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DETERMINATION OF THE NUTRITIONAL STATUS OF PRESCHOOL CHILDREN (<=5 YEARS) AMONG RESIDENT ESTATE WORKERS OF BROOKE BOND TEA ESTATES AT LIMURU AND SMALL SCALE FARMERS IN THE ADJOINING AREA.11

BY

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DECLARATION

This is my original work and has not been presented for a degree in any other university.



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DEDICATION
TO MY PARENTS

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research and writing the thesis.

ABSTRACT

The aim of the study was to determine the nutritional status of children of resident estate workers and small scale farmers, their morbidity experience and the factors that show association with the nutritional status.

Data was collected using a structured questionnaire, and weight and height measurements were taken for the children. The survey was conducted in a random sample of 200 households of small scale farmers with 305 children and 200 households of estate workers with 253 children.

Eighteen percent of the children of small scale farmers had a weight-for-age deficit (<80% of National Center for Health Statistics (NCHS) standards), while 35.2% of the children of the estate workers had a weight-for-age deficit. The difference was statistically significant ($p < 0.05$).

Of the children surveyed, 21.3% from the small scale farms had a height-for-age deficit (<90 % of NCHS standards), while 41.1% of the children of estate workers had a height-for-age deficit. The difference was statistically significant ($p < 0.05$).

Though 14.0% of the children of the small scale farmers had a weight-for-height deficit (90% NCHS standards), while 15.8% of the children of estate

workers had a weight-for-height deficit, the difference was not statistically significant.

There was a higher prevalence of diarrhea, cough, fever and vomiting among the children of the households of the estate workers as compared to those from the households of small scale farmers.

The households of the small scale farmers are generally better off socio-economically, although they have bigger families, more dependents

CHAPTER ONE

INTRODUCTION.

Malnutrition still continues to be a major health problem in most developing countries, predominantly in the form of undernutrition. Not always has general economic advancement been translated into improved nutritional status. Where such translations may have occurred the nutritional effect may be minimal. This state of affairs is more predominant where the economic development has not been general.

1.1 JUSTIFICATION OF THE STUDY

Though substantial research has been done to establish the nutritional status of children of the rural communities in Kenya, very little information exists on the health and the nutritional status of estate population, who constitute a substantial proportion of the agricultural workers. On the other hand they constitute a special group due to the limitations associated with their employment status.

These workers are mostly of rural background, have little education, and having abandoned their farms they no longer grow their own food. Instead they depend on cash and usually receive other social benefits such as schooling for their children, housing, medical care, entertainment, piped water etc., which

are provided free of charge by the estate owners.

Because of their generally low level of education, estate workers might not buy the right kinds of foods, and this could result in a de facto depressed nutritional status of their children. Children of the surrounding small scale farmers, generally considered to belong to low socio-economic status, might be substantially better nutritionally since their parents grow food for consumption and possibly for cash. This is likely to be the case even though the small scale farmers may not be better educated than estate workers. The small scale farmers may also very well constitute the population pool from which the estates draw their manpower. On the other hand, where women who have young children have to work in the estates, they have little or no time for child care during the day.

Moderate degrees of undernutrition have functional consequences especially in economically active populations in developing countries. Here, most of the populations who suffer from under nutrition do so in mild to marginal degrees. The physical performance of the agricultural labourers play an important role at both the household and the national level, since in these countries most agricultural activities are highly labour intensive.

This investigation sought to elucidate the nutri-

tional condition of the study communities and assess how they compare between themselves and with results reported from National Nutritional Surveys in Kenya, for the overall rural communities.

There is also need to update information on the nutritional status of the people in these communities, and the influencing factors in order to formulate the appropriate policies.

The study intended to describe the nutritional status of the two farming communities with special reference to preschool children who are usually at risk.

1.2 AIM OF THE STUDY

The overall aim of the study was to contribute insights that could lead to improvement of the health and the nutritional status among estate workers and small scale farmers through optimal use of the resources at their disposal.

1.3 BENEFITS EXPECTED FROM THIS INVESTIGATION

The investigation intended to document the state of nutrition of the children who are under five years of age in the Brooke Bond Tea Estates and small scale farmers in the adjoining area. The study also tried to elucidate the social, economic, demographic and environmental conditions of the people in this area,

and recommend simple and feasible measures to alleviate malnutrition, with the understanding that the underlying cause on malnutrition is mostly poverty.

Based on the acquired information it can be expected that the estate management can liaise with the estate workers and design policies that can facilitate the implementation of the recommendations made from the study. The results of this study can be used by the local administrators in deciding on the priority development projects. The study is also likely to arouse interest in understanding the health and nutritional status of other estate workers under a different setting, and working for a different cash crop.

The results from this study can be used by people planning rural services, development projects or agricultural projects in order to determine what inputs to include in the projects in order to ensure that it has a positive impact on the health and the nutritional status of the affected or participating community.

1.4 OBJECTIVES OF THE STUDY

The objectives of this study were to:

- (a) Determine the nutritional status of the children of the two farming communities, their characteristics and prevalence of certain diseases

among them.

- (b) Determine the demographic and socioeconomic characteristics of the households in the study.
- (c) Determine the association between household characteristics, children characteristics and the nutritional status of the children.

1.5 STUDY SETTING

The study area was in Kiambu District of Central Province. Kiambu town, the district headquarters is at an altitude of 1730 metres above sea level. Large parts of Kiambu have bimodal rainfall. The district has a total of 2578 km². The population grew to 665,806 in 1979 from 475,576 in 1969. The population density per km² was 117 persons in 1955, increasing to 184 persons in 1969. In 1979 the population density was 258 persons per km².

Mean annual rainfall in Kiambu district is 1031.8 mm. The long rains set in between late March and early April, continuing through May to end of June. They account for about half of the mean annual rainfall. The rest of the rains come in the short rain season. In areas above 2046 metres above the sea level there is a transitional season known as 'gathano'. Here, the light showers and mist, combined with low temperatures during the months of July and August, facilitate crops like maize, cabbage and irish potatoes to be planted in these upper areas. The District has 7 constituencies, namely: Gatundu, Juja, Githunguri, Lari, Kikuyu, Limuru and Kiambaa. The study was undertaken in Tigoni Location (Appendix 11) of in Limuru Division (appendix 12). Sublocations within the area of study area are Karambaini and Bibirioni. Limuru division has a size

of 464 km² while Tigoni Location has an area of 99km². Bibirioni and Karambaini sublocations have areas of 28, and 61 km² respectively.

Limuru division has an average altitude of 2,500 metres above sea level and has an annual temperature range of approximately 15 to 24⁰C. The annual rainfall is 800 mm for the lower zone and 1200 mm in the upper zone. The area has three types of soils i.e. luvisols, andasols and nitrosols.

The cash crops grown in the study area are mainly tea, pyrethrum, and some coffee. The main food crops are maize, potatoes, beans and kales. The horticultural crops grown are cabbage, spinach, lettuce, carrots, onions, tomatoes, peas, and flowers and broccoli.

Within Limuru Division, in 1986, there were 10,015 heads of grade cattle and 2,435 indigenous cattle 10,860 sheep, 3,845 goats, 3,890 pigs. The poultry population was 12,3550 and 2,200 rabbits (Information from Limuru Divisional Headquarters).

1.5.1 BROOKE BOND TEA ESTATES

There are two tea estates under the Brooke Bond management i.e. Mabroukie Tea Estate and Limuru Tea Estate. The estate workers who work in the Brooke Bond Tea Estates reside in houses within the estates which belong to the company. In the past the houses

were constructed of mud walls, earth floor and timber roof. Today about 80% of the households have cemented floors, stone walls, and the roofs are of corrugated iron sheets.

There are five main residential camps in the Brooke Bond tea estates. The company has employed workers for the maintenance of the camp and this includes collection of rubbish, cutting of grass and cleaning of toilets and bathrooms. The estates have piped water from bore holes and there are several strategically placed taps outside the houses at collecting points, with bathrooms situated next to each of them.

In every camp in the estates there is a canteen, television set and facilities for playing darts. The estate provides some health services which include curative and family planning services. The family planning services are supported by "Family Planning Private Sector" in terms of family planning equipment and training for the staff. There is a pick-up which is utilized for transport of the sick in case of emergency.

The estate workers are paid according to how much tea they pluck. Therefore, they make more money during the peak picking season.

In the estates there is a nursery school which caters for educational requirement for the preschool

children and also as a day care facility where children stay while their parents are working. When there is peak productivity, the management provides one-third of bread and a cup of tea to the estate workers, which is taken at the place where they are picking tea.

1.5.2 SMALL SCALE FARMERS

The small scale farmers are found in four sectors i.e. Itungi, Muna, Gikabu, and Kinyogori. Three of the sectors are in Karambaini Sublocation (Itungi, Muna, and Gikabu) while Kinyogori sector is in Bibirioni Sublocation. The pieces of land are quite small as is the case in the most productive areas of Central Province.

CHAPTER 2

LITERATURE REVIEW

2.1 PROBLEM OF MALNUTRITION.

Malnutrition is a primary cause of ill-health and death in developing countries (Test et al. 1986, Ground 1964). It is a common phenomenon in most developing countries, usually coupled with high episodes of infections which result in lots of disability and high mortality. It also causes higher vulnerability to infection, and results in decreased work output (Kielmann 1976). The average African child starts life at a disadvantage nutritionally (Omululu 1975), and may be born with low birth weight due to maternal malnutrition.

Malnutrition still afflicts a big proportion of the people in developing countries (Hansen et al. 1971). Therefore it is still a major problem in developing countries and when confounded with other disadvantages facing the developing countries, it becomes major killer of children. Child malnutrition has been reported to be the most widely spread disorder known in tropical and subtropical areas (Brock et al. 1952, Blankhart 1972, Jansen 1973, McLaren et al. 1973).

Malnutrition results in increased retardation in physical dimensions, mental development, and subscri-

bes to the morbidity in children and finally culminating in death. A survey done in Kenya (Ground 1964) showed that Protein Energy Malnutrition (PEM) caused 9.9% of the deaths in the hospitals, with 47% of the children who died in the hospitals having PEM at admission time already. Protein Energy Malnutrition is the most common form of malnutrition in Kenya (CBS 1983). The severest forms of malnutrition are marasmus and kwashiorkor. However the majority of the children suffer from mild-moderate malnutrition. Where evidence of severe forms of malnutrition exists there are many more children with moderate and mild forms of malnutrition (Jelliffe et al. 1975).

Children in their early stages of life are the most afflicted by nutritional deficiencies due to their rapid growth resulting in high nutrient requirement. The most vulnerable groups to malnutrition include preschool children (Jelliffe 1968), and especially those between 7 and 36 months of age who experience the nutritional problems associated with weaning (Welbourn, 1955). The best indicator of adequacy of food intake of a young child is growth (Scrimshaw 1981). Measurements of child nutritional status is an acceptable indicator of an individual or community well-being (Test et al. 1986).

