Effect of season on food consumption and nutritional status of smallholder rural households in Nakuru District

Research Outline

Hilda Kigutha

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Summary

Food production in many tropical African countries depends on rainfall which is usually seasonal, irregular and at times unpredictable. Seasonality in food production, therefore, implies fluctuations in food supply and food availability at certain periods of the year. This is especially true for those households with limited financial resources, and who mostly depend on the available land for their source of food.

For the farming communities, the period of lowest food stocks is during the lean season when the food from the previous harvest is nearly depleted. This is commonly referred to as the "lean season". This period also corresponds with the period of heavy physical work when the household members are busy with land preparation, planting and weeding the next crop. It means therefore, that the period of heavy physical work corresponds with the period of low energy intake and hence, negative energy balance. This may lead to loss of weight in some household members.

Studies have shown that household members who are involved in heavy physical work during times of food scarcity suffer loss of weight. Some of these studies have shown that the nutritionally vulnerable members of these households, especially women and children, suffer more nutritional insult than other members of the same households.

The aim of the proposed study is to find out the effect of climatic seasonality on food consumption patterns and the nutrition status of the vulnerable members of smallholder rural households — in Nakuru District, Kenya — with special attention to the children between eighteen and thirty-six months, lactating mothers, and elderly persons who are above sixty years.

This study is expected to provide information on the extent to which different seasons affect food consumption patterns, and to find out whether food consumption patterns at different seasons affect the nutritional status of household members, i.e. especially the vulnerable groups. Each category of the vulnerable groups will comprise of between forty and fifty subjects, thus making a total of between one hundred and twenty and one hundred and fifty subjects for the whole study.

The field work will involve taking regular measurements on food consumption by individuals in the study as well as the whole household. This will be done using the
twenty-four hour recall method on monthly basis, three-day weighed records as well as three-day household record method. The latter two methods of measuring food consumption will be applied at baseline and at the peak of the lean and the harvest seasons. Other monthly measurements will include anthropometry, and the assessment of health and activity patterns.

The main study will be carried out between January 1992 and May 1993. Prior to this study, a feasibility study will be done using households with similar characteristics as those to be included in the main study. This feasibility study will take place between June and December, 1991.
1. Introduction

Agricultural production in many of the tropical countries depends on rainfall, which is seasonal in nature and often unreliable in timing and amount of precipitation received. Seasonality in crop production implies fluctuations in food supply and food availability, especially for the rural households that depend wholly on what they grow for their daily food. When the rains are timely and adequate, there is usually a good harvest which ensures food availability for some time, but this food slowly gets depleted and becomes more scarce several months before the next harvest. It has been shown that fluctuations in food supply are greater in unimodal climates, which have one planting and one harvest season in a year, than in bimodal climates which have two planting and two harvesting seasons per year.

One of the major factors determining the nutritional status of a family or household is food consumption. During the harvest season, there is generally enough food of both quantity and quality to ensure adequate nutrition for all the family members. In the lean season, however, food is in short supply and the diets of most families are deficient in total energy and other nutrients. This is because the families rely for their food on the remains of the staple food, or on purchased supplements. Because the purchasing power of many families is low, the foods that are bought during these periods are often the lowly priced, high carbohydrate foods which are low in other nutrients.

In the rural areas of Kenya, land holdings are becoming small as a result of the high population growth rates and the resultant land sub-division. This has led to the fragmentation of land into smaller units, thus reducing the potential for food production of individual households. It is becoming apparent that in most households, the harvested crop is not enough to provide adequate food supply until the next harvest, and we seem to know little about how these families survive or are able to cope during periods of food scarcity.

* The figures between brackets refer to the numbered list of references.
Studies have found that people adjust to seasonal food shortages in many ways, showing diverse adaptations in the agronomic, economic, nutritional, and other spheres. There comes a stage, however, when such ordinary measures prove insufficient and food shortages occur.

Studies in the Coast Province of Kenya have found that smallholder families without income from off-farm employment are more prone to seasonal food shortages than those with off-farm employment.(7) Off-farm employment was found to be the most secure way to prevent seasonal stress, either in the form of permanent employment or as temporary casual labour. It was also found that, besides the households' welfare level as such, the composition of the household income was also of importance. A more than moderate income from off-farm employment was potentially a more secure preventive mechanism than an equal income from farm activities.(7)

For normal growth and development, children require energy, protein, and other nutrients in adequate amounts.(8) Pregnant and lactating women also have high demands for all nutrients needed to enable them to achieve safe motherhood, to successfully nurse their babies, as well as meet the demands and challenges of caring for their families and for their daily activities.(9) The older members of the rural households comprise of the grandparents. In most rural settings, the grandparents are cared and provided for by one of the married sons or other relatives. The nutritional needs of the elderly individuals are special in that they have higher or lower demands for some nutrients such as protein, calcium, vitamin A, iron, and other micro nutrients, as dictated by changes in body composition, activity patterns and metabolic processes.(10)

Because of their special nutritional needs, it is likely that changes in food availability and access to nutrients would affect the nutritional status of these groups of persons at an earlier stage, and more strongly than the rest of the household members. Firstly, it is not known to what extent vulnerable members of a family have access to adequate food and nutrients during times of food shortages resulting from seasonal patterns. Secondly, we do not know whether at times of shortage these members have equal access to food within a household or whether some groups have an advantage over others. Thirdly, it is not known whether the effect of possible food and nutrient deficiencies on nutritional status is the same or different among these three groups. This study is expected to provide information on these areas.

In this protocol, chapter two gives a review of the relevant literature. Chapter three describes the research, the design of the study and the methods to be used. Chapter four contains a manual of operations.
2. Review of Literature

2.1 Kenya's food production potential

Kenya's agricultural potential is quite low. Only about 13 per cent of the total land area can be classified as high potential agricultural land which receives more than 1400 mm of rainfall per year. Another 6 per cent is termed medium potential and receives between 800 and 1400 mm of rainfall annually. The remaining 81 per cent receives less than 800 mm of rain per year and consists of semi-arid and arid wastelands.\(^{(11)}\) The various types of agricultural land are not evenly distributed over the country and the majority of the population is concentrated in the parts of the country with good agricultural land, while the remaining low potential land is occupied by nomadic pastoralists and wildlife reserves (See maps 1 & 2; pp. 29-30).

