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SURVEY REPORT - KENYA
NUTRITIONAL, FOOD HABITS AND MARKETING INVESTIGATIONS
WITH THE VIEW OF DETERMINING PROTEIN FOOD
FORMULATIONS WHICH ARE ACCEPTABLE, MARKETABLE
AND ECONOMICALLY FEASIBLE
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JUNE, 1969

Submitted to: The United States Government
State Department
Agency for International Development

Submitted by: Del Monte Corporation
215 Fremont Street
San Francisco, California

PREFACE

OBJECTIVES

The objectives of this report are to present information on the marketing, nutritional status and food habits of the people of Kenya with particular interest in investigating the desirability and economic feasibility of production of high protein food(s) for sale in Kenya.

By-products of fulfilling these objectives include: a review of the nutriture of the people of Kenya, the strengths and weaknesses of the local type of nutrition; a study of the food habits and some of the attitudes and beliefs supporting the food practices; a brief review of activities in nutrition in Kenya; and recommendations for action programs.

METHODS

A Del Monte Corporation Marketing expert spent three and one-half months in Kenya investigating food marketing including the methods involved in promotion, distribution, retail, wholesale and consumer purchasing.

A Del Monte Corporation Research Center Nutritionist spent eight months in Kenya studying nutritional status, food habits and nutrition programs. The World Health Organization had just finished a six-year study of the nutritional status of the people. There are also a number of published and file reports related to nutrition in Kenya. These studies provided the information on which the review of the nutritional status of the people was based. Since little was known or reported about the food habits of the Kenya people, the nutritionist undertook a specific study of this subject.

A number of executives and staff of Del Monte Corporation as well as those of Kenya Cannery Ltd., a Del Monte Corporation subsidiary, participated in numerous aspects of this project.

ACKNOWLEDGEMENTS

The Government of Kenya, recognizing the importance of nutrition and nutrition education, is to be complimented on the programs initiated and underway to foster improvements in these fields. The valuable assistance and complete cooperation of the Ministries of Health, Co-operatives and Social Services, Agriculture, and Economic Planning and Development, and the University of Nairobi are gratefully acknowledged. The same acknowledgement is made for the valuable assistance and cooperation of USAID, WHO and FAO.

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This report and the recommendations are respectfully submitted to the United States of America, State Department, Agency for International Development, as agreed in the contract between the United States Government and Del Monte Corporation signed on June 28, 1968.

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SUMMARY

Kenya has an estimated population of ten million people. Ninety-seven percent are Africans of forty different tribes. Many of the people are peasant agriculturalists who barter or sell some of their crops. Ten percent of the Africans are employed in wage-earning positions. Probably 90 - 95% of Kenya's people depend on food raised by the family for a large portion of their basic diets. The rainfall is extremely variable in different sections of Kenya and in the same section from year to year. Agricultural production is dependent on a number of factors of which the annual rainfall looms large. Thus, food production for family consumption and for cash crops seems to be a "shauri ya Mungu" (a Kiswahili expression which translates to "the affair of God," and which is used frequently to explain or justify things which are not understood or planned.)

The average annual income of the wage-earner is estimated to be 229 Kenya pounds (\$641.20). If the wage-earners purchased all of their food based on Nairobi March 1969 prices, using the lowest-cost nutritionally-adequate diet, and estimating an average family size of 5.5 people, they would have to spend 45% of their wages for food. Thus, even the Kenya African with an average wage has a limited amount of money to spend. And in general, those dependent on barter and cash crops have even less money.

Life expectancy is estimated at 40 - 45 years. The infant mortality rate is 160-200/1000 live births, compared with a none-too-low U S.A. rate of 23/1000 live births. Malnutrition is the second most important cause of death in children one to five years old and contributes to many other deaths. Poor nutrition is rarely isolated from the associated evils of poor sanitation, infection, infestation, poverty and discouragement. Where malnutrition fails to cause death, it takes its toll in lowered resistance to infections, lowered work and learning abilities, and poor growth in children resulting in stunting in adults.

Caloric intakes were below 80% of the requirement for 42% of the families studied. Thirty percent of the families received less than 80% of their total protein requirements. Fat and vitamin A intakes were both extremely low. The quality of the protein consumed was poor with the sulfur-containing amino acids and tryptophan the limiting ones. Riboflavin intakes were below 80% of the requirement for 71% of the families. Unlike many other tropical nations, vitamin C intakes were also low. Height and weight measurements showed that a great many people are severely underweight and that they are stunted in height. The anthropometric measurements indicated that the caloric deprivation was relatively greater than the protein deprivation. The clinical evaluation and selected biochemical tests confirmed this information.

The caloric and nutrient inadequacies summarized in the previous paragraph were expressed on a year around nationwide basis. There is a great deal of variability throughout the year in the amount of food available. Post-harvest seasons are times of relative plenty.

Celebrations and ceremonies are held then. When the stores of foods are depleted, the calorie and nutrient deprivations are greater and affect larger numbers of people than the average figures indicate. For the great majority of Kenya Africans the year is divided into periods of lesser and greater hunger.

Cereals, principally maize, provided 64% of the calories and 53% of the protein. Legumes provided 14% of the calories and 27% of the protein. Together, cereals and legumes also provided the major amounts of iron, thiamine, riboflavin and niacin, and contributed generously to the calcium intakes. Vegetables and fruits were the primary sources for the seriously inadequate vitamin A intakes and together with the roots and tubers provided nearly all of the vitamin C intakes. A variety of green leaves, wild and cultivated, and bananas were the vegetables and fruits consumed most frequently in the largest quantities.

"Uji" (a gruel usually made with maize flour and water, to which milk is sometimes added), tea with sugar and milk, "ugali" (a stiff bread-like porridge, usually made with maize flour and water) eaten with a stew, mixtures of maize and beans, and green leaves serve as the "core" diet for many Kenya Africans. Important contributions are made by the "secondary" foods including plantains, bananas, roots and tubers. However, the variability of the relative importance of these foods in different tribal groups is great. There are foods such as rice and bread which are important to some tribes and rarely eaten by others. The manners of preparing some foods, especially

the maize-bean dishes, and the ingredients included are extremely variable from tribe to tribe. Even the kinds of cereals preferred for the "ugali" vary; the Western people prefer "ugali" made from millet flour while the Coastal people prefer maize flour "ugali."

Food preparation practices often include sprinkling a highly alkaline crystalline mineral over the green leaves and boiling this combination with whatever else is being cooked. Long cooking times and frequent re-heatings are also common. All of these practices, but most especially the alkaline mineral (a 1% solution has a pH of 9.8), may be expected to cause serious loss in the water-soluble vitamins.

Records show that there have been severe famines in various sections of the country. It is probably not an exaggeration to say that there are very few Kenya Africans who have not personally experienced hunger.

Food taboos exist and are apparently observed today for many pregnant Kenya African ladies. The specific food taboos vary tribally, but all include a fear that the fetus will become too large and delivery will be difficult. Nearly every Kenya woman's culture tells her she should avoid eating certain foods and eat sparingly of all foods when she is pregnant. Once the baby is delivered, the mother is fed generously, quantitatively and qualitatively. It is believed that food is important for the mother so that she may produce large amounts of milk for the infant. Most tribes are also concerned that the mother should recover rapidly from her lying-in, and they believe

that particular foods are helpful to her in this respect.

Many Kenya Africans delay initiating semi-solid foods to their infants until much too late in infancy and they often introduce foods which are largely carbohydrates, such as plantains, bananas, potatoes, or "uji" without milk. Aside from a belief that a baby has a delicate digestive system, which is certainly very understandable in view of an extremely high incidence of gastroenteritis in infants and children, there do not seem to be any strong beliefs regarding infant feeding.

The diet of most Kenya Africans is not widely varied due to traditional food habits, methods of preparation and the limited number of foods grown by each tribe.

The Ministries of Agriculture, Health, Education and the Community Development workers are the official agencies which include nutrition education in their programs. The Catholic Relief Society is the volunteer association involved in food distribution and nutrition education. There is no national committee for joint planning or coordination of programs. A great many of the field workers have received some nutrition education, often following the programs and books of M. A. Powers called "Feeding Your Family." Although, the Ministries involved do have limited supplies of some excellent materials, extension of nutrition education programs will require greater supplies for both teachers and students.

Retail selling of food in Kenya is accomplished through the supermarket type store, general line stores typical of our "country" stores, "dukas," or extremely small stores dealing

generally in basic necessities, and open air markets which usually deal in basic staples and fresh fruit and vegetables.

Advertising and promotion is carried out by means of newspapers and periodicals, radio, and limited television. Distribution practices will vary widely depending upon the type of store and whether or not it is located in an urban area. Food purchasing habits may vary widely. Significant is the fact that probably 90 - 95% of all of Kenya's people depend on food raised by the family for a large portion of their basic diets.

The market for formulated or processed foods in Kenya is small. The demand for protein-formulated products is complicated by the different eating habits among tribes and areas, which would mean that no one formulated product could expect general acceptance in all areas. The increased cost of a protein-fortified staple over the staple itself is also a deterrent to purchasing. The investment for the introduction of a product of this type, in relation to potential volume, would be sizeable in order that the product be brought to the attention of the buying public and the nutrition message be made known. Successful promotion is further complicated by the various languages involved.

CONCLUSIONS

The results of the review of the literature on nutritional status show that a large percentage of the people are suffering from caloric deprivation. Fat, protein and vitamin A deficiencies are also widespread. These deficiencies, together with illnesses often due to poor sanitation, are causing poor growth in children which results in stunting in adults. They are causing increased susceptibility to infectious diseases and probably the infestive conditions; an increase in the death rate; the severity of the clinical course and the length of time required for recovery.

It is concluded that the food taboos related to the quantity of food a pregnant woman is permitted to eat, as well as to specific items she must exclude, are widespread in Kenya and probably fairly generally observed. Taboos for other groups are dying out, except among the older people.

It is also concluded that full knowledge of appropriate infant feeding practices is limited.

In view of the findings in this study, it is concluded that at this time it is not economically feasible for Del Monte Corporation as a private enterprise to produce, distribute and market protein-formulated products due to the limited market potential in Kenya. However, from this study we have arrived at specific recommendations which we feel will serve as a guide to foster improvement in the field of nutrition in Kenya. The concept of the formulation of protein foods will be a continuing activity in our corporate research and development programs. Del Monte Corporation would be interested in discussing with US/AID and the Government of Kenya a program for implementation of the recommendations contained herein.

RECOMMENDATIONS

It is recommended that consideration should be given to the formation of a National Nutrition Committee.

Representation might be drawn from Parliament, ministries involved with nutrition education, research and food, the University of Nairobi, international agencies (especially FAO, WHO and UNICEF), voluntary agencies, and the private sector. The Committee would provide a meeting place for the exchange of ideas, function to foster uniformity in applied nutrition programs and nutrition education, and help to formulate and coordinate nutrition research.

Nutrition education might be expanded in all the educational systems. The primary schools should be a major target since they reach the greatest number of people receiving educational training. Tribal recipes, evaluated as to nutritional adequacy and modified by adding locally available foods, if necessary, for improved nutrient content, should become part of the practical nutrition education program. Preparation of these recipes should actually take place in the schools. Expansion of the practical courses in planting, growing, harvesting and storing of those staples which are used in the recipes should be undertaken. Teaching and student materials and supplies, including seeds, for this purpose should be made available to the schools through activities of the National Nutrition Committee. Sources of international funding should be taken into account. In this connection the Teachers Handbook and Students Handbook of Feeding the Family by Margaret A. Powers need revision and assurance of ready availability at all times.

It is further recommended that USAID continue to lend its assistance in making available to the Ministry of Agriculture, for test and distribution, any new cereal variety developments from various governments, Rockefeller and Ford Foundation programs. Assistance on variety development should be continued in Kenya itself where the Ministry of Agriculture has made such notable progress in this field.

The Ministry of Agriculture and the Community Development workers, in particular, need a nutrition specialist to assist in program planning, in-service training, preparation of program materials, and evaluation of nutrition education, and to provide technical information and assistance to the field workers. The Ministry of Health and the Ministry of Education might also use the services of such a person (s). While it is true that there are African women at the national level with training in home economics and/or nutrition, they are exceedingly busy with administration and simply do not have adequate time to devote to specific nutrition programs. As soon as possible, African women should fill the positions. In the interim, if the Kenya Government requests the assistance of nutrition specialists, USAID should consider supplying one or two people, as well as providing scholarships for training additional African women in this field.

High Priority in nutrition education programs should be given to the following specific subjects from a long list of possible areas for nutrition education:

(1) The people should be discouraged from using the "magadi" soda in cooking and encouraged to use the iodized salt as soon as it is available.

(2) A concentrated effort should be made by all of those involved in nutrition education programs to teach the people appropriate infant feeding practices. Emphasis should be placed on the time of introducing semi-solid foods, the suitable items to introduce, the methods to use and the importance of clean foods and utensils for infants and small children. Probably the best way to approach the problem is to include some sound information on infant feeding at the various in-service training programs of all the agencies involved in nutrition education. The programs should be coordinated among all the agencies involved to assure uniformity of information.

(3) Encouragement should be given for the continuation of the traditional feeding practices for the newly delivered, lactating women. Encouragement should also be given for the prolongation of breast feeding.

(4) Encouragement should be given to the use of additional amounts of fat.

(5) Encouragement should be given for increased intake of all of the green leaves. This might involve teaching people to grow them in larger quantities and in teaching people to dry them for out-of-season use.

The University of Nairobi, Department of Home Economics, is interested in doing nutrition research. Assistance is also needed in teaching some of the nutrition subject matter at the University level. The Department's requirements include either funding for hiring a qualified person and for research assistanceships or the provision of such a person(s) with adequate funding to undertake some research.

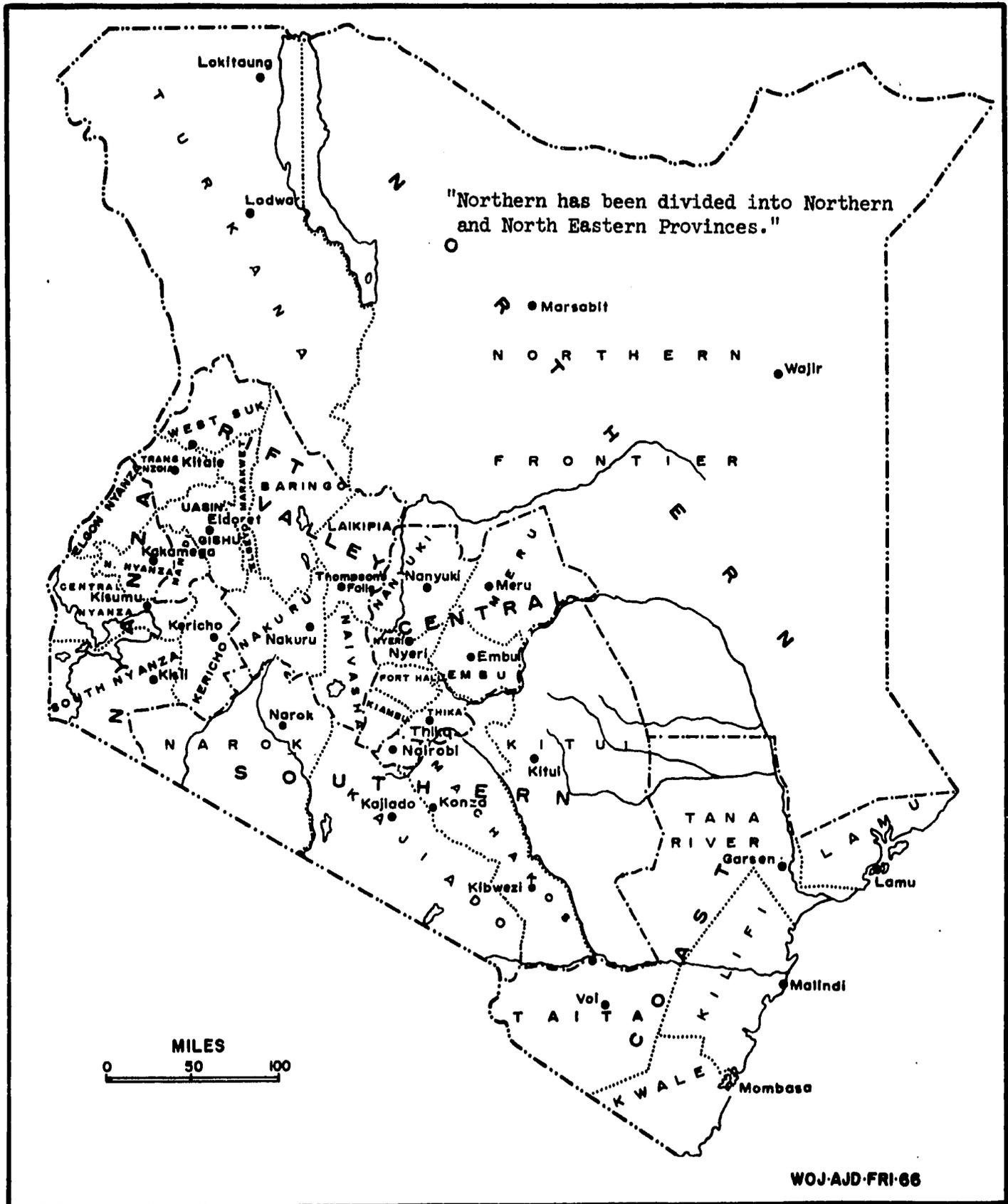
If requested by Kenya, USAID might investigate assistance to the University.

There are a number of areas for nutrition research.

Those suggested include:

- (1) A carefully designed and controlled evaluation of nutrition education programs.
- (2) An evaluation of the nutritional status of the adult men of Kenya which includes a study of their caloric expenditure.
- (3) An investigation or series of investigations in the general area of nutritional deprivation and mental retardation.
- (4) An analysis of Kenya foodstuffs, especially those foods cooked with "magadi" soda and those foods believed to be good sources of vitamins A and C.
- (5) A study of prenatal cravings and pica with the purpose of elucidating the etiology of these practices.
- (6) An evaluation of the nutritional status of the Coastal people which has not been done.
- (7) A study of possible methods which might be used to encourage good prenatal nutrition practices.

KENYA



BACKGROUND INFORMATION ON KENYA

The Country

Kenya is situated astride the equator in East Africa and bounded on the east by the Indian Ocean and the Somali Republic, on the north by Ethiopia and the Republic of the Sudan, on the west by Uganda and on the south by Tanzania. Kenya has a total area of 224,960 square miles, including 5,171 square miles of water. This is approximately equivalent to one and one-half times the area of California.

The Indian Ocean coastline, stretching from the Somali border in the north to Tanzania in the south, is 380 miles long. The Kilindini Harbor at Mombasa has become a major shipping harbor, particularly since the closure of the Suez.

Kenya is made up of seven provinces: Coast, Central, Rift Valley, Nyanza, Western, North Eastern, and Eastern Provinces. The country was granted independence by England in December 1963, and became a Republic within the Commonwealth in December 1964.

The hot, humid, coastal belt extends inland from two to ten miles and rises through plains and hills to thorn scrub country and increases in altitude to 5,000 feet on the eastern edge of the highlands. Low plateau, for the most part below 2,000 feet, extends over vast areas of eastern and northern Kenya. This section constitutes two-thirds of the whole country. The plateau is arid and portions are a waterless wasteland.

Kenya is cut by the Great Rift Valley which runs from north to south and varies from 30 to 40 miles in width. The floor of the Rift is 2,000 to 3,000 feet lower than the surrounding country. The greater part of the floor is low lying and arid, but at its highest central portion between Nakuru and Naivasha, the floor is over 6,000 feet above sea level with good conditions for farming. The Aberdare mountain range has an average height of 11,000 feet. Mt. Kenya rise to 17,058 feet, is bisected by the equator and snow covered. The West Kenya highlands are to the south and west of these mountains and to the north and west of the Great Rift Valley. They lie between 6,000 and 7,500 feet. This area is known as the granary of Kenya. The West Kenya highlands give way to the western plateau which extends from the 5,000 foot level down to the level of Lake Victoria and the Uganda border at 3,720 feet.

The altitude of Kenya governs the climate to a great extent: the land above 5,000 feet enjoys a temperature climate with fairly good rainfall. Seasons are defined by the amount of rain and in much of the country there are two rainy seasons: the "long rains" usually occur from March through May and the "short rains" during November and early December. Rainfall varies from little to none in the northern parts of the country to as much as 80 inches annually in Kericho between the Rift Valley and Lake Victoria. Vast areas of Kenya have a mean annual rainfall of less than 30 inches. Rainfall unreliability causes drought conditions

throughout much of the country is some years, and flooding occurs in other years. The coastal strip, including Mombasa, has a hot, humid climate; however, the trade winds which blow in from the Indian Ocean during most of the year keep the temperatures from exceeding 100°F. except on rare occasions. The hottest months are January through March while June through August are the coolest. The mean maximum temperature for Nairobi at 5,500 feet is 82°F. in February and the mean minimum temperature is 53°F. occurring in June and July. Nakuru temperatures vary from 45°F. to 85°F.; Eldoret from 48°F. to 78°F. and Kisumu from 60°F. to 87°F. The mean annual temperature at the equator (9,062 feet) is 56°F.

In the highlands between 4,500 and 9,000 feet the characteristic landscape consists of patches of evergreen forest separated by wide expanses of short grass. The forest reserves total 6,719 square miles and are almost exclusively in the highlands. Above the forest a zone of bamboo extends to about 10,000 feet. In the western plateaus and south of Mt. Kenya the highlands vegetation gives way to a formation in which low trees are scattered through grass three to eight feet tall. On the northern and southern margins of the highlands between 3,000 and 6,000 feet altitude, flat-topped trees are scattered through an even cover of grass three or four feet high. Semidesert conditions below 3,000 feet give rise to thornbush, interspersed with acacias, euphorbias and baobab trees. In the still drier areas of the northern Kenya

desert scrub is scattered in the bare ground. In the coastal belt dense high bush alternates with limited areas of forest and extensive open glades. Coconut palms and stands of mangrove occur.

Kenya is noted for its big game which ranges especially over the dry, thornbush country.

Five-thousand one hundred seventy one square miles of Kenya's square mileage area are water. This includes a portion of Lake Victoria, the largest lake in Africa of 24,300 square miles (only part in Kenya). Lake Rudolph, 2,473 square miles, lies wholly in Kenya as do the smaller lakes: Naivasha, 81 square miles; Baringo, 50 square miles; Hannington, 13 square miles; Nakuru, 20 square miles; and Elementeita, 7 square miles.

Kenya's People

The most recent population estimate was made in June 1967 and estimated 9,948,000 inhabitants. Table 1 shows that the majority of the people are of African origin.

TABLE 1

<u>Race</u>	<u>Number</u>	<u>Percent</u>
African and Somali	9,671,000	97.2
Asian (India and Pakistan)	192,000	1.9
European	42,000	0.4
Arab	39,000	0.4
Other	4,000	0.1
Total Non-African	277,000	2.8

Historically, the traditional society of Kenya was one of about 40, largely self-sufficient, tribes. In many instances the tribes consisted of clans with a very loose association to the whole tribe. There was no intertribal organization beyond occasional alliances against pastoral marauders, notably the Masai. Agricultural and pastoral tribes exchanged grain and livestock, raiding was epidemic between tribes and sometimes occurred between clans of one tribe.

Kenya, with its East-Central geographical location, was settled by Bantu, Hamites, Nilotes and Nilo-Hamites. Although this classification is based on language, the terms as popularly understood have a racial meaning including the color of the skin, shape of the nose and lips, height of the people, traits of social organization, such as divine kingship and cattle cults, and material culture or arts and crafts.