A report by the Ministry of Economic Planning (March 1973) indicated that in cash crop areas the

landless and the poor labourers have upto 40% of their preschool age children undernourished. The press, clergy and labour unions have made public the misery of the landless on some commercial estates (Ministry of economic planning March 1983).

About 30% of preschool children in the rural communities suffer moderate malnutrition with 1% being severely malnourished and categorized as marasmus and kwarshiokor cases (Ministry of Economic planning Nov. 1983).

2.2 CAUSES OF MALNUTRITION

Malnutrition is a pathological condition resulting from absolute or partial deficiency or excess of one or more essential nutrients. Deficiency rather than excess has mostly been observed in developing countries (Jelliffe 1966).

Malnutrition is a multifaceted problem just as its prevention and/or treatment. Malnutrition is caused by many interrelated factors, with the most important ones being socio-economic, environmental, agricultural, demographic and cultural factors, as well as infection (Morley et al. 1968, Addy 1975, Bennet 1971, Vamoer 1969).

The etiology of protein energy malnutrition in a specific child is complex. Very many factors interact which finally manifest as malnutrition. The immediate causes of malnutrition for individuals are

found to be similar in that there is usually a decreased food intake and decreased/increased food utilization. Decreased food intake can be due to poverty, famine, anorexia, maternal ignorance, and child neglect. Thus, the depressed socio-economic factors such as family income, family composition, and parental employment status do most often contribute to reduced food intake (Kielmann et al. 1976). Decreased food utilization can be caused by gastro-intestinal conditions, increased energy expenditure due to climatic stress or increased metabolic rate in illness, notably fever, injury, and inflammatory reactions. Both reduced food intake and decreased food utilization constitute the principal etiological factors for malnutrition.

Childhood malnutrition, its causes and consequences in developing countries are increasingly becoming more understood from epidemiological studies. For most populations serious nutritional problems do not arise until breastmilk becomes inadequate as a sole source of food, and then inadequate supplementary foods are given (Scrimshaw 1970).

2.3 AGRICULTURE AND SOCIOECONOMIC FACTORS

Under prevailing world economic conditions the developing countries cannot have rapid improvement in quality of life, and especially as depicted in terms of in socio-economic conditions, child nutrition and

environmental sanitation in the near future (Kielmann, 1976). Global abundance of food does not necessarily assure good nutrition in the whole world. A big proportion of the world today is afflicted with some degree of malnutrition despite the fact that the global per capita food figure may give the impression of adequacy in food.

As countries become more developed a change from subsistence to money based economy takes place. The benefits resulting from agricultural projects do not always ensure improvement of the nutritional status of the people involved. There can result adverse nutritional effects from agricultural projects due to economic factors affecting the the real incomes, and the social cultural factors affecting the ability of the household to adjust to changes resulting from agricultural projects (Lappe et al. 1977).

Agricultural projects can also occasionally lead to widening of economic gaps in the population and eventually displacement of poor farmers who become labourers (Lappe et al. 1977). The amount of cash earned by the estate workers might not be adequate to offset the disadvantage due to landlessness.

While the small scale farmers run the risk of losing most of their crops and earnings during adverse weather conditions, the estate workers while equally being affected by the weather (need to retain

their jobs) are always finding themselves victims of fast increasing prices which are not usually accompanied by similar increases in their earnings (Mason 1982).

In the estates husbands and wives (and probably some of their older children) usually go to work early, leaving young children at home to take care of themselves. Hence mothers have very little time to breastfeed and take care of their children. The casual workers have a seasonal cash flow. The cash incomes in most African set-ups are largely controlled by male members of the households who may be less concerned with the nutritional welfare of the family than the female members (Lele, 1975).

In a study done in Guatemala on resident workers in a coffee plantation, the need for improvement of personal hygiene, diet, immunization, environmental sanitation, provision of safe water, removal of waste, less crowding in order to improve and maintain good nutritional status and health was expressed (Scrimshaw 1970). In yet another study in rural Guatemala, undertaken on four groups of people namely small scale farmers, agricultural workers, skilled workers and merchants, results showed that preschoolers of the skilled workers and merchants were superior nutritionally. No differences in the nutritional status of preschoolers belonging to small scale

farmers and agricultural workers were observed (Varverde et al 1976). It would be expected that the children belonging to small scale farmers would be better nutritionally than those of agricultural workers but this was not the case.

In 1985 a nutritional study was carried out in a rice irrigation scheme in Kano Plains, of Kisumu district, to determine the nutritional status of four groups of households namely, resident tenants, non-resident tenants, individual rice growers and farm families not cultivating rice as a control (Ministry of Economic Planning 1985). The resident tenants were individuals working and living at the Ahero and West Kano irrigation scheme. The non-resident tenants were those growing crops at the scheme and residing outside the scheme. It was observed that the nutritional status of resident tenants was worse off than of non-resident tenants, while the small scale individual rice growers and non rice growers were in the middle. The non-resident tenants had more resources than the resident tenants. Since both the most favoured and the least favoured farmers participated in tenancy in the larger irrigation scheme, the results could not show whether participation in large scale rice production has negative or positive effect (Ministry of Economic planning 1985). Therefore restricted resource base must be blamed for the outcome.

As regards food composition it has been estimated that among the poor strata of the population in Kenya which includes such groups as small scale farmers and agricultural labourers, energy intake accounts for only 80% of the daily requirements (Shah and Frohberg 1980).

In 1979 an income of Ksh 650 per year per capita (assuming constant prices) was considered enough to meet energy requirements for a moderately active group of people in rural population (Frohberg et al 1980). For a very active group an extra Ksh 100 per caput per year was needed to meet caloric needs. The study also showed that the richer did not necessarily have a wider variety of food, but just more of the same food that was taken by the poor.

The situation in the world is one where there is rapid increase in food demand as a result of fast increase in population which has overtaken the rate of increase in food production (Labouisse 1974). The economic pace of Kenya has not been able to keep up with the population increase and the resources are highly over-stretched. With the fast growing population in Kenya the individual land sizes are continually getting smaller due to fragmentation until they are reaching sizes that are not economically viable for supporting a household, thus forcing the small scale farmers to rely more on the cash

economy for their food supply. Dietary inadequacy has been documented due to small plot sizes that are unable to meet the families' food needs due to the large number of dependents as family size increases (Stanfield 1972). In a study done in 1978 on children in Muranga, anthropometrical data using National Centre for Health Statistics Standards (NCHS) showed that those children below 80% Weight-for-Age, 90% Height-for-Age and below 90% Weight-for-Height were 28%, 28% and 22% respectively (Hoorweg et al. 1983). It was also observed that the family size, employment of head of household and degree of commercial farming bore a relationship with the nutritional status of the young children.

In 1983 the child population in Kenya within the age of 0-14 years accounted for 51% of the population while 21% of the population were underfives (UNICEF 1984). Landless rural men were shown to have the same fertility aspiration as the land owning men. Eighty per cent of Kenya's population were found to reside in 17% of the land which is suited for agriculture and the rural women were mainly employed as lowly paid agricultural casual labourers.

In a study in Brazil of children aged 12-35.9 months using anthropometry, the results showed that children in the large ranches were more likely to have conditions of stunting, wasting, and underweight

than those in the small scale farm district. It was further shown that children of labourers were more likely to be malnourished than those of landowners while children of share croppers had intermediate levels of malnutrition (Victora et al. 1985).

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1 DEFINITIONS

SMALL SCALE FARMERS: These are persons who have their family staying on their piece of land. They cultivate the land, keep animals, and may also be engaged in other economic activities. They own at most ten acres of land, and they may be growing cash crops or doing subsistence farming.

ESTATE WORKERS: These are persons employed and residing in the estate. They remain in the estate irrespective of the season. Their job is picking tea in the estate.

WEIGHT-FOR-AGE DEFICIT: Any child who has a weight-for-age value less than 80% of the reference child using National Centre for Health Statistics /WHO Standards is considered to have a weight deficit for his/her age. The child may also be referred to as being underweight.

HEIGHT-FOR-AGE DEFICIT: Any child who has a height-for-age value less than 90% of the reference child using National Centre for Health Statistics /WHO Standards is considered to have a height deficit for his/her age. The child may also be referred to as being stunted:

WEIGHT-FOR-HEIGHT DEFICIT: Any child who has a weight-for-height value less than 90% of the reference child

using National Centre for Health Statistics/WHO Standards is considered to have a weight deficit for his/her height. The child may also be referred to as being wasted.

MORBIDITY EXPERIENCE: It is expressed as the number of children who had certain disease symptoms during the previous 7 days before the survey, (as reported by the mothers or the interviewees).

STATISTICAL SIGNIFICANCE: Only occurrences that have a p-value of ≤ 0.05 are considered significant.

3.2. TOOLS USED IN COLLECTION OF DATA

3.2.1. Questionnaires

These were structured questionnaires which were administered to the respondents. The questionnaires used were modified versions of the questionnaire used during a field survey training exercise in the Community Problem Diagnosis Course, M.sc. Programme in Applied Human Nutrition, Department of Food Technology and Nutrition, University of Nairobi. A sample of the questionnaires are presented in appendices 7-10 (pages 103 to 109).

The questionnaires were initially tested on a few small scale farmers and estate workers, in the same zones, who could have been potential respondents but were not within the sampling frame. The results from the piloting were used for introduction of new que-

stions and rephrasing some questions for the interest of clarity. The research assistants were trained to translate the questionnaires for the respondents from English to Swahili or Kikuyu.

3.2.2. Weight Measurement

Round faced 'Aanonsen Model 102-10P BW' spring balance, weighing upto 25 Kg with an accuracy of 0.1 Kg and plastic shorts were used during the weight measurement of children.

3.2.3. Height Measurement

For children less than 3 years of age a 'fomatometer' infantometer was used. For children 3-5 years of age a height meter with a flexible measuring tape graduated in centimetres was used. Also a headboard was used to determine the highest point of the head.

3.2.4 Child Health Cards

These were used for the verification of the date of birth of the pre-schooler, and served as a source of record on immunization status of the child.

3.3 STANDARDIZATION OF RESEARCH TOOLS

The balances were standardized at the department of Weights and Measures in the Ministry of Commerce and Industry. In the field the accuracy of the balan-

ces were monitored by using standard weights of 4 Kg, 2 Kg and 1 Kg.

3.4 METHODOLOGY

3.4.1 TYPE OF INVESTIGATION

This investigation was a cross-sectional survey of the nutritional status of children between the ages of seven and sixty months. The target population of this study were the residential estate workers having children between the ages of seven and sixty months and small scale farmers in the adjoining areas who had children in the same age bracket. The area selected was Brooke Bond Tea Estates at Limuru, Kiambu district and small scale farmers in the surrounding area. The estate workers are ethnically heterogeneous coming from all over Kenya but with the dominant ethnic group being Kikuyu, Luo, Luhya, Kamba and Kisii. The small scale farmers are ethnically homogeneous and are exclusively Kikuyus.

