	40.0	4.4	-	14.9	88.0	6.0	6.0	-
Garden peas: Dry	-	-	-	-	-	3.2	-	100.0	-	-
Green	9.8	82.7	-	16.3	-	3.7	100.0	-	-	-
Cow peas	91.3	28.4	67.9	3.8	-	57.8	43.8	56.1	-	0.2
Pigeon peas	18.0	50.0	50.0	-	-	-	-	-	-	-
Green gram	-	-	-	-	-	0.0	-	-	-	-
Sorghum	11.1	91.9	-	8.1	-	-	-	-	-	-
Finger millet	18.0	100.0	-	-	-	-	-	-	-	-
Irish potato	38.6	88.6	-	6.5	4.9	18.5	66.5	20.5	10.3	3.2
Sweet potato	29.7	94.9	-	5.1	-	25.3	67.2	13.0	16.6	3.2
Arrow root	106.8	70.2	26.9	2.8	-	38.2	67.3	17.8	14.6	-
Cassava	3.7	97.3	-	2.7	-	51.7	71.6	27.9	0.6	-
Kales	116.5	47.2	45.2	7.6	-	48.1	62.0	31.8	6.2	-
Cabbage	144.0	75.0	-	25.0	-	36.0	50.0	-	50.0	-
Tomatoes	31.8	50.0	12.3	36.8	0.9	18.9	61.4	27.5	11.1	-
Onion bulbs	10.0	100.0	-	-	-	13.7	51.8	44.5	1.5	2.9
Leafy onion	67.3	99.1	0.4	0.4	-	32.1	46.4	43.0	7.5	3.4
Spinach	110.0	82.5	18.2	6.8	-	20.1	82.0	9.5	8.5	-
Egg plant	-	-	-	-	-	12.0	75.0	-	25.0	-
Amaranth	47.3	39.1	47.8	13.1	-	110.2	42.3	48.2	1.4	-
Bananas	6600	71.2	24.2	4.5	-	3366	48.0	46.7	5.3	-
Pumpkin	7.2	100.0	-	-	-	18.7	75.4	12.3	12.3	-
Sugar cane	168.8	25.6	67.0	7.4	-	59.6	3.9	91.1	5.0	-
Napier grass	720.0	100.0	-	-	-	128.6	-	93.3	6.7	-

Legend: Harv. = harvest; Cons. = Consumed

Appendix 1, continued

Table A9 Location of rural land by study group (%)*

	Korogocho farmers (N=24)	Korogocho non-urban farmers (N=50)	USUAP farmers (N=25)
Province			
• Nyanza	54.2	64.0	-
• Western	4.2	18.0	-
• Central	33.3	14	56.0
• Eastern	4.2	4.0	24.0
• Rift Valley	4.2	-	16.0
• Coast	-	-	4.0
Total	100	100	100

* Only households with access to rural land.

Appendix 1, continued

Table A10 Main food ingredients consumed (grams/household) by study group

	Korogocho farmers (N=48)		Korogocho non-farmers (N=67)		USUAP farmers (N=62)	
	% hh's	amount (g)	%hh's	amount (g)	% hh's	amount (g)
Maize: Meal	98	5319	98	5904	100	4777
Dry	58	1503	38	555	61	1423
Green	67	2742	36	723	37	654
Sorghum/millet	27	273	21	264	42	660
Bread	67	1083	63	919	71	1426
Wheat flour	27	615	17	253	34	710
Rice	58	734	44	488	77	1097
Sugar	83	1474	85	991	92	1580
Irish potato	58	2148	54	1533	76	3543
Sweet potato	33	933	15	237	35	1176
Arrow root	15	459	14	204	29	562
Cooking banana	10	253	5	89	2	129
Cassava	-	-	4	47	3	44
Pumpkin	2	21	-	-	-	-
Dry beans	81	2115	56	649	85	1766
Dry garden peas	-	-	-	-	2	4
Green beans/ peas	27	563	14	290	16	133
Green gram	10	65	10	48	16	92
Cow peas	-	-	1	23	-	-
Pigeon peas	-	-	-	-	6	51
Margarine	21	44	11	34	27	67
Cooking fat	92	540	87	335	90	535
Milk	71	2656	54	1052	87	3266
Beef	48	371	32	281	52	526
Mutton	-	-	-	-	5	26
Goat	-	-	-	-	1	6
Pork	2	15	5	26	-	-
Chicken	8	56	2	30	10	64
Tilapia fish	23	230	24	182	10	48
Dagaa fish	27	236	42	492	5	24
Fish chunks	10	100	23	149	13	93
Eggs	31	91	24	52	40	96
Kales	79	2094	88	1875	92	2195
Leafy vegetables	2	5	4	25	3	16
Cabbage	10	229	13	95	37	427
Tomatoes	2	8	1	31	11	321
Carrots	-	-	-	-	6	51
Spinach	-	-	-	-	6	97
Onions	2	5	-	-	3	34
Sugar cane	2	2	-	-	2	8
Soft drink	2	46	-	-	-	-