Bantu People - East Africa is the northern limit of Bantu African and most East Africans are Bantu. The Bantu people generally make a living cultivating with a hoe. In Kenya, the Bantu tribes include: Kikuyu, Meru, Embu, Luyis, Kisii, Kuria, Samia, Giriama, Teita, Pokomo.

Hamites - The true Hamites are a Caucasian, moderately fair skinned race including the ancient Egyptians and Berbers. In East Africa, even such people as the Somali, Galla, and Boran, who are classified as fully Hamitic, are racially mixed. They are few in number and live a nomadic pastoral life in the North Kenya desert.

Nilotic People - Their center is the Nile River of the Southern Sudan and through southwestward migrations they occupied portions of Western Kenya. The second largest tribe in Kenya, the Luo, are Nilotic. They are equally at home with agriculture, cattle-keeping and fishing. The Luo are relatives of the Nuer people of the Southern Sudan.

Nilo-Hamites - As the name implies, these people are a mixture of the two previous groups with a language of Hamitic grammatical features (word-ending) and Nilotic words or stems. The emphasis in their way of life is nomadic cattle-keeping. The Kenya Nilo-Hamitic tribes include: Masai, Turkana, and Kalenjin, (Nandi and Kipsigis).

Table 2 shows the distribution of the major tribes in Kenya according to the 1962 census. (Kenya Population Census, 1962).

English is the official language and is spoken by all the educated. Each tribe has its own language, but Swahili is spoken and understood by most African men, educated African women, and is used quite extensively by Europeans and Asians.

TABLE 2
African Tribal Distribution
(1962)

<u>Tribe</u>	<u>Number</u>	<u>%</u>
Kikuyu	1,642,065	19.6
Luo	1,148,335	13.7
Abaluhya	1,086,409	13.0
Kamba	933,219	11.2
Kisii	538,343	6.4
Meru	439,921	5.2
Mijikenda	414,887	4.9
Kipsigis	341,771	4.1
Turkana	181,387	2.2
Nandi	170,085	2.0
Masai	154,079	1.8
Ogaden	121,645	1.4
Tugen	109,691	1.3
Elgeyo	100,871	1.2
All Others	983,234	12.0
		100.0
Total		

Kenya's population is concentrated in the three major rural cultivated regions: the Coastal Region, centered at Mombasa; the Central Province where the Kikuyu, Meru, and Embu tribes are located among the Aberdare and Mt. Kenya foothills just north of Nairobi; and around Lake Victoria in Kakamega, Kisii, and Central Nyanza districts with Kisumu as the urban center. The non-African people usually live in the towns and cities: the 1962 census showed that more than 90% of the Asians lived in communities with more than 5,000 inhabitants; over 60% of the Europeans lived in places of similar size; and 75% of the Arabs lived in towns or cities of over 5,000 population, most of them at the coast. According to the 1962 census there were 34 towns with a population of more than 2,000 people and 92.2% of the total population lived outside these towns in rural areas. The increase of the urban population from the 1948 census to the 1962 census was 135% which gives an average annual rate of 6.3% (Kenya Statistical Digest).

High birth and death rates are largely responsible for the structures of the age distribution of the Kenya population (shown in Table 3) which is typical of the developing nations. In Kenya 26% of the population are adult men, who theoretically are the potential wage earners to support the population. Twenty-three percent of the population are adult women, who are responsible in the peasant agriculture of Kenya for raising, processing, storing and preparing the major portion of food eaten by their families, as well as for the care of the home and children, making of clothes, and often for the carrying of water and collection of wood.

The official estimate of the birth rate is 3%. (Statistical Abstract, 1967). This is based on the census of 1948

and the census of 1962. It is acknowledged that the 1948 census underestimated the population. It is probable, therefore, that the 3% estimate for the birth rate is somewhat high. The age distribution of the population shows that 46% are less than 15 years old. Although the death rate in this age group is still high in comparison with richer nations, it has been decreasing and there are and will be large numbers of young people reaching the child bearing years in the immediate future. This will increase the absolute number of births and may increase the birth rate. Table 4 shows the expected population increases in Kenya based on the 3% birth rate figure.

Kenya is the only tropical African nation which does include family planning as an official program in its five year development plan.

Table 3
Age Distribution - Census 1962

<u>Age Grouping</u>	<u>Number</u>	<u>Number</u>
Birth - 4 years	1,482,200	
5 - 10 years	1,365,900	
10 - 14 years	1,136,400	
Sub-total, Birth to 14 yrs.		3,975,500 (46%)
15 - 59 years (Males)	2,228,400	25.8% of total
15 - 59 years (Females)	2,014,100	23.3% of total
Sub-Total, 15 - 59 yrs. Both Sexes		4,242,500 (49%)
Over 60 yrs.	418,300	
<hr/>		
Total - 1962	8,636,300	
<hr/>		

Table 4
Population Estimates - Kenya

<u>Date</u>	<u>Population</u> (In Millions)
1962	8.6
1965	9.1
1970	10.6
1975	12.4
1980	14.7
1985	17.5
1990	20.8
1995	25.0
2000	30.3

Employment and Earnings

Total wage employment as reported in the Economic Survey of June 1968, was approximately 600,000.

Employment by major sector in 1967 is shown in Table 5.

TABLE 5

EMPLOYMENT BY SECTOR

Agriculture and Forestry	196,900
Private Industry and Commerce	202,500
Public Sector	198,000
	<hr/>
Total	597,400

These figures do not include the self-employed farmer who is rapidly proceeding to a cash crop basis. Based on the 1967 estimates, the total wage employment was close to 1,000,000 people of whom 93% were Africans. About 30% of these Africans were engaged on small holdings outside of settlement schemes. The estimated total wage employment is shown in Table 6.

TABLE 6

ESTIMATED TOTAL WAGE EMPLOYMENT 1967

Table 5	597,400
Addition for Under-Enumeration (Domestic Servants, etc.)	33,900
Rural Non-Agricultural	60,600
Small Holdings Outside Settlement	284,700
	<hr/>
Total	976,600
	<hr/>
Africans	922,500

Kenya's revised development plan for 1966-1970 hopes to raise the total employed African figure to 1,100,000 by 1970.

Total earnings of employees have continued to rise. While employment in 1967 rose by only 3.4%, the wage increased by 7.6% in both the public and private sectors.

Average yearly earnings per employee in 1967 are shown in Table 7.

TABLE 7

AVERAGE ANNUAL EARNINGS PER EMPLOYEE

	<u>K. pounds</u>	<u>U.S. Equiv.</u>
The Private Sector		
Agriculture and Forestry	66.5	\$ 186.20
Mining and Quarrying	291.7	816.76
Manufacturing and Repairs	296.0	828.80
Building and Construction	141.2	395.36
Electricity and Water	368.9	1032.92
Commerce	495.4	1387.12
Transport and Communications	334.9	937.72
Other Services	228.2	638.96
Public Service	308.6	864.08
	<hr/>	<hr/>
Average	229.0	641.20

Since 1964 employment growth has been 6% while average earnings have increased 23.5%. Thus earnings have risen about four times faster than employment growth. A considerable decline in average earnings was evidenced in the building and construction field primarily due to the influx of unskilled workers. Employment nearly doubled with almost no increase in the supply of better skilled workers. Excluding electricity and water, average earnings in all other sectors rose faster than employment.

The rapid rise in wages has had the following effects:

1. Slow growth in employment in Kenya which affects a major objective of the Development Plan.
2. Slowdown in growth of exports of primary products which has affected competitive ability in international markets.
3. Operation of transfer taxes on manufactured goods exported between Kenya and Uganda-Tanzania.

Between 80 and 90% of the adult population are subsistence farmers and most of them have been given their share of the land since independence. Some of this group are wage employed in various capacities and locations and operate their land as a side-line to supplement their income. In these instances, families or relatives are usually employed on the land to perform the actual labor.

Agriculture in Kenya

Kenya agriculture is divided into three classes; the large farm sector, the small farm sector, and the pastoral areas. In 1966 there were 2,760 large farms comprising 6,258,000 acres of land. Half of these acres were arable, the rest were pasture, forest or fallow. The small farm sector consisted of about 1 million holdings on 18 million acres of land. The majority of the owners were subsistence crop farmers with or without some cash crops. The pastoral areas are spread over some 110 million acres of low rainfall area and are inhabited by the nomadic pastoral tribes. From a nutrition point of view, our concern is with the crops grown for food consumption by the peasant agriculturalists in the small farm sector. The only study covering the entire country was done in 1960-1961 (Kenya African Agricultural Census 1960-1961). Table 8 shows the acreage of main food crops grown on the small farms in 1960-1961. Between 1960 and 1967 there have been dramatic changes in the cash crop production of the small farm sector. Table 9 shows the production for sale from the small and large farm sectors in 1960 and 1967

Table 8
Acreage of Main Food Crops
Grown by the Small Farm Holders

<u>Crop</u>	<u>Thousand Acres</u>	<u>Percentage</u>
Maize	2,890.5	40.1
Pulses	1,686.3	23.4
Sorghum	481.5	6.7
Millet	380.4	5.3
Cassava	293.2	4.1
Wimbi	282.7	3.9
Bananas	181.4	2.5
Sweet Potatoes	166.0	2.3
Potatoes	134.4	1.9
Yams	77.0	1.1

Table 9
Production for Sale: Small and Large Farms
1960, 1967 (in thousand tons)

	<u>1960</u>	<u>1967</u>	<u>1960</u>	<u>1967</u>
	<u>Small Farms</u>		<u>Large Farms</u>	
Maize	73.4	90.0	90.0	141.5
Wattle Bark	19.2	29.0	31.0	19.2
Pulses	11.3	24.6	0	0
Cotton	11.0	14.0	0	14.0
Rice Paddy	9.5	16.6	0	0
Clean Coffee	4.6	24.5	18.8	24.0
Raw Cashew Nuts	4.5	13.1	0.3	1.1
Pyrethrum	1.8	8.0	6.7	2.3
Wheat	0.7	6.8	126.7	153.6
Tea	0.1	1.5	13.5	26.0
Sugarcane	0	370.0	0	450.0
Sisal	0	1.0	46.6	50.0

(Statistical Abstracts, 1967). According to the figures for 1966 the cash revenue to the producers for the sale of crops was 16,436,000 pounds for the 1 million small farm holdings and 28,717,000 pounds for the 2,760 large holdings.

Table 10 from the Agricultural census in 1960-1961 shows the size of the holdings in the small farm sector. Because of the great variability in soil fertility and rainfall, it is difficult to estimate the size holding necessary to cover a family's subsistence food needs. The WHO team calculated that a family needed 4 to 7 acres of land in an area with rainfall over 35". Five acres has frequently been used as a sort of rule of thumb, estimate of the amount of land needed.

Table 11 shows the number of persons supported on each holding according to the size of the holding.

TABLE 10

PERCENTAGE OF HOLDINGS BY ACREAGE

	<u>Under 2.50</u>	<u>2.50- 2.99</u>	<u>5.00- 7.49</u>	<u>7.50- 9.99</u>	<u>10.00 14.99</u>	<u>Over 15.00</u>	<u>Total No. Holdings</u>
Central Province	32.4	32.4	18.4	7.6	5.9	3.3	278,700
Nyanza Province	22.8	24.8	14.5	8.7	11.7	17.5	401,500

TABLE II

PERSONS PER HOLDING BY SIZE (ACRES)

	<u>Under 2.50</u>	<u>2.50- 4.99</u>	<u>5.00- 7.49</u>	<u>7.50- 9.99</u>	<u>10.00 14.99</u>	<u>Over 15.00</u>	<u>Average per Holding</u>
Central Province	6.23	7.37	10.20	11.78	15.87	13.98	8.58
Nyanza Province	5.16	6.41	7.22	7.67	7.96	10.39	7.23

The Ministry of Agriculture has recently made considerable progress in teaching the peasant holder good husbandry of the land. The single most important factor relating to quantity of production is probably rainfall. There is a large variability in the timing and quantity of annual rainfall. In discussing the Machakos District, J. Heyer (1965) said, "a man growing all his own food suffers in years of drought because even his food crops do not yield enough to keep him and his family adequately fed. He may obtain enough in the best years - about 4 years in 10, with a surplus for sale; barely enough other years, and less than enough in the drought years - 3 years out of 10, sometimes finding it difficult to keep his family alive. In very bad years, about 1 in 10, he may expect to get Government famine relief, where there is no money or food left in his area."

Famine in Kenya

Recent studies of the history and anthropology of specific sections of Kenya have used major events to determine the dates. Calculating time from major events shows only too clearly that famine has been endemic in Kenya throughout recorded history. In one series of thirteen major events covering a period from 1883 to 1953 in Western Kenya, eight of the time-fixing events were famine. (Osogo, 1965). This series of dates is reproduced here in Table 12.

Probably the most noteworthy series of afflictions, including famine, occurred among the Masai, Kikuyu and Kamba between 1890 and 1900. Rinderpest and pleuropneumonia spread through herds while locusts denuded both their cattle pastures and their standing crops, small pox attacked the people with particular virulence, and throughout most of the three years from 1897 to 1900 a harrowing famine racked them. In

Table 12

Major Events - Western Kenya

1840 - 1953

(Osogo, J. The Buluyia, Oxford University Press, 1965
Pages 32 and 33)

1840 - 1850	The great famine of 'Lumala' (destruction) in which thousands died.
1875	The first European, H.M. Stanley touched Buluyia on his voyage round Lake Victoria.
1883	Arrival of the first European to pass through Buluyia on foot - Joseph Thomson.
1885	The locust raid of 'Osodo' in Samia.
1890	The famine of 'Oswekha' in Samia.
1894	The war of 'Lumboka' in Bukusu.
1895	The war of 'Chetambe' in Bukusu.
1908	The famine of 'Demesi' in Kakamega District. The famine of 'Achoka' in West Buluyia.
1918	The famine of 'Ngaira' in Kakamega District. Ngaira was a rainmaker who died.
1918	The famine of 'Obando' in west Buluyia 'Obando' is maize flour in KiLuo. Maize flour was sold for the first time in this famine.
1927	The famine of 'Liboyi' in Kakamega District.
1941	The famine of bananas - when people went to work in Maragoli to get bananas.
1943	The famine of 'Skikombe' in Kakamega and Bungoma Districts or the famine of 'Kedereyo' in Busia District. The government helped the people and schools to get cassava and millet.
1953	The famine of Mau Mau.

1897 the British Foreign Office took over the responsibility for the administration of British East Africa from the Imperial British East Africa Company which was in grave financial difficulties. It was during this period that British authority was gradually extended from the Kenya Coast to Uganda by developing police outposts supported by small punitive expeditions. It was also during this period that the railroad from the Kenya Coast to Lake Victoria was under construction with imported Indian labor. British purposes were aided considerably in the last years of the nineteenth century by the ravages of famine and disease among the Africans through whose territory they had to pass. (Harlow et al., 1965 and Patel, 1964).

A severe and widespread famine occurred as recently as 1961 and the Government's famine relief measures were hampered by unusually heavy and long "short rains" with serious flooding. Today there is semi-permanent famine relief work among the nomadic Turkana of Northern Kenya.

Mortality

Life expectancy is estimated to be 40-45 years. (U.N. Demographic Yearbook, 1966). The crude death rate is about 21/1000. (Grounds, 1964a). The crude death rate in the U.S.A. is about 9.5/1000. Table 13 shows the main causes of deaths occurring in hospitals in 1965 according to the records of the Ministry of Health. These are the most recent figures available. There are no figures or studies showing the causes of deaths occurring outside hospitals.

Table 13
Causes of Deaths in Hospitals, 1965

<u>Cause</u>	<u>%</u>
Diseases of Respiratory Tract (excluding Tuberculosis)	21.0
Gastroenteritis	14.0
Cardiovascular Diseases	8.0
Nutrition Diseases (including anemias)	6.0
Tuberculosis	4.5
Malignant Tumors	4.5
Accidents	4.4
Malaria	3.3
Others (No one cause accounting for 3% of the deaths)	34.3
<hr/>	
Total	100.0
<hr/>	

Sixty to seventy percent of all deaths occur in children under six years of age (ibid). About 125,000 children under six years old were estimated to have died annually between 1962 and 1964. Of these child deaths, 7,000 per year took place in hospitals. Thus for every child who died in a hospital there were 15 - 20 who died at home.

Estimates of Infant Mortality and Child Deaths

Infant mortality and child deaths are closely related to socio-economic level and are sensitive indices of the nutritive-infestive-infective status of a country. The 1948 census included a more detailed study of 7.7% of the population. The study was designed to collect information which would permit an estimate of infant and child deaths. The methods used involved asking mothers, in the presence of the headman, about deaths of any of their children and those under one year old. The infant mortality rate was estimated to be 184-200/1000 live births and the total wastage (all child deaths) rate was 352/1000 live births.

Estimates of mortality of Kenya infants and children had been made by the district medical officers at various times and using various methods. Most of the figures were in departmental reports and letters. In 1964 Grounds (1964b) reviewed this information, recognized the possible errors in the figures and also recognized that these figures plus the 1948 census study were the only estimates available. From a large number of reports all over Kenya, Grounds suggested, "The average infant mortality rate for Kenya

might be about 160-170/1000" (for the period 1962 to 1964). He also concluded that, "Probably about one-third of all babies born, die before reaching adolescence". Dr. Grounds' estimates depend on the work of scattered district physicians. The women they contacted were a self selected sample who attended clinics. The estimates that only 6% of the infant and child deaths occurred in hospitals in 1962-1964 has been presented. There is little basis on which to make an estimate of infant and child mortality rates "in the bush". A reasonable guess is that they are probably somewhat higher than Grounds' estimates, perhaps near the upper limit of the 1948 special census study of 200/1000 live births. In 1922 the infant mortality rate was estimated to be 400/1000 live births in Western Kenya. (Johnstone, 1924). In the USA in 1915 the Infant Mortality Rate was 99.9/1000 live births; in 1958 it was 45.7 and 23.8/1000 live births for non-whites and whites respectively. (Wallace, 1962).

Turning to the causes of infant and child deaths, Grounds examined the death registers of every government hospital (excluding Nairobi) for 1962 and extracted information regarding the cause of death of every child under 6 years old. A retrospective survey of 4,577 infant and child deaths resulted. Table 14 shows the main causes of infant and child deaths occurring in hospitals in Kenya in 1962.

Grounds comments, "Malnutrition is the second most important cause of child deaths." Its rise in importance in this group compared with infants in their first year of life is expected. In general, infants suffer from some degree of subnutrition during the second six months of their life, but it is not serious enough to kill them.

This is accentuated during their second year of life when they are weaned and it is at this time that malnutrition is likely to become sufficiently severe to cause death. It must be appreciated, however, that malnutrition is a condition that may vary from year to year depending mainly on the amount of rain that falls. There may well be a greater annual variation in the amount of malnutrition than there is of mortality from other causes. Furthermore, even though it is not recorded as the cause of death, malnutrition is probably a contributory factor in an unknown proportion of other deaths."

Because malnutrition was listed as a contributing cause of death in so many of the hospital records which Grounds examined, he undertook a prospective study to examine this more carefully. He studied the mortality of children under six years old for one month, (Nov. 15 to December 15, 1963)* with particular attention to the nutritional status of the child on admission to the hospital. The number of deaths studied was 243, a relatively small number and the time interval was short. Two major factors which may have tended to exaggerate the number of cases of malnutrition observed are: (1) when a specific condition is isolated and actually looked for, those involved in the study are more conscious of observing the condition and usually see it much more frequently and (2) in Kenya when children are admitted to the hospital they are usually very seriously ill and might

* The peak rate of mortality and morbidity from malnutrition are just prior to the harvest season. In Central Province which has a large concentration of people, November-December is the height of one of the two annual harvest seasons. In Western and Nyanza Provinces, also with large population concentrations, Nov.-Dec. are mid-way between harvest seasons.

well show clinical signs of malnutrition. One factor of major importance which might tend to lower the number of cases of malnutrition is the self-selection of the patients using hospitals: the parents who bring their children to hospitals are believed to be wealthier and better educated than the average and this might mean that there would be more food available to the children in these homes. There is no other study of this type in Kenya. Whatever its shortcomings and inaccuracies, it does provide a basis for discussion. Table 15 shows the percentage of children at each age with malnutrition on admission for their terminal illness.

Apart from those children certified as dying from kwashiorkor, malnutrition meant any child obviously weighing less than the average for its age, and/or any child with typical signs of protein deficiency, that is, straight, fine, pale or brownish-colored hair, with or without edema. Malnutrition was certified as the cause of death in 10% of the cases for all ages.

Morbidity

In 1965, 2,445,800 patients were treated in Government Hospitals as both in and out-patients. The diseases were diagnosed in the proportions shown in Table 16.

Although many of these conditions are commonly associated with poor nutrition, the figures are not very useful as an assist in estimating the degree of gravity of nutritional problems of the people of Kenya. Killen (1960) reported that 90% of the African recruits from some areas for World War II were rejected. Table 17 and 18 show the number of in and out-patients who have been treated in Government Hospitals for malnutrition and diseases related to nutritional status in recent years.

Table 14
 Important Causes of Death Under Six Years of Age
 Expressed as Percentages of all Deaths in
 That Age Group
 (Grounds, 1964c)

<u>Cause</u>	<u>%</u>
<u>Neonatal (birth to one month)</u>	
Prematurity	26.5
Tetanus	26.2
Resp. Tract Infections	23.1
Congenital Abnormalities	4.7
Gastroenteritis	3.9
Other (no one causing 5% of the deaths)	18.6
	100.0
<u>Infant (one month through eleven months)</u>	
Resp. Tract Infections	37.4
Gastroenteritis	30.4
Malaria	5.7
Malnutrition	5.1
Meningitis	4.3
Whooping Cough	4.0
Tuberculosis	2.4
Measles	1.6
Other	9.1
	100.0
<u>Child (one through five years)</u>	
Resp. Tract Infections	26.3
Malnutrition	14.5
Gastroenteritis	12.3
Malaria	11.4
Whooping Cough	6.4
Tuberculosis	6.2
Meningitis	4.6
Burns and Scalds	3.2
Measles	2.9
Tetanus	2.1
Polio and Encephalities	1.4
Other	8.7
	100.0

Table 15
Percentage of Children by Age with Malnutrition
on Hospital Admission for Terminal Illness
Kenya - 1963
(Grounds, 1964c)

<u>Age</u>	<u>Malnutrition</u>	
	<u>Present</u> <u>%</u>	<u>Absent</u> <u>%</u>
1st Year	31.3	68.7
2nd Year	67.9	32.1
3rd Year	40.6	59.4
4th Year	52.6	57.4
5th Year	33.3	66.7
All 5 years	46.9	53.1

Table 16
Morbidity - 1965

<u>Disease</u>	<u>%</u>
General Infectious and parasitic	26.1
Respiratory diseases	20.7
Alimentary	14.7
Skin and Musculo-skeletal	10.8
Nervous system and sense organs	5.9
Accidents, injuries	4.5
Allergic, metabolic, blood	2.5
Pregnancy, puerperium	2.5
Genitourinary	2.1
Other	10.2
	<hr/>
	100.0

Table 17
In-Patients Treated in Government Hospitals for Malnutrition
and Conditions Associated with Nutritional Status

<u>Condition</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>
Beri-Beri	5	17	34	-	Report
Pellagra	45	74	74	77	Not
Scurvy	3	5	19	10	Yet
Kwashiorkor	1581	1736	2107	2571	Available
Other Deficiency States	626	422	905	429	
Iron Deficiency Anemia	1012	499	486	500	
Pernicious and other Hyperchromic anemias	153	113	71	113	
Other Anemias	1326	948	1706	1836	
Allergic, Endocrine Metabolic and Blood Diseases	453	263	299	390	

Tapeworm, Ankylostomiasis Ascariasis, other Diseases due to Helminths	4159	2812	3267	2909	
Malaria - all types	8838	5297	5849	5081	
Total In-Patients			156,690	162,098	

Table 18
Out-Patients Treated in Government Hospitals for Malnutrition
and Conditions Associated with Nutritional Status

	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>
Avitaminosis and other Metabolic diseases	346	2144	1582	2265	5824
Kwashiorkor	5422	6911	7717	15280	19530
Anaemia	5271	7565	7710	11927	13215
Other Allergic, Endocrine, Metabolic and Nutritional Diseases	8245	6059	8381	15061	75897

Gastroenteritis Less than 2 yrs.	40135	45243	41003	71875	74370
Gastroenteritis Over 2 yrs.	24280	16803	25006	41029	33159
Tapeworm, Ankylostomiasis, Ascariasis	36866	49530	50163	91752	134200
Schistosomiasis	6847	8171	9605	12913	20476
Malaria, all types	98763	97376	97845	193416	Not Yet Available

Total, Out-Patients (new cases)		1,427,924	2,214,786		

CALORIE AND NUTRIENT INTAKES RELATED TO ADEQUACY

Methodology and its Limitations:

Much of the information reported here in the caloric and nutrient intakes was collected by the WHO Team from 1962-1968. The method requires weighing the food which the family eats for seven days, deducting any wastage, recording the number of people sharing the food, calculating the calories and nutrients from tables of food values and dividing these figures by the number of people sharing the food. This is a family food consumption survey in contrast to an individual or institutional study. In cultures where the family eats from a common pot or two with the fingers and enough food is cooked for several meals, it is extremely difficult to determine the amount of food any one family member consumes. The methodology used assumes an equal distribution of food among the family members. In most cultures, and certainly those of the major tribes of Kenya, the male family members are in a favored position in quantity and quality of food they receive. That is, when there is a limited amount of food in the family pot or a limited amount of animal protein in the stew, the father and sons, especially older boys, receive proportionately more food or meat than the mother or daughters receive. If a family food record shows that the family is receiving 80% of their caloric requirements, this may mean that the men and boys are receiving enough or nearly enough food to meet or nearly meet their theoretical caloric needs while the women and girls are more severely deprived than the 80% figure indicates.