3.4.2 POPULATION SAMPLING PROCEDURE

The study covered the households in the Brooke Bond Tea Estates at Limuru and households of small scale farmers who were within two hours walk from the estate. Only households with children of age between 7 to 60 months were used in the selection of the study sample. From literature review, the proportion of malnourished children in Kenya is approximately

30% (Jelliffe 1968). For determination of minimum sample size needed for this study, an assumption of 30% rate of malnutrition was therefore taken into account. The confidence limit of 95% and a range of 7% was used for the determination of the required sample size. The sample size was computed using the following formula:

$$N = \frac{z^2 pq}{r^2}$$

Where:

- N = sample size required
- z = The desired level of confidence of estimate of population of malnourished children in the study community. In this case the confidence limit was 95%. This corresponds to a Z value of 1.96.
- p = estimate of population of malnourished children in the study community =0.3.
- q = 1-p = proportion of well nourished children in the study community =0.7.
- r = Precision or risk of error in estimating the prevalence protein energy malnutrition. This was set at 7%.

Therefore:

$$N = \frac{(1.96)^2 \times 0.3 \times 0.7}{(0.07)^2} = 165$$

The sample size required in this study was therefore 165 children aged 7-60 months for small scale farmers and 165 children of the same age range for estate workers.

Before the start of the investigation a visit to all the households within the area of study and assessment of those households with children within the target age group (7 to 60 months) in both the estates and small scale farms was done.

From the list of households, 200 households from

small scale farms and 200 households from residential estate workers were randomly selected. A sample larger than 165 was chosen to cater for those respondents who might have been unavailable for questioning or refuse to take part. Fortunately there were no cases of refusal, and the larger sample allowed for more power of statistical analysis tests.

3.5. DATA COLLECTION PROCEDURE AND MANAGEMENT

3.5.1 TYPE OF DATA COLLECTED

The following data was collected during the study:

- a) Demographic information i.e. family composition, age, sex, education, occupation and marital status of the members of the household.
- b) The occurrence of births and in a particular household within 12 months before the date of interview.
- c) The literacy of the head of the household.
- d) The income in the household from different sources.
- e) The ownership of land, amount of land cultivated, type of crops grown and livestock kept.
- f) The ownership of certain household asset e.g. lamp, paraffin stove, motorcycle, bicycle, animal cart, sofaset, etc.
- g) Type of housing, energy used for lighting and cooking and main source of water.

h) The morbidity experiences of children between the ages of 7 and 60 months using a seven day recall.

i) Anthropometric measurements, occurrence of wasting in the pre-schoolers and information on breastfeeding for children less than 19 months of age.

j) The semi-quantitative dietary information and breastfeeding for children less than 19 months of age.

The data was collected using a personally administered structured interview schedule.

3.5.2 DATA COLLECTION PROCEDURE

On arriving at a household the person collecting data introduced himself/herself to the respondent and requested for availing of the preschooler(s) who had been identified during the establishment of the sampling frame. A request for cooperation in taking measurements and administration of questionnaire was made.

3.5.3 Weight measurement

The balances with the plastic shorts were zeroed after every measurement was made. Most of the clothing e.g. shirts, shorts, coats and shoes, except minimal indoor clothing were, removed from the child. The child was then suspended using the straps of the plastic shorts. The weight was taken as soon as the child was still, and hanging freely without any support.

3 .5.4 Height measurement

For children less than three years of age the length was taken horizontally using a 'somatometer' infantometer. The child with all clothing and shoes removed was then made to lie on a flat surface. The child's head was firmly placed against a vertical board, set exactly at right angles to the floor. A sliding vertical board was brought into firm contact with the heels, with the child's eyes looking straight upwards. The knees were pressed straight and the sliding foot board was moved until it was firmly against the heels and the reading was taken.

For children between 3-5 years of age, the clothing and shoes were removed. The height was measured using a centimeter tape with a length of two metres. The bare-footed child was asked to stand straight and look straight ahead on a flat surface. The heels were maintained together and the body was placed so that the shoulder blades, buttocks, and heels were touching the vertical surface of the heightmeter. The feet were maintained flat on the floor, slightly apart with the legs and back straight and arms at the sides. The shoulders were relaxed and in contact with the heightmeter. As the child stood still the horizontal headboard was placed firmly against the head. The height was read at the base of the horizontal board which was wide enough to measure the child's

crown only.

3.5.5 Immunization

Information on immunization was collected through questioning the respondent about the immunizations the child had received as well as from the child health card where available. Information as to whether the child had contracted measles was sought from the respondents and a check made on the BCG scar. Approximately 85% of the children examined had health cards.

3.5.6. Morbidity

Morbidity data was collected on certain diseases which were frequent and have strong nutritional implication. The diseases that were considered are diarrhea, vomiting, coughing and fever. One week recall was made. The aim was to establish prevalence of the diseases.

3.5.7 Questionnaire Administration

All other data on the household and the children was collected through interviews and observation. The respondents were mostly wives of the male headed households. Where there was no wife or male head, a re-visit was arranged.

3.5.8 DATA CLEANING, PROCESSING AND ANALYSIS

Data cleaning was carried out to check for completeness of data from the answers given, and to ensure that data had been entered correctly into the compu-

ter. Data was entered into computer using flash code programme. Simple cross-tabulations were done to determine relational distribution before deciding on the most appropriate statistical analysis for the data. Finally correlation analysis was done on the data.

CHAPTER 4

RESULTS

4.1 DESCRIPTION OF POPULATION

A total of 400 households, divided equally between the estate and small scale farming communities were surveyed. The coverage achieved with respect to the total number of households in the whole study area was approximately 20%. The ethnic distribution of the households in the study area as given in Appendix 1 was: 289(72.2%) Kikuyu, 42(10.5%) Kisi, 37(9.3%) Luhya 16(4.0%) Luo, 8(2.0%) Kamba, and 8(2.0%) belonged to the other tribes.

Seventy percent of the small scale farmers households had houses with mud floors while 15 % of the estate workers households had similar floored houses. Eighty five per cent of the estate workers had cemented floor houses and 25% of the small scale farmers had similar floored houses. Five per cent of the the small scale farmers had other types of floors in their houses.

In the small scale farmer households, 12.5% had houses with mud walls while 14.5% of the estate workers had houses with similar walls. Approximately 47% of the small scale farmers had houses made of off-cut walls. Thirty percent of the houses of the small scale farmers had timber walls, while four percent of their houses had stone walls. In the estate, 85.5% of

the workers had houses with stone walls.

Two per cent of the households of the small scale farmers had grass thatched houses while 2.5% had flat tinned roofs and 94.5% had corrugated iron sheet. Only 1% of the households of the small scale farmers have other types of roofs on their houses. Approximately 91% of the estate workers have corrugated iron sheets roofs while the rest have other types of roofs.

Thirty one per cent of the small scale farmers had a separate structure for the kitchen from the main house while the rest had the kitchen located in the main house. Only one percent of the estate workers had a separate structure for the kitchen.

Eighty nine per cent of the small scale farmers used wood for cooking and the rest used other sources of fuel for cooking. In the estate, 98.5% of the workers used wood for cooking. In the small scale farms 91.00% of the households used paraffin for lighting and 94% of the estate workers used paraffin for lighting. This showed that majority of the households of both the small scale farmers and the estate workers use wood and paraffin for cooking and lighting respectively.

All the estate workers got water from taps installed in the residences while 19%, 8.0% and 73% of the of the small scale farmers got water from taps, wells

and rivers, respectively.

Three hundred and fifty three (353) underfives were surveyed from the small scale farmers households and 205 from estate workers households. In the small scale farms, 75.5% of the children who were older than one year had completed immunization while only 58.3% of the estate workers' children in the same age group had completed immunization. In the small scale farmers households, 14.4% of the children had had measles compared to 17.4% of the children of the estate workers who had had the disease.

Of the study children 11.1% of the small scale farmers children were less than one year of age while 13.8% of the estate workers children were in the same age-group. On the other hand, 23.6% and 24.6% of the children from the small scale farmers and the estate workers, respectively were between 1-2 years old. The children between 2-3 years old constituted 23.3% and 26.1% of the total children of the small scale farmers and the estate workers respectively. Those between 3-4 years old were 21.6% and for the small scale farmers and 17.4% for the estate workers, while those more than 4 years of age were 20.3% and 18.2%, respectively.

Other salient socio demographic characteristics are shown in Table 1.

Table 1. Demographic characteristics of the study population.

Characteristics	Small scale farmers	Estate workers
People in sample households	1460	1196
No. of underfives	305	253
Mean no. of people/household	7.3	6.0
Mean no. dependents*/household	4.3	3.66
Mean no. underfives	1.72	1.56

*No. of dependents =<16 years, and >=65 years of age

As illustrated in Table 1, on the average there were more people, underfives and dependents in the households of the small scale farmers than in the households of the estate workers. Among the small scale farmers households, data for 305 children was collected compared with 253 children for the estate workers. Of the total number of 558 children studied, 289 were females, while 269 were males.

In all the study households the mean family size was 6.64 and the mean number of dependents was 3.94, while the mean number of underfives was 1.64. The minimum family size was 2 and the maximum family size was 15. The number of underfives in a household

ranged between one and four.

Among the small scale farmers' households, the mean family size was bigger than the mean family in the households of the estate workers. The small scale farmers have larger numbers of dependents than the estate workers. A similar trend is observed with regard to the number of underfives in the households, with the households of the small scale farmers having an average of 1.72 underfives while the estate workers have an average of 1.56 underfives.

Within the previous 12 months preceeding the survey, seventy seven births were reported to have occurred among the estate sample and sixty five among the small scale farming group, giving birth rates of 64/1000 and 44/1000, respectively.

The 200 small scale farmers households consisted of invariably Kikuyu tribe. The sizes of the farms varied from 0.5 acres to 9.0 acres.

4.2 HOUSEHOLD CHARACTERISTICS

With reference to the sex of the heads of household in the two communities, there were more male headed households in the small scale farming community (88.5%) than in the estate workers community (76.0%). The difference was statistically highly significant ($p=0.0025$) as depicted in Table 2 below.

Table 2. Distribution of the heads of the household by type of community and sex.

Sex	Small scale farmers	Estate workers
Male	177	152
Female	23	48
Total	200	200

$\chi^2 = 9.2$ DF = 1 $p=0.0025$

DF = Degrees of freedom

The data was assessed to determine what marital situations were most prevalent in the two communities. As illustrated in Table 3, most of the households were primarily those of married couples.

Table 3. Distribution of the heads of the households by the type of community and marital status.

Marital status	Small scale farmers (n=200)	Estate workers (n=200)
	%	%
Single	8.0	14.5
Married	86.0	75.5
Divorced	2.0	9.5
Widow	4.0	0.5

$X^2 = 20.3$, DF = 3 p=0.0001

There was a statistically significant difference in the marital status of the heads of the households between the small scale farmers and the estate workers. A higher proportion of the single and divorced heads of households were found in the estates, while a higher proportion of married and widowed heads of the households were in the small scale farms.

When the information on the number of years of education of the head of the household were classified into certain educational categories (Table 4) it was observed that a bigger proportion of heads of the households from the small scale farms had acquired more than eight years of education compared to the household heads in the estates.