Under the influence of the steadily increasing pressure on land, there has been a shift from large-scale farming to small-scale farming. This process of converting large (former settler) farms into smallholder farms resulted in a movement of the population from the areas already experiencing population pressure by independence time, into the areas formerly reserved for European settlers which were known then, as "scheduled areas" or "white highlands".\(^{(6)}\) The population movement was mainly directed to the districts in the Rift Valley Province such as Nakuru, Trans Nzoia, Uasin Gishu and Laikipia, which all had good arable land.

Since independence in 1963, Kenya's agricultural production has expanded rapidly. This is a result of an increase in smallholder production which was brought about by the encouragement given to these small farmers to engage in commercial farming, as well as the introduction of modern means of crop production, and the development of high yielding varieties of maize which is Kenya's main staple food.\(^{(6)}\) Unfortunately, agricultural growth slowed down from the early 1970's onwards. The expansion of the crop production area in the high and medium potential zones had reached the boundary of the marginal lands with their low rainfall and low potential for agricultural production. This problem was aggravated by the country's rapid population growth rate which was about 3.5 per cent per year in the mid-seventies.\(^{(12)}\) The
continued high rate of population growth resulted in more and more people settling in the drier areas of the country which are unsuitable for cultivation under rain-fed conditions and where crop failures are common. As such, there is an increasing discrepancy between Kenya's rapid population growth rates and the availability of good quality land for food production.(6, 13)

The population growth rate in Kenya continues to be one of the highest in the world. In 1989, it was reported to be 3.7 per cent per annum.(14) This has continued to create a growing demand and increasing competition for arable land which has brought about considerable land fragmentation in the high and medium potential zones. Land fragmentation has not only resulted in a decline in farm sizes but also in a decline in per capita production levels and food availability.(6) It has also increased the number of people who are landless. As a result, the country has witnessed an increasing level of rural-rural migration directed towards areas with only a marginal agricultural potential.(15) The expansion of cropping activities into such areas, and the settlement of families in areas with unreliable rainfall and low crop production is likely to expose these families to risks associated with regular food shortages.

Some studies have noted a declining trend in overall nutritional levels in Kenya. On the national level, there was a reduction in the nutrition status between the first survey in 1977 and those taken later in 1979 and in 1982.(16) The average daily food availability which amounted to 2412 and 2453 kilocalories per capita in the periods 1965-1970 and 1971-1975, respectively, decreased to 2385 kilocalories between 1976 and 1980.(17) Although the latter figures are somewhat higher than the FAO/WHO recommended averages of 2362 kcalories, it should be noted that satisfactory per capita intake does not mean that every family or person is adequately fed, because problems of chronic food deprivation and nutritional deficiency are related to poverty more than to occasional crop failures.(6) The figures further refer to calories derived not only from domestic food production, but also include imports and food aid. As such, they obscure fluctuations and shortfalls in national and regional food production.

Seasonal fluctuations in food production as a direct consequence of environmental conditions, is an important factor contributing to fluctuating levels of food availability in the rural areas of most developing countries, but more so in the countries of tropical Africa.(18) As explained above, this also applies to Kenya. The country has a varied ecological environment, which is characterized by important differences in agricultural potential, and in patterns of food production. This instability in food production and food availability frequently results in local and more widespread national food shortages.(6) Although the information may not be fully documented, localized food
shortages are likely to be more frequent than the national food shortages, especially in the new settlements which have taken place in the marginal areas.

Nearly all parts of Kenya where arable agriculture under rain-fed conditions is possible have two harvests per year except Rift Valley Province, and parts of Coast Province, which have a unimodal type of climate, allowing only one planting and one harvesting season in a year.(6) Nakuru District, the area in which this study will be based, is found in the Rift Valley Province.

The distinction between bimodal and unimodal climatic conditions is an important one. In general, people living in regions with bimodal climatic patterns are reported to experience less seasonal stress than those living in regions with one rainy season. In the former case, two annual harvests are often possible, thus reducing the time gap between harvests as well as the storage problems experienced by small farmers, which lead to food losses through damage by pests. This situation was first observed by Schofield.(2) Using survey materials from 25 African villages, she observed that in the fifteen villages with a unimodal climate, caloric requirements were met at 100 per cent during the dry season, but only at 88 per cent in the wet season. In the ten villages with a bimodal climate, no such differences were found. Other reports show that even in bimodal climates, food stocks are usually at a minimum level by the end of the rainy season.(19,20) In Central Kenya, for example, less than one-sixth of the households had any food items left in store by the end of the short rains. And in Eastern Kenya, the food stocks from the long rain harvest do not last until the harvest from the short rain crop is ready.(20) It could be expected then, that a bimodal climate would favour farmers with sufficient land to grow the amounts of food needed to meet the family's food needs until the next harvest. In this case, farmers with very small pieces of land might not fully benefit from a bimodal climatic condition.

2.2 Food consumption patterns in Kenya

Maize is the staple food of the majority of Kenyans and thus the chief source of calories and proteins for both the urban and the rural populations. The current knowledge of Kenya's food consumption pattern is mainly derived from two surveys, namely the Integrated Rural Survey (IRS-I) of 1974/75 and the Urban Food Purchasing Survey of 1977.(21,22) The IRS-I data refer exclusively to smallholders, who make up more than 80 per cent of Kenya's population.(23) The Urban Food Purchasing Survey was limited to households with incomes below Ksh.2500 per month, that is the lower and middle income classes, representing 85 per cent of the urban population in Kenya.
Using data from these surveys, Shah and Frohberg carried out a detailed food consumption analysis and presented information on per capita food consumption for different rural and urban income classes as well as for different provinces. They reported that the average smallholder obtained a large share of the daily calorie intake from a limited range of foods, which included maize and maize meal, millet and sorghum (together making 61 per cent), starchy roots (i.e. English potatoes, sweet potatoes, cassava and yams), making 12 per cent, beans 5 per cent, sugar 5 per cent, and milk 4 per cent.(24)

These foods represented 87 per cent of the total daily caloric intake for the rural farming community. For the urban low and middle income groups, the food basket was more diverse. Maize meal, millet and sorghum contributed 45 per cent of the daily caloric intake, starchy roots 4 per cent, beans 5 per cent, sugar 9 per cent, wheat (bread and flour) 12 per cent, rice 3 per cent, meat 4.5 per cent, milk 3.5 per cent, and fats and oils 6.5 per cent. Together, these foods accounted for 92.5 per cent of the total daily caloric intake for this group. Food expenditure expressed as a per centage of the total expenditure was found to be high and varied from 77.2 per cent for the average poor rural households to 66.7 per cent for the average 'rich' rural households. Corresponding per centages for the urban population were much lower at 49.6 per cent for the urban poor and 31.1 per cent for the urban middle income groups.(24)

Meal patterns and food preparation methods differ from one ethnic group to another. However, as mentioned earlier, maize is the main staple food of the majority of Kenyans in both the rural and urban centres. Ugali, a popular maize meal dish which is eaten with a meat, vegetable or a pulse sauce, may be eaten twice a day for the main meals.(25-27)

Only a few studies have addressed the eating patterns of the Kenyan population.(25-28) Usually these studies do not give a general account of food habits in Kenya but have confined themselves to different ethnic groups in different provinces. This is justified by the fact that meal patterns and food habits differ from one community to another, and depend on the types of foods that can be grown in the different ecological zones.