Appendix 1, continued

Table A11 Nutritional status of children 6-60 months old by study group and sex

Anthropometric indicator	Korogocho farmers		Korogocho non-farmers		USUAP farmers	
	Boys (N=22)	Girls (N=13)	Boys (N=36)	Girls (N=48)	Boys (N=14)	Girls (N=16)
Weight-for-age (WA)						
• Average	85.1	86.7	82.7	84.4	87.1	86.9
• (standard deviation)	(14.5)	(15.1)	(14.6)	(15.3)	(10.1)	(12.4)
• % WA<80%	36	38	39	44	21	31
• % WA<60	-	-	8.3	2.1	-	-
Weight-for-height (WH)						
• Average	98.3	92.8	94.0	93.9	94.3	93.8
• (standard deviation)	(10.1)	(10.9)	(10.2)	(11.6)	(7.4)	(8.4)
• % WH<80%	-	7.7	13.9	4.2	-	-
Height-for-age (HA)						
• Average	91.1	94.8	92.1	92.9	95.4	95.1
• (standard deviation)	(5.3)	(5.3)	(7.3)	(7.4)	(4.8)	(5.1)
• % HA<90%	36	23	44	33	14	19

APPENDIX 2: Note on Consumer Units

For the analysis of survey findings at household level, it is important to standardise household size. The most common way is a straight count of the number of household members, which means that each member receives an equal weight. However, for some purposes such as food consumption, a weighted summation is needed because the food requirements of household members differ from each other. An approximation of the relative needs is offered by a physiological weighting, namely according to the nutritional requirements of individual household members. This incorporates various biological characteristics: age, sex, physiological status and physical activity level and it offers a fair approximation of overall requirements. The weights obtained in this way are expressed as **consumer units**. One consumer unit (cu) is the consumption equivalent (here: in terms of required energy) of a nominal adult male. For this study an energy requirement of 2960 kcal per day for a reference adult male of 20-29 years was used. The energy requirements of the various age and sex groups, expressed in terms of consumer units, are as follows:

age	male	female	age	male	female	age	male	female
0yr	0.3cu	0.3cu	8-10yr	0.7cu	0.7cu	30-39yr	1.0cu	0.8cu
1yr	0.4cu	0.4cu	11-16yr	0.8cu	9.7cu	40-59yr	0.9cu	0.7cu
2-4yr	0.5cu	0.5cu	17-19yr	0.9cu	0.7cu	60yr+	0.7cu	0.6cu
5-7yr	0.6cu	0.6cu	20-29yr	1.0cu	0.8cu			

APPENDIX 3: Note on Anthropometric Indicators

It is general practice to standardise height and weight measurements mutually and for age by calculating height-for-age, weight-for-height and weight-for-age with the aid of international growth references. In this study the reference values of the WHO (1983) reference population were used.

Height-for-age expresses the height of a child as a percentage of the corresponding median height of children of the same age in the reference population. Height-for-age values of less than 90% are generally regarded as evidence of stunting, indicating that the child has failed to grow satisfactorily during lengthy periods in the past. Therefore, height-for-age is commonly regarded as an indicator of nutritional history reflecting social and economic conditions.

Weight-for-height expresses the weight of a child as a percentage of the corresponding median weight of children of the similar height in the reference population. Weight-for-age values of below 80/85% can be regarded as evidence of wasting, indicating acute malnutrition. In this report, a value of 80% is used. Weight-for-height is an indicator of present nutritional status.