Table 4. Distribution of the heads of the households by the type of community and education level.

Education level (years)	small scale farmers (n=200)	Estate workers (n=200)
	%	%
0-1	20.0	30.0
2-5	23.0	25.0
6-8	33.5	38.0
9-17	23.5	7.0

$\chi^2 = 30.2,$ $DF = 3$ $p = 0.0000$

The difference in the educational level of the heads of the households in the two communities was highly significant.

Data on the family sizes of the study communities was grouped into 3 classes (Table 5) and as depicted below most of the households in both had families that had less than 10 members.

Table 5. Distribution of the heads of the households by the type of community and family size.

Family size	small scale farmers (n=200)	Estate workers (n=200)
	%	%
1-4	21	32
5-9	56	57.5
10-15	23	10.5

$\chi^2 = 13.9$ DF = 2 p=0.0009

There was significant difference in the family sizes of the two communities. A bigger proportion of the households in the small scale farms had family sizes of more than 9 members than in the estate.

When the demographic data was analyzed for the number of dependents * to determine the number of households with a certain number of dependents as shown in Table 6, most of the households had less than seven dependents.

Table 6. Distribution of the households by the type of community and number of dependents.

No. of dependents per household	Small scale farmers (n=200)	Estate workers n=200
	%	%
1-3	40	48
4-6	42	47.5
7-10	18	4.5

$\chi^2 = 18.5$ DF = 3 p = 0.0003

dependents* = Number of dependents (0-<15 years and those whose age is more than 64 years) in the household.

The majority of the households in the two communities had less than seven dependents. The proportion of households with more than 6 dependents in the estates was lower than in the small scale farms.

Data on the number of underfives in the households of the two communities (Table 7) showed that most of the households had less than three underfives. The percentage of the households that had more than two underfives was higher in the small scale farms than in the estates.

Table 7. The distribution of the households by the type of community and number of underfives.

Number of underfives per household	Small scale farmers (n=200) %	Estate workers (n=200) %
1	39	48
2	49.5	48.5
>=3	11.5	3.5

$X^2 = 11.8$ DF = 2 p = 0.0026

There was a significant difference in the number of underfives within the two communities, with more underfives being found in the households of the small scale farmers than those of the estate workers.

Information on the annual income of the households of the two communities (Table 8) shows that about two-fifths of the households of the small scale farmers have an annual income of less than Ksh 8,400, while more than two thirds of the households of the estate workers had an income of less than Ksh 8,400 per annum.

Table 8. Distribution of the households of the two communities and the annual income in Kenya shillings.

Income category	Small scale	Estate
	farmers (n=200)	workers (n=200)
	%	%
0-8399	37.5	68.0
8400-12000	23.5	22.5
>12000	39.0	9.5

$\chi^2 = 53.6$, DF = 2 p=0.000

* annual income = salary of the head of the households + salary of the wife of the head of the household + income from other sources.

The difference in the annual incomes of the households of the two communities was significant.

The mean annual income of the small scale farmers was Ksh 14,120 while the mean annual income of the estate workers was Ksh 8,175. The minimum wage set by Government of Kenya is presently Ksh 700 per month and hence this works out to a minimum income of Ksh 8,400. Therefore the mean annual income of the small

scale farmers is higher than the mean annual income in Kenya while the converse is true for the estate workers.

Results of the monthly salaries (Table 9) show that while slightly over half of the heads of the households of the small scale farmers have salaries below Ksh 700, over nine-tenths of the estate workers have salaries less than Ksh 700.

Table 9 .Distribution of the households by the type of community and the monthly salary of the head of the household in Kenya shillings.

Income category	Small scale farmers (n=200)	Estate workers (n=200)
	%	%
0-699	56.5	94.0
700-1000	24.0	5.5
>1000	19.5	0.5

$\chi^2 = 78,$ $DF = 2,$ $p = 0.0000$

Ninety four percent of the estate workers had a monthly income which was less than Ksh 700. Approximately one-fifth of the households of the small scale farmers had a monthly income of over Ksh 1,000 as compared to 0.5% of the estate workers.

There was a statistically significant ($p=0.0000$) difference in the incomes of the heads of the households in the small scale farms and estate workers.

Results from the dietary information showed that the households of the small scale farmers tended to consume most of the foods listed in Table 10 more frequently than the households of the estate workers. Table 10 shows all the foods whose consumption was significantly different between the two communities. For all the foods whose intake was found to be significantly different between the two communities, only the vegetable and fish intake was found to be higher in the households of the estate workers than of the small scale farmers. The intake of all other foods was higher in the households of the small scale farmers.

Table 10. Distribution of the households by food intake and type of community for foods whose intake showed significant difference ($p < 0.05$) in consumption between the two communities.

Food Item	Small scale farmers (n=200)		Estate workers (n=200)	
	Food intake in days per week		Food intake in days per week	
	1-3 %	4-7 %	1-3 %	4-7 %
Bread	38	22	38	7
Wheat	58	7	41	6
Sugar	2	95	7	89
Rice	50	9	30	6
Potatoes	18	79	40	47
Beans	49	46	54	26
Peas	22	8	9	5
Meat	46	11	29	6
Fish	3	1	16	10
Vegetables	28	70	17	82
Fruits	30	39	29	13

'bread' refers to leavened bread bought from shops.

'wheat' refers to the wheat flour used for making products at home.

4.3. FINDING OUT THE HOUSEHOLD AND CHILDREN CHARACTERISTICS THAT COULD HAVE CONTRIBUTED SERIOUSLY TO THE NUTRITIONAL STATUS OF THE CHILDREN.

Only tables with characteristics that showed significant association ($p < 0.05$) with the children nutritional status are given.

Results in Table 11 showed that about one-fifth of the children from small scale farmers had a weight deficit for their age, while more than one-third of the children of the estate workers had a weight deficit for their age. The cut-off point for nutritional status using weight-for-age is 80%. Those below 80% are considered malnourished.

Table 11. Distribution of the children by their nutritional status (weight for age (NCHS)) and type of community.

Cut-off point for weight-for-age	Small scale farmers (n=305)	Estate workers (n=253)
<80%	18.0%	35.2%
>=80%	82.0%	64.8%

$\chi^2 = 20.3$, DF = 1, p = 0.0000

The proportion of malnourished (underweight) children in the estates is significantly higher ($p = 0.0000$) than in the small scale farms.

Table 12 shows nutritional status using height-for-age with the cut-off point at 90%. Those children who fell below this cut-off point are considered malnourished, while those above are well nourished. As can be seen in the table, about one-fifth of the children of small scale farmers had low height for their age, compared with two-fifths of the children of the estate workers who were of similar nutritional status. The children with a low height for their age can be considered stunted.

Table 12. Distribution of children by their nutritional status (height-for-age) and type of community.

Cut-off point for height-for-age	Small scale farmers (n=305)	Estate workers (n=253)
<90%	21.3%	41.1%
>=90%	78.7%	58.9%

$\chi^2 = 24.7,$ $DF = 1,$ $p = 0.0000$

The proportion of children who were stunted in the estates was significantly higher ($p=0.0000$) than in the small scale farming group.

Table 13 shows the nutritional status of the children according their weight for height. The results suggest that most of the children of the two communities had appropriate weight for their height. Children who have a low weight for their height are considered to be wasted.

Table 13. Distribution of the children by their nutritional status (weight-for-height (NCHS)) and the type of community.

Cut-off point for weight-for-height	Small scale farmers (N=305)	Estate workers (N=253)
<80%	14.0 %	15.8%
>=80%	86.0%	84.2%
$\chi^2 = 0.11306$ DF = 1 p = 0.7367		

The difference in wasting of the children of the two communities was not significant ($p > 0.05$). This suggests there is a substantial degree of adaptation by the children from the estate and hence the little difference in the level of wasting in the children of the two communities. This means that the level of current malnutrition prevailing in the two communities is for practical purposes the same.

Information on how the nutritional status of the children of the small scale farmers relate to the sex of the head of the household is given in Table 14. The results indicate that about one-fifth of the children of the male headed households had a weight deficit for their age, while about one-third of the children of female headed households suffered from the same nutritional condition.

Table 14. Distribution of the children of small scale farmers by the sex of the head of the household and nutritional status using height-for-age.

cut-off point for height-for-age	Children from male headed households (n=273)	Children from female headed households (n=32)
<80%	19.4%	37.5%
>=80%	80.6%	62.5%

$\chi^2 = 5.59$ DF = 1 p = 0.0181

In the small scale farms children from female headed households run a higher risk of becoming malnourished than children from in born in male headed household within this study area.

Data on the relationship between education standard of the head of the household and the nutritional status of the children of the children of the small scale farmers is given in Table 15. The difference in nutritional status of children from households whose heads have attained different levels of education was significant ($p=0.0189$).

Table 15. Distribution of the children from the small scale farms by their nutritional status (height-for-age) and the education level of the head of household in years.

Cut-off point for height-for-age	Educational level of head of the household (years).				
	0-2	3-5	6-8	9-17	
<90%	28.2%	24.1%	24.0%	18.3%	
>=90%	71.8%	75.5%	76.0%	91.7%	
n=	71	58	104	72	305
$\chi^2 = 9.96$	DF = 3	$p = 0.0189$			

From the table above a small proportion (8.3%) of children of the small scale farmers from households whose head had acquired more than 8 years of education had a height-for-age deficit. On the contrary about one-quarter of the children from households whose head had not acquired more than 8 years of education had a height for age deficit. The results suggest that malnutrition decreases as the level of

The results in Table 16 indicate that while over two-fifth of the children of the small scale farmers from divorced and single families had a height-for-age deficit only about one-fifth of the children from married and widowed families had a height-for-age deficit.

Table 16. Distribution of the children of the small scale farmers by their nutritional status (height-for-age) and by marital status of the head of the household.

Height-for-age	Marital status of household head			
	Single	Married	Divorced	Widowed
<90%	43.5%	19.1%	40.0%	20.0%
>=90%	56.5%	80.9%	60.0%	80.0%
n=	23	267	5	10

$\chi^2 = 8.57$ DF = 3 p = 0.0356

The difference in the nutritional status of children from households whose heads had different marital status is statistically significant (p=0.0356). In the small scale farms there was a higher proportion of stunted children among the households of single and divorced heads of households than in the households of those heads who were married or widowed.

A summary of the relationship between nutritional status and the annual income is illustrated in Table 17. The results show that the higher the household income the smaller the proportion of children who were malnourished.

Table 17. Distribution of the children of the small scale farmers by their nutritional status (weight-for-age) and annual income in the household.

Weight-for-age	Income groups (Kenya shillings)		
	0 -8399	8400 -12000	>12000
<80%	21.6%	21.8%	11.7%
>=80%	78.4%	78.2%	88.3%
N=	116	78	111

$\chi^2 = 5.2$ DF = 2 p = 0.035

As demonstrated in Table 17 about one-fifth of the children from small scale farmers household in the income group of less than Ksh 12,000 per annum had a weight-for-age deficit. On the other hand only about one-tenth of the children with such a condition came from households with an annual income between greater than Ksh 12,000. The difference in the nutritional status from the households with different incomes was significant (p=0.035).