The available studies report that most Kenyan families consume at least three meals per day, with breakfast contributing the lowest caloric value to the day’s diet.(25-28) Lunch and supper serve as the main meals of the day for the adults, while snacks are mainly consumed by young children. Sweet tea made of water, milk, tea leaves and sugar, is the most common drink for adults and it is consumed at breakfast, with the main meals, and between meals. Porridge which is made of maize meal, water, and milk, is prepared for the younger children for breakfast and other periods of the
day. Young children are weaned on a variety of foods such as cow's milk, green bananas, irish potatoes, soft green vegetables, and sometimes eggs and tinned cereal products.\(^{(28)}\)

The most frequently used foods in both the dry and the wet seasons are maize, pulses, milk, vegetables, sugar, tea and fat. In most homes maize is eaten twice a day and pulses once a day, and this was found to be the case for all the income groups in the rural areas studied. However, the higher income groups added more fat, meat and a higher proportion of pulses to maize in a dish, than the low income group.

### 2.3 Seasonal food availability

As has been stated before, the seasonal cycle of food production in semi-arid tropics does not create a situation which ensures a continuous food supply to the family or community. After the harvest, that is during the dry season, there is usually enough food for some time, but during the following wet season food stocks are slowly depleted with food becoming more and more scarce during the few months before the next harvest,\(^{(1,4,20)}\). Kumar reported a situation in Zambia in which by the end of the planting season, only about 40 per cent of the households had maize stocks remaining, only 15-20 per cent of the households had sorghum and groundnuts and almost no one had any sweet potatoes left.\(^{(4)}\)

For the agriculturally dependent households, food shortages tend to be highest during the wet season and just before the harvest. This is also the period in which hard work is required in the farms and when energy demand is highest.\(^{(29)}\) When peak agricultural labour inputs coincide with reduced calorie intakes in the wet season, the combined nutritional effects will be felt in the long and in the short term.\(^{(2)}\)

Apart from seasonal factors, the amount of food available to a household is influenced by other factors as well. Such factors include the amount of land available for food production, the household size, its demographic composition and the total household income.\(^{(19,20)}\) Reardon & Matlon, as quoted by Focken\(^{(19)}\), analyzed caloric intake levels of two communities in Burkina Faso with different socio-economic status. The authors did vary seasonal energy intake levels in relation to the wealth levels of the households. They found little differences in caloric intakes of the poor households in two separate villages, but found great differences when they compared caloric intakes of the poor households with the rich households in another village. The poor households showed strong seasonal fluctuations in caloric intake which was below standard during the hot season. In a survey conducted in the Coast Province of Kenya,
Niemeijer et al. found that mothers from households with a low resource base had a lower average weight-for-height than their counterparts from households with a higher resource base. However, they found no indication that the women from households with a lower resource base experience greater seasonal stress.\(^7\) In India, McNeill et al. found a clear socio-economic gradient in energy intake in both men and women from four different economic groups, with the poorer group consuming energy at 86 per cent of the rich group during different seasons. The interactions between socio-economic and seasonal factors was statistically significant in women, but not in men.\(^{31}\) These studies demonstrate that wealth is a determinant in food intake and that seasonality is much more confined to the poorer strata of society and especially to those who depend solely on subsistence farming for their daily food.

2.4 Seasonal influence on food intake and body weight of vulnerable groups

Climatic seasonality affects the nutritional status of household members through a number of intervening variables. The most important of these variables are workload, food supply and health. At the community or household level, different socio-economic classes, different age groups, and different genders may have different exposure to the effects of seasonal variations in food availability.\(^{31,35}\)

Low caloric intakes during times of seasonal food scarcity are associated with seasonal weight changes which have been reported by several researchers.\(^{31-35}\) In most agricultural communities, body weight is maximal shortly after the end of the harvest, while the minimum is achieved during the pre-harvest cultivation. This is also the period when maximum energy is required for field work and other household activities. Recent studies from Ethiopia\(^{32}\) and Benin\(^{33}\) recorded seasonal changes in body weights of women between different seasons within one year. In both studies, the weight was lowest during the lean season, but then increased gradually as the food became available. The Ethiopian study found large inter-individual differences in body weight with more than 18 per cent of the subjects losing more than 3.5 kilograms or 8 per cent of their initial body weights. In both studies, the women with a higher body mass index were found to lose more weight than those with a lower body mass index. Similar results were reported in India, by Durmin et al.\(^{34}\)

Although the evidence is limited, there are strong indications that the intra-household distribution of food is uneven, also in times of stress. Some studies have found that women are more seriously affected by seasonal food shortages than
men.\(^{(2,31,36)}\) In analyzing data from ten African village studies, Schofield found that, in relation to their requirements (except for pregnant and lactating women), men consumed more than any other age group. Adult males fulfilled their calorie and protein requirements at 101 and 231 per cent respectively, while adult females achieved lower levels of 96 and 136 per cent.\(^{(2)}\) In Bangladesh, Abdullah et al. found that energy intake of adult men was significantly higher than that of adult women in all the four seasons of the year.\(^{(36)}\) Similar observations were made in Tamil Nadu, India, by McNeill et al.\(^{(31)}\)

In the Gambia, Rowland et al. reported that pregnant and lactating women had energy intakes considerably below the normally accepted ranges during the rainy season, and as a consequence, weight fluctuations of these women showed the same seasonal pattern.\(^{(37)}\) In Zaire, Pagezy found that during the rainy season, weight decreased in all categories of the women irrespective of pregnancy status or lactation. The lactating women, however, were much more affected and lost more weight than the other groups.\(^{(38)}\)

As has been shown above, and in comparison to women, men are reported to be in a better nutritional condition than women during times of food shortages. However a few studies in the Gambia\(^{(39)}\), Senegal\(^{(40)}\), and Zaire\(^{(41)}\) have reported weight losses in men during periods of seasonal stress. This happens where the men are involved in agricultural activities which demand high energy intakes. These studies show that seasonal fluctuations in food availability may affect all family members and that men are not spared even if they tend to be favoured by intra-household food distribution.