The weight of a child can also be expressed in terms of *weight-for-age*, often used as a 'short-cut measure' because it reflects both previous growth and present nutritional condition. It is used for a broad classification of malnutrition. Children with less than 60% of the reference weight for their age are generally regarded as severely malnourished while those with a weight-for-age between 60% and 80% as malnourished.

APPENDIX 4: Income Levels and Welfare Index

In order to be able to obtain a more accurate picture of the importance of urban agriculture in the livelihood of the three groups, a crucial variable like household income should be kept constant. In order to do so, a sub-analysis was carried out using only the very poor households. These households were selected in two different ways: a) those with a monthly income below Ksh. 2500, and b) those with a low welfare index. For both sub-groups, a sub-analysis concerning food consumption and nutritional status was done. In both cases, the trends were found to be the same as when the whole sample of households were used. Hence, the results presented in the main text are based on the whole sample. For completeness sake, the results of the two sub-analyses are presented below.

A) Household monthly income level

Using the estimated monthly income for the year 1993, the study households were divided into two income groups (see Table A12). The group earning less than Ksh. 2500 was considered as the "very low income" group. Almost all (but 7) households among the non-farmers compared to two-thirds among the Korogocho farmers and about half among the USUAP farmers were found to be in this group. To ensure the results were not influenced by outliers, children's nutritional status as well as energy and protein intake analysis was carried out using only the low income households based on this classification. The results are presented in Tables A13 and A14.

Table A12 Monthly income by study group

	Korogocho farmers	Korogocho non-farmers	USUAP farmers
Income (Ksh./mth)			
• <2500	31 (65%)	60 (90%)	34 (55%)
• >=2500	17 (35%)	7 (10%)	28 (45%)
Total	48 (100%)	67 (100%)	62 (100%)

Appendix 4, continued

Table A13 "Very low income" households: daily energy and protein intake per consumer unit by study group

	Korogocho farmers (N=31)	Korogocho non-farmers (N=60)	USUAP farmers (N=34)
Energy intake (kcal/cu/day)			
• Average intake	1874	1774	2058
• % of requirements*	63.3	59.9	69.5
• % households with intake<75% of requirements	71	68	71
Protein intake (gr/cu/day)			
• Average intake	61.1	59.4	62.1
• % of recommendation*	122.1	118.9	124.1
• % households with intake<75% of recommendation	23	32	18

* Energy requirements have been estimated at 2960 kcal/day per consumer unit. A safe level of protein intake is estimated at 50 grams per consumer unit per day (for calculation, see Appendix 5).

Table A14 "Very low income" households: nutritional status of children aged 6-60 months by study group

Anthropometric indicator	Korogocho farmers (N=27)	Korogocho non-farmers (N=62)	USUAP farmers (N=19)
Weight-for-age (WA)			
• Average*	82.9 (13.5)	82.0 (14.4)	85.6 (8.9)
• % WA<80%	41	44	21
• % WA<60	-	6.5	-
Weight-for-height (WH)			
• Average*	93.5 (8.0)	94.0 (11.6)	93.4 (7.3)
• % WH<80%	3.7	9.7	-
Height-for-age (HA)			
• Average*	92.2 (6.1)	91.4 (6.3)	95.1 (5.3)
• % HA<90%	37	45	21

* Standard deviations in parentheses.

B) Welfare index

Since income is usually not reliably estimated, a welfare index was developed using weights allocated to items owned by households. The items used were radio, sofa set and bicycle. Households received a score of 1 for the ownership of any of these items and a score of zero for not owning the item. The scores were summed up so that the lowest score was zero and the highest score was 3. The distribution of the households is shown in Table A15. Households scoring below 2 were considered to be "very poor". Again, energy and protein intake as well as children's nutritional status were analysed using only the low index (0-1) households (Tables A16 and A17).