The results for the distribution of the children of the estate workers by their nutritional status and sex are given in Table 18. While about three-tenths of the the female children had a weight-for-age deficit over two-fifths of the male children of the of the estate workers had a weight-for-age deficit.

Table 18 : The distribution of the children of the estate workers by sex and their nutritional status .

Weight-for-age	sex of children	
	male	female
<80%	40.2%	29.8%
>=80%	59.8%	70.2%
n=	132	121

$\chi^2 = 3.5$

DF = 1

p=0.034

The results for the distribution of the children of the small scale farmers by their nutritional status and the number of dependents in the household are given in Table 19. While about one-tenth of the children from households with upto two dependent had a weight-for-age deficit about one fifth of the children from households with three to six dependents had a weight-for-age deficit and over a fifth of the children from households having more than six dependents had a weight-for-age deficit.

Table 19 : The distribution of the children of the small scale farmers by their nutritional status and by the number of dependents in the households.

Weight-for-age	number of dependents		
	0-2	3-6	7+
<80%	10.6%	18.0%	25.4%
>=80%	89.4%	82.0%	74.6%
n=	66	172	67

$\chi^2 = 5.4$ DF=2 p=0.043

4.4 MORBIDITY INFORMATION

Table 20. shows that there was a higher prevalence of diseases in the children of the estate workers than in the children of the small scale farmers.

Table 20. Prevalence of certain diseases in the children of the two communities.

Number of positive responses						
Children of small scale farmers (n=305)			Children of estate workers (n=253)			
Symptoms	No.	%	No.	%	p	
Diarrhea	36	11.9	56	22.1	<0.01	
Cough	87	28.9	09	39.9	<0.05	
Vomiting	17	5.6	28	11.1	<0.05	
Fever	53	17.5	74	29.5	<0.01	

The pattern of morbidity in the two communities was similar. The prevalence of the diseases in the two communities in descending order was cough, fever, diarrhea and vomiting. The morbidity experience was significantly higher ($p < 0,05$) in the children of the estate workers than in the children of the small scale farmers.

The results on the association between the nutritional status of the children of the estate workers and vomiting experience in the previous week are given in Table 21.

Table 21. Distribution of the children of the estate workers by their nutritional status (weight-for-age) and vomiting experience.

Weight-for-age;	Vomiting experience	
	no	yes
<80%	33.3%	50.0%
>=80	66.7%	50.0%
n=	225	28

$$\chi^2 = 5.1 \quad DF = 1 \quad p = 0.022$$

Approximately one-third of the children of the estate workers who had not vomited in the previous week had a weight for age deficit while one-half of the children who had experienced vomiting in the previous week had a weight-for-age deficit. The proportion of children who had vomited and had a weight-for-age deficit is significantly higher ($p < 0.05$) than that of those children who had experienced no vomiting.

Table 22 gives the distribution of the children of the estate workers by their nutritional status and by vomiting experience. From the table it is observed that while only about one-third of the children who had vomited were stunted three-fifths of the children of the estate workers who had experienced vomiting were stunted.

Table 22. Distribution of the children of the estate workers by their nutritional status (Height-for-age) and vomiting experience.

height-for-age	vomiting experience	
	no	yes
<80%	38.7%	60.7%
>80%	61.3%	39.3%
	225	28

$X^2 = 5.0$ DF = 1 p=0.0253

The difference in the proportion of the

children of the estate workers who had vomited and are stunted is statistically significant from the proportion that had not vomited but was stunted.

As depicted in Table 23 about one-half of the children of the estate workers who had fever in the previous week had a weight-for-age deficit. Only about a one third of the estate workers children children who did not have fever in the previous week had a weight-for-age deficit.

Table 23. Distribution of the children of the estate workers by their nutritional status (weight-for-age) and experience of fever.

Weight-for-age	fever experience	
	yes	no
<80%	45.9%	30.7%
>=80%	54.1%	69.3%
n=	74	179

$X^2 = 5.3$ DF = 1 P = 0.0211

The proportion of children who had fever in the previous week and had weight for age deficit is significantly higher ($p < 0.05$) than that of children who did not have fever in the previous week but had a weight for age deficit.

ANALYSIS OF VARIANCE

Table 24 :Analysis of variance of nutritional status
(weight-for-age) by type of community.

Mean weight-for-age

sample mean = 91.18%

small scale farmers children mean= 94.37%

estate workers children mean =87.34%

parameter	significance		
	DF	F	of F
farming type	1	3.931	0.048

Table 25 :Analysis of variance of the nutritional
status (Height-for-age) by type of community

Mean height-for-age

Sample mean =92.70%

small scale farmers children mean = 93.94%

estate workers children mean =91.21%

parameter	significance		
	DF	F	of F
farming type	1	35.3	0

SMALL SCALE FARMERS CHILDREN

Table 26 :Analysis of variance of the nutritional status (weight-for-age) by sex of the children in the small scale farms.

Mean weight for age

mean for both sexes =94.37%

mean for the males =87.82%

mean for the females =99.71%

parameter	DF	F	significance of F
Sex of child	1	4.734	0.03

Table 27 :Analysis of variance of the nutritional status (weight for height) by the diarrhea experience in the previous week in the small scale farms.

Mean weight for height

mean for all children =96%

mean for children who did not experience diarrhea = 98%

mean for those children who experienced diarrhea =89%

parameter	DF	F	significance of F
Diarrhea	1	4.222	0.041

ESTATE WORKERS CHILDREN

Table 28 : Analysis of variance of the nutritional status (weight-for-age) by sex of the child in the estates.

Mean weight-for-height

mean for all children =87.34%

mean for males = 83.74%

mean for the females =91.26%

parameter	DF	F	significance of F
Sex of the child	1	3.3	0.07

Table 29 : Analysis of variance of the nutritional status (height-for-age) by vomiting experience of the children in the estates.

Mean height for age.

mean for all children =

mean for children who did not vomit= 91.49%

mean for children who vomited= 88.98%

parameter	DF	F	significance of F
vomiting	1	5.37	0.021

4.5 Correlation between nutritional status of the underfives, household and children characteristics and morbidity.

Data on the household and children characteristics plus morbidity were analyzed as potential indicators of the nutritional status of the children in the two areas. Table 30 shows the degree of correlation between these factors in the small scale farming areas, and weight-for-age, height-for-age and weight-for-height. Table 31 on the other hand shows the degree of correlation of the same factors among the estate workers, and weight-for-age, height-for-age, and weight-for-height.

Table 30. Correlations between household and children characteristics and morbidity experience in the small scale farming area and weight-for-age, height-for-age, and weight-for-height.

CORRELATION MATRIX

CHARACTERISTIC	NUTRITIONAL INDEX		
	W/A	H/A	W/H
Household annual income	S	S	NS
Marital status of household head	S	NS	NS
Sex of the head of household	NS	S	NS
Family size	NS	NS	NS
Educational level of household head	NS	S	NS
Educational level of the wife of household head	NS	NS	NS
Number of dependents per household	NS	S	NS
No. of Underfives per household	NS	S	NS
Child diarrhea experience in previous 7 days	NS	NS	S
Child cough experience in previous 7 days	NS	NS	NS
Child vomiting experience in previous 7 Days	NS	NS	NS
Fever experience	S	NS	S
Amount of land owned	NS	S	NS
Sex of child	S	NS	NS
Age of child	NS	NS	S

S(significant)= $P < 0.05$

NS =Not significant

Table 31. Correlation between household and children characteristics, and morbidity and Weight-for-Age, Height-For-Age, Weight-for-Height .

CORRELATION MATRIX

CHARACTERISTIC	W/A	H/A	W/H
Household Annual income	NS	NS	NS
Marital status of household head	S	NS	NS
Sex of the head of household	NS	S	NS
Educational level of household head	NS	NS	NS
Family size	NS	NS	S
Educational level of the wife household head	NS	NS	S
Number of dependents per household	NS	NS	NS
Number of underfives per household	NS	NS	NS
Child diarrhea experience in previous 7 days	NS	NS	S
Child cough experience in previous 7 days	S	NS	NS
Child vomiting experience in previous 7 Days	NS	S	NS
Fever experience by child	S	S	NS
Amount of land owned	NS	NS	NS
Sex of child	S	NS	NS
Age of child	NS	S	NS

S(significant) = $p < 0.05$

NS =Not significant

CHAPTER 5.

DISCUSSION

5.1 HOUSEHOLD CHARACTERISTICS.

In total 305 children from the small scale farmers and 253 children from the estate workers were within the study target age group in the sample households. This gave an average of 1.5 and 1.2 children per household in the small scale farms and in the estates, respectively. This is to be expected considering that there were more underfives from households of the small scale farmers than of the estate workers.

However the trend might change in future considering that more households of the estate workers reported occurrence of births over the previous 12 months (77 births) than in small farms (65 births), although the difference between the births was not significant ($p > 0.05$). The above figure gives an estimated crude birth rate of 44/1000 in the small farms and 64/1000 in the estate. This is rather worrying considering the fact that the children of the estate workers were more poorly nourished compared with those of small scale farmers despite the smaller family sizes. This high birth rate will lead to more mouths to feed, and this is likely to lead to a worse state of affairs if nothing drastic is done to improve the socio-economic status of the estate workers.

Increased number of births in the estate population may be explained by the estate workers youthfulness who were in their early reproductive cycle. Also the presence of unmarried men or men who have left their wives in their home areas, and the single and divorced women, increases the likelihood of development of relationships that consequently may result in pregnancies.

5.2. NUTRITIONAL STATUS :

Of the 558 children studied, 144 (25.8%) had a weight-for-age deficit, (<80% Weight-for-Age). One hundred and sixty nine (30.3%) of them were below 90% height-for-age while 84 (15.1%) were below 90% weight-for-height (appendix 3).

Of the 132 male children of the estate workers (40.2%) were underweight for their age while of 121 female children of the estate workers, 29.8% had weight deficits for their age. The difference between the males and the females nutritional status in the estates was significant. There was no statistically significant difference in the nutritional status of the male and female children of the small scale farmers. In the National Rural Nutritional Survey in Kenya, carried out in 1982 the difference in nutritional status that appeared between male and female children was not significant (CBS 1983), hence supporting the findings of this study. However in a study done in India (Grewal 1973), a sex difference in nutritional status was observed with males having better nutritional status. This was attributed to the Indian cultural bias against female children.

Analysis of the nutritional status of all the children results (Table 11, Table 12) showed that the nutritional status of the children of the estate workers, using weight-for-age and height-for-age

standards, was poorer than that of the children of small scale farmers. The difference was significant at ($p < 0.05$). Eighteen percent of the children of the small scale farmers were below 80% of WHO weight-for-age standards compared to 35.2% for the children of the estate workers. In the small scale farmers households 21.3% of the children were stunted (below 90% of the height for age (WHO standards)), compared to 41.1% for the children of the estate workers.