The effects of seasonality on children are not well documented. However, the few available studies show that the pre-school children are at greater nutritional risk during times of food scarcity than the older school children. In the Bangladesh study reported earlier, Abdullah et al. found that the energy and protein intake of pre-schoolers of between 1-4 years had significant seasonal differences with girls receiving lower intakes than the boys.\(^{(36)}\) In analyzing data from ten African village studies, Schofield found that pre-school children fulfilled their caloric requirements at a much lower level of 80 per cent compared to the men and women.\(^{(2)}\)

In the Coast Province of Kenya, Niemeijer & Klaver found that children showed a different seasonality pattern than adult women. They reported that children had a growth spurt in height during the dry season coupled with lesser weight growth resulting from low food supplies, and that weight growth occurred during the long rains. From these observations, they concluded that weight growth of children is food related and hence, losses occur during periods of food shortages, while growth in height is
mainly health related and therefore increases during the dry season, which is a relatively healthy period as far as childhood diseases are concerned.\(^{(30)}\)

The nutritional status of infants and children is also complicated by the prevalence of diseases which occur during particular seasons of the year.\(^{(2,42,43)}\) Such diseases include, among others, respiratory tract infections, measles, malaria and diarrhoea. In general, the wet season is the worst as far as the health situation is concerned, because some childhood diseases occur more often than during the dry season. It is also the period of intensive labour requirements (which means less care and attention for the children), and of food scarcity. In Nigeria, Tomkins\(^{(42)}\) reported a peak of hospital admissions for children with severe protein-energy malnutrition during the rainy season, while Onchere & Slooff\(^{(43)}\) reported that 80 per cent of all deaths in under-fives in Machakos District in Kenya, occurred during the long rainy season.

The existing literature is lacking information concerning the situation of the elderly persons in the seasonal cycle of food fluctuations. Today, more than half of world's elderly persons are living in the developing countries and it is estimated that by the year 2000, roughly two out of every three of the world's elderly people (i.e., those aged 60 years or more), will be living in the developing countries.\(^{(44,45)}\) In the tropics most of the elderly are found in the rural areas where they live either alone or in extended households with their relatives. As a nutritionally vulnerable group, they are likely to be exposed to the seasonal cycle of food availability and nutrient intakes in the same way as the other vulnerable members of these families are, as shown by the studies cited above. There is a need therefore, for investigations to be done in this area.

In summary, this review of literature suggests that:

(-) Seasonal fluctuations in food production affect food consumption in Kenya and other countries. However, the degree of this effect seems to depend on the different coping strategies;

(-) According to studies outside Kenya, seasonal fluctuations in food consumption may affect all family members. However the women, especially the pregnant and lactating, and the pre-school children are more vulnerable than the other household members;

(-) Studies on the nutritional status of elderly during different seasons are unknown. Since the proportion of the elderly people in Kenya and other African countries is growing, more information about this group is required.
3. Method

3.1 Research objectives

The general aim of the study is to find out the effect of climatic seasonality on food consumption and nutritional status of vulnerable members of smallholder rural families, with a minimum amount of land and with very small extra cash income.

The study is expected to provide answers to the following questions:

I. Are there seasonal differences in food consumption in poor small-holder households in rural areas with unimodal climatic conditions?

II. To what extent does food intake vary for certain vulnerable groups in particular?

III. Do the differences in food consumption affect the nutritional status of the vulnerable members in these households?

IV. Does any of the vulnerable groups provide a more timely index of nutritional stress during times of food scarcity?

3.2 Hypotheses

The following null hypotheses are advanced:

I. There are no seasonal differences in food consumption in the smallholder rural households in Kenya.

II. Seasonal differences in energy and nutrient intake have no effect on the nutritional status of vulnerable members of these households.

3.3 Study area

The study will be carried out in Njoro Division in Nakuru District in the Rift Valley Province in Kenya. This area has been selected because, besides being in a unimodal climatic zone, it is also situated within a twenty-five kilometer radius from Egerton
University, where the principal investigator will be based, and where the project office will be located.

As mentioned in the review of literature, Nakuru District was one of the districts formerly reserved for the European settlers before Kenya became independent. It experienced a rapid population influx from districts already experiencing population pressure by independence time. These people moved into the province in search of good farming land.

Smallholders in the district belong to one of several land buying cooperative societies which bought the former settler farms and then subdivided them into small pieces known as 'shares'. Households were then allocated their pieces according to the number of shares bought. As most of these families were poor, they only managed to buy one or two shares. The amount of land per share was determined by the size of the original farm, and the number of members in each cooperative society. In the majority of farms in Njoro Division, one share was equivalent to two-and-a-half acres. However, there are a few farms in which each share was worth only one acre of land.

### 3.4 Study Population

The study will involve rural households with the following nutritionally vulnerable groups: young children below five years, nursing women and elderly people.

Three or four of the cooperative farms described above, will be selected. A census will then be taken covering all the households in these farms in order to identify those who qualify for the study. To qualify, a household must meet the following criteria: (-) it must have one or more of the target subjects mentioned in the sampling procedure below; (-) it should own land with a size between one and three acres (0.4-1.2 ha.), and (-) it should not have an external income of more than five hundred Kenya shillings (US$ 20) per month.

### 3.5 Sampling

The subjects of interest in this study are three of the nutritionally vulnerable groups from poor smallholder rural households in Nakuru District in Kenya. These are: preschool children, lactating women, and the elderly.

During the selection stage, specific categories of the study subjects will be made as follows:
I Children between 18 and 24 months (during the period of study, these childrens' ages will change to 33 and 39 months, respectively).
II Lactating women with young infants between one and two months.
III Elderly persons between 65 and 74 years of age, either living alone or in extended households.

The elderly will be included only if they are "apparently healthy". This means that they are not bed-ridden, not hospitalized, not suffering from senile dementia and not suffering from life-threatening illness which require constant medication at the onset of the study.

A preliminary census will be carried out in the selected area in which all the households fitting the above criteria will be listed. Using this list, three sample frames will be constituted, one for each of the three groups listed above. From each sample frame, a random sample will be drawn. The sample size will be determined after a feasibility study is carried out prior to the main study.

3.6 Data collection

The data will be collected by observations and questionnaires. Most of the data will be collected by trained field workers, while other measurements such as height and triceps skinfold, will be made by the principal investigator.