There are numerous other assumptions made and errors possible inherent in the methodology of family food consumption studies. One of the more serious questions is the accuracy with which international tables of food values do represent the caloric and nutrient contents of the foods grown in the geographical areas under study. The food value tables for calories and the nutrients used for most of the foods consumed in the WHO study were those of Platt (1962). Amino acid content of the foods was calculated using the FAO (1963a) and Orr and Watt's tables (1957).

A second question is the degree to which the caloric and nutrient "requirements" or "recommendations" do represent the actual needs of the people. In the WHO studies the following sources were used to establish these levels:

Calories, Thiamine, Niacin: Reh, E., 1961 and FAO Calorie Requirements, 1957.

Protein, Iron, Vitamin A, Vitamin C: National Academy of Sciences, National Research Council Recommended Dietary Allowances Revised 1964, Publication 1146.

Calcium: FAO-WHO Calcium Requirements, 1961.

Riboflavin: HMSO, Manual of Nutrition.

One may be justified in feeling a lack of confidence in the preciseness of the specific figures presented to represent the number of calories, grams of protein or quantities of other nutrients which a particular family consumed. However, these figures for consumption and recommendations are presented only on a grouped basis and they probably do reflect the caloric and nutrient intakes of the people in comparison to their requirements. When information is available on mortality and morbidity, anthropometry, nutritional clinical examinations,

biochemical measurements of metabolite levels in body tissues, fluids and/or urine, food balance sheets, agricultural production and family economics, and when all this information supports the results of the food intake studies, there seems little doubt of the findings.

Distribution of Calories into Percentages of Carbohydrates,

Fats and Proteins:

When a diet meets the recommended allowances, the caloric distribution should be represented approximately in the following ratio: carbohydrates, 70 cal %; fat, 20 cal %; proteins, 10 cal % (fully available protein). The mean values from the Kenya studies are shown in Table 19.

Table 19

Caloric Distribution of Kenya Diets

	<u>Cal. %</u>	<u>±</u>	<u>S.D.</u>	<u>Range</u>
Carbohydrate	75.8	±	2.1	(72.5 - 79.6)
Fat	10.2	±	2.0	(6.1 - 13.4)
Protein	14.0	±	2.5	(11.0 - 18.9)

It is apparent that the Kenya diets are very low in fat content.

Calorie Intake

Summary Table 20 shows the percent of the people fulfilling various ranges of adequacy for their caloric intakes. The table shows

Table 20
 Percent of People in Each Classification
 According to Percentage of Adequacy of Intake
 (Based on WHO data)

<u>Tribe</u>	<u>No.</u>	<u>Calories</u>			
		<u>Percentages of Adequacy</u>			
		<u>0-59%</u>	<u>60-79%</u>	<u>80-90%</u>	<u>>100%</u>
Kikuyu	645	25.8	25.6	22.9	25.7
Luo	503	23.4	21.9	19.5	35.0
Kamba	583	11.0	17.2	23.8	48.0
Nairobi (Largely Kikuyu)	115	18.8	25.0	43.8	12.5
Total	1846	20.0	21.9	23.6	34.5

that on the average throughout the year, twenty percent of the people studied were fulfilling less than 60% of their caloric requirements and 42% were fulfilling less than 80% of their requirements. One-third of the people were exceeding their theoretical caloric requirements. The table also shows that a larger percentage of the Kikuyu people received fewer calories in relation to their requirements than the other tribes studied and that the Wakamba people are the least seriously deprived calorically.

Figure 1 shows the percent of the people by tribe and month of the year who were eating only enough food to provide less than 80% and less than 60% of their caloric requirements.

The figure shows that there was considerable variability in the caloric intake throughout the year. As would be expected, fewer people showed caloric deprivation during the harvest seasons; e.g., during the July bean harvest, more Kikuyu were meeting their caloric requirements than during other months shown. The harvest seasons vary throughout the country so that when one section is receiving a generous amount of food, another section may not be. For example, in preharvest October in Central Province, 67% of the Kikuyu were receiving less than 80% of their caloric needs, while in the same month in Nyanza Province, fewer (29%) of the Luo showed a caloric intake of less than 80% of adequacy. The number of harvests per year also varies from section to section in Kenya.

In addition to seasonal variability in caloric intake throughout Kenya, there is also annual variability as indicated by the occurrence of famines. A severe food shortage may affect

PERCENTAGE OF THE PEOPLE STUDIED* FULFILLING LESS THAN 60% AND 80% OF THEIR CALORIC REQUIREMENTS

(NUMBERS IN PARENTHESIS REPRESENT NUMBER STUDIED)

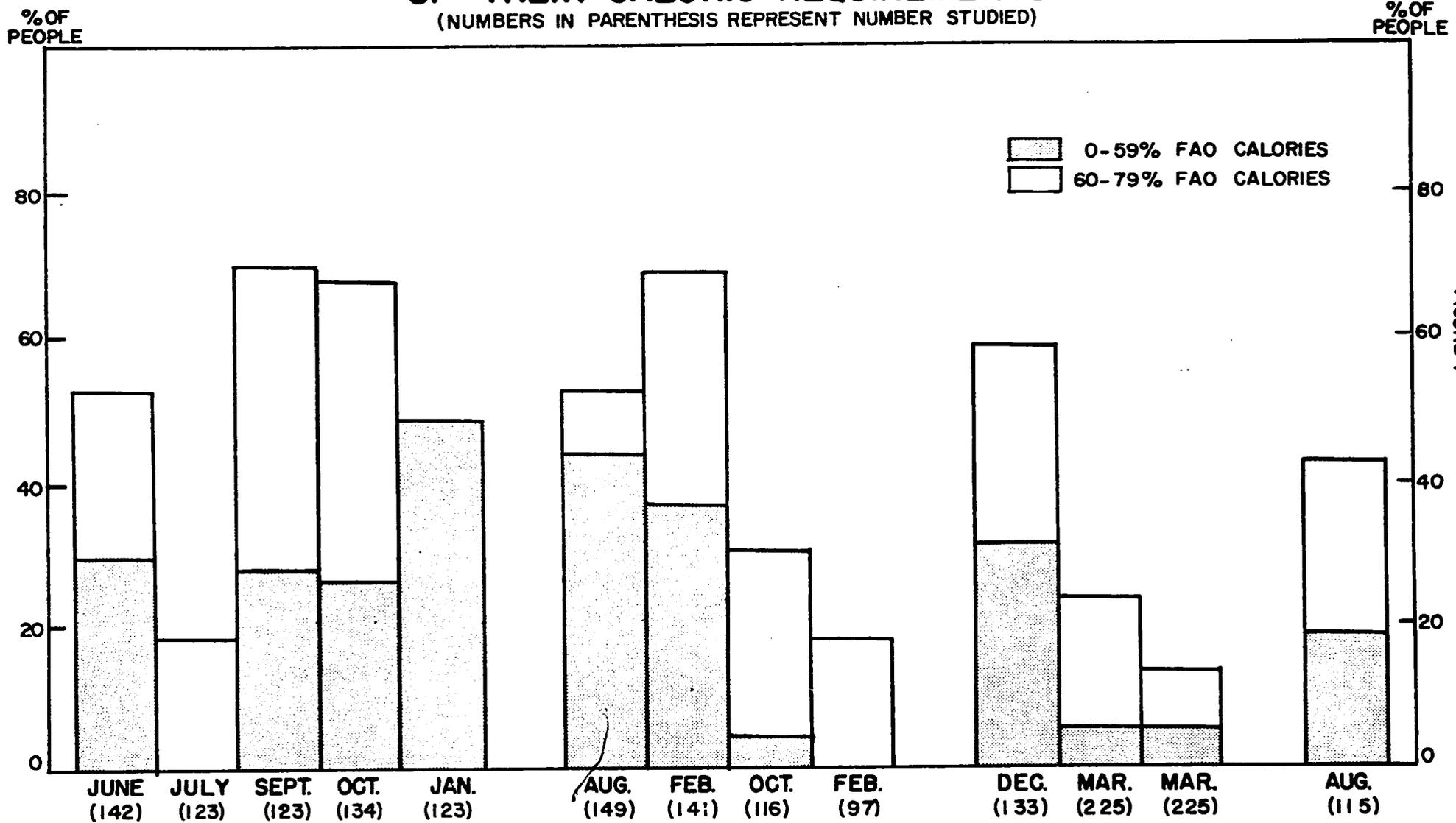


FIGURE 1

* WHO 1968

one section of the country and not another section.

Table 21 shows the mean caloric intake per person per day, the mean percent of adequacy and the ranges of caloric intakes by tribe and month of the year. The table appears to indicate that there has been an improvement in the caloric situation from the studies done in 1961-1962 to those done in 1965-1966. This is probably a false impression: the Meru people were studied during the preharvest period when the food stores were exhausted, the Kikuyu people studied in April 1962 were landless and largely unemployed, the Masai were suffering the early stages of a famine and government food supplies were provided to them immediately following this survey. Thus most of the groups studied in 1961-1962 happened to be selected populations who probably represented the more nutritionally deprived at that time.

Protein Intake

Table 22 summarizes the percentage of people studied who fell into the various National Research Council classifications of adequacy for total protein intakes. Figure 2 shows the percent of the people who received less than 60% and 80% of their NRC recommended protein allowances by tribe and at various times of the year. For example, in preharvest June, 2/3 of the Kikuyu received less than 80% of their protein allowances and at the same time 1/3 of these people received less than 60% of their protein allowance; but in July, during the bean harvest, none of the people received less than 80% of their allowance. (Actually, during July, 96%

MEAN CALORIC INTAKE PER PERSON PER DAY,
RANGES AND MEAN PERCENT OF ADEQUACY (FAO)
BY TRIBE AND MONTH

(FROM WHO STUDIES)

<u>TRIBE</u>	<u>DATE</u>	<u>NO.</u>	<u>CAL/PERSON/DAY</u>	<u>RANGE</u>	<u>MEAN PERCENT ADEQ.</u>
KIKUYU	JUNE 1965	142	1727	565-3986	87
	JULY 1965	123	2370	1078-4599	109
	SEPT 1965	123	1702	883-4167	76
	OCT 1965	134	1558	891-3310	75
	JAN 1966	123	1728	657-3728	80
	APR 1962	78	1394	429-2592	73*
	JUNE 1962	59	1906	1198-4693	99*
LUO	AUG 1965	149	1671	595-3385	80
	FEB 1966	141	1487	662-3018	72
	OCT 1965	116	2498	979-6087	115
	FEB 1966	97	2471	1592-4227	118
KAMBA	DEC 1965	133	1426	658-2389	70
	MAR 1966	225	2103	932-3919	107
	MAR 1966	225	2426 }		109
NAIROBI (LARGELY KIKUYU)	AUG 1962	115	1790	1085-2864	81
MERU	AUG 1962	52	1549		79*
	SEPT 1962	69	2157		67*
	SEPT 1962	56	1175		57*
	SEPT 1962	33	1182		67*
MASAI	AUG 1961	43	741	251-1008**	35*
KIPSIGIS	AUG 1961	140	1124	746-1594	52*

* NICHOL'S STANDARDS.

** FAMINE RELIEF INSTITUTED SHORTLY AFTER STUDY.

Table 22
 Percent of People in Each Classification
 According to Percentage of Adequacy of Intake
 (Based on WHO data)

<u>Tribe</u>	<u>No.</u>	<u>Protein</u>			
		<u>Percentages of Adequacy</u>			
		<u>0-59%</u>	<u>60-79%</u>	<u>80-99%</u>	<u>>100%</u>
Kikuyu	645	13.8	18.9	16.9	50.3
Luo	503	25.2	8.0	12.7	54.2
Kamba	583	14.6	13.6	24.3	47.5
Nairobi (Largely Kikuyu)	115	6.3	12.5	37.5	43.8
Total	1846	16.7	13.8	19.4	50.1

of these people were eating food which supplied enough total protein to be in excess of their theoretical allowances).

Table 23 shows the average amount of protein consumed per person per day, the ranges, and the average percent of adequacy by tribe and month.

Table 24 shows the mean grams of animal protein consumed per person per day and the percent of animal protein and vegetable protein in the total protein consumed. These are simple and somewhat crude methods of giving an impression of the quality of the protein consumed. In interpreting the meaning of the average intake of animal protein per person per day, it is generally assumed that when a diet contains 30 grams of protein from animal sources it will be adequate. An average of less than 30 grams per day is likely to be of dubious quality especially for the vulnerable groups (infants, children, pregnant and lactating women, and people who are ill or recovering from illness). When the average animal protein intake is less than 15 grams per day, one is almost certain to find protein malnutrition in some segments of the population (Altschul, 1965). In interpreting the percent of animal protein, the "rule of thumb" percentage below which the protein quality is likely to be adequate is 10%, assuming that the caloric and total protein allowances are met. The tables already presented show that many of the families studied were not meeting their caloric and total protein allowances.

Table 25 shows the mean protein score, range, and the limiting amino acids. The protein score is a method of expressing the quality of a protein as a numerical value. The score is arrived

TABLE 23

MEAN PROTEIN INTAKE (GMS) PER PERSON PER DAY,
RANGES, MEAN PERCENT OF ADEQUACY BY TRIBE AND MONTH

<u>TRIBE</u>	<u>DATE</u>	<u>No.</u>	<u>PROTEIN (GM)/ PERSON/DAY</u>	<u>RANGE (GMS)</u>	<u>MEAN PERCENT ADEQUACY</u>
KIKUYU	JUNE 1965	142	48	14-131	79
	JULY 1965	123	109	44-195	166
	SEPT 1965	123	66	31-132	109
	OCT 1965	134	56	24-97	96
	JAN 1966	123	78	25-145	125
	APR 1962	78	37	10-99	62*
	JUNE 1962	59	57	28-139	95*
LUO	AUG 1965	149	55	20-120	88
	FEB 1966	141	52	19-137	87
	OCT 1965	116	73	18-134	117
	FEB 1966	97	86	38-135	142
KAMBA	DEC 1965	133	45	20-86	77
	MAR 1966	550	64	38-136	104
NAIROBI	AUG 1962	115	62	38-100	102
MERU	AUG 1962	52	47		78*
	SEPT 1962	69	48		80*
	SEPT 1962	56	38		62*
	SEPT 1962	33	39		67*
MASAI	AUG 1961	43	39		62*
KIPSIGIS	AUG 1961	140	38	29-63	65*

* NICHOL'S STANDARDS.

TABLE 24

**ANIMAL PROTEIN (GMS) INTAKE, PERCENT ANIMAL
AND VEGETABLE PROTEIN BY TRIBE AND MONTH**

(WHO DATA)

<u>TRIBE</u>	<u>DATE</u>	<u>No.</u>	<u>ANIMAL PROTEIN (GMS)</u>	<u>PERCENT ANIMAL PROTEIN</u>	<u>PERCENT VEGETABLE PROTEIN</u>
KIKUYU	JUNE 1965	142	1.4	3.0	97.0
	JULY 1965	123	1.8	1.7	98.3
	SEPT 1965	123	5.3	8.0	92.0
	OCT 1965	134	3.1	5.5	94.5
	JAN 1966	123	1.5	1.9	98.1
	APR 1962	78	4.4	5.6	94.4
	JUNE 1962	59	6.5	11.1	88.9
LUO	AUG 1965	149	13.6	24.8	75.2
	FEB 1966	141	20.0	38.0	62.0
	OCT 1965	116	22.6	31.0	69.0
	FEB 1966	97	19.8	23.0	77.0
KAMBA	DEC 1965	133	2.7	6.1	93.9
	MAR 1966	550	7.0	11.0	89.0
NAIROBI	AUG 1962	115	20.5	33.0	67.0
MERU	AUG 1962	52	4.0	8.6	91.4
	SEPT 1962	69	7.7	16.0	84.0
	SEPT 1962	56	1.7	4.4	95.6
	SEPT 1962	33	0.0	0.0	100.00
				9.3	90.7

**PERCENTAGE OF THE PEOPLE STUDIED*
FULFILLING LESS THAN 60% AND 80%
OF THEIR PROTEIN ALLOWANCES (NRC)**

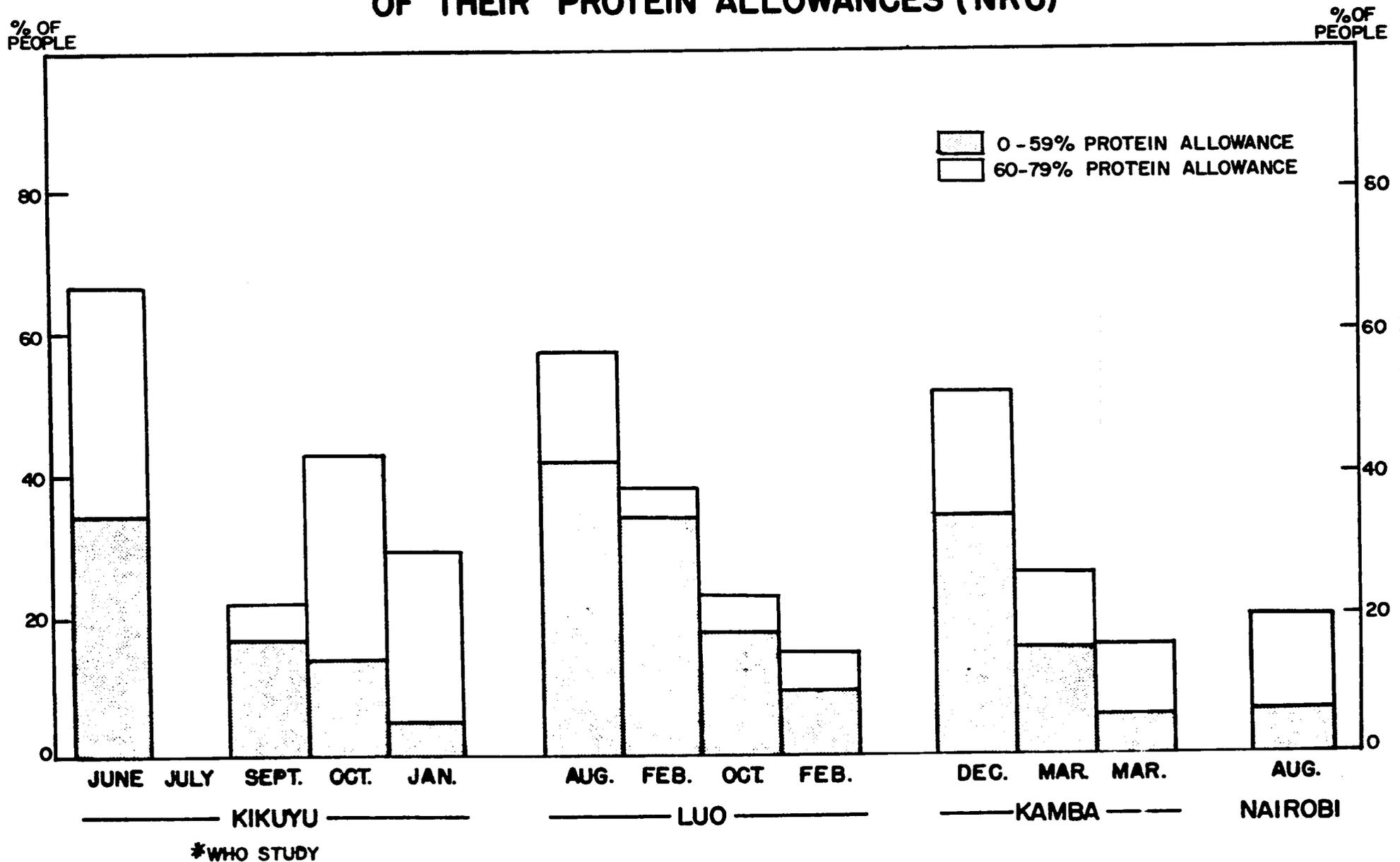


FIGURE 2

TABLE 25

PROTEIN SCORE AND LIMITING AMINO ACIDS

<u>TRIBE</u>	<u>DATE</u>	<u>No.</u>	<u>MEAN SCORE</u>	<u>RANGE</u>	<u>PERCENT OF FAMILIES WITH GIVEN LIMITING AMINO ACID</u>		
					<u>S.A.A.</u>	<u>TRY</u>	<u>LYS.</u>
KIKUYU	JUNE	142	65	48-80	50	50	0
	JULY	123	51	39-65	100	4	0
	OCT	134	58	45-68	67	33	0
LUO	AUG	149	69	42-80	29	62	8
	OCT	116	70	56-80	50	42	8
KAMBA	DEC	133	68	60-82	73	27	0
	MAR	225	59	43-84	10	10	81
	MAR	225	63	48-81	5	43	52
AFRICAN DIETS			53-72*				
BRITISH DIETS			70-80*				
EGG			100*				
BEEF MUSCLE			80*				
MILK (COW'S)			80*				

* W.H.O. TECH. REPT. SERIES: PROTEIN REQUIREMENTS, No. 301, GENEVA, 1965

at by: (1) calculating the quantity of each essential amino acid plus the quantity of cystine and tyrosine in the food expressed as mg/g of total essential amino acids and (2) calculating the deficit of the most limiting amino acid compared with the pattern of the essential amino acids of whole egg. In interpreting the results, one needs to keep in mind that the food value tables of amino acids have been compiled on limited numbers of analyses, two different tables often give very different results, and the essential amino acid pattern of whole egg is not exactly comparable to human requirements for amino acids at various ages. When these laborious calculations, done by the WHO Team, are interpreted on a grouped basis, they no doubt identify the amino acids in short supply in the usual diets of the Kenya tribes studied.