Fourteen percent of the children of the small scale farmers were below 90% weight-for-height of the WHO standards compared to 15.8% of the children for the estate workers (Table 13). The difference, however, was not significant at ($p < 0.05$).

Twenty four per cent of the children from the male headed households were below 80% weight-for-age compared to 35.5% for the children of estate workers (Table 14). The difference was significant at ($p < 0.05$). Of the children from the male headed households 27.5 % were below 90% height-for-age of the WHO standards compared to 44.1% of the children from female headed households (Table 15). The difference was significant at ($p < 0.001$).

Usually the female-headed households are insecure, and the pressure of providing for the household is such that the female heads can not give as much attention to the children as would be the case if they

were living with a spouse. This is more so where the females who are heading households are either single or divorcees as was the situation in the study.

The nutritional status of the children as shown in Appendix 4 suggests that the children of the two communities are not different nutritionally until after one and a half years when the small scale children become significantly better off than those of the estate workers.

The nutritional status with respect to ethnicity was 119, (27.9%) of the Kikuyu children were stunted compared to 10 (52.6%) Luo and 12 (26%) Luhya children. Four (50%) of the Kamba children were stunted while 19 (38%) and 5 (55%) of children from Kisii and other tribes respectively were stunted (Appendix 2). Studies done in East Africa (Stephenson et al. 1983) show that the growth deficits in the children appear to be a feature of deprivation and poverty rather than ethnicity.

The high level of underweight children in both small scale farms and the estates could be due to small body sizes owing to chronic malnutrition or due to the recent malnutrition afflicting some of the children. In this study chronic malnutrition was more prevalent than recent malnutrition.

Deficit in height-for-age (also referred to as stunting) is an indicator of chronic malnutrition. It

is brought about by long periods of deprivation, leading to arrest or slackening in the rate of growth of height. The proportion of children who are stunted is quite substantial to warrant concern in the two communities. Results of a rural nutrition survey done in Kenya in 1982 (CBS 1983) showed that the level of stunting was 28%. This shows that the small scale farmers had a slightly lower (21.3%) prevalence of stunting than the 28% figure in 1982, while the estates have a much higher figure. This shows that the children of the small scale farmers in this study were subjected to less chronic malnutrition than the overall national population.

This study was not able to determine whether the estate communities would be better or worse off nutritionally if they lived in their home areas. Usually most of the people who work in the estates are not endowed with many resources, and have little or no education. They have to depend primarily on their salary income, which has been shown to be lower than income among the small scale farmers (Table 8).

A deficit of weight-for-height is referred to as wasting. Weight-for-height is a good indicator as to whether a child has suffered a food deprivation in the very near past. This is because when people suffer acute malnutrition a very fast decrease in weight occurs with no noticeable change in height. It

therefore assumes that a child is doing well as long as he has a certain weight for a particular height. Therefore it does not differentiate between those who have been well nourished all along and those who suffered malnutrition in the past but are presently well nourished thereby having appropriate weight for their stunted height. Weight-for-height standards cannot differentiate between children who have grown normally all along, from those who have undergone adaptation. Whether weight attained or height attained is more affected by PEM depends on when PEM occurs, the duration of the PEM and the seriousness of the PEM.

As depicted by the results (Table 12) a big proportion of the children of the estate workers and small scale farmers have been subjected to long periods of inadequate food either due to intake or utilization, and this has resulted in shorter stature. Shorter people generally have smaller body masses and therefore less weight. Though there was a significant difference in the children nutritional status between the two communities, using weight-for-age and height-for-age, the two communities appear to have the same level of current malnutrition as depicted by weight-for-height.

For such communities where quite a substantial proportion of the children are stunted, as is the

case in our study communities, the Weight-for-age results are influenced by the effects of chronic and acute malnutrition. This makes it tricky to say whether results that are below the standard are as a consequence of presently existing malnutrition or due to malnutrition in the past or both. In the communities included in this study most of the children having a low weight for their age seem to be mainly due to their relatively short stature rather than acute malnutrition.

5.3 INFLUENCE OF HOUSEHOLD FACTORS ON THE NUTRITIONAL STATUS OF THE CHILDREN.

The relatively better socio-economic level of the small scale farmers compared to the estate workers, for example in educational level of the head of the household (Table 4), income (Tables 8 and 9) and other factors such as livestock kept and ownership of certain households assets (appendix 6) tends to explain why the children of the small scale farmers are at greater advantage nutritionally compared to their estate workers counterparts. Similar findings (Ballweg 1972, Ramlingaswam 1974, Latham 1975, Grewal et al. 1973, Brink et al. 1976) where the nutritional status of the children was found to be highly associated with economic status of households have been reported. Here, children from higher economic status were better off nutritionally. Low income has been noted to be an important characteristic of families with high prevalence of malnourished infants and preschool children (Ritchie and Naismith 1975, Ceudo et al. 1972). The nutritional status of children from small scale farms was better despite the bigger family sizes, more dependents and more under-tives per household (Tables 5, 6 and 7). Though the small scale farmers have bigger families, they are in a more advanced stage marriage. Hence they are more stable financially due to the higher incomes and

therefore can still manage to take care of their bigger families better than the estate workers.

Other studies reported showed no association between family size and nutritional status (Karanja 1975). On the other hand, studies by Ballweg 1972, and Morley et al. 1968 showed there was association between nutritional status and the family size, with smaller families having children with better nutritional status. The smaller family sizes of the estate workers can be attributed to most of the couples being young. They are therefore in their early and middle stages of their reproductive cycle, while most of the small scale farmers were older, most being in their middle or late stages of the reproductive cycle. The difference in the stages of reproductive cycle can be explained by the fact that there were more births reported within the 12 months among the estate workers than by the small scale farmers.

Table 14 shows that a significantly higher proportion of children of female-headed households in the small scale farms have a height-for-age deficit. This could be due to the fact that these households have a single parent. The task of providing for the dependents tends to exert an extra burden on the single parents who are mostly unmarried or divorced. They therefore cannot get as much resources as compared to the households where both parents are involved

in bringing up children. The female heads can not get enough time to be with their children since most of the time they have to be away looking for money to take care of their dependents. In all the male-headed households both parents were actively involved in bringing up children. The burden of providing for the children was therefore lighter.

Job opportunities and wage earning potential to a large extent depends on the educational level attained. The higher educational level of the heads of the households from small scale farms means that most of them had more paying jobs. This was further demonstrated by the higher incomes in the households of the small scale farms compared to the estate workers.

The higher intake of most of the foods (Table 10) in the households of the small scale farmers may be attributed to the ability to get some of these foods from their farms, and also to the higher purchasing ability due to being better off economically compared to their estate counterparts. The difference in intake for most of the foods by the estate households was significantly ($p < 0.05$) lower than in the small scale farmers households. The higher intake of these foods and the more varied diet in the small scale farms would invariably lead to better nutritional status among the children of small scale farmers.

There was no significant difference in the intake

of maize and maize flour between the estate and the small scale farmers population. There was however, a significant difference ($p < 0.05$) between the two groups in the intake of bread, wheat flour, sugar, rice, potatoes, beans, peas, meat, fish, milk, vegetables, and fruits. Only fish and fruit intake was found to be higher among the estate households as compared to households in the small scale farms. There was on the other hand a higher frequency of intake of a more varied diet in the small scale farms as noted above. The varied diet of the small scale farmers can be due to their ability to grow some of the foods on their pieces of land. Also their higher incomes gave them better purchasing ability. The higher frequency of the intake of foods and the more varied diet hence leading to better nutritional status among the children in the small scale farms.

5.4 MORBIDITY AND NUTRITIONAL STATUS.

The morbidity results (Table 20) show that there was a higher prevalence of diarrhea, vomiting, fever, and coughing among the children of the estate workers than the children of the small scale farmers. There was significant association ($p < 0.05$) between the vomiting experience and the nutritional status of the children of the estate workers (Tables 21, 22) using weight-for-age and height-for-age). There was a significant association between the nutritional status of the children of the estate workers and their fever experience leads to fast utilization of the energy and hence leads to weight loss. The higher morbidity experience in the estates shows a positive relationship with the poorer nutritional status of the children of the estate workers. Malnutrition reduces the body's resistance to infection, and infection compounds the malnutrition problem (Latham 1975).

Since all the children in the estate go to a *nursery* and spend the day there, there are high chances of transmission of infections. The *nursery* serves both as an educational place as well as a day care centre for the children to stay, while their parents are working on the estate. Children of all ages attend and remain in the place, whether or not teaching

is going on. This could have led to the higher level of morbidity recorded, compared to the children of small scale farmers. Here the children usually stay with their mothers on their land. The children in the small scale farms who go to the nursery schools are usually above 5 years of age. They go there for academic purposes mainly in contrast to the children of the estate workers. There is much crowding in the estates, since most of the workers who are accommodated are provided with only one room to occupy with the family. This may tend to counteract the advantages accruing from having piped water and better kept compounds in the estate.

The levels of diarrhea episodes; 11.9%, and 22.%, in the small scale farmers children and in the estate workers children respectively, tend to imply that both the small scale farmers and the estate workers have a sanitation problem, though worse in the estates.

5.5. INTERACTION BETWEEN HOUSEHOLD CHARACTERISTICS, MORBIDITY FACTORS AND NUTRITIONAL STATUS OF THE CHILDREN.

Analysis of variance results (Tables 24 and 25) suggest that there is a strong association between the nutritional status of children measured by the weight-for-age and height-for-age, and the type of farming that exists. Working in the estates tended to put the children at a disadvantage compared to their counterparts in the small scale farm households.

The results of analysis of variance showed that the female children of the small scale farmers children were better of nutritionally than the male children using weight-for-age.

Also analysis of variance shows that the female children in the estates were better off nutritionally than the male children using weight-for-height and height-for-age

CORRELATION ANALYSIS

Results on correlation analysis (Tables 30)) suggest that there was a strong association between the nutritional status of the children of the small scale farmers measured using weight-for-age and height-for-age and the annual income of the household. This concurs very much with results from other studies (Ramlingaswam 1974, Ballweg 1972).

Income is a very good indicator of the economic status of a community or household. Children from households with high income have better nutritional status than those from households with lower incomes. This can be explained by the fact that higher income increases the purchasing power and hence ability to buy food.

A bigger proportion of children of the small scale farmers who were reported to have had diarrhea were significantly underweight for their height compared to the proportion of those who were underweight but with no diarrhea. Diarrhea leads to a sudden loss of weight and hence low weight-for-height. The precarious synergism between nutrition and infection (Morley et al, 1968,) seems to have had its effect in the study community, resulting in bigger proportions of children who had been ill, being malnourished.

In the small scale farms experience of fever over the previous one week was highly associated with the nutritional status of the children using weight-for-age and height-for-age. Fever can be a symptom for very many illnesses. A higher proportion of children who had fever in the previous week were underweight. This can be attributed to the high catabolism during fever, and it is usually accompanied by poor appetite which may lead to malnutrition due to reduced food intake.