General household characteristics
These data will be collected with a questionnaire designed to collect information on socio-demographic characteristics such as age, sex, occupation and family, and on socio-economic status indices such as land, housing, level and source of income, food sources, water and fuel sources, etc. This questionnaire will be administered once at the beginning of the study by field workers.

Household food consumption
This will be assessed by use of a combined and alternating household record/24-hour recall method for three days each. This will be administered at intervals planned to coincide with different seasons. The combined method is ideal because it records the foods available in the household for consumption for an uninterrupted period of six days. Six days of food records are believed to be adequate in reflecting the actual food consumption patterns of these families and to detect differences between the seasons.
During the intermittent period, household food consumption will be assessed by means of the twenty-four hour recall.

**Individual food consumption**

Food consumption data will be collected for the vulnerable members within each household by the same method as the household food consumption and will be done by trained field workers. Individual food intakes for the same persons will be collected on a monthly basis by use of the 24-hour recall method. The combined method will be taken at baseline, and again during the lean and the harvest season (see time schedule).

The following nutrients will be of interest to the study: total energy, total protein, vitamin A, calcium, iron, vitamins B₁, B₂, niacin, and vitamin C. These are the nutrients expected to be affected by variations in the type and quantity of the foods available to the households, and hence accessible for consumption by the individuals in the study group.

**Anthropometric measurements**

The following anthropometric measurements will be taken: weight, height, mid-upper arm circumference and triceps skinfold. Body Mass Index (BMI) will be calculated for the adults while weight-for-age and weight-for-height will be calculated for the children. Weight measurements will be recorded every month for all the subjects in the study. The mid-upper arm circumference and triceps skinfold measurements and height for the children will be taken three times, as shown on the schedule.

**Health assessment**

A general health assessment, which will include morbidity and mortality, will be carried out on a monthly basis throughout the study period. This will be done by use of a structured questionnaire and will cover all the individuals in the study group. This assessment is intended to provide information on seasonal variability on disease patterns affecting the rural communities in Kenya.

**Activity patterns**

An inventory of the general activity patterns will be kept for the adult subjects on a monthly basis. This will be done by three open 24-hour recalls during the period of individual food consumption, and by use of a structured questionnaire which will be administered by way of a seven-day recall of major activity categories.
3.7 Pilot study

Preceding the main study, a pilot study will be carried out to standardize food consumption methodologies as well as other measurements; more in particular:
- to test the questionnaires which will be used for the study;
- to get an impression of the food consumption patterns in the research area;
- to determine the number of days that would be considered adequate to assess the energy and nutrient intake of the subjects and to have a representative recording of the activity and disease patterns; and
- to help identify problems which might occur during the study and which may not be seen during the planning stage.

The pilot study will take a period of three months and rely on a group of twenty-six households with similar characteristics as that of the study population, but living in an adjacent area.

3.8 Time schedule

The study started with a six month fellowship at the Agricultural University in Wageningen during which time the literature review was done and the research proposal drafted. Recruitment and training of enumerators was done between June and August 1991 and the feasibility study between September and December 1991. The major data collection will take place between March 1992 and May 1993 with intensive data collection in three phases, while other measurements will be done continuously on a monthly basis. The data analysis and report writing will take place at the Department of Human Nutrition, Wageningen Agricultural University, The Netherlands, between August 1993, and June 1994 (see work schedule attached, p. 31).
4. Manual of operations

4.1 Sample selection

As mentioned in the study protocol, three groups of small poor rural households with nutritionally vulnerable members will be selected from Njoro Division, Nakuru District. These groups will be categorized into three classes as follows:

I Households with children in the age range between eighteen and thirty-six months;
II Households with nursing mothers, who are breast-feeding young infants between zero and two months;
III Households with elderly persons who will be sixty years and above, either living alone or in extended households.

From each group a random sample will be drawn and then studied longitudinally for a period of fifteen months.

Selection procedure

Smallholders in Nakuru District belong to one of several land buying co-operative societies who bought farms from the former settlers and then subdivided them into small pieces (or shares), which were then allocated to the members, according to the number of shares bought. Njoro Division, which is the study area, has several such farms which have completely resettled their members. The study population will be selected from two or three of such farms which are within a 20-25 kilometer radius from Egerton University.

Initially, a census will be done covering all the households in each of the selected areas. During this census, all the households with one or more of the vulnerable groups will be identified and listed, if they own between 0.4-1.2 hectares of land, and if the off-farm income does not exceed five hundred Kenya shillings per month.

Using this list, three sample frames will be constructed, which will be made up of the different categories of households with vulnerable members, mentioned above. From each sample frame, a random sample of households will be selected.
Recruitment of the study population.
A visit will be made to the selected households to explain the objectives of the study and to seek the cooperation of the head of the household, or the appropriate person depending on the household set-up. If the approval is given, the household will be assigned a number which will be matched with the sample frame it belongs to. The assigned household number will become operational and will remain as the identity of that household throughout the study period.

Exclusion criteria
(-) Households with an external income of more than five hundred Kenya shillings per month;
(-) Households which are newly resettled on their land, i.e if they have not been settled for more than five years;
(-) Households with elderly persons who are not apparently healthy as defined above.

Non-respondents
Those households refusing to participate in the study will be registered separately and asked for the reasons for their refusal to participate. The non-participants will be compared later with the participants with respect to as many variables as possible. Some of such variables will include land size, income level, housing type, education level of head of household, household size, water and fuel source, etc.

4.2 Data collection
Data will be collected by means of various questionnaire and observation methods as further described below. A copy of the full data collection schedule is attached at the end of this report.

General household questionnaire
This will be administered by trained field workers. It will be structured in a way to include information on household characteristics such as family size, age, sex and education level of members, income level, land size, housing type, food sources, water and fuel sources. This questionnaire will be administered once, at the beginning of the study.
Household food consumption
Total household food consumption will be assessed by a combined record/recall method, at three different intervals i.e. during baseline, at the peak of the harvest season, and during the lean season (see schedule). This will involve weighing all the food prepared and consumed in the household concerned for three consecutive days. Any food served to visitors will be subtracted from the total amount.

Household food consumption will also be assessed on a monthly basis with the help of a 24-hour recall method.

Individual food consumption
Food consumption by the target subjects will be assessed by using the combined record/recall method which will be done at three different periods (see schedule), and by the 24-hour weighed recall method on a monthly basis.

Weighed food records will involve weighing all the raw food items separately and then weighing the cooked food followed by weighing the actual serving portion of the subject. This will be done with an electronic balance with a zero device and a digital display. The scale should be accurate to the nearest gram. Left-overs will be weighed and subtracted from the original weight of the portion. Alcoholic and other beverages will be recorded, and any food eaten in the absence of the field worker will be obtained by recall and the quantities estimated using household measures.