Vitamin A Intake

Table 26 shows the summary of the percent of subjects in each classification according to the percentage of adequacy of intake of Vitamin A and its precursors. Table 25 shows the mean intake by tribe and month. The diets contained more than 80% of carotene as a source of Vitamin A. This has been taken into consideration in establishing the requirements. The intake of Vitamin A was without exception very low. Although there was some variability in dietary intake of Vitamin A throughout the year, the intakes were low even in times of plenty.

Food consumption studies in developing nations usually underestimate the Vitamin A (and C) contents of the diets because wild fruits, berries and grasses are often picked and eaten by

Table 26

**Percent of People in Each Classification
According to Percentage of Adequacy of Intake
(Based on WHO data)**

<u>Vitamin A</u>					
<u>Tribe</u>	<u>No.</u>	Percentages of Adequacy			
		<u>0-59%</u>	<u>60-79%</u>	<u>80-99%</u>	<u>>100%</u>
Kikuyu	645	95.4	2.8	1.8	0.0
Luo	503	93.0	5.2	1.7	0.0
Kamba	583	99.0	0.0	1.0	0.0
Bondeni	115	87.5	0.0	6.3	6.3
Total	1846	95.4	2.4	1.8	.4

children enroute to school, by women in the "shamba" (field) and by everyone at the market. Since Vitamin A is stored in the liver, high intakes in times of plenty may be utilized during time of scarcity. Nevertheless, the dietary intakes were so very low that one might expect to observe clinical signs of Vitamin A deficiency. The WHO Team did indeed frequently observe clinical signs usually associated with Vitamin A deficiency.

Thiamine - Riboflavin - Niacin Intakes

Thiamine:

The consumption of thiamine was more than satisfactory for the majority of the people. Table 28 shows the average intake per person per day, the ranges of intake and the average percent of adequacy and Table 31 shows the percent of the people in each classification according to percent of adequacy of thiamine intake.

Riboflavin:

Table 29 shows the mean and ranges of riboflavin intake and the percentage of adequacy. Table 31 shows the percent of the people according to the classifications of adequacy. Consumption of riboflavin was insufficient in all areas except among the Meru whose basic carbohydrate was millet.

Niacin:

Table 30 shows the mean and ranges of niacin intake and the percentage of adequacy. Table 31 shows the percent of the people according to the classifications of adequacy of their niacin intakes. One would expect the niacin intakes to be low in a country where maize is the staple carbohydrate source for a large portion of the population. This is not true, because most diets contain

legumes, millet, sorghum, and/or wheat.

Vitamin C Intake

Tables 32 and 33 show the information relating to the Vitamin C intakes and to the percent of the family diets falling into various classifications of adequacy for Vitamin C. In a country where fresh vegetables and fruits are available throughout much of the year, it is surprising to find as many families with inadequate intakes as these tables indicate there to be. Reservations similar to those mentioned under the presentation of the Vitamin A intakes must be considered in interpreting these figures.

Iron Intake

Tables 34 and 35 present the information about the iron intakes. The consumption of iron appears to be more than satisfactory. This is discussed later in connection with the relatively high incidence of iron-deficiency anemia.

Calcium Intake

Tables 36 and 37 present the information on the intakes of calcium.

TABLE 27

MEAN INTAKES, PER PERSON PER DAY AND PERCENTAGES OF ADEQUACY
VITAMIN A AND PRECURSORS
 BY TRIBE AND MONTH

<u>TRIBE</u>	<u>DATE</u>	<u>No.</u>	<u>VITAMIN A</u> <u>(I.U./DAY)</u>	<u>RANGE</u>	<u>PERCENT OF</u> <u>ADEQUACY</u>
KIKUYU	JUNE 1965	142	1538	126-4121	44
	JULY 1965	123	354		10
	SEPT 1965	123	167	44-1555	5
	OCT 1965	134	527		14
	JAN 1966	123	524		13
	JUNE 1962	59	1358		35
LUO	AUG 1965	149	596	93-2400	15
	FEB 1966	141	705	0-3288	19
	OCT 1965	116	1305	236-3971	30
	FEB 1966	97	1179	144-3385	30
KAMBA	DEC 1965	133	1036	400-3778	30
	MAR 1966	225	225	0-1139	5
	MAR 1966	225	540		13
NAIROBI (LARGELY KIKUYU)	AUG 1962	115	1327	139-4669	34
MERU	AUG 1962	52	<u>MG.</u> 0.6		80
	SEPT 1962	69	0.2		26
	SEPT 1962	56	0.05		7
	SEPT 1962	33	0.09		13
MASAI	AUG 1961	43	55 I.U.		< 2
KIPSIGIS	AUG 1960	140	865 I.U.	516-1607	24

TABLE 28

MEAN, RANGES AND PERCENT OF ADEQUACY OF
THIAMINE BY TRIBE AND MONTH

<u>TRIBE</u>	<u>DATE</u>	<u>No.</u>	<u>THIAMINE MG/PERSON/DAY</u>	<u>RANGE Mgs</u>	<u>PERCENT ADEQUACY</u>
KIKUYU	JUNE 1965	142	1.38	.58-3.20	136
	JULY 1965	123	2.70	1.14-4.84	246
	SEPT 1965	123	1.75	.60-4.40	159
	OCT 1965	134	1.63	.90-2.90	158
	JAN 1966	123	1.95	.70-3.90	179
	APR 1962	98	1.51	.46-3.30	164*
	JUNE 1962	59	2.54	1.20-8.90	278*
LUO	AUG 1965	149	1.47	0.50-3.20	142
	FEB 1966	141	1.14	0.50-2.80	109
	AUG 1965	116	1.80	0.80-4.00	163
	FEB 1966	97	1.90	1.10-3.40	190
KAMBA	DEC 1965	133	1.20	0.80-2.20	116
	MAR 1966	225	1.92	0.72-4.97	190
	MAR 1966	225	2.25		201
URBAN	AUG 1962	115	1.80	1.06-2.52	165
MERU	AUG AND SEPT 1962	52	1.63		173*
		69	1.45		165*
		56	1.26		127*
		33	1.42		178*
MASI	AUG 1961	43	0.68**	0.23-0.97	68**
KIPSIGIS	AUG 1961	140	0.92	0.50-1.40	104*

* NICHOL'S STANDARDS.

** FAMINE RELIEF FOODS WERE PROVIDED IMMEDIATELY FOLLOWING THIS SURVEY.

TABLE 29

**MEANS, RANGES AND PERCENT OF ADEQUACY
OF RIBOFLAVIN BY TRIBE AND MONTH**

<u>TRIBE</u>	<u>DATE</u>	<u>No.</u>	<u>RIBOFLAVIN MG/PERSON/DAY</u>	<u>RANGE MG/DA</u>	<u>PERCENT ADEQUACY</u>
KIKUYU	JUNE 1965	142	0.85	0.40-1.54	69
	JULY 1965	123	1.12	0.50-1.83	86
	SEPT 1965	123	0.81	0.20-1.80	64
	OCT 1965	134	0.85	0.50-1.50	68
	JAN 1966	123	0.94	0.40-1.90	75
	APR 1962	98	0.61	0.16-1.16	50*
	JUNE 1962	59	1.05	0.50-2.10	83*
LUO	AUG 1965	149	0.68	0.28-1.40	54
	FEB 1966	141	0.65	0.19-1.60	52
	AUG 1965	116	0.90	0.50-1.00	71
	AUG 1966	97	1.20	0.60-1.80	94
KAMBA	DEC 1965	133	0.64	0.30-1.20	52
	MAR 1966	225	0.78	0.26-2.68	64
	MAR 1966	225	1.10		82
URBAN (LARGELY KIKUYU)	AUG 1962	115	1.17	0.56-1.63	90
MERU	AUG TO SEPT 1962	52	2.44		210*
		69	2.01		172*
		56	2.05		183*
		33	.89		77*
MASAI	AUG 1961	43	0.69	0.11-1.50	35*
KIPSIGIS	AUG 1961	140	1.29	0.80-2.38	109*

* NICHOL'S STANDARDS.

TABLE 30

MEANS, RANGES AND PERCENT OF ADEQUACY
OF NIACIN BY TRIBE AND MONTH

<u>TRIBE</u>	<u>DATE</u>	<u>No.</u>	<u>NIACIN MGS/PERSON/DAY</u>	<u>RANGE (MGS)</u>	<u>PERCENT ADEQUACY</u>
KIKUYU	JUNE 1965	142	9.7	4.6-21.6	95
	JULY 1965	123	14.0		130
	SEPT 1965	123	10.2		98
	OCT 1965	134	11.5	8.0-23.0	110
	JAN 1966	123	10.2		94
	APR 1962	98	8.8	3.2-17.4	72*
	JUNE 1962	59	15.0	8.9-44.1	123*
LUO	AUG 1965	149	13.4	5.0-34.0	128
	FEB 1966	141	8.6	3.0-22.0	82
	AUG 1965	116	15.0		120
	FEB 1966	97	13.7		130
KAMBA	DEC 1965	133	7.5	3.6-13.0	74
	MAR 1966	225	11.6	3.8-35.0	115
	MAR 1966	225	14.0		123
NAIROBI (LARGELY KIKUYU)	AUG 1962	115	12.0	8.0-18.0	110
MERU	AUG 1962	52	7.4		61*
	SEPT 1962	69	7.3		62*
	SEPT 1962	56	7.0		56*
	SEPT 1962	33	6.2		62*
MASAI	AUG 1961	43	11.8		90*
KIPSIGIS	AUG 1961	140	7.4	5.60-11.35	62*

* NICHOL'S STANDARDS.

Percent of People in Each Classification
According to Percentage of Adequacy of Intake
(Based on WHO data)

<u>Thiamine</u>					
<u>Tribe</u>	<u>No.</u>	<u>Percentages of Adequacy</u>			
		<u>0-50%</u>	<u>60-79%</u>	<u>80-99%</u>	<u>>100%</u>
Kikuyu	645	0.0	8.5	4.5	87.0
Luo	503	4.7	14.4	10.7	70.2
Kamba	583	2.1	2.9	11.5	83.6
Bondeni (Largely Kikuyu)	115	0.0	0.0	0.0	100.0
Total	1846	1.9	7.8	8.1	82.1
<u>Riboflavin</u>					
Kikuyu	645	36.7	31.3	16.7	15.2
Luo	503	51.0	27.0	7.2	14.7
Kamba	583	50.7	23.3	9.4	16.6
Nairobi (Largely Kikuyu)	115	12.5	31.2	18.8	37.5
Total	1846	43.5	27.6	11.9	16.9
<u>Niacin</u>					
Kikuyu	645	13.0	16.9	16.8	53.3
Luo	503	16.0	13.1	19.7	51.2
Kamba	583	15.4	11.0	26.4	47.2
Nairobi (Largely Kikuyu)	115	0.0	6.3	37.5	56.3
Total	1846	13.8	13.3	21.9	51.0

Table 3'

Percent of People in Each Classification
According to Percentage of Adequacy of Intake
(Based on WHO data)

<u>Tribe</u>	<u>Vitamin C</u>				
	<u>No.</u>	<u>Percentages of Adequacy</u>			
		<u>0-59%</u>	<u>60-79%</u>	<u>80-99%</u>	<u>>100%</u>
Kikuyu	645	36.6	8.8	5.4	49.1
Luo	503	33.1	8.4	14.1	44.4
Kamba	583	80.5	3.9	2.1	13.5
Nairobi (Largely Kikuyu)	115	18.8	0.0	18.8	62.5
Total	1846	48.4	6.6	7.5	37.4

TABLE 33

MEAN, RANGES AND PERCENT OF ADEQUACY OF
VITAMIN C BY TRIBE AND MONTH

<u>TRIBE</u>	<u>DATE</u>	<u>No.</u>	<u>VITAMIN C MG/PERSON/DAY</u>	<u>RANGE (MG)</u>	<u>PERCENT ADEQUACY</u>
KIKUYU	JUNE 1965	142	130	35-330	130
	JULY 1965	123	51	3-295	51
	SEPT 1965	123	22	0-67	22
	OCT 1965	134	90	10-249	90
	JAN 1966	123	53	5-124	53
	APR 1962	98	23	12-161	24*
	JUNE 1962	59	163	50-305	175*
LUO	AUG 1965	149	52	10-130	52
	FEB 1966	141	81	0-248	81
	AUG 1965	116	87	21-224	87
	FEB 1966	97	69	3-173	69
KAMBA	DEC 1965	133	84	26-174	131
	MAR 1966	225	5	0-42	5
	MAR 1966	225	3	0-42	3
NAIROBI (LARGELY KIKUYU)	AUG 1962	115	81	22-137	124
MERU	AUG TO	52	17		20*
	SEPT	69	19		20*
	1962	56	13		15*
		33	8		9*
KIPSIGIS	AUG 1960	140	66	11-158	70*
MASAI	AUG 1961	43	0.2	0-9	<1

* ESTIMATED, NOT CALCULATED.

TABLE 34

Percent of People in Each Classification
According to Percentage of Adequacy of Intake
 (Based on WHO Data)

<u>Tribe</u>	<u>Iron</u>				
	<u>Percentages of Adequacy</u>				
	<u>No.</u>	<u>0-59%</u>	<u>60-79%</u>	<u>88-99%</u>	<u>>100%</u>
Kikuyu	645	0.9	1.8	5.4	91.9
Luo	503	6.3	7.4	7.4	78.9
Kamba	583	1.6	4.7	10.9	82.8
Nairobi (Largely Kikuyu)	115	0.0	6.2	0.0	93.8
Total	1846	2.8	4.5	7.0	85.7

TABLE 35

MEAN, RANGES AND PERCENT OF ADEQUACY OF
IRON BY TRIBE AND MONTH

<u>TRIBE</u>	<u>DATE</u>	<u>No.</u>	<u>FE (MG)</u>	<u>RANGE</u>	<u>PERCENT ADEQUACY</u>
KIKUYU	JUNE 1965	142	17	5.8-37.8	
	JULY 1965	123	36	14.0-65.0	334
	SEPT 1965	123	19	10.0-44.0	174
	OCT 1965	134	18		173
	JAN 1966	123	27	10.0-53.0	254
	APR 1962	98	13	3.5-27.9	150*
	JUNE 1962	59	18	11.0-33.8	204*
LUO	AUG 1965	149	15	6.0-35.0	140
	FEB 1966	141	13	5.0-28.0	113
	AUG 1965	116	27	11.0-56.0	240
	FEB 1966	97	23	13.0-32.0	210
KAMBA	DEC 1965	133	15	6.0-28.0	145
	MAR 1966	450	17	6.0-42.0	164
NAIROBI (LARGELY KIKUYU)	AUG 1962	115	17	6.0-26.0	157
MERU	AUG 1962	52	16		174*
	SEPT 1962	69	14		162*
	SEPT 1962	56	14		148*
	SEPT 1962	33	11		129*
MASAI	AUG 1961	43	12		78*
KIPSIGIS	AUG 1961	140	17		200*

* NICHOL'S STANDARD.

TABLE 36

Percent of People in Each Classification
According to Percentage of Adequacy of Intake
 (Based on WHO Data)

<u>Tribe</u>	<u>Calcium</u>				
	<u>Percentages of Adequacy</u>				
<u>No.</u>	<u>0-59%</u>	<u>60-79%</u>	<u>88-99%</u>	<u>>100%</u>	
Kikuyu	645	48.6	19.8	10.8	20.7
Luo	503	52.6	14.7	6.3	26.3
Kamba	583	65.6	15.6	9.4	9.4
Bondeni (Largely Kikuyu)	115	6.2	25.0	25.0	43.8
Total	1846	51.4	17.5	9.8	21.3

TABLE 37

MEAN, RANGES AND PERCENT OF ADEQUACY OF
CALCIUM BY TRIBE AND MONTH

<u>TRIBE</u>	<u>DATE</u>	<u>No.</u>	<u>Ca (MG)</u>	<u>RANGE</u>	<u>PERCENT ADEQUACY</u>
KIKUYU	JUNE 1965	142	259	113-494	53
	JULY 1965	123	451	116-766	88
	SEPT 1965	123	276	74-629	49
	OCT 1965	134	313	132-664	65
	JAN 1966	123	446	213-1088	86
	APR 1962	98	190	26-340	28*
	JUNE 1962	59	408	232-653	60*
LUO	AUG 1965	149	338	74-1611	65
	FEB 1966	141	326	84-1513	66
	AUG 1965	116	987	136-3579	188
	FEB 1966	97	534	157-2492	111
KAMBA	DEC 1965	133	250	113-526	49
	MAR 1966	450	263	33-760	54
NAIROBI (LARGELY KIKUYU)	AUG 1962	115	510	300-820	93
MERU	AUG 1962	52	260		41*
	SEPT 1962	69	260		39*
	SEPT 1962	56	130		19*
	SEPT 1962	33	110		14*
MASAI	AUG 1961	43	250		25*
KIPSIGIS	AUG 1961	140	660	400-1260	97*

* NICHOL'S STANDARDS.

FOOD GROUP SOURCES OF CALORIES AND NUTRIENTS

Calories

The percent source of calories and nutrients from food groups are summarized in Table 38.

The major sources of calories as a summation for all tribes and all seasons were the cereal foods which provided 64.5% of the calories. Legumes provided 14% and roots and tubers provided 10%. There was variability throughout the year in the quantities contributed by these major food groups. Legumes are harvested and eaten prior to maize harvest and legumes were the major caloric source for the Kikuyu people during the brief harvest periods. Irish and sweet potatoes are usually consumed during and shortly following the harvest period while cassava and arrowroot are often left in the ground and serve as a food reserve, used when maize stores are low or depleted. There was also some variation among the tribes; the Kikuyu use proportionately more legumes than the Luo or Wakamba people.

During certain periods of the year the food group "fruits and vegetables" was an important caloric source. Plantains were the principal food consumed in this group. It is apparent that sugar and fat are negligible caloric sources, except for the urban Bondeni people studied.

Protein

Cereals and legumes also contributed the major portion of the protein with cereals providing 53% and legumes 27% as a year around summation for all tribal groups studied. Animal foods contributed 15% of the total protein but this is almost entirely due to the fish consumption of the Luo living near

Lake Victoria and the meat eaten by the urban Bondeni people. As with calories, there is seasonal variability with the legumes contributing as much as 73% of the total protein during the Kikuyu July and January bean harvest periods. Bondeni people received one-third of their total protein from animal sources: the people are urban, wage-earners members of the emerging Kenya middle class.

In analyzing the animal protein sources, the WHO Team compared the milk and egg consumption of the subjects studied with the ownership of cattle and poultry and observed no correlation between the two. All livestock, cattle in particular, represent accumulated wealth in the traditional Kenya societies. Cattle and goats are still used to pay the bride price. Production of meat, milk and eggs is low due to poor stock, undernourishment, sickness and neglect, or lack of knowledge and facilities for proper animal and poultry husbandry. There are some excellent programs through the Ministries of Agriculture and Veterinary Science which are working to improve this situation; their primary appeal and objective is to help the African realize a cash profit from animal and poultry raising.

Vitamin A

Vegetables and fruits provided 73% of the Vitamin A on an annual average basis. The percentage varied somewhat throughout the year but this food group contributed the major portion of the Vitamin A in all tribes studied at all seasons except for a period when the Wakamba people were eating yellow

maize received through famine relief supplies. There are a great many wild and cultivated dark green leaves, of which all the people are extremely fond, which contributed generously to the Vitamin A intakes. Cabbages, tomatoes, pumpkins, bananas, pawpaws, mangoes, oranges, pineapple, and lemons all make seasonal contributions to the Vitamin A intakes.

Animal foods are a source of 15% of the Vitamin A intake. This is of course, primarily from milk. Fats make an extremely negligible contribution to the Vitamin A intakes.

Roots and tubers provide 8% of the Vitamin A: sweet potatoes are the major contributor.

Thiamine - Riboflavin - Niacin

Cereals and legumes provided 84%, 63% and 74% of the thiamine, riboflavin and niacin respectively. The harvest seasons affected the amount contributed by the two food groups as was discussed under caloric sources. Animal foods contributed 18% and 10% to the riboflavin and niacin intakes respectively. Thirteen percent of the riboflavin came from fruits and vegetables and 10% of the niacin from roots and tubers.

Vitamin C

Fruits, vegetables, roots and tubers provided 90% of the Vitamin C on a year-round, nationwide basis. Essentially the same specific fruits and vegetables which supply the Vitamin A are also important contributors to the Vitamin C intakes. In addition to sweet potatoes, Irish potatoes and cassava are also a source of Vitamin C.

In calculating the consumption of Vitamin C, the WHO Team did not make any corrections for probable losses in storage and cooking. Storage losses for roots, tubers and fruits are probably low, as these are ordinarily eaten shortly after harvest. Potential cooking losses of Vitamin C in roots, tubers and vegetables are very great. The green leaves are usually cooked with an alkaline mineral called "magadi", which probably destroys a large amount of the original Vitamin C. Cooking times are relatively long, meals are often warmed up several times, and excess cooking water is sometimes discarded - all of these practices would contribute to considerable losses.

Calcium

Calcium was supplied by animal foods, principally milk and the bones of whole dried fish, and legumes. Cereals, fruits and vegetables were also sources of calcium.

Iron

Eighty percent of the iron came from cereals and legumes and 15% from roots, tubers, fruits and vegetables. The other 5% was provided by animal foods.

Table 38

Percent Source of Calories
and
Nutrients from Food Groups
(WHO Data)

CALORIES

<u>Tribe</u>	<u>N</u>	<u>Cereals</u>	<u>Legumes</u>	<u>Roots + Tubers</u>	<u>Fruits + Vegetables</u>	<u>Animal Food</u>	<u>Sugar</u>	<u>Fat</u>
Kikuyu	645	49.0	29.4	9.4	7.3	2.6	1.4	.9
Luo	503	66.7	5.4	17.5	1.2	6.6	1.1	1.5
Kamba	583	84.4	5.5	2.5	1.1	3.8	1.3	1.3
Bondeni	115	41.0	14.0	13.0	4.0	11.0	8.0	9.0
<u>Total</u>	<u>1846</u>	<u>64.5</u>	<u>14.3</u>	<u>9.7</u>	<u>3.5</u>	<u>4.6</u>	<u>1.7</u>	<u>1.7</u>

PROTEIN

Kikuyu	645	36.5	51.7	4.0	3.9	4.0	--	--
Luo	503	53.1	11.5	3.3	2.3	29.6	--	--
Kamba	583	75.5	12.2	1.1	1.4	9.9	--	--
Bondeni	115	30.0	26.0	8.0	3.0	33.0	--	--
<u>Total</u>	<u>1846</u>	<u>53.0</u>	<u>26.7</u>	<u>3.1</u>	<u>2.6</u>	<u>14.6</u>	<u>--</u>	<u>--</u>

VITAMIN A

Kikuyu	645	.2	2.8	9.5	67.4	20.1	--	--
Luo	503	2.5	0.4	7.4	83.4	6.3	--	--
Kamba	583	47.1*	2.3	1.4	29.6*	18.1	--	1.5
Bondeni	115	3.0	4.0	6.0	64.0	20.0	--	3.0
<u>Total**</u>	<u>1263</u>	<u>1.4</u>	<u>2.0</u>	<u>8.3</u>	<u>73.4</u>	<u>14.6</u>	<u>--</u>	<u>.3</u>

* Yellow maize was provided for famine relief and the usual sources of Vitamin A were altered.

** The Kamba figures were omitted from the totals because of the effect of famine-relief yellow maize, which is unusual.

Table 38 (Contd.)