Table A15 Welfare index by study group

Welfare Index	Korogocho farmers	Korogocho non-farmers	USUAP farmers
• Low (0-1 items)	33 (69%)	60 (90%)	35 (56.5%)
• Medium (2 items)	14 (29%)	6 (9%)	23 (37%)
• High (3 items)	1 (2%)	1 (1%)	4 (6.5%)
Total	48 (100%)	67 (100%)	62 (100%)

Appendix 4, continued

Table A16 Households with low welfare index: daily energy and protein intake per consumer unit by study group

	Korogocho farmers (N=29)	Korogocho non-farmers (N=50)	USUAP farmers (N=43)
Energy intake (kcal/cu/day)			
• Average intake	1869	1691	2089
• % of requirements*	63.1	57.1	70.6
• % households with intake<75% of requirements	69	68	68
Protein intake (gr/cu/day)			
• Average intake	59.1	57.3	64.8
• % of recommendation*	118.3	114.6	129.6
• % households with intake<75% of recommendation	28	34	19

* Energy requirements have been estimated at 2960 kcal/day per consumer unit. A safe level of protein intake is estimated at 50 grams per consumer unit per day (for calculation, see Appendix 5).

Table A17 Households with low welfare index: nutritional status of children aged 6-60 months by study group

Anthropometric indicator	Korogocho farmers (N=27)	Korogocho non-farmers (N=62)	USUAP farmers (N=19)
Weight-for-age (WA)			
• Average*	82.9 (13.5)	82.0 (14.4)	85.6 (8.9)
• % WA<80%	41	44	21
• % WA<60	-	6.5	-
Weight-for-height (WH)			
• Average*	93.5 (8.0)	94.0 (11.6)	93.4 (7.3)
• % WH<80%	3.7	9.7	-
Height-for-age (HA)			
• Average*	92.2 (6.1)	91.4 (6.3)	95.1 (5.3)
• % HA<90%	37	45	21

* Standard deviation in parentheses.

APPENDIX 5: Calculation of Safe Level of Protein Intake

The study results on one-day protein intake per consumer unit have been derived from aggregate household food consumption data, and as such indicate only how much dietary protein was available from the pot; they do not correct in any way for (interindividual) distribution of protein between household members. Hence, the proposed procedure for the calculation of the protein allowance for a household (WHO/FAO/UNU, 1985: Table 55) could be followed here.

The procedure is, to derive first an average protein requirement and then to add a margin for statistical uncertainty (conventionally: + 2 standard deviations). While the coefficient of variation (CV) of individual protein requirements is estimated to be 12.5%, the CV for aggregate household requirement is much less, as summing up of individual variances gives a lower overall variance (op cit., Table 55). On the basis of a model household with about 6 consumer units, a CV of aggregate household protein requirement of about 4.5% can be derived.

One consumer unit corresponds to an energy intake of 2960 kcal (for a nominal adult male). The same male needs on average 0.6 g reference (ideal) protein per kg body weight. Assuming a protein digestibility of 88%, his average requirement in terms of dietary protein (body weight: 60.3 kg) would be 41.4 g (5.55% of the energy). His individual "save level" of protein would be that amount plus 2 times the CV of 12.5% (see above), that is 51.4 g, which represents 6.94% of the energy. However, members of the vulnerable groups (children below 3, adolescents, women and the elderly) have relatively higher protein requirements within a given amount of energy; besides, children and adolescents have relatively high requirements of the essential amino acids, so that their requirements have to be corrected upwards to account for protein quality.

Therefore, an average requirement of dietary protein of 6% of the energy has been chosen here (this corresponds to a "safe level" of 7.5% on an individual basis). The safe amount per consumer unit (supposing ideal distribution among individuals; see above) becomes then 6% of 2960 kcal, that is 44.4 g dietary protein, plus two times the CV of 4.5%, that makes a "safe household level per consumer unit" of 48.4 g dietary protein. This figure has been rounded to 50 g.

REFERENCES

ALARCON, J. A. & RIVERA, J. (1994)
The Impact of Changes in Purchasing Power on Food Consumption on an Urban Population in Guatemala City. *Ecology of Food and Nutrition*, Vol. 31, Nos. 3-4, pp. 171-182.

ANDRÆ, G. (1992)
Urban Farmers as Workers: Agro-links of Nigerian Textile Workers in the Crisis of the 1980s. In J. Baker & P. O. Pedersen (eds.), *The Rural-Urban Interface in Africa: Expansion and Adaptation,* pp. 200-222. Copenhagen: The Scandinavian Institute of African Studies and Centre for Development Research, Seminar Proceedings No. 27.