The 24-hour recall will be done for all the subjects on a monthly basis. The amounts of food eaten during the previous day will be estimated by use of standardized household measures.

Food consumption data will be converted into energy and nutrients by use of the food composition tables developed by CTA-ECSA, for use in East, Central and Southern African countries.

The following parameters will be used to describe nutrient intake:
(-) Energy (kcal/day);
(-) Protein (g/day); total vegetable and animal protein;
(-) Fat (g/day);
(-) Vitamin A; as retinol equivalents (ug/day);
(-) B-carotene (ug/day);
(-) Calcium (mg/day);
(-) Iron (mg/day);
(-) Vitamin B₁ (mg/day);
(-) Vitamin B₂ (mg/day);
(-) Niacin (mg/day)
(-) Vitamin C (mg/day).
**Anthropometric measurements**

Anthropometric measurements will be performed at various stages of this study. These measurements will include height, body weight, triceps skinfold, and mid upper arm circumference of the subjects.

**Height**
The height of the adult subjects will be taken while standing on a horizontal surface against a wall, with heels together, chin tucked and stretched upwards to full extent and the head in the so called "Frankfurt plane". The hands and arms should be hanging relaxed, and the feet flat on the ground.

For the young children below two years, length measurements will be taken on a flat plane with a fixed headboard and a movable foot rest. They will be placed on the plane with their head facing up and legs close together with the heel at a perpendicular angle with the foot rest, and the knees pressed down. Two persons will be required for measuring children's lengths to ensure a complete stretch of the knees.

All height and length measurements will be done to the nearest 0.1 cm.

**Weight**
Body weight will be taken once every month for all the subjects. It will be measured in the morning hours after breakfast and after the subjects have emptied their bladders. The subjects will be dressed in light clothing. The weight will be measured by digital pressure sensitive bathroom scales precise to the nearest 0.1 kg. The weighing scales will be calibrated regularly with standard weights.

**Triceps Skinfold**
The skinfold measurements will be done for adult subjects, on the left side of the body. The skinfold will be picked up at the back of the arm halfway between the inferior border of the acromion process and the tip of the olecranon process. These will be measured with a Holtain caliper in triplicate, with readings to the nearest 0.1 mm. Skinfold measurements will be performed at baseline and then once during each season as shown on the schedule.

**Mid-Upper Arm Circumference**
This will be taken with the subjects in a standing position with feet fairly close together and weight divided equally on both legs. The subjects arms should hang relaxed just away from the trunk. The measurements will be taken perpendicularly on the axial line of the upper arm at the level marked for the triceps skinfold. Measurements will be done
with reinforced plastic tapes, in duplicate, and accurate to the nearest 0.1 cm. This measurement will be taken at the same time with the skinfold measurements for adults and on monthly basis for the children.

*Health assessment*
A general health assessment for all the subjects will be done on monthly basis using a recall questionnaire covering the illness occurring during the previous one week for diarrhea and fever, and for the previous month for other diseases. For the children, the mothers or the care-givers will serve as the respondents.

*Activity patterns*
An inventory of the activity patterns of all the adult subjects will be made by observation, during the food consumption measuring sessions, and by the use of a 7-day recall questionnaire concerning major activities. This will be administered once every month.

### 4.3 Data analysis

The data will be entered into computer diskettes on a continuous basis to avoid backlog. At the end of the data collection, the data will be cleaned before the researcher travels to Netherlands.

Data analysis will be done with the assistance of staff at the African Studies Centre, Leiden, using standard computer analysis packages and programmes for the Apple Macintosh. In data treatment, the effect of season will be treated as an intervention.

Thesis writing will take place at the Department of Human Nutrition, Wageningen Agricultural University, The Netherlands.
MAP 1: AVAILABILITY OF HIGH POTENTIAL LAND PER CAPITA BY DISTRICT, 1983 (HA)

Ha/cap

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 0.10</td>
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<tr>
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<td>0.11 - 0.20</td>
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<tr>
<td></td>
<td>0.21 - 0.50</td>
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<tr>
<td></td>
<td>&gt; 0.51</td>
</tr>
<tr>
<td></td>
<td>No information / no high potential land in district</td>
</tr>
</tbody>
</table>

Information on Tana River and West Pokot based on southern part of district only.

MAP 2. DECREASE OF HIGH POTENTIAL LAND PER CAPITA BY DISTRICT, 1982-1983

- decrease in %
  - 60+
  - 41 - 60
  - 31 - 40
  - 20 - 30
  - no information / no high potential land in district

Information of Tana River and West Pokot based on southern part of district only
No information E Marakwet because of boundary changes

Work schedule for H. Kigutha

1990
- Fellowship period at Wageningen

1991
- Prep. and training of field assistants
- Feasibility study

1992
- Prep. survey mat.
- Data collection

1993
- Data cleaning

1994
- Data analysis and writing at Wageningen

Monthly measurements:
- Anthropometry & health
- Activity patterns
- Food production, purchases & consumption
- Off-farm income

Comprehensive measurements (3x):
- Food consumption
- Anthropometry
**HEADER - SEASONALITY RESEARCH PROJECT, NJORO.**

- **Farm Name**
- **Household Nr**
- **Farm code**
- **Round**
- **member nr**

**Name of household head**

**Name of person/s studied**

<table>
<thead>
<tr>
<th>day</th>
<th>mon</th>
<th>yr</th>
<th>Name of assistant/supervisor</th>
</tr>
</thead>
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</tbody>
</table>

**Recall interv. check**

**Hhold observ. check**

**Nr of pages**

<table>
<thead>
<tr>
<th>Form 2</th>
<th>Form 3</th>
<th>Form 4</th>
<th>Form 5</th>
<th>Form 6</th>
<th>Form 7</th>
<th>Form 8</th>
<th>Form 9</th>
<th>Form 10</th>
<th>Form 11</th>
<th>Form 12</th>
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**Coding**

**Data entry**

**Check**

**Comments**
FORM 2- HOUSEHOLD CHARACTERISTICS

Household Member Characteristics

<table>
<thead>
<tr>
<th>member nr</th>
<th>name</th>
<th>age yrs</th>
<th>age mon</th>
<th>age sex</th>
<th>educ marital level</th>
<th>rel to head</th>
<th>perm resid</th>
<th>freq of visits</th>
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</tbody>
</table>