Percent Source of Calories
and
Nutrients from Food Groups
(WHO Data)

THIAMINE

<u>Tribe</u>	<u>N</u>	<u>Cereals</u>	<u>Legumes</u>	<u>Roots + Tubers</u>	<u>Fruits + Vegetables</u>	<u>Animal Food</u>	<u>Sugar</u>	<u>Fat</u>
Kikuyu	645	43.4	41.4	7.9	5.7	1.6	--	--
Luo	503	61.4	14.0	14.5	4.3	5.7	--	--
Kamba	583	80.3	11.1	2.3	1.8	4.5	--	--
Bondeni	115	47.0	31.0	13.0	3.0	6.0	--	--
<u>Total</u>	<u>1846</u>	<u>60.2</u>	<u>23.7</u>	<u>8.3</u>	<u>3.9</u>	<u>3.9</u>	<u>--</u>	<u>--</u>

RIBOFLAVIN

Kikuyu	645	33.6	34.5	5.3	15.4	11.2	--	--
Luo	503	45.1	7.6	8.8	19.5	18.7	--	--
Kamba	583	61.5	7.0	1.6	7.0	23.0	--	--
Bondeni	115	39.0	17.0	7.0	6.0	31.0	--	--
<u>Total</u>	<u>1846</u>	<u>45.9</u>	<u>17.4</u>	<u>5.2</u>	<u>13.3</u>	<u>18.2</u>	<u>--</u>	<u>--</u>

NIACIN

Kikuyu	645	44.7	28.5	13.9	9.4	3.5	--	--
Luo	503	53.1	12.0	11.1	3.3	20.5	--	--
Kamba	583	78.7	6.7	1.7	4.1	8.8	--	--
Bondeni	115	40.0	17.0	25.0	5.0	13.0	--	--
<u>TOTAL</u>	<u>1846</u>	<u>57.4</u>	<u>16.4</u>	<u>10.0</u>	<u>5.8</u>	<u>10.4</u>	<u>--</u>	<u>--</u>

Table 38 (Contd.)

Percent Source of Calories
and
Nutrients from Food Groups
(WHO Data)

VITAMIN C

<u>Tribe</u>	<u>N</u>	<u>Cereals</u>	<u>Legumes</u>	<u>Roots + Tubers</u>	<u>Fruits + Vegetables</u>	<u>Animal Food</u>	<u>Sugar</u>	<u>Fat</u>
Kikuyu	645	5.2	.3	47.4	46.9	.2	--	--
Luo	503	.6	1.6	41.9	55.4	.3	--	--
Kamba	583	--	--	7.8	73.5	18.7	--	--
Bondeni	115	5.8	15.0	44.8	47.2	2.3	--	--
<u>Total</u>	<u>1846</u>	<u>2.3</u>	<u>1.4</u>	<u>32.9</u>	<u>57.2</u>	<u>6.2</u>	<u>--</u>	<u>--</u>

CALCIUM

<u>Tribe</u>	<u>N</u>	<u>Cereals</u>	<u>Legumes</u>	<u>Roots + Tubers</u>	<u>Fruits + Vegetables</u>	<u>Animal Food</u>	<u>Sugar</u>	<u>Fat</u>
Kikuyu	645	8.7	47.8	6.1	16.5	20.8	--	--
Luo	503	13.1	7.1	13.3	13.6	52.9	--	--
Kamba	583	29.2	12.2	2.5	8.4	47.7	--	--
Bondeni	115	29.0	21.0	6.0	9.0	35.0	--	--
<u>Total</u>	<u>1846</u>	<u>17.6</u>	<u>23.8</u>	<u>6.9</u>	<u>12.7</u>	<u>38.9</u>	<u>--</u>	<u>--</u>

IRON

<u>Tribe</u>	<u>N</u>	<u>Cereals</u>	<u>Legumes</u>	<u>Roots + Tubers</u>	<u>Fruits + Vegetables</u>	<u>Animal Food</u>	<u>Sugar</u>	<u>Fat</u>
Kikuyu	645	28.9	51.1	9.4	8.4	2.2	--	--
Luo	503	56.9	12.4	12.4	9.6	8.7	--	--
Kamba	583	78.3	12.4	3.2	3.5	2.5	--	--
Bondeni	115	32.0	33.0	12.0	6.0	17.0	--	--
<u>Total</u>	<u>1846</u>	<u>52.3</u>	<u>27.2</u>	<u>8.4</u>	<u>7.0</u>	<u>5.0</u>	<u>--</u>	<u>--</u>

METHOD OF COOKING, FOODS CONSUMED AND RECIPES

Cooking Methods:

In the rural areas or reserves, cooking is almost always done over a wood fire with the cooking pot balanced on the traditional three stones. The cooking pot may be a fired, clay one or a "suferia" (round, handleless, aluminum saucepan). The cooking is often done inside the chimneyless huts but occasionally it is done out-of-doors. In the towns and cities cooking is usually done over charcoal in a "jiko" (small, round stove) set on the ground. The fires are rarely protected and are a hazard to small children; there are large numbers of children taken to health centers or hospitals with serious burns.

Boiling, roasting, and occasionally, frying are the chief methods of food preparation. Onions are fried together with curry powder for a short period to develop flavor, the remaining vegetables are added, the mixture is fried momentarily, and then boiled to make a vegetable stew. Maize and legumes are boiled together. Maize flour is added to variable amounts of boiling water and stirred while boiling to make both "uji" (gruel) and "ugali" (porridge).

The most frequently prepared recipes are given in Appendix I.

Foods Consumed

Cereals:

White maize is grown exclusively. Yellow maize is disliked. When it is used in famine relief programs, there are complaints.

Maize was apparently introduced into Kenya in approximately 1880. There are still elders living who remember as children eating sorghum and a number of different millets and not having maize. Maize gave higher yields per unit area planted, was considerably less work to raise, harvest and prepare for consumption, had better storage properties, and was not eaten as extensively by birds at harvest time as the sorghum-millet cereals. Maize appears to have replaced these types of cereals in a relatively short period of time. Sorghum and millet are well liked, however, especially in Western and Nyanza Provinces, by the Abaluyia and Luo tribes. Other tribes enjoy using a mixture of maize and millet.

Maize is prepared in a variety of ways:

(1) Maize on the cob: The "green" maize is roasted in the fire and eagerly anticipated and thoroughly enjoyed at harvest time.

(2) Whole Maize is removed from the cob and boiled, usually with legumes, e.g., cow peas, pigeon peas, or beans, potatoes, and plantains often are added also. Green leaves may be added before the cooking is completed. Recipes using maize in this way include "githeri," "irio-mataha njugu," "njahi," "githeri na viasi," "githeri na njuga," and "mataha mboco."

(3) Pounded Maize: Maize kernels and a little water are placed in a large mortar made from a log with one end hollowed out and pounded with a heavy pestle. When the transparent outer layer has been cracked it is winnowed away. The maize is pounded

and winnowed a second time. At this point the maize kernel has been broken into particles. This pounded maize is called "chenga" or "njenga" and used to prepare "muthokoi" which is a favorite of the Wakamba and Taita tribes.

(4) Maize Flour: When maize flour is prepared at home, the maize is pounded as described above and this cracked corn is hand-grounded by kneeling women on a stone base with a smaller stone. There are many small local mills usually operated by water power. Occasionally one sees a small motor where the cereals are ground for a small charge. Commercially milled maize flour; whole grain, sifted, and sifted with 15% dry skim milk solids added are available in the local shops. "Uji", a gruel usually drunk for breakfast, and "ugali," a stiff porridge eaten with vegetable or vegetable-meat stews, are made from maize flour and water.

Sorghum and millet may be cooked whole or ground to a flour and prepared in the same way as maize.

Wheat flour is used almost exclusively to make chapatties although in times of maize shortage it is used to make "uji." Unga Ltd., the major Kenya milling company, employs four home economists. Their demonstrations include ones for making doughnuts, breads, scones (baking powder biscuits), pancakes and cookies from wheat flour, apparently in an effort to increase sales of wheat flour. White bread is purchased for special occasions and enjoys high status although it does not seem to be genuinely liked.

Rice: The Coastal Africans (Giriama) use rice quite frequently. "Pilau" and "wali" are two of their recipes using rice. Other Kenya Africans consider rice a food to use when entertaining friends or on other special occasions. They prepare it by boiling it in salted water.

Roots and Tubers:

White potatoes (usually called English potatoes) and the very light yellow, sweet potatoes are a common item of the diet as are yams. They are usually cooked in a mixture of other vegetables or in a mixture of maize and beans. Cooked potatoes and plantains are often removed from the mixture and fed to infants and small children. Plantains are sometimes cooked with potatoes or sweet potatoes and eaten with a ground nut or bean sauce. Arrowroot is usually boiled and eaten accompanied by tea. Cassava is used in Nyanza, Western, and Coast Provinces by the Luo, Abaluhya and Giriama peoples. It is simply boiled before eating. The Coastal and Lake Victoria people sun dry the cassava and pound it in a large mortar and pestle to make a flour. This flour may be cooked in water to make a cassava flour "ugali" but it is usually combined with millet or sorghum flour to make the "ugali."

Legumes:

A large assortment of legumes are eaten in Kenya: The species vary from one altitude to another. Those most commonly used include: "Kikuyu peas" (a small black or dark brown bean with one white eye), cowpeas, pigeon peas, red kidney beans, red beans with white flecks, groundnuts, sesame seeds, dried peas and various types of grams. Many of the recipes referred to in

the discussion of maize also include legumes. "Simsim na Kunde" is prepared from sesame seeds and green vegetables. Groundnuts are pounded into a sauce like peanut butter.

Animal Protein:

Meat is eaten only occasionally. It is a compulsory part of many ceremonies and is considered a food for special occasions. The degree of importance of the ceremony, wealth of the host, and number of people participating dictates the animal to be slaughtered. A large celebration given by a wealthy family would include the slaughter of one or more oxen. Goats, sheep and chickens might also be slaughtered for a large party and each has a place for smaller gatherings. Portions of the meat are roasted over an open fire or over charcoal and portions are boiled. Fish is rarely eaten by the people of Central and Eastern Provinces (Kikuyu, Meru, Wakamba, etc.). Fish is popular with the people of Lake Victoria (Luo and Abaluhya) and of the Kenya Coast (Giriama). However, a person from the West of Kenya refuses to eat the Indian Ocean species of fish and vice versa. Fresh and dried fish are used and are usually cooked in a stew with vegetables and seasonings. "Samaki" (fish) stew is prepared by the Luo and Abaluhya.

Cow's milk is popular. It is usually taken in tea or "uji" but may be given to infants and children either whole or diluted with water. "Maziwa Lala" (literally translated: sleeping milk; which is sour milk) is also well-liked. It may be drunk plain or used with some sugar added as a dip for "Ugali."

Game animals can rarely be obtained legally by Kenya Africans. When asked if they have ever eaten wild animals, most male Africans will readily admit to having eaten them at some time in their lives. In heavily populated areas, the game has been decimated. At present, wild animals do not represent a source of food of any consequence for Africans.

Migrating termites are popular with some tribes but the consumption is limited to a very few days annually. The same is true of locusts.

Vegetables and Fruits:

A wide variety of dark green leaves, both wild and cultivated, are consumed. "Kunde" (cow pea leaves) are grown specifically for use as a spinach. When the plant is about 8 inches tall it is pulled, the leaves are picked off, washed, chopped and cooked. "Kunde" is usually cooked with other foods, although it may be cooked alone. Recipes using "kunde" include: "mataha mboco," "simsim na kunde," and "kunde". Cabbage is used throughout the country in mixed vegetable stews and is included in several of the recipes. "Sukuma wiki" is a broad dark green leaf of the cabbage family which is popular throughout the country. Literally translated "sukuma wiki" means "stretches the week." There are a number of other green leaves eaten; among them is the stinging nettle.

Onions are fried in a small amount of fat and used as a seasoning for a number of dishes. A small quantity of tomatoes are frequently added to the frying onions for seasoning purposes. The Giriama use "kachunbari," a sort of relish,

to eat with pilau. This is the only instance of the use of raw vegetables which I observed. Peas, green beans, carrots and pumpkins are also used in vegetable stews. A recipe for "chishombo" used by the coastal people includes broad beans. These, however, are rarely eaten in other parts of the country.

The cooking of vegetables, especially the green leaves, is prolonged. A crystalline mineral called "magadi" is often sprinkled over the chopped green leaves prior to cooking and cooked with them. The mineral contains sodium carbonate, sodium bicarbonate, a little sodium chloride and impurities. A 1% solution has a pH of 9.8. Cooking vegetables at such a pH inevitably destroys most of the water soluble vitamins. Frequently the people drink the cooking water; however, some discard it.

A number of species of bananas are grown. There are several types which are usually used as plantains, green cooking bananas, and several which are permitted to ripen and used as ripe bananas. Some varieties may be used either green or ripe. Pawpaw (papaya), passion fruit, mangoes, pineapples and oranges are liked and seasonally available throughout the country. Fruits (except for plantains) are usually considered snack foods and are eaten between meals or at the market on market day.

Drinks:

"Uji" (gruel) is popular throughout the country and is made from different cereals or combinations of cereals.

The most popular is a fermented "uji". Tea is made by boiling water, milk, sugar and a few tea leaves together and is popular. Coffee is less popular but is used by some people. Soft drinks appear to have wide-spread consumption. Beer, locally brewed and commercially produced, is popular. The local and commercial beers seem to be thought of as two distinctly different beverages, as indeed they are. On ceremonial occasions, it would be usual to find both available. The locally brewed beer is called "pombe" and may be made from any or a mixture of the common cereals, (millet, sorghum or maize) with or without the addition of sugar or honey. "Pombe" is also made from coconuts, bananas, pressed sugarcane, or honey. How much illegal distillation of any of the "pombes" occurs is a matter for conjecture: the unstillied "pombes" are popular and legally available at "African Bush Bars."

ANTHROPOMETRIC MEASUREMENTS

Nutritional anthropometry is concerned with the measurements of the variations in the physical dimensions and gross composition of the human body at different ages. Physical dimensions of the body, especially during periods of rapid growth in infancy and early childhood are affected by nutrition. In interpreting the results one must remember that there are many factors in addition to nutrition which affect growth, body composition and physical dimensions. Infective and parasitic illnesses, particularly the chronic ones which are prevalent in Kenya, have a deleterious effect on growth. Parental size and genetic constitution affect body measurements, but recent work suggests that the environmental influences, especially the infective-parasitic-nutritive factors, are of greater importance than the genetic background. Body measurements can give valuable information on the probable prevalence and virulence of malnutrition.

The easiest of the anthropometric measurements to collect are heights and weights. Interpretation of such figures in children is difficult when their ages are unknown. In many developing nations, including Kenya, many people's ages are not known, even the ages of young children. Birth registration has been started in Kenya in specific areas and is gradually being geographically extended.

Birth weights have been difficult to obtain because the great majority of births occur in the hut attended by a native midwife. Until very recently the births occurring in hospitals or health centers were either the complicated deliveries or those of the better educated upper socio-economic level and these groups, singly or in combination, are not representative of the general population. Recently the Pumwani Hospital has expanded its delivery services and a large number of Africans living in the greater Nairobi area do deliver their babies at the hospital. The Department of the Royal Tropical Institute, Amsterdam, Netherlands, has a medical Research Center in Nairobi. One of their recent research projects involved recording the birth weights of Africans, Europeans and Asians representing one thousand consecutive single live births in each ethnic group from three Nairobi hospitals, including the Pumwani Hospital. The results of their study are shown in Table 39. It is difficult to distinguish between a premature low birth weight and a low weight mature infant. Indian birth weights have always been observed to be lower than any other ethnic group and this was observed in Kenya. Among the Africans, the Wakamba tribe showed the lowest birth weights, followed by the Kikuyu. The differences are entirely due to differences in the female birth weights. The number of premature births and infants with low birth weight decreases when there is good prenatal care, including prenatal nutrition. Infants born to mothers having good or

Table 39

Birth Weights in Europeans, Asians and Africans
Consecutive, Single, Live Births
(from Wiersinga)

	<u>Total Number</u>	<u>Number Males</u>	<u>Number Females</u>	<u>Sex Ratio ♂ Per 100 ♀</u>	<u>Total Average Weight (Grams)</u>	<u>Average Weight Males (Grams)</u>	<u>Average Weight Females (Grams)</u>	<u>% Below 2500 (Grams)</u>	<u>% Below 2250 (Grams)</u>	<u>% Below 2000 (Grams)</u>
Europeans	1000	484	516	94	3212	3283	3144	7.8	2.9	1.6
Asians	1000	507	493	103	2856	2913	2769	19.2	8.4	3.4
African	1000	452	548	82	3088	3127	3044	11.8	4.8	3.0
Wakamba	135	62	73	(85)	3010	3109	2926			
Kikuyu	599	262	337	78	3075	3120	3040			
Baluhya	93	49	44	(111)	3112	3120	3102			
Luo	136	59	77	(77)	3127	3112	3138			
U.S.A.				104						
U.S.A.*	Total**				3400***			7.4	-	2.4
	White							7.0	-	2.3
	Non-White							9.6	-	3.2

* Wallace, H. M. Health Services for Mother and Children - 1962
Saunders & Co., Philadelphia, Pa. Page 79

** All live births, including multiple deliveries, January - March 1950

*** Vickers, V.S. and H.C. Stuart, Anthropometry in the Pediatrician's Office,
J. Pediatrics, 22, 155, 1943

excellent nutrient intakes during pregnancy have repeatedly been shown to be in better physical condition at birth than infants born to mothers with poor nutrient intakes in pregnancy. The amount of protein in the expectant mother's diet is known to influence the birth weight and birth length of her newborn infant. In general, many Kenya Africans have a determined ambition to produce a small baby, which they associate with an easier delivery. To realize this goal, the pregnant woman eats sparingly, especially as the date of confinement approaches. Related to this desire for a small baby, is the custom of some of the tribes to practice female circumcision. This involves surgically removing all external genitalia (clitoris, major and minor labia); the resulting scar tissue is inelastic and can complicate the delivery. Thus many of the African women have a very good reason for wanting a small baby.

Some comment must be made about the preponderance of female over male births. It is well documented that the male death rate is higher than the female death rate at all ages and in all ethnic groups. Dr. Wiersinga, the author of this study, theorizes that this sex-specific death rate may start at conception with a higher male fetal death rate resulting in the observed excess of female:male births. The sex distribution in the 49% of the Kenya African population who are 15 - 59 years old shows that 26% are males and 23% are females. If at birth there are only 82 African males for every 100 females and if in adulthood this proportion alters to slightly favor the male, it appears that in Kenya the sex specific death rate favors the male instead of the female.

Johnstone (1924) working among the Luo in 1922 observed that 104.8 males were born for every 100 females.

The WHO Team collected some anthropometric measurements including heights, weights, triceps skinfold measurements, and midarm circumferences and calculated the midarm muscle circumferences. Ages were usually unknown and were estimated into age groupings. Estimating children's ages is extremely hazardous and the tendency in developing nations is to underestimate the age. The results showed that all the measurements taken in all tribes and at all ages were shifted downward when compared with normal values.

Among the rural children 1 - 5 years old, the weight and height for the Luo children approximated normal values, the Kikuyu median was in the range of 90% and the Wakamba children's median was in the range of 80% of normal. Nairobi African kindergarten children, 4 - 6 years old, who presumably represented the most privileged class, were also measured. Their heights and weights were slightly above the 50th percentile of the Stuart-Meredith standards. Results similar to those observed for the 1 - 5 year old rural group were observed for African rural children age 6 - 15 years. For adult men and women the relative position of the three tribes were the same: that is, more of the Wakamba were light in weight for their height than the Kikuyu and the Luo. Though the majority of the Luo were still below the standards, it was not as large a majority as for the Wakamba. In the adults, a slightly larger percentage of the men were light in weight for their heights than the women.

Wadsworth (1960) measured 1880 African adult males, almost all Kikuyu, in 1956. Their average height was 65.2 ± 2.9 inches (5 feet 5 inches). Their average weight was 125 ± 12 pounds. These men were prisoners and the food provided reportedly contained 2300 calories, 84 grams of protein, 33 grams of fat and 425 grams of carbohydrate. Wadsworth presented the results of height and weight measurements of adult African men collected by other authors and these are reproduced together with the results of his study in Table 40. The last column shows the weight for one meter height and is a measure of relative leanness or fatness.

The WHO data for the triceps skinfold measurements were below the standards. The median for children 1 - 5 years old was about 80% of the standard; for older children and adults the median was about 60% of the standard. The medians of the measurements of the midarm circumferences were 80 - 90% of the standard for the various ages. The medians for the calculated midarm circumferences were about 90% of the standard. These measurements of the arms of the people give documentation to the observation that there is a thinner layer of subcutaneous fat among the Africans than the standards.

The Dutch Medical Research unit has initiated a longitudinal growth study from birth to five years for the specific purposes of examining the relations between nutrition and growth in an urban Kenya African population. Heights and weights are taken monthly and the children's ages are known. Urine specimens

TABLE 40

(from Wadsworth)

Heights and Weights of Adult Kikuyu Males Compared with Those of Some Other Groups

<u>Racial Group</u>	<u>Author</u>	<u>Number</u>	<u>Weight (kg)</u>	<u>Height (cm)</u>	<u>Wt./Ht.</u>
Kikuyu	Wadsworth (1956)	1,880	56.6	165.5	34.2
Kikuyu	Orr and Gilks (1931)	423	52.1	164.5	31.7
Kikuyu (uneducated)	Anderson (1937)	40	55.3	165.0	33.5
Kikuyu (educated)	Anderson (1937)	30	62.5	166.0	37.7
Kenya African (Nyanza)	Harvey (1949)	243	57.0	170.0	33.5
Kenya African (Central Province)	Harvey (1949)	209	56.3	163.8	34.4
Masai	Orr and Gilks (1931)	88	60.8	172.0	35.4
English	Kemsley (1950)	460	61.8	171.7	35.6

are collected and estimations for creatinine, nitrogen, inorganic sulfate-sulfur, hydroxyproline and urea are made. The results have not been reported yet, but Dr. Wiersinga kindly permitted me to quote the first results of the heights and weights. They are shown in Table 41.

Table 41
Percent of Childrens' Heights and Weights in
 the Percentage Classes of the Standard

<u>No.</u>	<u>100%</u>	<u>100-91%</u>	<u>90-81%</u>	<u>80-71%</u>	<u>70-61%</u>	<u>60%</u>
	<u>Height For Age (Percent)</u>					
351	19	62	17	1	0.5	0.5
	<u>Weight For Age (Percent)</u>					
353	18	27	29	18	7	1

If the distribution of the heights and weights of these children were comparable to the standard used, 50% of them would be over 100% and 50% under 100% as the 100% figure is the 50th percentile for the Stuart-Meredith Standards. These African children are both shorter and lighter than the standard children. More of the children fall into lower classifications for weight than height; thus these children are somewhat shorter and much thinner than the standard children. According to Dr. Wiersinga, half the sample are of Nilotic origin. The Nilotic people are taller than the Bantu people. The WHO results showed that the Luo

(Nilotic) were heavier for their height than the Kikuyu or Wacamba (both Bantu). The majority of the Kenya tribes are of Bantu origin. It is probable that the children's heights and weights studied by Wiersinga present a more favorable picture than exists in the majority of the Kenya African population.

CLINICAL EXAMINATION

Clinical assessment of a community can give useful information especially in regions of the world where malnutrition is widespread. The value of the method decreases as the nutritional plane of the community improves. This method is based on examination for changes, believed to be related to inadequate nutrition, that can be seen or felt in superficial epithelial tissues, especially the skin, eyes, hair and buccal mucosa, or in organs near the surface of the body, such as the parotids and thyroid glands.