ATUANYA, E.I. (1987)
Nutrition as an Indicator of Urban Poverty. A Dietary Survey of the Urban Poor in Benin City, Nigeria. In P.K. Mwakinwa & A.O. Ozo (eds.), *The Urban Poor in Nigeria,* pp. 109-127. Ibadan: Evans Brothers (Nigeria Publishers) limited.

BARBA, V. C. CORAZON (1990)
Food and Nutrition Situation in Urban Philippines.
In *Urban Nutrition: Pre-School Children,* pp. 28-30. Foundation for the Advancement of the Knowledge of the Nutrition of Mother and Child in Developing Countries (FMC).

BIBANGAMBAH, J. R. (1992)
Macro-level Constraints and the Growth of the Informal Sector in Uganda. In J. Baker & P. O. Pedersen (eds.), *The Rural-Urban Interface in Africa: Expansion and Adaptation,* pp. 303-313. Copenhagen: The Scandinavian Institute of African Studies and Centre for Development Research, Seminar Proceedings No. 27.

CBS (1977)
Urban Food Purchasing Survey 1977, Part 1.
Nairobi: Ministry of Finance and Planning, Central Bureau of Statistics.

CBS (1986)
Urban Housing Survey 1983. Basic Report.
Nairobi: Ministry of Works, Housing and Physical Planning (Department of Housing) and Ministry of Planning and National Development (CBS).

CBS (1991)
Economic Survey 1991.
Nairobi: Ministry of Planning and National Development, Central Bureau of Statistics.

CBS (1992)
Economic Survey 1992.
Nairobi: Ministry of Planning and National Development, Central Bureau of Statistics.

CBS (1993)
Economic Survey 1993.
Nairobi: Ministry of Planning and National Development, Central Bureau of Statistics.

CBS (1994)
Economic Survey 1994.
Nairobi: Ministry of Planning and National Development, Central Bureau of Statistics.

CBS (1995)
Economic Survey 1995.
Nairobi: Ministry of Planning and National Development, Central Bureau of Statistics.

DEN HARTOG, A. P. & VAN STAVEREN, W. A. (1985)
Manual for Social Surveys on Food Habits and Consumption in Developing Countries.
Wageningen: PUDOC.

DENNERY, R. PASCALE (1995)
Inside Urban Agriculture: An exploration of Food Producer Decision Making in a Nairobi Low income (Thesis). Wageningen: Agricultural University.

DRAKAKIS-SMITH, D. (1992)
Strategies for Meeting Basic Food Needs in Harare. In J. Baker & P. O. Pedersen (eds.), *The Rural-Urban Interface in Africa: Expansion and Adaptation,* pp. 258-283.
Copenhagen: The Scandinavian Institute of African Studies and Centre for Development Research, Seminar Proceedings No. 27.

FAO (1985)
The State of Food and Agriculture 1984. World Review: The ten years since the World Food Conference. Urbanisation, Agriculture and Food Systems. In *Agriculture Series* No. 10, pp. 102-105. Rome: Food & Agriculture Organisation.

FOEKEN, D. & TELLEGEN, N. (1992)
Household Resources and Nutrition of Farm Labourers in Trans Nzoia District, Kenya.
Nairobi / Leiden: Ministry of planning and National Development / African Studies Centre, Food & Nutrition Studies Programme, Report No. 44.

FREEMAN, D. (1991)
A City of Farmers: Informal Agriculture in the Open Spaces of Nairobi, Kenya.
Toronto: McGill University Press.

GABR, M. K. (1990)
Urban Nutrition in Developing Countries with Special Emphasis on Pre-School Children. In *Urban Nutrition: Pre-School Children,* pp. 3-6. Foundation for the Advancement of the Knowledge of the Nutrition of Mother and Child in Developing Countries (FMC).

GATHURU, P. K. (1988)
Urban Agriculture Project: Hopes and Challenges.
Unpublished paper submitted for Workshop on 'Food for the Future', Eldoret, Kenya.

GEFU, J. O. (1992)
Part-Time Farming as an Urban Survival Strategy: A Nigerian Case Study. In J. Baker & P. O. Pedersen (eds.), *The Rural-Urban Interface in Africa: Expansion and Adaptation,* pp. 295-302. Copenhagen: The Scandinavian Institute of African Studies and Centre for Development Research, Seminar Proceedings No. 27.