**sex**
- female=1
- male=2

**educ Level**
- beyond sec sch=1
- high sch=2
- upper prim=3
- lower prim=4
- adult educ=5
- no educ=6

**marital status**
- married=1
- single=2
- separated=3
- widowed=4

**relation to head**
- head=1
- spouse=2
- daughter=3
- son=4
- grandchild=5
- perm worker=6
- other=7

**occupation**
- off-farm empl=1
- perm farm empl=2
- casual farm empl=3
- unemployed=4

**residence**
- yes=1
- no=2

**frequency of visits**
- weekly=1
- monthly=2
- several times a year=3
- once a year=4
- during school holidays=5
- very seldom=6
FORM 3 - HOUSEHOLD OWNERSHIP

CONFIDENTIAL

Date
Name of respondent

nr of hhold units in compound
nr of houses in hhold unit
presence of latrine
presence of store in hhold unit

nr of rooms in main house
presence of separate kitchen

condition of main house
walls
mud=1
wood=2
stone=3
cement=3
tin/iron=2	thatch=1

roof

nr of land owned(acres)
land rented (acres)
land used for (acres)
food crops
cash crops
pasture/animal feed
land given/rented out

nr years spent on land

codes
distance to water
at home=1
within 10 minutes=2
within 30 mins=3
less than 1 hr=4
more than 1 hr=5

household items owned
radio
sofa set
dining set
paraffin stove
gas cooker
fridge
television

type of fuel used
firewood
charcoal
paraffin
gas
electricity

livestock owned(nr&type)
grade cows
native breeds
bulls & male calves
sheep & goats
pigs
poultry
other (spec)
# FORM 4 - FARM CHARACTERISTICS

**Recall of monthly crop harvest and sales**

<table>
<thead>
<tr>
<th>Date</th>
<th>Name of respondent</th>
</tr>
</thead>
</table>

## Harveses

<table>
<thead>
<tr>
<th>food crop/milk/eggs</th>
<th>crop code</th>
<th>whether harvested</th>
<th>amount harvested</th>
<th>price/amount given out</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>yes=1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>no=2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Sales

<table>
<thead>
<tr>
<th></th>
<th>amount sold</th>
<th>price/unit</th>
<th>amount given out</th>
<th>price/unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

## Gifts

<table>
<thead>
<tr>
<th></th>
<th>amount given out</th>
<th>price/unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

## Amounts harvested & sold (Unit)

- 90 kg bag=1 kilograms=8
- 50 kg bag=2 litres=9
- big nylon bag=3 bundles=10
- small nylon bag=4 heaps=11
- 18 kg debe=5 numbers=12
- 1 kg tin=6 treetop bottle=13
- 2 kg tin=7 other (spec)=14

## Crop/Food Codes

- maize=1
- green maize=2
- wheat=3
- sorghum=4
- millet=5
- beans=6
- green beans=7
- green peas=8
- cow peas=9
- njahi=10
- dark leafy greens=20
- light green leaves=21
- lima beans (noe)=11
- irish potatoes=12
- sweet potatoes=13
- cassava=14
- arrowroot=15
- green banana=16
- cabbage=17
- carrots=18
- onions=19
- milk/day=28
- eggs/day=29
- string beans=22
- tomatoes=23
- pumpkin=24
- citrus fruit=25
- passion fruits=26
- other fruits=30
- other crops(sp)=31

## Comments

...
### FORM 5 - FOOD PURCHASES/GIFTS

(Record of foods purchased/gifts last month)

<table>
<thead>
<tr>
<th>Date</th>
<th>Household Nr</th>
<th>Farm Code</th>
<th>Page Nr</th>
<th>Farm Name</th>
</tr>
</thead>
</table>

**Interview date:**

Name of respondent:

**Purchased Foods & Ingredients**

<table>
<thead>
<tr>
<th>Food/Ingredient</th>
<th>Code</th>
<th>Quantity</th>
<th>Price/u</th>
<th>Source</th>
</tr>
</thead>
</table>

- maize flour=1
- maize=2
- green maize=3
- wheat flour=4
- wheat=5
- bread=6
- sugar=16
- rice=7
- tea leaves=17
- beans+pulses=8
- tubers=9
- vegetables=10
- market=1
- kiosk=4
- supermarket=2
- neighbour=5
- shop=3
- other(spec)=6

**Amount Bought (Units):**

<table>
<thead>
<tr>
<th>Weight</th>
<th>Quantity</th>
<th>Units</th>
</tr>
</thead>
</table>

- kg weight=1
- grams=2
- 2kg tin=3
- 1kg tin=4
- 1/2 kg tin=5
- 1/4 kg tin=6
- glasses=7
- loafs=9

### Source of Food:

- market=1
- kiosk=4
- supermarket=2
- neighbour=5
- shop=3
- other(spec)=6

### Comments

Legend: nr(u) = number of units, price/u = price per unit
**FORM 6 - ECONOMIC ACTIVITIES**

(for working adults only)

<table>
<thead>
<tr>
<th>Date</th>
<th>member nr</th>
<th>Name of respondent</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>member nr</th>
<th>name</th>
<th>type of activity during past month</th>
<th>activity code</th>
<th>duration</th>
<th>unit</th>
<th>estimated income per unit</th>
</tr>
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<tbody>
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</tbody>
</table>

**activity**
- agric casual labour = 1
- agric perm labour = 2
- non agric casual labour = 3
- non agric perm labour = 4
- small business = 5
- domestic help = 6
- other (sp) = 7

**unit**
- day = 1
- week = 2
- month = 3

**Comments**

([Blank space for comments])
# FORM 7 - FOOD PREPARATION

(for total household prep & consumption)

**Observation Day**

<table>
<thead>
<tr>
<th>member nr</th>
<th>dish code</th>
<th>obs/ recall</th>
<th>left over</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Farm Name</th>
<th>Farm Code</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Household Nr</th>
<th>Page Nr</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Date</th>
</tr>
</thead>
</table>

nr served

- under fives
- 5-16 yr
- 17 & over
- 60 &over

**Left over**

- no=2
- yes=1

**Measurement Method**

- water=1
- maize kernels=2
- ingred itself=3
- ingr unpeeled=4
- ingr peeled=5
- ingr cut & dry=6
- ingr cut & wet=7
- food models=8

**Raw/Cooked**

- raw=1
- obs/recall=2
- cooked=2
- recall=2

**Dish/Ingredient Code**

- use separate list

<table>
<thead>
<tr>
<th>prep dish time ref</th>
<th>dish/ingredient</th>
<th>amount used</th>
<th>code</th>
<th>type</th>
<th>quant</th>
<th>unit</th>
<th>size</th>
<th>r/c</th>
<th>src</th>
<th>method</th>
</tr>
</thead>
</table>