Most signs of malnutrition are not specific to lack of one nutrient. For example, glossitis may be seen in niacin, folic acid, Vitamin B₁₂, or riboflavin deficiencies. Some of the signs associated with malnutrition may be produced by non-nutritive factors, e.g., general dryness of the skin, especially of the legs, with an appearance similar to xerosis, can occur in very hot, dry, windy regions as a result of the climate or in an old person, as a result of spending a great deal of time close to a fireplace. In the mixed diets that people usually eat, if one nutrient is extremely low, other nutrients are likely to be limited. As many U.S. weight-watchers have learned, if caloric intake is limited to 1,000 calories per day, very careful selection of the food eaten must be exercised in order to meet all nutrient requirements.

Interpretation of the observed clinical signs is best supported and confirmed by: (1) nutritional anthropometry, (2) food-consumption surveys and (3) selected biochemical tests. The occurrence of deficiency diseases and some of the signs of deficiencies have been likened to an iceberg: that is, when these conditions do occur, a much larger percentage of the population is believed affected than the percentage of obvious cases indicates.

The 1963 WHO Expert Committee Report on Medical Assessment of Nutritional Status defined and described the commonly employed physical signs into three classifications: (1) those considered to be of value in nutritional assessment, (2) those needing further investigation, and (3) those not related to nutrition which are similar to and must be differentiated from signs of known nutritional value. This document has helped those involved in clinical assessment select and standardize the signs used. The WHO Kenya Team was using a more extensive list in 1961 but revised their protocols to the Expert Committee's suggestions. The results of the Kenya studies are reported in Tables 42, 43 and 44, showing percentage incidence of clinical signs in three age groupings. The signs have been arranged under the nutrient heading most commonly associated with the occurrence of the sign, although it is recognized this is probably an oversimplification and the actual etiology may be much more complex. Three specific communities are reported. Only those signs occurring are reported.

Table 42

Frequency and Clinical Signs (Percent) in Children
One to Five Years Old

(WHO Data)

	<u>TRIBES</u>		
	Kikuyu (Gitugi)	Luo (Masumbi)	Wakamba (Uthiuni)
	<u>%</u>	<u>%</u>	<u>%</u>
Signs Commonly Related to Protein Deficiency:			
Hair: Lack of Lustre	3.5	-	28.0
Thin & Sparseness	3.5	3.1	40.0
Dyspigmentation	3.5	1.0	37.0
Moon Face	3.5	-	3.0
Edema of the Legs	10.0	-	-
Hepatomegaly	-	5.0	37.0
(Malaria and Schistosomiasis are also associated with this sign)			
Signs commonly related to Vitamin A Deficiency and/or a Low Fat Diet Deficient in Essential Fatty Acids:			
Xerophthalmia	-	1.0	-
Xerosis of the Skin	-	12.0	-
Follicular Hyperkeratosis	3.5	-	-
Signs Commonly Associated with Riboflavin Deficiency:			
Angular Palpebritis	3.5	-	-
Angular Stomatitis	3.5	-	9.0
Corneal Vascularization	7.0	-	3.0
Signs Commonly Associated with Niacin Deficiency:			
Scarlet Raw Tongue	3.5	-	3.0
Atropic Papillae	10.0	-	-
(Iron Deficiency also associated with this sign)			
Signs Commonly Related to Iron and/or Folic Acid Deficiency:			
Pallor of the Membranes	14.0	-	3.0

Table 43

Frequency and Clinical Signs (Percent) in Children
Six to Fifteen Years Old
(WHO Data)

	<u>TRIBES</u>		
	Kikuyu (Gitugi) <u>%</u>	Luo (Masumbi) <u>%</u>	Wakamba (Uthiuni) <u>%</u>
Signs Commonly Related to Protein Deficiency:			
Hair: Lack of Lustre	-	-	1.0
Thinness	-	-	4.0
Dyspigmentation	-	1.0	12.0
Parotid Enlargement	13.0	2.0	10.6
Hepatomegaly	-	5.1	10.6
(Malaria and Schistosomiasis are also associated with this sign)			
Edema	2.0	-	-
Psychomotor Changes	-	-	2.0
(Deficiency of the Vitamin B-Complex also associated)			
Signs Commonly Related to Vitamin A Deficiency and/or a Low Fat Diet Deficient in Essential Fatty Acid:			
Xerosis Conjunctivae	-	1.0	-
Xerophthalmia	-	1.0	-
Xerosis (Skin)	2.0	9.0	-
Conjunctiva Thickening	11.0	7.0	-
Signs Commonly Associated with Riboflavin Deficiency:			
Angular Stomatitis	-	4.0	-
Corneal Vascularization	31.0	-	2.0
Sign Commonly Associated with Niacin Deficiency:			
Atropic Papillae	22.0	3.8	-
Signs Commonly Associated with Iron and/or Folic Acid Deficiency:			
Koilonychia	2.0	1.9	-
Pallor of the Membranes	4.0	5.0	-
Sign Associated with Iodine Deficiency:			
Thyroid Enlargement	36.0	5.0	-
Signs Associated with Excess of Fluoride:			
Mottled Enamel	25.0	5.0	-
Brown Enamel	22.0	1.9	-

Table 44

Frequency of Clinical Signs (Percent) in Adults
(WHO Data)

	Kikuyu (Gitugi) %	Luo (Masumbi) %	Wakamba (Uthiuni) %
Signs Commonly Related to Protein Deficiency			
Hair: Lack of Lustre	-	5.8	-
Dyspigmentation	-	-	2.5
Parotid Enlargement	2.5	1.0	14.0
Psychomotor Changes	-	-	7.0
Hepatomegaly (Malaria and Schistosomiasis also associated)	5.0	20.4	12.0
Edema	5.0	-	-
Signs Commonly Related to Vitamin A Deficiency and/or a Low Fat Diet:			
Xerophthalmia	-	3.1	-
Bitot Spot	-	1.0	7.0
Xerosis (Skin)	-	14.8	-
Follicular Hyperkeratosis	15.0	-	-
Conjunctivae Thickening	12.2	3.0	-
Signs Commonly Associated with Riboflavin Deficiency:			
Angular Palpebritis	-	5.8	-
Angular Stomatitis	2.5	1.0	-
Angular Scars	-	-	9.5
Magenta Tongue	2.5	-	-
Scrotal Dermatitis	2.5	-	-
Corneal Vascularisation	25.0	-	-
Signs commonly Associated with Niacin Deficiency:			
Atrophic Papillae	45.0	-	-
Pellagrous Dermatitis	-	3.0	-
Signs Commonly Associated with Thiamine Deficiency:			
Sensory Loss	-	-	7.0
Loss of Ankle Jerks	7.0	-	7.0
Calf Muscle Tenderness	7.0	-	-
Sign Commonly Associated with Vitamin C Deficiency:			
Spongy Bleeding	-	-	7.0

Table 44 (Contd.)

Frequency of Clinical Signs (Percent) in Adults
(WHO Data)

	Kikuyu (Gitugi) <u>%</u>	Luo (Masumbi) <u>%</u>	Wakamba (Uthiuni) <u>%</u>
Sign Commonly Associated with Iron and/or Folic Acid Deficiency:			
Pallor of Membranes	-	6.0	31.0
Sign of Iodine Deficiency:			
Thyroid Enlargement	38.0	20.7	5.0
Sign of Excess Fluoride:			
Mottled Enamel	-	3.0	-

Endemic Goiter:

A total of 28,520 school children in 108 schools were examined from 1962-1964 for endemic goiter by the WHO Team. It was found in 30% of the children. The children living in the highlands showed a 30-72% incidence of goiter while the children living in lower altitudes showed an incidence of 15-28%. Plans are under way to iodize salt which will no doubt correct the problem in most areas.

Dental Fluorosis:

In 1952 Schwartz described a high frequency of dental fluorosis among the Masai. Neville and Brass (1953) observed dental fluorosis in European children living in Kenya. Williamson (1953) examined 2,798 people for dental fluorosis in 1952: the results are shown in Table 45.

Table 45

Incidence of Dental Fluorosis in 1952 in Kenya
(According to M. M. Williamson)

<u>Tribe</u>	<u>No.</u>	<u>% Incidence</u>
Kipsigis	375	57.6
Luo	272	53.7
Kikuyu	1595	39.3
Tugen	164	22.6
Abaluhya	265	17.4
Nandi	127	16.5

Public Health Dentists in the United States recommend the addition of fluoride to water supplies at levels of 1 ppm

to help prevent dental caries. Severe mottling of the teeth and skeletal damage occur when very high levels of fluoride are used. Williamson also published analytical data on the concentration of fluoride in the various Kenya waters and dusts. An abbreviated list of his results is shown in Table 46.

The WHO Nutrition Team conducted a study on the incidence and dental fluorosis from 1963-1964. A total of 18,997 school children in 72 schools were examined. An incidence of 44.1% was observed.

There are no practical preventive measures which can be taken. However, prevention of further aggravation of the problem can be attempted. Any large-scale settlement scheme may be arranged in areas where the water fluoride content is appropriate. An evaluation of the fluoride and protein problems can be made before there is intensive exploitation of fish resources or the introduction of fish protein concentrate. Fish in general and fish protein concentrate in particular are high in fluoride content.

BIOCHEMICAL EVALUATION

The WHO Team did biochemical examinations on blood and urine with particular focus on an evaluation of anemia and protein nutrition status. The tests conducted and methods used were:

- (1) Hemoglobin - fingertip blood sample determined using the AO Hemoglobin Meter checked against the cyanmethemoglobin method (Hainline 1958).
- (2) Hematocrit by the method of Natelson (1963).

TABLE 46

Fluoride Content (PPM) of Some
Kenya Waters and Dusts

<u>Lakes</u>	<u>PPM</u>	<u>Rivers & Springs</u>	<u>PPM</u>
Victoria	0.50	Tsavo	2.00
Rudolph	13.10	Narok	3.15
Baringo	18.00	Mackakos	7.70
Naivasha	30.00	Naivasha Springs	25.50
Crater Lake (Naivasha)	145.00	Naivasha	35.50
Natron	1,500.00		
Elementeita	1,640.00		
Hannington	2,800.00		
Nakuru	2,800.00		
<u>Miscellaneous</u>			
Highest Dam Content			10.70
Highest Well Content			39.00
Highest Borehole Content			43.50
Volcanic Ash, Nakuru (Soluble Parts)			45.00
Dust from Shelves in African House, Nakuru			150.00
Dust from Nakuru City			240.00
Dust from Nakuru Lake Shore			5,600.00

- (3) Total serum protein using the method of Schmidt (1960), the serum was read in an Abbe Refractometer.
- (4) Serum Albumin - cellulose acetate electrophoresis (Briere & Mull, 1964).
- (5) Plasma amino acid ratio - Whitehead & Dean (1964).
- (6) Urea nitrogen/creatinine ratio (mg/mg) in urine: creatinine by the method of Folin and Wu (1919); Urea by the method of Valey (1963).
- (7) Inorganic sulfate sulfur/creatinine ratio (ug/mg) in urine: inorganic sulfate by the method of Berglund and Sorbo (1960).
- (8) Hydroxyproline index by the method of Prockhop and Underfriend (1960) as modified by Howells and Whitehead (1967).

The standards given in the ICNND manual (1963) for hemoglobin, hematocrit, protein and albumin were used. Whitehead and Dean's (1964) values for the amino acid ratio and Whitehead's (1965) values for the hydroxyproline index were used. For the urea/creatinin ratio (mg/mg) a comparison was made between the Kenya results and those of Arroyave (1962), Luyken and Luyken-Koning (1960), and Couvée (1962). No reference for normal or standard values for children for the inorganic sulfate sulfur was available. The WHO Team conducted a study to estimate normal values for the anthropometric and clinical assessments and biochemical tests among children they expected to be in good nutritional status and to grow normally. They chose the sample of 28 Europeans, 45 Africans and 14 Asian children, aged 4-5 years

from an elite kindergarten in Nairobi.

Results:

Hemoglobin and Hematocrit:

The etiology of iron-deficiency anemia is not clearly understood. Probably the most common precursor of this condition in children and adults is blood loss for whatever reason.

In the tropics hookworm infestation is associated with iron-deficiency anemia and hookworms are known to require blood for their own life processes. Infections, including malaria, are also associated with iron-deficiency anemia. Deficient dietary intakes of iron, folic acid and/or protein can cause iron-deficiency anemia. Altitude affects the hemoglobin and hematocrit levels. The usefulness of hemoglobin determinations as a specific measurement of nutritional status is limited. "Nevertheless," according to Pearson (1966), "hemoglobin levels are perhaps the best single biochemical index of the general state of health of a population."

Tables 47 and 48 show the mean hemoglobin and hematocrit values for the Kikuyu, Luo and Wakamba people by age groups as reported by WHO for three specific communities and the acceptable levels established by ICNND (1963). Nearly all of the mean hemoglobin values for the three tribes at all ages are slightly below the acceptable levels. Nearly all of the hematocrit values approximate or exceed the acceptable levels (except for Luo adults). ICNND also presents hemoglobin and hematocrit values representative of "deficient" and "low" levels. Tables 49 and 50 shows the percent of subjects in these two classifications. The

Table 47

Mean Hemoglobin (Gm/100ml) Values by Age Groups
for Three Kenya Tribes, Children
from Elite Kindergarten and Acceptable Levels*
(WHO Study)

	1 - 5 Years		6 - 15 Years		Adult Males		Adult Females	
	Normal	Mean	Normal	Mean	Normal	Mean	Normal	Mean
Kikuyu	13.1	11.9	13.1	13.0	16.2	13.7	13.1	12.9
Luo	12.6	11.7	12.6	12.9	15.6	13.7	12.6	12.7
Wakamba	12.6	11.0	12.6	11.5	15.6	12.7	12.6	11.6
Kindergarten	13.1	13.1	--	--	--	--	--	--

* ICNND "Acceptable Levels" corrected by 2.0% for each 1000 feet altitude; For the Kikuyu and Kindergarten, 6000 feet altitude was used; For the Luo and Wakamba, 4000 feet altitude was used.

Table 48

Mean Hematocrit (percent) Values by Age for Three Kenya Tribes,
Children from Elite Kindergarten and Acceptance Levels*
(WHO Study)

	1 - 5 Years		6 - 15 Years		Adult Males		Adult Females	
	Normal	Mean	Normal	Mean	Normal	Mean	Normal	Mean
Kikuyu	37.8	42.0	37.8	42.1	45.8	44.8	42.6	43.0
Luo	37.0	37.7	37.0	38.7	44.9	41.8	41.8	39.8
Wakamba	37.0	37.0	37.0	38.1	44.9	43.2	41.8	41.3
Kindergarten	37.8	--	--	--	--	--	--	--

* ICNND "Acceptable Levels" corrected by 1.1% for each 1000 feet altitude; For the Kikuyu and Kindergarten, 6000 feet altitude was used; For the Luo and Wakamba, 4000 feet altitude was used.

Table 49

Percent of the Subjects by Age Groups having Hemoglobin
Values at the ICNND "Deficient" and "Low" Levels
(WHO Study)

	<u>1 - 5 Years</u>		<u>6 - 15 Years</u>		<u>Adult Males</u>		<u>Adult Females</u>	
	Deficient	Low	Deficient	Low	Deficient	Low	Deficient	Low
	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>
Kikuyu	13	7	--	--	13	33	3.5	3.5
Luo	17	21	7	8	15	55	9	3
Wakamba	19	29	13	15	35	48	12	17

Table 50

Percent of the Subjects by Age Groups having Hematocrit Values
in the ICNND "Deficient" and "Low" Ranges
(WHO Study)

	<u>1 - 5 Years</u>		<u>6 - 15 Years</u>		<u>Adult Males</u>		<u>Adult Females</u>	
	Deficient	Low	Deficient	Low	Deficient	Low	Deficient	Low
	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>
Kikuyu	6	--	--	--	29	--	19	--
Luo	12	17	5	14	38	--	4	41
Wakamba	5	--	2.5	2.5	5	36	29	--

ICNND values for "deficient" and "low" used in Kenya were not corrected for the increased levels necessary for increasing altitude. This means simply, that in this case the "low" levels may also be considered as "deficient."

Total Serum Protein and Serum Albumin:

Plasma proteins, especially the albumin fractions, are reduced in severe protein-calorie malnutrition. It is generally agreed that the body's ability to synthesize serum albumin is affected relatively late in the sequence of the development of kwashiorkor (Jelliffe 1966), that the laboratory test serves "only as a confirmation of a condition already clinically evident" (Arroyave, 1961), and thus the test is of no value in detecting sub-clinical cases. Some workers have observed elevated plasma total protein levels which are usually characterized by high globulin levels and depressed albumin levels. Globulin levels increase in infections, including malaria. To confuse the picture further, Negroids have lower serum albumin and higher globulin levels than Caucasoids residing in the same area. This has been demonstrated not only in the tropics where infections are probably more common in Negroids than in Caucasoids, but also in healthy groups in the United States (Rownsley, et al., 1956; Milan, 1946; Comens, 1957; Bronte-Stewart et al., 1961; and Du Plessis, 1967).

Since many of the studies have been done on hospitalized children, WHO is interested in investigating the usefulness of these measurements, especially serum albumin tests, in community

studies. This is probably why the Kenya WHO Team undertook these tests.

The percent of the children having "deficient" and "low" values and the mean values for total serum protein and serum albumin are shown in Table 51.

Plasma Amino Acid Ratio:

Holt et al. (1963) have shown that the plasma aminograms from hospitalized cases of kwashiorkor in many parts of the world showed a similar pattern with decreased levels for the essential (and certain non-essential) amino acids and normal or elevated levels for most of the non-essential amino acids.

A test for imbalance in the serum amino acids consists of separating and quantitating four essential amino acids (leucine, isoleucine, valine, methionine) and four non-essential amino acids (glycine, serine, glutamine, taurine) by one-dimensional paper chromatography. (Whitehead, 1964; Whitehead and Dean, 1964; and McLaren et al., 1965). The result is expressed as a ratio of dispensable to indispensable amino acids which is high (5-10) in kwashiorkor and low (less than 2) in well-fed, healthy preschool children. The test is normal in children with marasmas. Whitehead and Dean (1964) suggested the following levels for interpreting the results: below 2, "ideal"; 2-3, "doubtful"; above 3, "abnormal". Table 52 summarizes the amino acid ratios and the mean ratios for children in two age groups and four Kenya locations.

TABLE 51

Percent of the Children in Two Age Groups Having Total Serum Protein and Serum Albumin Values Which Fell into the ICND "Deficient" and "Low" Ranges, and the Mean Values
(WHO Study)

	1 - 5 years		6 - 15 years		1 - 5 years	6 - 15 years
	Def. %	Low %	Def. %	Low %	Mean gm/100m	Mean gm/100m
<u>TOTAL SERUM PROTEIN</u>						
Kikuu	6	0	0	0	7.5	7.1
Luo	0	15	0	0	6.9	6.9
Wakamba	11	7	0	0	6.9	7.3

Acceptable 6.5 - 6.9
Standard

<u>SERUM ALBUMIN</u>						
Kikuu	Report not available at this time					
Luo	0	10	0	2	4.10	3.91
Wakamba	5	10	5	15	3.81	3.81

Acceptable 3.52 - 4.24
Standard

Table 52

Percent of the Children in Two Age Groups and Four Kenya Locations with Normal, Doubtful and Abnormal "Whitehead" Amino Acid Ratios and the Mean Ratios (WHO Study)

	<u>1 - 5 yrs.</u>			<u>6 - 15 yrs.</u>			<u>1-5</u>	<u>6-15</u>
	<u>2.1-</u>			<u>2.1-</u>			<u>yrs.</u>	<u>yrs.</u>
	<u><2.0</u>	<u>2.1-3.0</u>	<u>>3.1</u>	<u><2.0</u>	<u>2.1-3.0</u>	<u>>3.1</u>	<u>Mean</u>	<u>Mean</u>
	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>	<u>Ratios</u>	<u>Ratios</u>
Luo								
West Koguta N = 84	40	50	10	35	57	8	2.43	2.40
Masumbi N = 57	50	50	0	50	42	8	2.04	2.26
Wakamba								
Uthiumi N = 80	--	64	36	2	70	28	2.98	2.74
Nyaami N = 78	35	65	0	37	61	2	2.18	2.17

Standard Values: Less than 2.0 = normal
 2.1 - 3.0 = doubtful
 greater than 3.0 = abnormal

Urea Nitrogen/Creatinine Ratio:

Creatinine excretion in the urine is very often used as a denominator to express urinary excretion of various nutrients. Folin (1905) distinguished two types of protein metabolism, one which was described as constant and largely independent of diet, and the other which reflected diet. The constant or endogenous metabolism yield creatinine, uric acid, and neutral and ethereal sulfur as urinary excretory products. The variable or exogenous metabolism yield of urea and inorganic sulfur, and the amount of these in the urine reflected the amount of protein ingested. Muscle creatine is converted to creatinine at a nearly constant rate, and the creatinine excretion is very closely correlated with the basal metabolic rate or "metabolic mass" (Brody, 1945 and Hegsted, 1964). Stearns et al., (1958) showed in children that creatinine excretion is related to total musculature. Thus Folin's early work in 1905 showing that the daily excretion of creatinine is related to body mass has stood the test of time.

In areas where poor nutritional status is frequent, total musculature decreases and creatinine excretion falls. Where creatinine excretion is expressed as a ratio to height, a Guatemalan study showed that adequately nourished, urban, upper-income children excreted more creatinine per centimeter of height than was excreted by rural, low-income children or those with kwashiorkor, (Arroyave, 1962). Unexplained variations in creatinine

excretion can occur from time to time, (Forbes, 1962).

Folin (1905) found that as protein intake increased, the urea nitrogen became a greater percentage of the total nitrogen excreted. Platt, (1958) found that the ratios of urea nitrogen to total nitrogen were markedly reduced in poorly nourished children and lactating mothers. Arroyave (1962) has recorded similar findings in Guatemala but believes the urea nitrogen/creatinine ratios are better indices to reflect the protein intake. These ratios in a group of "urban upper-income" preschool children averaged 15.3 and were nearly twice those found in "rural lower-income" children. Luyken and Luyken-Koning (1960) observed similar results in Surinam. Dugdale and Edkins (1964) have suggested that an index of 30 or lower is indicative of malnutrition.

DuPlessis (1967) has recently described the surveys done in white, colored, Bantu and Indian school children in South Africa. The urea/creatinine ratios were lowest in white children and he concluded: "This ratio seems to be unsatisfactory as an index of nutritional status in population where the basic diets differ widely in nature." Pearson (1966) concluded about the urea nitrogen/creatinine ratio, "More experience is necessary before the validity of this method can be firmly established."

The results of the WHO study in Kenya are shown in Table 53.

Urine Inorganic Sulfate Sulfur/Creatinine Ratio:

The urine inorganic sulfate sulfur is believed to be derived mainly from the dietary sulfur-containing amino acids,

TABLE 53

Mean Values for Urine Urea Nitrogen/Creatinine (mg/mg) Ratios
in
Kenya Children and from other Studies
(WHO Study)

	1 - 5 years	6 - 15 years	N	Total	
	<u>Mean Ratio</u>	<u>Mean Ratio</u>		<u>1 - 15 years</u>	
Luo				<u>X</u>	<u>+ S.D.</u>
West Koguta	8.9	9.9	85	9.2	+ 6.0
Masumbi	10.6	11.9	57	11.2	+ 4.4
Wakamba					
Uthiumi	6.5	6.7	80	6.6	+ 3.1
Nyaami	9.6	11.8	78	10.7	+ 4.1
Elite Kindergarten	15.3		87	15.3	+ 8.0
Arroyave (1962)					
Urban upper-income	15.3	12.0			
Rural Lower-income	8.9	6.3			
Luyken (1960)					
Dutch	28.0				
Negroes	7.5				
Couvée (1962)					
Netherlands	12.4				
New Guinea	2.0				

Standard suggested by Dugdale = 30

cystine and methionine (Bell et al., 1963). Therefore, its output varies with the sulfur amino acid intakes (Dodgson et al., 1966).