In the small scale farms the marital status of the head of the household were significantly associated with the nutritional status of the children. The nutritional status for children from married couples were nutritionally better than those from the divorced, singles, and widows. Children of male headed households were also nutritionally better off than those from female headed households. Most of the females heading households were singles and divorcees. These were usually socially and economically disadvantaged. They hence have less food available in their households. Similar findings have been reported elsewhere regarding children from single parents family (Ballweg 1972).

In the small scale farms the family size was significantly associated with the nutritional status of the children using weight-for-height with children from the bigger families being worse nourished than those from the small scale farms.

In the estate the education of the wife of the head of household was found to be significantly associated ($p < 0.05$) with the nutritional status of the children. The children from mothers who had more education had better nutritional status. The more educated mothers are generally more health conscious, and are more likely to keep their children in better hygienic conditions compared to uneducated

ones. This reduces affliction from most infectious diseases, thus reducing the risks of being predisposed to malnutrition. Literate mothers also tend to understand better the teaching in health and nutrition programs. More educated women also tend to get married to the learned men hence increasing their socio-economic status (Aliling and Elequin 1976).

Diarrhea experience in the week before the interview showed a significant association ($p < 0.05$) with the nutritional status using weight-for-height in the small scale farms and in the estates. This can be due to the fact that a recent episode of diarrhea results in a very fast loss in weight, but it has little or no effect on the height in the short run. A bigger proportion of children who were reported to have had diarrhea were malnourished compared with the proportion of the malnourished who reported having had no diarrhea.

Coughing experience, vomiting experience and fever experience showed showed significant association with the nutritional status of the children of the small scale farmers and the estate workers with those who had suffered being worse off nutritionally than those who had not suffered.

The age of the children showed significant association ($p < 0.05$) with the nutritional status of the children using height-for-age in the estates and

weight-for-height in the small scale farms. The nutritional status of the children tends to deteriorate with increase in age due to being subjected to adversities for a longer time.

Studies have shown that transient nutritional problems normally do not arise after six months of life (Hoorweg et al. 1983), and especially in communities that are still breastfeeding their children, such as is the case of Limuru area where the study was undertaken. A study done in Kenya showed that in the first six months, the growth of infants closely followed the Harvard Standards of weight for age, and height for age (Oomen et al 1979). The results from this study showed that for children who are less than 18 months of age only a few stopped breast-feeding. For all the children in the study none had stopped breastfeeding at an age earlier than 10 months. It is when the children start deriving the bulk of the nutrients they need from a predominantly adult diet that noticeable faltering in growth occurs. This is aggravated by the high energy need of the children for their growth, and very active life. Ceado et al. (1972) demonstrated the age interval during which under nutrition develops in infants. This corresponds to between 5-6 months when breast milk is no longer adequate, and between 12-15 months due food

insufficiency, unsafe water and infectious diseases.

The amount of land owned a significant association with nutritional status (height-for-age) of the small smallscale farmers. Therefore there was an association between the extent of stunting and the amount of land owned and cultivated. The amount of land owned is by itself a social economic indicator. The ownership of land can be used to a certain degree to assess the extent of food security in the households. Therefore children from households with bigger pieces of land are rarely likely to have suffered from long periods of food shortage.

CHAPTER 6

6. CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

1. The children included in this study show a substantial level of malnutrition. This is characteristic of most rural communities, where a big proportion of the people are not able to have adequate food through out the year. The dominant form of malnutrition in both communities is chronic malnutrition. The farming rural communities are faced with lots of food during harvesting followed by long period of food shortage before the following harvest season. This state of affairs is observed in typical small scale farm areas like the one studied here. The food produced does not usually last the families for long. The high levels of stunting in the study communities suggests a high degree of poverty in the two communities.

The estate communities are faced with a continuous purchasing of food through out the years and are subjected to the ever fluctuating food prices, which are not followed by proportionate increase in salaries. This goes on to strain their already low salaries.

2. The level of malnutrition observed in the estates is higher than the national malnutrition level reported in the most recent rural National nutritional

survey (CBS 1983). The estate workers therefore are a disadvantaged group of the rural communities in terms of ability to own resources and procure food for their household members.

3. The two rural communities apparently have big proportions of their children ill in a week. This is apparently worse in the estate workers' households, despite the provision of piped water, of company health services, stone houses (though small in size), hygienic maintenance of residential areas (toilets and bathrooms), and employees to trim grass and collect rubbish around the residence.

4. Both communities have bigger families than can actually be comfortably supported by the resources at their disposal. They therefore would need to reduce their reproductive rates in order to have family sizes that they can economically manage. Bigger families could lead to worsening of the existing nutritional problems. The nutritional status of the study children was found to be significantly influenced by the households' socio-economic condition and the morbidity experience.

5. In the small scale farms the following factors in a declining order showed significant correlation with the nutritional status of the children measured in at least one of the three indicators of the nutritional status: Annual income of the household, number of

dependents in the household marital status of the head of the household, sex of the head of the household, amount of land owned, diarrhea experience of the children, number of underfives in the household, and the sex of the child.

In the estates the following factors in a declining order had significant correlation with the nutritional status of the children measured in ^{at} least one of the three nutritional indicators: Recent diarrhea, cough, vomiting and fever experience, marital status of the head of the household and sex of the head of the household, educational level of the wife of the household head, sex and age of the child.

2 RECOMMENDATIONS

1. There is need to do more research on estates growing similar crop or growing different crops in order to get a clearer picture of the nutritional situation of the estate population dietary patterns.
2. Nutrition and health education is vital for the communities that are in a similar set-up as the study communities, emphasizing the fact that the underfives are the groups at risk and have special needs for growth and development. The education can also improve the knowledge in better feeding practices.
3. Family planning services need to be intensified in order to have smaller family sizes, considering the generally low incomes of the study communities.
4. A general improvement in terms of service for the estate workers such as more salaries, more spacious houses and more equipped medical service facilities would lead to better social and nutritional conditions.
5. Since there is some bare land within the estate, provision of small gardens to the estate workers for growing of vegetables and such crops like potatoes and tomatoes would supplement the food they buy with their wages.
6. The workers should start a cooperative society to assist in times of relatively heavy financial

burdens such as for payment of school fees to avoid all the children joining the vicious cycle whereby they can only become estate workers when they grow up.

7. There is need to introduce lunch meals at the nursery schools for the children to take while their parents are plucking tea.

8. In view of the high morbidity experience in the estates, the persons manning the nursery schools should report any ill child to the health personnel in the estate.

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APPENDICES.

Appendix 1. Ethnic composition of the households included in the study sample.

Ethnicity	No. of households	%
Kikuyu	289	72.2
Luo	16	4.0
Luhya	37	9.3
Kamba	8	2.0
Kisii	42	10.5
Other	8	2.0
n=	400	100.0

Appendix 2. Distribution of children by ethnicity and stunting.

Ethnicity	No. of	children	number stunted
Kikuyu	426		119
Luo	19		10
Luhya	46		12
Kisii	50		19
Kamba	8		4
Others	9		5

Appendix 3. Prevalence of malnutrition using weight-for-age, Height-For-Age, and Weight-for-Height standards for all the children included in the study sample.

Indicator	No. below Standard	%
	N=558	
<80% Weight-for-age	144	25.8
<90% Height-for-age	169	30.3
<90 % weight-for-height	84	15.1

Appendix 4. Mean height-for-age percent in different age groups in the two communities.

Age (months)	Small scale farmers	Estate workers	Significance
7-12,	94.3	94.2	NS
13-18	92.9	91.6	NS
19-24	94.1	90.4	S.05
25-30	94.4	90.1	S.0.5
31-36	94.1	91.1	S.01
37-42	94.0	90.4	S.01
43-48	94.8	90.3	S.05
49-54	94.1	91.0	S.05
55-60	92.9	89.8	NS

Appendix 5. Distribution of the children by their nutritional status (weight-for-height (cut-off point 80%)) and type of community.

Weight-for-height:	Small scale farmers (%)	Estate workers (%)
<80%	2.0	2.8
>=80%	98.0	97.2
n=	305	253

Appendix 6. Number of households owning certain selected household items.

Type of household item	Small scale farmers	Estate workers
	n=200	n=200
	%	%
Table	95.5	68.0
Radio	72.0	42.5
Paraffin lamp	91.0	79.5
Cupboard	81.0	39.5
Sofaset	34.5	5.0
Sewing machine	9.5	2.5
Paraffin stove	34.0	15.0
Bicycle	16.5	6.5
Gas cooker	7.0	1.5
Wheelbarrow	21.0	3.5
Animal cart	6.0	1.5
Motor cycle	8.5	1.0

Appendix 7

DEMOGRAPHIC QUESTIONNAIRE

Form no. _____ Date of survey _____
 Division _____ Location _____
 Sublocation _____ Estate /Sector _____
 Ethnicity _____ Household no. _____
 Name of head of household _____
 Name of respodent _____

Name	Sex	Age years	Marital status	Education level	Occupation
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

KEY

<u>Sex</u>	<u>Marital Status</u>	<u>Occupation</u>
1= male	1=single	1=farmer
2=female	2=married	2=estate worker
	3=divorced	3=housewife
	4=widowed	4=building
	5=response refused	5=not applicable
	8=other	7= no response
	9=do not know	8=other

How many births have occurred in this household in the last 12 months ? _____

Appendix 8

NUTRITIONAL SURVEY QUESTIONNAIRE FOR SOCIO-ECONOMIC STATUS.

Form no. _____ Date of survey _____
 Division _____ Location _____
 Sublocation _____ Estate /Sector _____
 Ethnicity _____ Household no. _____
 Name of head of household _____
 Name of respodent _____

1. What is the monthly salary of the head of the household ?

2. What is the monthly salary of the wife of the head of the household ?

3. What is the monthly salary of any other person who contributes to the upkeep of the household?

5. How much land do you own (in acres) ? _____
6. How much land do you cultivate (in acres)?

7. How much money in a year do you earn from sale of crops?

8. Do you own livestock Yes=1 No =2 _____
 What livestock do you own? _____

9. How much money in a year do you earn from sale of livestock or livestock products?

AVAILABILITY OF PURCHASED GOODS.

10. Which of the following items do you own ?

Yes =1 No= 2

- | | |
|------------------|------------------|
| __table | __radio/cassette |
| __paraffin lamp | __cupboard |
| __sofaset | __sewing machine |
| __paraffin stove | __bicycle |
| __gas cooker | __wheelbarrow |
| __animal cart | __plough |
| __motorcycle | |

11. What material is used for the construction of the main house floor ?

1=mud 3=Cement 8=Others

12. Material used for construction of main house walls?

1=mud 2=cement 3=woods 5=brick/block/stones

13. Material used in construction of the roof of the main house ?

1=thatch 2=flat tin 3=corrugated iron sheets

14. Is the kitchen located in the main house or has a separate structure been constructed for it ?
Kitchen in the main house =1 separate kitchen =2

15. What type of energy is normally used for cooking?

1=wood 2=paraffin 3=gas 4=electricity

16. What type of energy is normally used for lighting ?

1=wood 2=paraffin 3=gas 4=electricity

17. What is the normal source of water ?

18. What is the distance from the main source of water ?

1= within compound

2=outside the compound but within 5 minutes walk

3= within 6-10 minutes walk

4=greater than 10 minutes walk

Appendix 9

MORBIDITY AND ANTHROPOMETRIC QUESTIONNAIRE

Form no. _____ Date of survey _____
Division _____ Location _____
Sublocation _____ Estate /Sector _____
Ethnicity _____ Household no. _____
Name of head of household _____
Name of respondent _____

A: MORBIDITY

1. Identify the child by name, Age (to the nearest month), sex .

Name _____

Age (months) _____ sex: Male=M Female =F

2. Has this child been ill within the last seven days?

1=No 2=DNK 3=Yes ___

What illness did he/she have ?

a) _____

b) _____

c) _____

3. Within the last seven days has this child had diarrhea ?

1=No 2 =Yes

How many loose stools did the child have per day when he/she had diarrhea?