**Amount Used (Units)**

- kg weight=1
- grammes=2
- 2kg tin=3
- 1kg tin=4
- 1/2kg tin=5
- 1/4kg tin=6
- glasses=7
- tablespoons=14
- loafs=9
- heaps=10
- bunches=11
- number=12
- pieces=13
- litres=16
- millilitres=17
- treetop bottle=18
- soda bottle=19
- beer bottle=20

**Prep Time**

- morning=1
- midday=2
- afternoon=3
- evening=4

**Size**

- very small=1
- small=2
- medium=3
- big=4
- very big=5

**Source**

- own prod=1
- purchased=2
- gift=3
- borrowed=4
- other(spec)=5

**Comments**
## Form 8 - Food Consumption - By Study Group

(Observation or recall of foods consumed by subjects)

**Observation Day**

**Recall Day**

<table>
<thead>
<tr>
<th>Date</th>
<th>Member Nr</th>
</tr>
</thead>
</table>

**Subject's Name**

<table>
<thead>
<tr>
<th>Dish Meal Ref Code</th>
<th>Dish/Ingredient</th>
<th>Code Type</th>
<th>Amount Served</th>
<th>Left Over</th>
<th>Amount Consumed</th>
<th>Measurement Method</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td>water=1 maize kernels=2 ingred itself=3 ingr unpeeled=4 ingr peeled=5 ingr cut &amp; dry=6 ingr cut &amp; wet=7 food models=8</td>
</tr>
</tbody>
</table>

**Amount Used (Units)**

- kg weight=1 number=12
- grammes=2 pieces=13
- glasses=7 litres=16
- loafs=9 ml=17

**Meal Codes**

- breakfast=1
- am snack=2
- lunch=3
- pm snack=4
- supper=5
- night snack=6

**Size**

- very small=1
- small=2
- medium=3
- big=4
- very big=5

**Comments**

...
**FORM 9 - ANTHROPOMETRY & HEALTH**

(Anthropometric and health data for study subjects)

**CONFIDENTIAL**

<table>
<thead>
<tr>
<th>Farm name</th>
<th>Household nr</th>
<th>Farm Code</th>
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</table>

**Date**

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</tbody>
</table>

### 1. Children

<table>
<thead>
<tr>
<th>name of child</th>
<th>member nr</th>
<th>birthdate da mo yr</th>
<th>height weight muac</th>
<th>diseases past week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>dis</td>
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<tr>
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<td></td>
<td></td>
<td>bf</td>
</tr>
</tbody>
</table>

### 2. a) Lactating mothers

<table>
<thead>
<tr>
<th>Name</th>
<th>member nr</th>
<th>age yrs</th>
<th>height weight muac</th>
<th>tsf</th>
<th>diseases past week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>dis</td>
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<td>na</td>
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<td>vd</td>
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<td>chd</td>
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<td></td>
<td></td>
<td></td>
<td>lact</td>
</tr>
</tbody>
</table>

### 2. b) Baby

|               |           |                    |                    | dis                |
|               |           |                    |                    | co                 |
|               |           |                    |                    | fe                 |
|               |           |                    |                    | di                 |
|               |           |                    |                    | vo                 |
|               |           |                    |                    | na                 |
|               |           |                    |                    | vd                 |
|               |           |                    |                    | bf                 |

### 3. Elderly

<table>
<thead>
<tr>
<th>Name</th>
<th>member nr</th>
<th>age yrs</th>
<th>height weight muac</th>
<th>tsf</th>
<th>diseases past week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>dis</td>
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<tr>
<td></td>
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<td></td>
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<td>co</td>
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<td>di</td>
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<tr>
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<td></td>
<td></td>
<td>vo</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>na</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>vd</td>
</tr>
</tbody>
</table>

**Legend:**
- da = day, mo = month, yr = year, muac = mid upper arm circum, tsf = triceps skinfold,
- dis = disease type, nr = number, co = cough, fe = fever, di = diarrhoea,
- vo = vomiting, na = no appetite, vd = visit doctor, bf = breastfeeding

**symptom/breastfeeding**
- yes = 1
- no = 2

**diseases**
- colds = 1
- pneumonia = 2
- measles = 3
- malaria = 4
- other (sp) = 5

**comments**
FORM 10 - ACTIVITY PATTERNS - OPEN RECALL
(for adult subjects only)

Date    

Name of subject    

<table>
<thead>
<tr>
<th>Time of day</th>
<th>Description of main activities</th>
<th>Time taken</th>
<th>Activity code</th>
<th>Score</th>
<th>For whom</th>
</tr>
</thead>
<tbody>
<tr>
<td>before 6 am</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Nr hrs slept during last 24 hrs    

<table>
<thead>
<tr>
<th>Activity code &amp; score</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>resting=1 &amp; 1</td>
<td></td>
</tr>
<tr>
<td>planting=7 &amp; 4</td>
<td></td>
</tr>
<tr>
<td>light household work=2 &amp; 2.5</td>
<td></td>
</tr>
<tr>
<td>fetching water=3 &amp; 5</td>
<td>harvesting=9 &amp; 4</td>
</tr>
<tr>
<td>fetching firewood=4 &amp; 5</td>
<td>walking (heavy load)=10 &amp; 6</td>
</tr>
<tr>
<td>land preparation=6 &amp; 4</td>
<td>walking (normal)=11 &amp; 3</td>
</tr>
<tr>
<td>Sedentary work=12 &amp; 1.5</td>
<td></td>
</tr>
</tbody>
</table>

Comments    

For whom

household=1
cash payment=2
helping others=3

Time spent per occasion
approx. 1 hour =1
approx. 2 hrs=2
approx. 3-4 hrs=3
approx. 6 hrs=4
**FORM 11 - ACTIVITY PATTERNS - 7 DAY RECALL**

(for adult subjects only)

**Date**  
**Name of subject**

<table>
<thead>
<tr>
<th>Types of activities</th>
<th>Nr of times past week</th>
<th>Average time spent per occasion</th>
</tr>
</thead>
<tbody>
<tr>
<td>fetching water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>fetching firewood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>planting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>weeding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>preparing land</td>
<td></td>
<td></td>
</tr>
<tr>
<td>harvesting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking with heavy load</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other heavy activity (spec)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Time spent per occasion**
- approx. 1 hour = 1
- approx. 2 hrs = 2
- approx. 3-4 hrs = 3
- approx. 6 hrs = 4

**Comments**
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