The results of this test done on Kenya children by the WHO Team are shown in Table 54.

Hydroxyproline Index:

Whitehead (1965) and Picou et al., (1965) have independently introduced a test for marginal malnutrition based on the urinary excretion of hydroxyproline. The rationale for the test is that there is an increase in excretion of urinary hydroxyproline, a metabolite of collagen formation, during periods of rapid growth. In calculating the index, hydroxyproline excretion is multiplied by body weight, this product is divided by creatinine excretion. Indices for normal children range between 2.0 and 5.0 with a mean of 3.0 and with little variation between 3 months and 7 years of age. Clinically malnourished children have indices of between 0.5 and 1.5 with a mean of 1.0, and in marginally malnourished children the values range between 1.0 and 2.0. Abnormal values are found in children deficient in protein (kwashiorkor) or calories (nutritional marasmus).

The results of the tests done in Kenya children are shown in Table 55.

TABLE 54

Mean Values
for
Urine Inorganic Sulfate Sulfur/Creatinine Ratios (ug/mg)
in
Kenya Children
(W.H.O. Study)

	1 - 5 yrs. <u>Mean Ratio</u>	6 - 15 yrs. <u>Mean Ratio</u>	<u>Total</u> 1 - 15 years		
			<u>No.</u>	<u>X</u>	<u>S.E.</u>
Luo					
West Koguta	430.7	441.5	85	435.5	19.8
Masumbi	470.6	520.1	58	495.3	19.2
Wakamba					
Uthiumi	300.1	392.5	82	386.3	19.1
Nyaami	470.5	449.9	78	460.3	20.1
Elite Kindergarten	668.9		87	668.9	22.1

TABLE 55

Mean Values for the Hydroxyproline Index
for
Kenya Children (WHO study)

	1-5 <u>yrs.</u>	6-15 <u>yrs.</u>	<u>No.</u>	<u>Total Group</u>	
				<u>Mean</u>	<u>S.E.</u>
Luo					
West Koguta	2.40	2.51	87	2.45	0.24
Masumbi	2.61	2.74	57	2.67	0.17
Wakamba				1-5 <u>yrs.</u>	6-15 <u>yrs.</u>
Uthiumi	1.71	2.13	29, 49	1.71 ± 0.15	2.13 ± 0.17
Nyaami	2.86	2.75	75	2.80	0.19
Elite Kindergarten	2.49	----	87	2.49	0.25

Standard Values: < 2.0 = abnormal

> 2.0 = normal

DISCUSSION OF NUTRITIONAL STATUS

Periodic famines throughout the years have been accompanied by an unknown number of deaths and a great deal of suffering. Assuming no serious natural disasters or wars occur, there is little probability that there will be many deaths from famine in the immediate future among the major population groups of Kenya. The government maintains warehouses of maize for just such an emergency; there are voluntary associations both national and international, as well as foreign governments, ready to assist in emergency situations. Present transportation facilities make it possible to move food supplies to needed areas most of the time, although roads are occasionally closed due to heavy rains. Some of the smaller, isolated tribes may be expected to suffer from periodic famines, e.g., the Turkana of Northern Kenya. However, the danger of crop failure followed by famine requires that the Government devote some of its limited resources to maintaining food stores and facilities for food distribution in case of famine. The long term solution to famine lies in programs the Government has initiated in agriculture, animal husbandry, irrigation and insect control.

The present problem is one of food deprivation which falls short of causing widespread starvation but does lead to some deaths from kwashiorkor and other nutritional diseases, to stunting of growth, some clinical signs of malnutrition, lowered resistance to infections, and lowered work (or learning) efficiency.

In the face of the amounts of work remaining to be done in the development of Kenya, this is a serious impediment.

The high infant mortality rate of 160-200/1000 live births compared with 23/1000 live births in the USA, and the high child death rate of 350/1000 are both partially due to poor nutrition. In children one to five years old malnutrition is specifically listed as the cause of death in 14.5% of the deaths and is the second most important cause of child deaths. Two-thirds of the two-year-old children who died did have malnutrition at the time of death although it was not always listed as the primary cause of death. Malnutrition is a contributory cause of many deaths. Poor nutrition is extremely difficult to isolate from associated evils of poor sanitation, infection, infestation, poverty, and discouragement.

The Government figures show that in 1962 there were 5,400 children treated as out-patients for kwashiorkor, and in 1966 there were 19,530 children treated. This almost four-fold increase may be partially or wholly explained by an increase in services with approximately twice as many health centers in 1966 as there were in 1962. It is also probable that kwashiorkor was recognized by more of the clinic staff and was diagnosed more often. During the same period there were three times as many cases treated for schistosomias and somewhat over twice as many treated for malaria. If the increase in kwashiorkor cases were entirely due to expanded services, one would expect to see a similar rate of increase in cases treated for other conditions.

Since the rate of increase is greater for kwashiorkor than for the other conditions, this provides some evidence to speculate that kwashiorkor is increasing in incidence in Kenya. Those physicians who have worked in Kenya a number of years believe that there is an increase in kwashiorkor, but usually also suggest that this may be because the people are becoming more aware that clinics can treat the condition and more people may be bringing the children to the medical facilities, instead of, or in addition to, taking the child for treatment by the traditional medicine man.

Nearly 20% of the out-patients were treated for conditions directly associated with faulty nutrition. This requires the time of a great many of the Ministry of Health personnel in treating conditions which would not exist if the people had adequate amounts of the right foods.

In addition to diseases directly attributable to poor nutrition, lack of hygiene is primarily responsible for a high incidence of stool parasites and for a high incidence of diarrhea, especially in children under two years old. Poor hygiene is an indirect cause of malnutrition.

Lower average birth weights for Kenya African infants compared with Kenya European birth weights or with Negro or white birth weights in the USA and a larger percentage of premature births attest to a poor level of prenatal nutrition as well as to the associated factors.

Standard et al. (1966) objectively assessed the use of clinical signs of malnutrition and heights and weights. They concluded, "In the West Indies, measurements of size may be of greater use in surveys of nutritional status than recording the prevalences of particular signs."

In Kenya, the weight in relation to height measurements reported by WHO were lower than the standard at all ages for all tribes except for the privileged class of four to six years old Nairobi kindergarten children. These privileged children's weight to height measurements were slightly above the standards. This seems to indicate that the same genetic potential for growth in height and weight for Kenya Africans exists as exists among the United States children measured for the standards.

The method selected by the WHO Team to present the results of height and weight measurements tells us that all of the tribes and all of the age groups were underweight for the height they had attained in comparison to the standard. Weirsinga's work shows that the children she measured were not as tall as the standard in spite of the fact that half the sample were Nilotics, who are taller than Bantus. The weights of the children Wiersinga measured are even more depressed than the heights. Wadsworth's measurements of the adult male Mau Mau detainees shows that they were short and light in weight.

The measurements of the midarm triceps skinfold, circumference and muscle show that there is a thinner layer of subcutaneous fat on the arms of Africans compared with the standard.

Subcutaneous fat can, of course, be gained or lost at any time in life. It is distressing to observe that the more permanently fixed midarm muscle mass is also smaller than the standard.

These anthropometric measurements show that a large proportion of the people of all ages are stunted in height and probably in muscle mass and are very thin. The most important factors influencing anthropometric measurements are: the feeding patterns and availability of food throughout the year, general hygiene, appropriate medical care and preventive measures against infectious diseases, and the energy expenditure required. Anthropometric measurements may be affected by a disease from which a person has just suffered, especially children's communicable diseases, as well as poor nutrition.

The anthropometric measurements indicate that the caloric deprivation is relatively greater than the protein deprivation. Body weight and subcutaneous body fat, which both measure caloric status, are relatively more depressed than height or muscle mass which are indirect measurements of protein status. Clinically, the marasmic type of kwashiorkor is seen more frequently than the classic type of kwashiorkor, indicating that caloric deprivation tends to be more prevalent than protein deprivation. The food consumption data showed that 42% of the people received less than 80% of their caloric requirements and 30% received less than 80% of their total protein recommendations on a year round basis. The food consumption studies showed an uneven distribution of food throughout the year. Purely and simply, a good many people are hungry, and the year is divided into periods of greater and lesser hunger. Many of the people are not receiving enough of any kind of food. There was a particularly low level of fat

consumption, both absolutely and as a percent of total calories. The clinical signs observed and usually considered to be signs of Vitamin A deficiency may be signs of fat deficiency or of a combination of fat and Vitamin A deficiency.

Nothing is known of the energy costs of activity, including working, in Kenya. Lowenstein (1968) has recently reviewed the subject. He estimates that between 70 and 80% of the adult men and many of the adult women in tropical Africa are engaged in agriculture. He summarized a study done in Gambia in which men used between 5 and 14.6 cal/min and women 4.1 - 6.6 cal/min in different types of farming activities. This is a relatively high level of energy expenditure, as may be seen by comparing these figures with those in Table 56.

Table 56

Energy Expenditure and Intensity of Work
(Lowenstein quoting Christensen, 1953)

<u>Energy Expenditure</u>	<u>Intensity of Work</u>
Less than 2.5 cal/min	Very light
2.5 - 4.5 " "	Light
5.0 - 7.4 " "	Moderate
7.5 - 9.9 " "	Heavy
More than 10.0 " "	Very Heavy

However, the farmers work at this intensity only three to six months of the year with an annual average of three to four hours a day. In Northern Ghana and Nigeria the caloric intake of farmers is lowest during the time of their heaviest work load and they lose 10 - 15% of their body weight. According to Davey (1967) the limited calorie supply, particularly during the season of the greatest demand, will act as a limiting factor

on the amount of work which can be done and hence will prevent any increase in productivity.

Recent findings have shown that in tropical climates a greater energy expenditure is required for the same amount of work than is required in cooler climates. (Consolazio, 1963). These findings were made on men accustomed to living in the temperate zone. If the findings hold true for people accustomed to living in the tropics, the caloric status of the Kenya people living at the Coast and on the shores of Lake Victoria will need reevaluation.

The quality of the protein consumed by the Kenya people is poor. The mean protein score is low. Forty-one percent of the people received protein limited in the sulfur-containing amino acids and 33% had protein limited in tryptophan. When caloric requirements are not met, a large portion of the protein intake is diverted by the body to fulfill its demand for calories. When the essential amino acids are not available in the necessary amounts during a fairly short time interval, the rest of the amino acids cannot be used to fulfill the protein functions of the body.

Vitamin A intakes were exceedingly and consistently low by all the tribes throughout the year. In the face of the low fat intakes the questions arises as to whether or not the Vitamin A that is available can be absorbed properly. Clinical signs usually associated with Vitamin A deficiency were seen fairly frequently and have been mentioned in the discussion of the low fat intakes. The WHO Team has reported, regarding Vitamin A, "the lack of this

vitamin is probably also responsible - together with calories, proteins and diseases - for the retardation of growth in childhood."

Seventy-one percent of the people had dietary intakes of less than 80% of adequacy for riboflavin, 27% met less than 80% of their niacin allowances, and 10% received less than 80% of their thiamine needs. The Kikuyu, Luo and Wakamba were about equally deprived in their intakes of these three nutrients. The clinical signs usually associated with riboflavin and niacin deficiencies were much more common among the Kikuyu people than the Wakamba or Luo, although clinical signs were also observed among these people.

The nutrient intakes of Vitamin C present an unexpected finding. First, the NRC allowances, which were used to evaluate the degree of adequacy, are believed by many nutritionists to be excessively high. Next, most nutritionists working in many of the tropical regions of the world have long thought that Vitamin C needs were usually adequately met. They based this belief on the following: (1) scurvy was rarely observed in the tropics, (2) clinical signs associated with ascorbic acid deficiency are rarely seen and (3) in many tropical areas a plethora of fruits, berries, vegetables and grasses are available and eaten by the people. For Kenya, a reevaluation of these factors seems in order. In 1964 and 1965 there were 19 and 10 cases respectively of scurvy diagnosed and treated in hospitals in Kenya. The WHO Team did observe a few people with clinical signs

of Vitamin C deficiency among Wakamba adults, but recorded none among the other tribes or age groups. It has been repeatedly illustrated that 10-20 mgs of Vitamin C per day is required to prevent clinical scurvy (USDA, 1959). The ranges of Vitamin C intakes show that some of the people are falling into this dangerously low Vitamin C category of intake.

Ninety percent of the Vitamin C was provided by fruits and vegetables (57%) and by roots and tubers (33%). The most commonly eaten fruit is the banana - both cooked and ripe. The most commonly eaten vegetables are green leaves and cabbages; both are cooked for relatively long periods of time and are often reheated several times. White potatoes are always peeled before cooking and also are often warmed-up. The customs of adding "magadi," the crystalline mineral which was analyzed and found to consist primarily of sodium carbonate and sodium bicarbonate, to the green leaves and cooking it with them and whatever else is being cooked cannot help but destroy a large part of the water soluble vitamins. The practice of long cooking and reheating will also destroy these vitamins.

Hopefully, the problem of endemic goiter will be essentially solved when iodized salt is made available and used. This is expected in the near future. Little of a practical nature can be done about dental fluorosis until water supplies with acceptable fluoride contents can be made available to the people. This availability may depend on the development of a low cost method of extracting fluoride from some of the existing water resources.

Iron deficiency anemia is relatively common, especially in the lower areas which are hot and humid. The anemia is usually associated with hookworm infestation. Sanitation, particularly encouraging people to build, use and maintain latrines, and encouraging the people to wear shoes all the time, is part of the Government program and should help to decrease the incidence of iron-deficiency anemia. In addition to playing a part in the etiology of iron deficiency anemia, abuse of the basic rules of hygiene causes a high incidence of gastroenteritis, especially in infants. This has already been mentioned as a contributory cause of malnutrition. The additional stress of infections, especially measles and/or whooping cough, often precipitates kwashiorkor.

The most interesting aspect of the biochemical findings by the WHO Team is the comparison between the values found among the children of the elite kindergarten and the children of the rural low-income families. There were highly significant differences ($P < 0.001$ in most cases) between the values for the children for the following tests: plasma amino acid ratios, urea nitrogen/creatinine (mg/mg) ratios, inorganic sulfate sulfur/creatinine (ug/mg) ratios, hemoglobin and hematocrit. On the basis of the differences of the the three ratios listed, the WHO Team concluded that the protein intakes of the rural children probably were not adequate. It is of particular importance to realize that children living in Kenya under favorable circumstances can grow well and have tests which indicate buoyant

health.

Nutritionists working in developing nations have been especially concerned with the nutrition of infants, small children, and pregnant and lactating women. Many of the programs and services have been directed towards these particular groups. The results of the assessment of the nutrition of the people of Kenya shows that these groups continue to need attention. However, the height and weight measurements and the clinical examination done in Kenya show that the adult men are suffering quite seriously from inadequate food intakes.

No study has been made, but casual observations indicates that the new middle-income class of Africans is beginning to show an occasional case of obesity. The caloric intakes did show that one-third of the people were eating in excess of their theoretical requirements. From 1961 - 1963 one rarely saw an overweight Kenya African, today it is not entirely unusual to see a few.

FOOD HABITS

Introduction

In a study of human nutrition, the social sciences are as important as the natural sciences. It is evident that we need to know what sorts of nutrients our bodies need, how much of each, the food sources of these nutrients, what happens if we do not get appropriate amounts of any one or a combination of them, and how adequately an individual or community meets their nutrient needs. If one is interested in changing (improving) food habits and/or introducing new foods, it is extremely important to know something of the practices, attitudes and beliefs of groups and individuals towards food, and of the factors determining the preferences, habits and choices of particular foods.

Our terms of reference for the project in Kenya specifically included an interest in exploring the acceptability and feasibility of a high protein food(s). About the introduction of high protein foods, Yudkin (1964) has written, "Many attempts have been made in recent years to introduce new foods, of high nutritional quality, to some of the poorer countries. There are however very few reports which indicate that they have been received with any great enthusiasm by the people concerned. In fact, little evidence of acceptability has been published, but private discussions seem to reveal some considerable concern about acceptability in Africa, Asia and Central America."

The major objective of the food habit study done in Kenya was to assess the existing food practices and the belief systems supporting these practices with a view towards identifying culturally acceptable vehicles for high protein foods. Of course, such a product (s) must also be nutritionally desirable and economically feasible. A second

objective was to provide information necessary to determine how to persuade the population that the new or modified foods were really in their interest. A third objective was to identify where changes in food practices might be realistically attempted through nutrition education programs. Such changes should be in keeping with the established food habits of the people, acceptable within the framework of their value systems and nutritionally necessary.

Lowenberg et al. (1968) used the term food habits in reference to group habits that reflect the way a culture standardizes individual behavior in relation to food so that the group comes to have a common eating pattern.

Foster (1966) has written that "dietary patterns, as parts of total socio-cultural systems, depend upon and are conditioned by circumstances such as the following:

1. Foodstuffs available through primary production and markets
2. Patterns of social relations within the family and community
3. Ideas and practices related to health and illness"
4. Purchasing power of families to health and illness

He continued to comment that changes in dietary practices will be dependent on a variety of factors, including those itemized above.

Fathauer (1960) states that, "Food is always defined culturally."

Lee (1957) points out that culture determines what is recognized as food, in what form the food shall be consumed, at what time of the day, or occasion of the year and which part of the plant or animal is eaten.

Cassel (1955) provides an interesting example of incorporating these cultural factors on dietary choice; he reported that the Zulus kill an

ox one year after the death of the head of the family, the entire kin group meets, and each person is given a prescribed part of the ox, according to age, sex, and relationship to the family.

Dr. May (1957) has written, "The factors governing human diets can be listed as follows: (1) men eat what they can get from the environment, (2) given a choice they eat what their ancestors have eaten before them."

The concept of "core" items, which are staple foods used universally and regularly by a population; "secondary" foods, which are used widely but not universally; and "peripheral" foods, which are used occasionally was suggested by Passin and Bennett (1948). Changes in "secondary" or "peripheral" foods are believed to be easier than changes in "core" foods.

Eppright et al. (1963) have written that "When urbanization is low and economic condition poor, diets are resistant to change."

Ojiambo (1967a, 1967b) studied the food habits of the Abasamia, chosen because they lived in one of the most remote districts of Western Kenya and thus were thought to be little influenced by foreign ways of living. She discovered that these people have genuine food taboos during pregnancy, lactation and in early babyhood. Restrictions against the eating of meat or fish during pregnancy were widespread. Emphasis on a plentiful diet for lactation was general. A long list of foods disallowed for infant feeding was observed.

The Kenya WHO study incorporated some questions about infant feeding and weaning and about food taboos. They concluded that the food taboos were dying out among the sample they questioned (or that the questionnaire technique might not be suitable for this study or group of people studied).

Johnston (1925) reporting on a study done among the Luo in 1922

observed that the period of weaning occurred when the infant was 18 months old.

Trant (1954) described food taboos in East Africa. The study included some of Tanzania's tribe's who live adjacent to the Kenya border. She discussed particularly the many taboos against food during pregnancy which resulted in a very meager diet for the pregnant woman. Lema (1963) described infant feeding practices among the Chagga of northern Tanzania, on the slopes of Mt. Kilimanjaro bordering Kenya. He observed that there was a fear of becoming too fat in pregnancy and that old women told young women they should not eat too much during pregnancy. After delivery, the diet was extremely important for the new mother with millet porridge, large amounts of sour milk and cow's blood the chief articles given her. Rwegerlera (1963) reported on the infant feeding practices among the Haya, who live on the western shores of Lake Victoria. He observed that a pregnant woman must continue with manual work for fear she will become fat and lazy and will not be able to push effectively during labor and that the fetus may get too fat. He reported that the infant's first meal was a sour native beer prepared from bananas and given to see if the baby can swallow, to wake him from sleep, to relieve him of delivery exhaustion and to clear his throat.

Three recent dietary studies from Tanzania have shown that there were no concepts of special food for children among the group of people studied (Masesa, 1968); ignorance, low socio-economics and lack of protein sources were contributing factors to the observed 20 - 25% of the children who deviated to below 60% of the median weight standards (Dyauli, 1968); and that in the majority of infants, dietary supplementation was delayed until the age of 6 months and the food given at this time was usually a thin "uji" (Ebrahim, 1968).

McLaren (1966) quoted Peiper (1910) who was an itinerant medical officer in German East Africa. Peiper described the infant feeding practices in Kilwa circa 1910. On the first two days of life the infant received only boiled water because "he would not be hungry then." This restriction to water might last for as long as 5 days. The child would thereafter be breast fed until it was able to walk. The breast was supplemented, usually from the end of the first month, with "uji", a very thin gruel made of maize, rice or millet flour flavored with salt, pepper and wild honey.

What may have been the beginnings on the African continent of the hazardous practice of bottle feeding, is described by Peiper as reported by McLaren. There were feeding bottles on sale in the Kilwa district in 1912 which were pear shaped, had rubber teats and were manufactured in Vienna.

McLaren (1966) reported that Peiper (1912) made the very significant observation that the disease largely responsible for the high infant mortality - "often up to 60 percent of the children die within their first year, mostly due to acute and chronic intestinal catarrh" - was identical with "mehlnahrschaden" in his own country. This disease is described as having all the essential features of severe protein-calorie malnutrition.

Namboze (1967) conducted a study among 73 Baganda women living in Kampala to determine the weaning practices followed and how much they knew about kwashiorkor. Four of the 73 did not know the clinical signs of kwashiorkor, 25 did not know the cause and 53 of the 73 either did not know how it may be prevented or specified unrelated practices for kwashiorkor's prevention.

Guthe and Mead (1945) discussed in detail the "Context for the Collection of Data" in food habit studies. Mead (1964) extended this discussion. An FAO Report (1963b) outlines the kind of information to be collected in food habit studies. Dr. Davey, Chief, Applied Nutrition, FAO, Rome, shared three food habit questionnaires (unpublished) being administered to school children in Accra. These references, together with the information on food habits of various tribes in East Africa, formed the background against which the outline of specific information to be collected and the questionnaire for Kenya were designed.

Materials and Methods

Specific Information Collected:

In order to fulfill the objectives of the food habits study, we needed specific information including:

A. Subject Description and Income

1. Descriptive material of the subjects including:
 - sex, number of children, marital status, number of people usually eating together, income and its sources, income spent for food, education and type of job.

B. Ordinarily Used Foods

1. Foods usually eaten, from a 24-hour recall (with specific interest in protein foods).
2. Vegetables used most frequently.
3. Fruits used most frequently.
4. Beverages used most frequently.
5. Acceptance of consumption of wild animals.

C. Status and Preferred Foods

1. Favorite foods of the subject.
2. Food (if any) the subject would like to use more.
3. Foods served to a respected guest.
4. Foods used at festivals or ceremonies.

D. Food Sources

1. Crops grown in the shamba (garden) and animals kept.
2. Foods purchased, with frequency of purchase for high protein foods (and quantities if the subject knew).

E. Foods Used for Nutritionally Vulnerable Groups

1. Foods used for pregnancy; traditionally and currently and why. Foods avoided in pregnancy. Food especially liked or craved by the subject or subject's wife (or wives) during pregnancy.
2. Foods used or avoided in lactation and why.
3. Infant feeding and weaning history; concepts of foods believed to be good and bad for infants and small children.
4. Subject's knowledge about kwashiorkor.

F. Miscellaneous information related to food taboos or specific foods used or avoided by certain age or sex groups.

Questionnaire:

Bearing in mind the specific information we needed to collect, several Africans with some training in nutrition assisted in drafting the questionnaire. In the first pilot study, women attending the Ministry of Health's Child Health Clinics were interviewed in the vernacular with an interpreter. The results showed that food was so scarce that these people exerted little choice in food selection. Choices among foods are made only when food is reasonably plentiful. The pilot study was not sufficiently extensive to be sure whether or not the usual food taboos and restrictions had been relaxed. Observations among a group where food was more plentiful indicated that the first pilot group accepted foods which the second group rejected.