HASSAN, N. & AHMAD, K. (1991)
The Nutrition Profile of the Low Income Dwellers: A Comparison with the Rural Poor. *Ecology of Food and Nutrition,* Vol. 26, No. 3, pp. 203-214.

HOLM, MOGENS (1992)
Survival Strategies of Migrants to Makambako — an Intermediate Town in Tanzania. In J. Baker & P.O. Pedersen (eds.), *The Rural-Urban Interface in Africa: Expansion and Adaptation,* pp. 238-247. Copenhagen: The Scandinavian Institute of African Studies and Centre for Development Research, Seminar Proceedings No. 27.

HOORWEG, J., NIEMEIJER, R., FOEKEN, D., OKELLO, W. & VEERMAN, W. (1991)
Economic and Nutritional Conditions at Settlement Schemes in Coast Province.
Nairobi / Leiden: Ministry of Planning and National Development / African Studies Centre, Food & Nutrition Studies Programme, Report No. 36.

HUNTER, GUY (1974)
Rural/Urban Migration in Tropical Africa.
Nairobi: University of Nairobi, Institute of Development Studies.

KAKITAHI, J. (1990)
Nutrition of Infants and Young Children in Urban Communities in Kampala, Uganda. In *Urban Nutrition: Pre-School Children,* pp. 161-180. Foundation for the Advancement of the Knowledge of the Nutrition of Mother and Child in Developing Countries (FMC).

KENYA, GOVERNMENT OF (1988)
National Development Plan for the Period 1989-1993.
Nairobi: Kenya Government Printer.

KENYA, GOVERNMENT OF (1993)
National Development Plan for the Period 1994-1996.
Nairobi: Kenya Government Printer.

KENYA, GOVERNMENT OF /UNICEF (1990)
Metropolitan Household Survey, 1989.
Nairobi: Government of Kenya/Unicef.

KENYA, GOVERNMENT OF /UNICEF (1992)
Children and Women in Kenya: A Situation Analysis 1992.
Nairobi: Government of Kenya/Unicef.

KHAIRUDDIN, YOSUF (1984)
Urban Slum and Squatter Settlements: Variations in Needs and Strategies.
In WHO/ISPCAN Pre-Congress Workshop, *Child Abuse and Urban Slum Environments,* pp. 4-20. Geneva: World Health Organisation.

KRHODA, M.A. (1991)
The Effect of Some Common Illness on the Nutritional Status of Pre-School Children in an Urban Area (Nairobi, Kenya). Nairobi: University of Nairobi (Thesis).

LADO, CLEOPHAS (1990)
Informal Urban Agriculture in Nairobi, Kenya: Problem or Resource in Development and Land Use Planning? *Land Use Policy,* July 1990, pp. 257-266.

LAMBA, D. (1993)
Urban Agriculture: Eastern Africa. In L. J. A. Mougeot & D. Massé (eds.), *Urban Environment Management; Developing a Global Research Agenda,* Vol. 1, pp. 90-97. Ottawa: International Development Research Centre (IDRC).

LEE-SMITH, D., MANUNDU, M., LAMBA, D., & GATHURU, P. K. (1987)
Urban Food Production and the Cooking Fuel Situation in Urban Kenya.
Nairobi: Mazingira Institute.

MALETNLEMA, T. N. (1990)
The General State of Urban Underfives Nutrition in sub-Saharan Africa. In *Urban Nutrition: Pre-School Children,* pp. 181-196. Foundation for the Advancement of the Knowledge of the Nutrition of Mother and Child in Developing Countries (FMC).

MATRIX DEVELOPMENT CONSULTANTS (1993)
Nairobi's Informal Settlements. An Inventory Report PN-ABH-741 prepared for USAID/REDSO/ESA. Mimeograph.

MAXWELL, D. G. & ZZIWA, S. (1992a)
Urban Agriculture in Kampala: Indigenous Adaptive Response to the Economic Crisis. *Ecology of Food and Nutrition,* Vol. 29, No. 2, pp. 91-109.

MAXWELL, D. & ZZIWA, S. (1992b)
Urban Farming in Africa: The case of Kampala, Uganda.
Nairobi: ACTS Press.

MEMON, P.A. & LEE-SMITH, D. (1993)
Urban Agriculture in Kenya.
Canadian Journal of African Studies, Vol. 27, No. 1, pp. 25-42.