(Diarrhea in this case is considered to be at least 3 loose stools in 24 hours.

4. Within the last 7 days has this child had a cough?

1=no 2=yes

5. Within the last 7 days has this child vomited?

1=no 2=yes

6. Within the last 7 days has this child had fever?

1=no 2=yes 3= not applicable

ANTHROPOMETRY

7. Weight of the child in kg (to the nearest 0.1 kg)

8. Height in cm. (to the nearest 0.5cm). _____

9. If the child is less than 18 months of age ask "Is the child being breastfed".

Yes =1 no=2

If not breast fed ask " At what age did the child stop breast feeding?"

Appendix 10

DIETARY QUESTIONNAIRE

Form no. _____ Date of survey _____
 Division _____ Location _____
 Sublocation _____ Estate /Sector _____
 Ethnicity _____ Household no. _____
 Name of head of household _____
 Name of respodent _____
 NAME OF RESPODENT _____

	1	2	3
	Do you	How many	Did you eat
Food	eat this	times do	this in the
item	food?	you eat this	the last
		food in a week?	week?
_____	_____	_____	_____
sugar			
bread			
maize			
rice			
millet			
sorghum			
wheatflour			
beans			
peas			
vegetables			
cassava			
potatoes			
eggs			
meat			
fish			
milk			
oils/fats			
_____	_____	_____	_____

	1	2	3
	Do you	How many	Did you eat
Food	eat this	times do	this in the
item	food?	you eat this	the last
		food in a week?	week?
fruits			
bananas			

Codes:

For column 1 & 3

y=yes n=no

For column 2

1=7 times/week

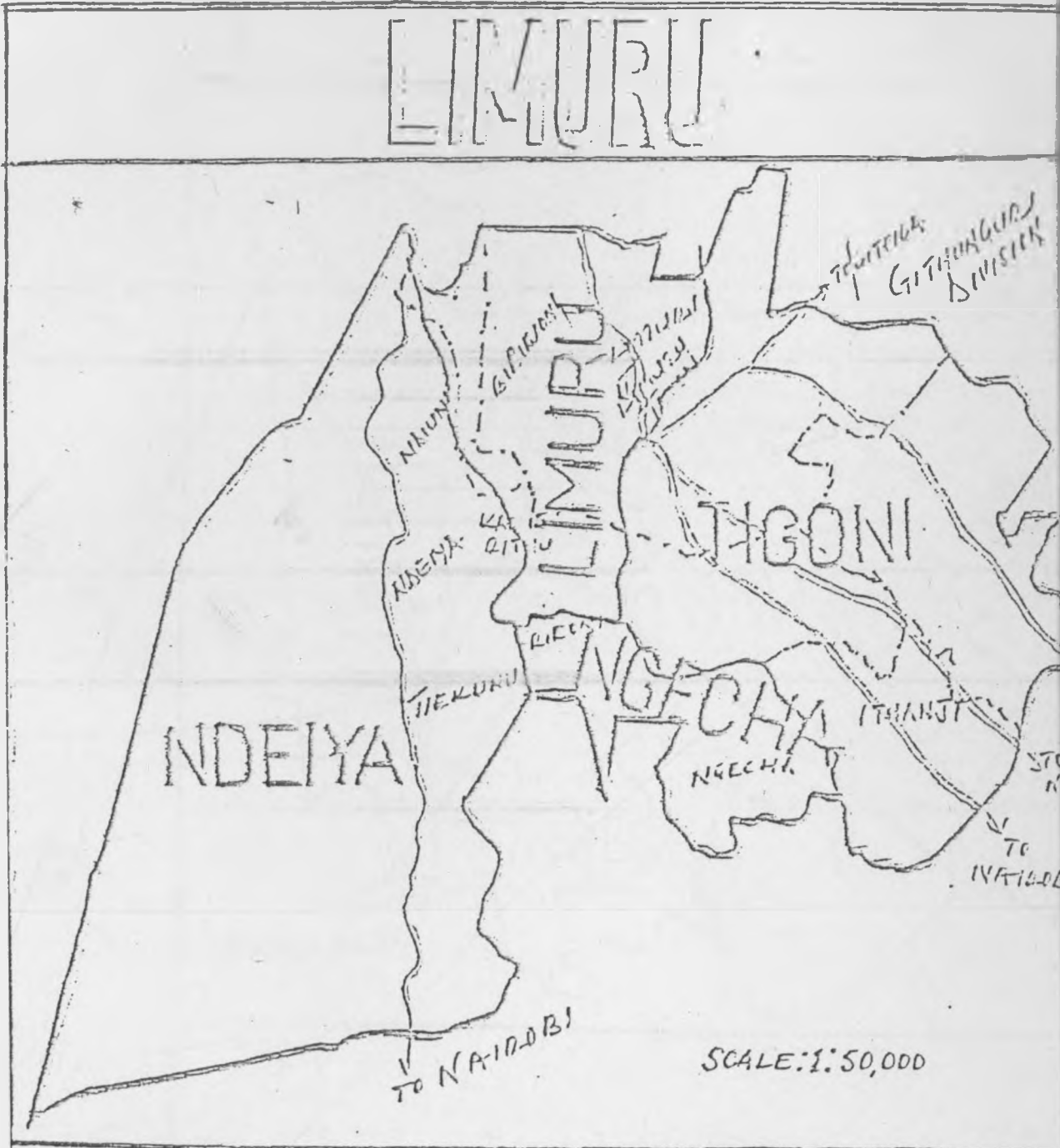
2=4-6times/week

3=1-3 times/week

4=rarely

5=never

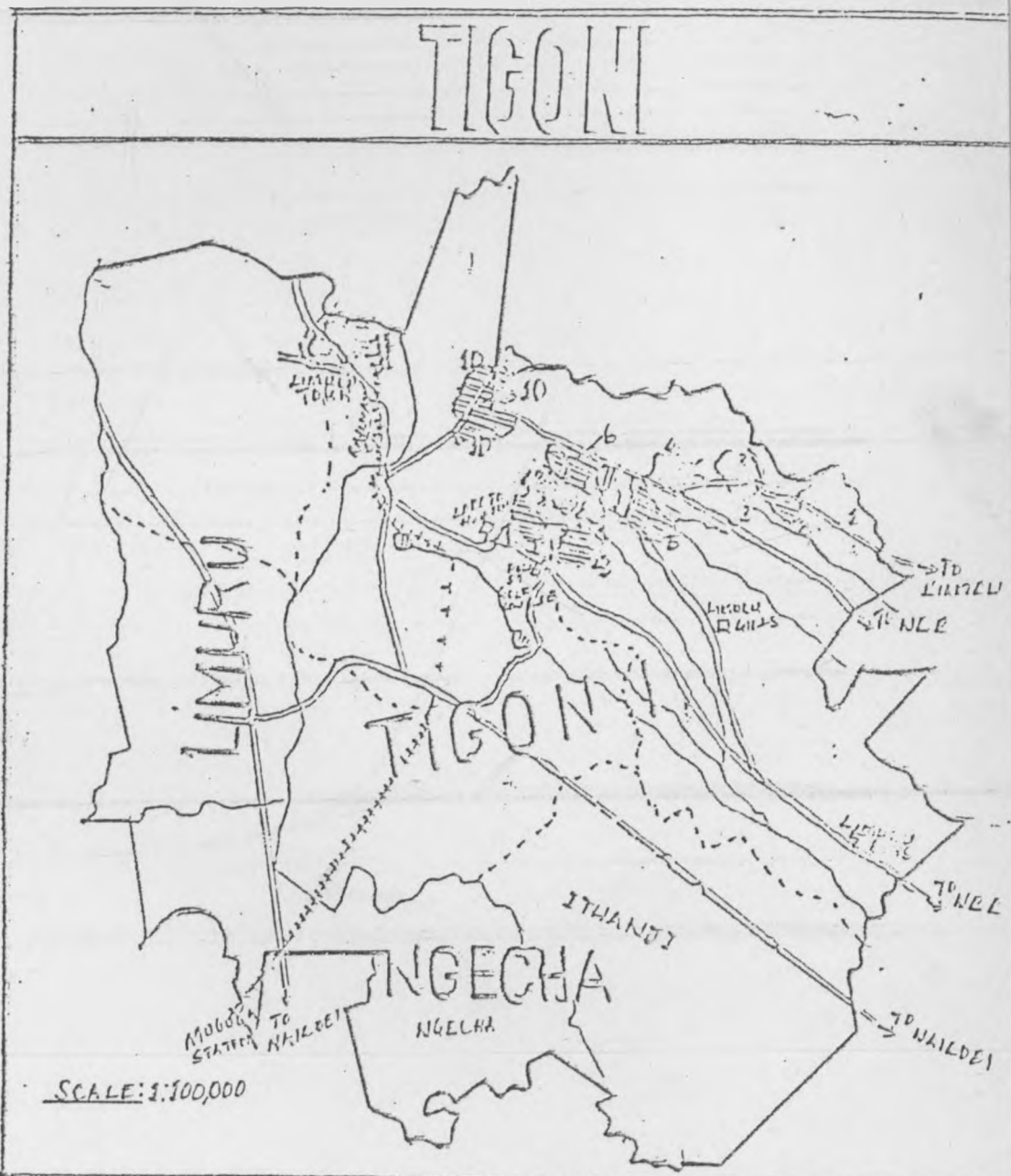
Appedix 11. Map of Limuru Division.



KEY:

- DIVISIONAL BORDER
- LOCALITIONAL BORDER
- SUB-LOCALITIONAL BORDER
- TARMALIKEL'S DIABS

Appendix 12. Map of Tigoni Location



KEY:

- | | | |
|---------------------|-------------|----------------------|
| TEA ESTATES | 1 MUNA | 7 MABROUKIE ESTATE |
| SMALL SCALE FARM | 2 KIANAROGA | 8 GACHURID |
| RAILWAY LINE | 3 GIKREU | 9 GATHALA |
| MAIN ROAD | 4 ITUNGU | 10 LIMURU TEA ESTATE |
| DIVISIONAL BORDER | 5 NO.5 | 11 KINYODORI |
| LOCALITIONAL BORDER | 6 KINAKA | 12 KIANBURU |
| DAM | | |
| RIVER | | |