MLOZI M. R. S., LUPANGA, I. J. & MVENA, Z. S. K. (1992)
Urban Agriculture as a Survival Strategy in Tanzania. In J. Baker & P.O Pedersen (eds.), *The Rural-Urban Interface in Africa: Expansion and Adaptation*, pp. 284-294.
Copenhagen: The Scandinavian Institute of African Studies and Centre for Development Research, Seminar Proceedings No. 27.

MUTISYA, D. N. & LADO, C. (1991)
Some Socioeconomic Factors Behind Roadside Farming in Kiambu District, Kenya.
Journal of Eastern African Research and Development, Vol. 21, pp. 107-127.

NAIROBI CITY COUNCIL (1961)
City of Nairobi General Nuisance By-Laws (1961)
Nairobi: City Council.

NIEMEIJER, R., FOEKEN, D. & KLAVER, W. (1991)
Seasonality in the Coastal Lowlands of Kenya, Part 4/5: Food Consumption and Anthropometry. Nairobi / Leiden: Ministry of planning and National Development / African Studies Centre, Food & Nutrition Studies Programme, Report No. 38.

OBUDHO, R. A. (1991)
Urbanisation and Street Children in Eastern and Southern Africa.
Nairobi: University of Nairobi, Centre for Urban Research, Publication No. 91/01.

RAKODI, C. (1985)
Self-Reliance or Survival? Food Production in African Cities, with Particular Reference to Zambia. *African Urban Studies*, Vol. 21, pp. 53-61.

RAKODI, C. (1988)
Urban Agriculture: Research Question and the Zambian Evidence.
Journal of Modern African Studies, Vol. 26, pp. 495-515.

REDFERN, PAUL (1993)
Kenya Ranked 20th in List of Poor States.
The Daily Nation , 7-7-1993.

SACHS, I. & SILK, D. (1990)
Food and Energy: Strategies of Sustainable Development.
United Nations University Press (UNU).

SANYAL, B. (1987)
Urban Cultivation in East Africa: People's Response to Urban Poverty.
Cambridge: Massachusetts Institute of Technology.

SAWIO, C. J. (1993)
Urban Agriculture: Eastern and Central Africa.
In L. J. A. Mougeot & D. Massé (eds.), *Urban Environment Management; Developing a Global Research Agenda, Vol. 1*, pp. 59-82. Ottawa: International Development Research Centre (IDRC).

TRICAUD, P. (1987)
Urban Agriculture in Ibadan and Freetown.
Tokyo: United Nations University, Food Energy Nexus Programme.

VON BRAUN, J., MCCOMB, J., FRED-MENSAH, B. & PANDYA-LORCH, R. (1993)
Urban Food Insecurity and Malnutrition in Developing Countries: Trends, Policies, and Research Implications. Washington, D.C.: International Food Policy Research Institute.

WADE, I. (1987)
Community Food Production in Cities of Developing Nations.
Food and Nutrition Bulletin, Vol. 9, No. 2, pp. 29-35.

WEST, E. Clive (1987)
Food Composition Table for Energy and Eight Nutrients in Foods Commonly Eaten in East Africa. Nairobi: CTA & ECSA.

WHO (1983)
Measuring Change in Nutritional Status: guidelines for assessing the nutritional impact of supplementary feeding programmes for vulnerable groups.
Geneva: World Health Organisation.

WHO (1988)
Urbanisation and its Implication on Child Health, Potential for Action.
Geneva: World Health Organisation.

WHO/FAO/UNU (1985)
Energy and Protein Requirements.
Geneva: World Health Organisation, Technical Report 724.

WORLD BANK (1990)
Poverty: World Development Report 1990.
New York: Oxford University Press.

WORLD RESOURCES INSTITUTE (1992)
World Resources 1992-93: A Report by The World Resources Institute in collaboration with The United Nations Environment Programme and The United Nations Development Programme. New York: Oxford University Press.

WORLD VISION INTERNATIONAL (1990)
Field Experience From Korogocho Project.
Unpublished paper.

YEUNG, Y. (1987)
Examples of Urban Agriculture in Asia.
Food and Nutrition Bulletin, Vol. 9, No. 2, pp. 14-23.