After the initial pilot study, the questionnaire was drastically revised, and a second pilot study was done among wage-earning Africans. Further refinements of the protocol were made.

All interviews were done by George Gikonyo, MS (Food Science) and Ann Burroughs, Dr. P.H. (Nutrition). Each interview required 40-60 minutes. The two interviewers made a conscious effort to duplicate one another's techniques in asking the questions and in interpreting the replies. They usually interviewed two subjects in the same room and could clarify any uncertainties on the spot. There were no discernable differences which they could observe between the answers given to the African male or the United States female; however, it is the opinion of both, that rapport was established more quickly and the subject answered the questions much more fully because one African was interviewing.

Learning and using the vernacular words for the names of foods and familiarity with the usual food preparation techniques probably not only expedites the interview but also gives the subject confidence to discuss his food habits more fully. A copy of the final questionnaire used is in Appendix II.

Subjects:

In the description of Kenya it was clear that the altitude and rainfall are extremely variable from one section of the country to another. The environment dictates, to a large extent, the foods which can be efficiently grown and on which these primarily peasant agriculturalists must depend. In their migrations to Kenya, the various tribes tended to select an environment suitable to their habitual ways of acquiring food: the Masai occupied the plains, suitable for grazing their huge herds of cattle; the Luo settled near Lake Victoria where fish were available; and the Kikuyu occupied lands suitable for hoe agriculture. The Kenya tribes still live in different geographical locations throughout the country: thus, selecting to divide the sample by tribe or by geographical location is very nearly synonymous. We selected a tribal division. Viewing the amount of time and personnel available to do the study, it was apparent that not all 40 tribes could be studied. Priority was given to: (1) the major population groups; (2) those tribes who could be readily reached by a possible high protein food(s), thus those included in the existing marketing systems; and (3) all major geographical areas of the country. These items all overlapped, the larger population groups are involved in a marketing economy. Thus, the Kikuyu, Luo, Abaluhya, Kamba, and Kisii are the first five major population groups - they are involved in the marketing

system to the greatest extent, and were studied for these reasons. The sixth group we selected to study was the Mijikenda, usually called the Giriama, a coastal people of nine related tribes, who are also in the marketing system and were expected to have food habits which were quite different from the other groups: these people also represented a different geographical region of Kenya.

If a high protein product(s) is to be economically successful, the people with purchasing power will have to be convinced to buy it or it will require some subsidy. The people with purchasing power are often the leaders in their communities. They are usually the segment of the population with the greatest education. With the rising numbers of employed Africans, these newly employed people are likely to look to their longer employed peers and model their new practices of living - including food habits - on what they observe these people to be doing.

According to the 1967 estimates there were 922,500 Africans who earned wages. This is between 8 and 10% of the total estimated population. According to the 1962 census 25.8% of the total population were adult males. If this percentage is applied to the 1967 population estimate there were 2,566,584 adult males. The number of people employed who are single, that is, not heads of households, is not known. If one "guesses" that 7% of the total 1967 population estimate are employed male heads of households, there would be 696,360 of them or 27% of the adult male population. Some of the employed people are women who are heads of households and some single men are heads of households. Thus, an estimate that 30% of the families of Kenya have a head of household who is a wage earner is suggested. These are the Africans who constitute the new middle-class of Kenya and to whom an unsubsidized high protein product could be directed. These are the Africans who served as the subjects for the food habit interview.

Arrangements were made to administer the questionnaire in English and/or Kiswahili to Africans employed by the Ministries of Agriculture, Health, Education and to Community Development workers. Table 57 shows the number of Africans interviewed by tribe and sex.

Table 57

Number of Subjects in Food Habit Study by Age and Sex

	<u>No. Males</u>	<u>No. Females</u>	<u>Total</u>
Kikuyu	15	13	28
Wakamba	11	13	24
Mijikenda	18	12	30
Luo	22	8	30
Abaluhya	13	6	19
Kisii	10	8	18
Other Tribes	<u>5</u>	<u>4</u>	<u>9</u>
<u>Total</u>	94	64	158

The total number interviewed in each tribal group is not large; however, the repetitiousness of the replies indicated that the topics were quite fully explored. The subjects interviewed were verbal, cooperative, extremely interested in the study and excellent informants. If each tribal sample studied is representative of the food practices of that tribe, we theoretically have included about 70% of Kenya's African population.

Recipes:

According to Guthe and Mead in the Manual for the Study of Food Habits (1945), "For any study of food habits, something about food preparation in the home is necessary." If we hoped to determine how high protein products, which might make a major impact on the people, would be

used, it was imperative to collect the recipes and observe the methods of preparation of the foods usually eaten. Nearly all of the recipes were prepared at Kenya Cannery Ltd.'s laboratory where facilities for weighing and preparing the foods were available. All foods were purchased in the African market. One woman, the mother of ten children, who is half Kikuyu and half Wakamba and knew the traditional cooking methods of both, prepared all of the Kikuyu and Wakamba dishes. She was especially interested in food and cooking and in demonstrating the typical methods of preparation used. One man prepared the Luo foods and a young woman prepared the Giriama dishes.

There was an added benefit to being in the Kenya Cannery Ltd.'s facilities: foods were usually prepared in quantities serving sixteen to twenty-four people. The African supervisors working at Kenya Cannery soon learned that recipes were being prepared and found some pretext to visit the laboratory at about the time they anticipated the food would be ready to eat. Their reactions to the dishes served as a subjective index of the degree of popularity and the status of the recipe. Had this been anticipated, some systems of taste testing or evaluation could have been incorporated. For example, it was very apparent from these people's reactions, that chicken holds a high place in an ordering of status foods. It was also evident that the Kikuyu people did not enjoy the "samaki" (fish) stew, for it was the Luo and Abaluhya supervisors who devoured this. And when "njahi" was prepared, three of the women employed on the lines and who had recently had babies were invited to share it with some other women, for this is the special Kikuyu dish for lactating women. Only one old man touched this dish, other younger men walked by it, smiled and said, "That is women's food."

We have listed a specific weight for each item contained in the recipe. No such preciseness is characteristic: the recipe contains one shilling's worth of green leaves or ten cents worth of onions; when these items are high in price, the recipe is modified to contain a smaller quantity, and when the items are plentiful, the recipe contains a larger quantity. At the time we were preparing these recipes, tomatoes were relatively high in price: regardless of the fact that whoever was preparing the recipe did not have to pay for the ingredients, they could not bring themselves to take advantage of the largesse of someone else buying the foods and simply said, "Tomatoes are too expensive, we can only put in a few of them now."

Results:

Reaction of the Informants to Some of the Questions:

The subjects had no trouble whatsoever in recalling precisely the foods they had eaten in the previous 24 hours. This is in contrast to interviewing United States subjects, who usually have to stop and think quite carefully about what they have eaten and often omit several items. The technique of the 24-hour dietary intake has been described as a test of memory rather than a method of discovering what people eat (Beal 1967). This criticism is not valid among the African subjects we interviewed. Part of the explanation may be that the Africans eat far fewer items than most people in the United States eat; part of the explanation may be that food is a far more important aspect of life to an African than to most United States persons, and part could very well be that with a long tradition of oral history and customs the Africans do have better memories than United States subjects have.

The Africans also knew exactly how many shillings they spend for food: this is as true of the African man as it is of the African woman who is responsible for the food marketing. Africans write no formal shopping lists. They noisily bargain for and purchase the same items at the market with last minute adjustments made in the amount purchased depending on current prices.

When Africans were asked their three favorite foods, there was usually a rather surprised response, as though the subject had never really considered any food as being more desirable than another food. The impression was that all items classed by the culture as foods were good and that the major concern was simply with having enough of any food.

There was no hesitation in replying to the questions about foods to serve a respected guest or for ceremonials, once the respected guest or type of ceremony was identified. We identified the respected guest as "an old school friend, whom you have not seen for some time" and asked the subject to identify whatever ceremony he preferred to tell us about. At present in Kenya there is a general interest in the old traditions of the people, a concern with knowing about them and preserving some of them. This is especially true for the dances and music, but extended to interest in knowing old traditions about food and old taboos. Distinctions about traditional and modern foods for ceremonies were made by the Africans, in addition to distinctions about what would be served at a wedding in town and one "back on the reserve." The impression was that the customs of the reserve were preferable and anyone who could would arrange ceremonies in his reserve home, rather than in his urban dwelling. There are specific foods which must be prepared for the in-laws; in most tribes this involved slaughtering

a ram or goat and one got the impression that this particular habit is carefully observed.

It is surprising that the men knew a very great deal about the beliefs and traditions which should be observed by the pregnant and lactating women and about the weaning of infants. There was always complete objectivity and candor in replying to the questions relating to these subjects.

The African subjects delighted in describing the process for making "pombe" (native beer); between 1961 and 1963 which was just prior to Kenya's independence, it was very difficult for a Caucasian in Kenya to learn the Africans' recipes for "pombe."

In replying to the questions about the acceptability of wild animals as food, most of them seemed quite amused. Many of them readily admitted that they had eaten game at some time in their lives. The women seemed more furtive if their replies were affirmative.

Information About the Subjects Interviewed:

A total of 158 subjects were interviewed; details about the 149 belonging to the Kikuyu, Mijikenda, Luo, Abaluhya, Wakamba and Kissi tribes are shown in Table 58. The other nine subjects were members of other tribes and salient features of the information they provided will be reported later.

In Table 7 the average annual income of Kenya employees in 1967 was reported to be 229 Kenya pounds. The mean annual income of the male subjects interviewed in the food habits study was 376 Kenya pounds and the women received a mean annual income of 299 Kenya pounds. On the basis of income alone, it appears that the sample interviewed are members of Kenya's new upper middle class.

Table 53
Information About the Subjects Interviewed

	KIKUUU		WAKAMBA		MIJIKENDA		LUO		ABALUHYA		KISII		TOTAL	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
Number	15	13	11	13	18	12	22	8	13	6	10	8	89	60
Mean Age (Years)	37	33	36	31	34	30	31	26	37	29	32	26	34.2	29.7
Age Range (Years)	26-50	21-56	23-52	18-55	24-50	20-50	21-46	20-36	26-52	24-36	24-41	23-30	21-52	18-55
Number with Children	14	11	10	11	15	10	18	7	13***	5	9	4	79	48
Mean Number of Children	6.0	5.0	6.0	4.0	4.0	2.5	5.0	3.0	8.0 ***	3.4	5.0	3.5	5.6	4.7
Mean Income/Month: K. Shs.	520	365	620	370	500	330	785	400	778	450	475	435	626	32
U.S. Equivalent \$	72.80	51.10	86.80	51.80	70.00	46.20	109.90	56.00	108.90	63.00	66.50	60.90	87.64	53.48
Median Income/Month: K. Shs.	500	300	600	300	500	35	600	375	700	450	375	375	550	320
U.S. Equivalent \$	70.00	42.00	84.00	42.00	70.00	4.20	84.00	52.50	98.00	63.00	52.50	52.50	77.28	45.08
Income Range/Month K. Shs.	300-900	200-500	500-720	200-700	200-1200	100-600	300-1600	300-500	300-1600	250-650	200-900	80-800	200-1600	80.-800.
U.S. Equivalent \$	42.00	28.00-70.00	70.00-100.80	28.00-98.00	26.00-168.	14.00-584.00	42.00-224.	42.-70.	42.00-224.	35.00-91.00	28.00-126.	11.20-112.00	28.-224	11.20-112.00
Education														
None	0	2	0	1	2	0	1	0	0	0	0	0	3	3
1 - 4 Years	0	1	4	5	3	1	1	0	0	2	0	1	8	10
4 - 8 Years	15	10	4	6	12	10	11	8	7	4	9	6	58	44
School Certificate	0	0	3	1	1	1	5	0	5	0	1	1	15	3
Higher School Certificate	0	0	0	0	0	0	2	0	0	0	0	0	2	0
University	0	0	0	0	*	0	2	0	1	0	0	0	3	0
Technical Training														
None	2	2	0	0	6	0	1	0	0	1	0	0	9	3
Less than 1.0 Year	4	2	6	8	7	8	5	3	3	3	7	2	32	26
1.0 - 3.0 Years	5	5	5	5	4	4	13	5	7	2	3	5	37	26
More than 3.1 Years	4	4	0	0	1*	0	1**	0	3	0	0	1	9	5

*Diploma in Agriculture

**2 University Graduates

*** 3 Polygamous Families

This group of subjects averaged 30 to 34 years old. With an estimated life expectancy in Kenya of 40 - 45 years, this group would be classed as middle-aged.

Ninety-five percent of the men and 77% of the women had finished between 4 and 8 years of formal school. The great majority of these people had received the Kenya Primary Education Certificate. Eighty-eight percent of the men and 95% of the women had received some sort of technical education. Most of the jobs these people were doing would require a college degree in the United States.

Ninety percent of the men were married with an average of 5.6 children, while 80% of the women were married and had an average of 3.7 children.

The women were younger than the men interviewed, received considerably less income than the men, and fewer of the women had received as much education as the men.

The large average number of children for the male Abaluhya, in comparison to the other tribes, is probably due to the three polygamous families included. Men in a polygamous culture father more children than men in a monogamous culture. There do not appear to be any other noteworthy tribal differences in this basic information about the subjects interviewed.

Usual Eating Pattern:

The 24-hour diet recall showed that this group of Africans is accustomed to a three-meal-a-day pattern with a mid-morning tea break at work and tea or "uji" in the late afternoon after they return home from work.

The breakfast pattern for the wage-earning Kenya Africans was very similar throughout the nation and is shown in Table 59. Nearly everyone drank tea with milk and sugar in it and 60% of the people ate bread or another high carbohydrate food with the breakfast beverage.

Table 59

**Foods Eaten for Breakfast by 149
Wage Earning Kenya Africans**

Item	No.
Tea with sugar and milk	114 (7 also drank "uji")
"Uji"	19
Coffee	8
Milo, milk, meat bone soup, 1 each	3
Nothing (3 observing Ramadan)	<u>5</u>
Total	149

In addition:

Bread, with or without spread	67	} 90
Sweet potato, English potato, roasted maize or left-over maize and beans	12	
Banana or plantain	11	
Egg	24	} 29
Fish, groundnuts or sour milk	5	

119 items eaten
in addition
to beverage

The items eaten for lunch or supper are usually interchangeable. These meals consist of a carbohydrate source which is eaten with a stew, or a casserole of predominately maize and beans. A summary of the general items eaten for lunch and supper by the six tribes studied is shown in Table 60. "Ugali" is a stiff bread like porridge made from flour and water and eaten by breaking off a piece, deftly making an indentation in it with the thumb and half dipping and half wrapping the "ugali" around the accompanying stew. Usually white maize flour is used to make "ugali" but in some sections of the country it is made from millet, sorghum or cassava flours or a combination of flours. While "ugali" with a stew is eaten almost 60% of the time for lunch and supper by the six tribes studied here, there is a great deal of tribal variation in the frequency of its consumption. The Kikuyu distinctly prefer casseroles made from maize and beans or other items to "ugali" while the Kisii and Luo would feel deprived indeed if they did not have their quota of "ugali". The Mijikenda people, who live at the Kenya Coast, and have had centuries of association with the Arabs and some Persians, eat rice with a stew (pilau) for lunch or dinner 28% of the time; other Kenya Africans eat it much less frequently.

Table 61 presents a more detailed analysis of the foods these informants said they ate for lunch and dinner during the 24 hours previous to the time we talked to them. The vernacular names of food dishes listed in Table 61 are described in Table 62. For these wage-earning Africans the stew which accompanies the "ugali" contains some animal protein or sour milk more often than it is just a stew of a combination of vegetables. The actual percentages calculate to show that stew consists of vegetables with an animal protein 61% of the time,

Table 60

Summary of Lunch and Supper Foods Eaten by Kenya African Tribes: 1968 - 1969

TRIBE	Kikuyu		Wakamba		Mijikenda		Luo		Abaluhya		Kisii		All Tribes	
No. of Potential Meals	56		48		60		60		38		36		298	
Item Eaten	No.	%	No.	%										
"Ugali" with Stew	14	25.0	26	54.2	29	48.3	49	81.7	24	63.2	34	94.4	176	59.1
Maize and Beans	23	41.1	18	37.5	0	0.0	6	10.0	4	10.5	1	2.8	52	17.4
Rice with Stew	0	0.0	1	2.1	17	28.3	3	5.0	4	10.5	1	2.8	26	8.7
Other	16	28.6	3	6.2	11	18.4	2	3.3	6	15.8	0	0.0	38	12.8
Missed Meals	3	5.3	0	0.0	3*	5.0	0	0.0	0	0.0	0	0.0	6	2.0
Total	56	100.0	48	100.0	60	100.0	60	100.0	38	100.0	36	100.0	298	100.0

* Observing Ramadan

Table 61

Details of the Foods Eaten by Kenya Tribes for Lunch and Supper

TRIBE	Kikuyu		Wakamba		Mijikenda		Luo		Abaluhya		Kisii		Total	
Total Potential Meals	56		48		60		60		38		36		298	
	No.	%	No.	%										
"Ugali" with:														
Green Vegetables					15	25.0	11	18.3	10	26.3	18	50.0	54	18.2
Cabbage and Potatoes	4	7.1	7	14.5									11	3.7
"Maziwa Lala" (Sour Milk)	2	3.6	9	18.7					8	21.0	8	22.2	27	9.1
Vegetables and Meat	8	14.3	9	18.7	3	5.0	19	31.7	2	5.3	8	22.2	49	16.4
Vegetables and Fish			1	2.1	6	10.0	6	10.0	2	5.3			15	5.0
Vegetables and Chicken					3	5.0	1	1.7	2	5.3			6	2.0
Vegetables and Milk							5	8.3					5	1.7
Vegetables and Eggs							5	8.3					5	1.7
Green grams, Ground nuts or Simsim					2	3.3	2	3.3					4	1.3
Mixed Maize and Legume Dishes:														
"Githeri"	20	35.6											20	6.7
"Irio"	3	5.4											3	1.0
"Muthokoi" or "Chenga"			9	18.8									9	3.0
"Isyo" or "Nyoyo"			9	18.8			6	10.0	4	10.5	1	2.8	20	6.7
Rice with Vegetables, Meat or Legumes			1	2.1	17	28.4	3	5.0	4	10.5	1	2.8	26	8.7
"Kitoweo"	13	23.2											13	4.4
Other Items:														
Yams with Fish					2	3.3			6	15.8			8	2.7
Chapatties with vegetables, meat or legumes			1	2.1	4	6.7	1	1.7					6	2.0
Cassava with Fish or Meat			1	2.1	3	5.0							4	1.3
Meat only (Restaurant Meals)	2	3.6											2	0.7
Sweet Potatoes with Ground nuts or Peas	1	1.8					1	1.7					2	0.7
Plantains with Meat, Fish or Beans					2	3.3							2	0.7
Tea with Bread			1	2.1									1	0.3
Missed Meal	3	5.4			3	5.0							6	2.0
TOTAL	56	100.0	48	100.0	60	100.0	60	100.0	38	100.0	36	100.0	298	100.0

Table 62

Description of the Vernacular Dishes in Table 61

<u>Githeri</u>	Maize, dry beans or peas, cabbage usually without meat, but occasionally with meat.
<u>Irio</u>	Maize, beans, potatoes, plantains, green leaves.
<u>Kitweo</u>	A combination of any of the following with or without meat: potatoes, cabbage, carrots, peas, tomatoes, onions, greens, plantains.
<u>Isyo</u>	Maize, beans, green leaves.
<u>Muthokoi</u>	Pounded maize and beans.
<u>Chenga</u>	Pounded maize, beans, cabbage, tomatoes, onions.
<u>Nyoyo</u>	A mixed dish of maize and beans.

a legume 2% of the time and some combination of green vegetables 3% of the time. Often when the African mentioned one of the foods listed here under "other items: he comments, "We eat this once in the while, just for variety". These comments were frequent enough to indicate that there is conscious thought about introducing variety into the menus. Nevertheless, each tribe's food, with the exception of the Mijikenda of the Coast, does tend to be monotonous.

Two-thirds of the Kikuyu and Abaluhya subjects said that they eat vegetables every day while one-third said they eat them every other day. The other four tribes eat vegetables less frequently and the proportions of frequency of consumption of vegetables were just reversed. The most popular vegetables in terms of the frequency with which people mentioned them were the green leaves. There must be approximately a dozen different kinds eaten: one Abaluhya informant listed nine types of green leaves in the vernacular and the seasons when they are available; members of the other tribes listed five or six each. However, many of the plants are identical with different vernacular names. We collected ten different types from November to January. Cow pea leaves, pumpkin leaves, (*Chenopodium opulifolium*, *Solanum nigrum*, and *Gunandropis pantaphilla* appear to be used most frequently. The dark green leaves are often cooked with "magadi" soda as described earlier. They are seasonal and cabbages are used throughout the country as an alternative vegetable. If we group all the dark green leaves into one class, the variety of vegetables the people eat frequently is small. Besides green leaves and cabbages, onions and tomatoes are used as seasonings throughout Kenya. A few people mentioned that they eat carrots, green peas, pumpkin, marrows and cauliflower. The Mijikenda had a wider variety of vegetables, which in addition to those already mentioned, included green beans, okra, brinjils and broad beans. Some of the subjects made a distinction between

the quantity and variety of vegetables they eat here (usually a small town) and when they are "at home," meaning in the reserves. At home they eat more of the dark green leaves and more vegetables totally; in town they eat more cabbages and cow pea leaves.

The frequency and kinds of fruits the members of the various tribes ate seemed to depend closely on the quantity and kinds of fruits growing in the areas where they live. The Kikuyu and Kisii live at altitudes ranging from 4500 - 8000 feet. The topography is characterized by elongated ridges with deep valleys. There is usually a stream in the valley and farming is done on the sides of the steep hills. At this altitude it tends to be very cool. Both the Kikuyu and Kisii informants said that they ate fruit on the average of once each week and it was usually bananas, although oranges were mentioned frequently. The Kikuyu eat a fruit from the tomato tree, which apparently only grows in Kikuyuland. The Luo and Abaluhya live adjacent to the shores of Lake Victoria where the altitude is 3700, although it rises rapidly in some of the area immediately bordering the Lake. Half of these people said they eat fruit every day, one-fourth said they eat it every other day and one-fourth eat fruit less frequently. The informants said they eat bananas, oranges, pawpaw and lemons very frequently, but that they also eat guavas, mangoes, pineapples, and passion fruit quite often. Both of these groups classified sugarcane, soft drinks, squash, and jam with fruits and said that when fruit is scarce they substitute these items. The Wakamba gave virtually the same information about their consumption of fruits as the Luo and Abaluhya provided and mentioned two fruits, limes and peaches, that they occasionally eat. No members of other tribes mentioned these fruits. Seventy percent of the Coastal Mijikenda people said they eat fruit daily and the rest said they eat it every other day. Oranges,

bananas, pawpaw, mangoes, pineapples, guavas, tangerines and lemons were mentioned as the fruits eaten most often. Occasionally fruit is eaten for breakfast, but it is usually eaten between meals.

Tea and "uji" are universally consumed frequently by all of the African informants. Two-thirds of them specified milk (often sour) as a beverage they frequently drink as distinct from using it in tea or "uji". Two-thirds also said they drink soda and coffee frequently. About one-half said they drink squash and cocoa often. A few mentioned milo and ovaltine. The Coastal people said they often drink fresh orange and lemonade; one would expect fluid consumption to be much higher in the Coastal heat. We asked no specific questions about beer or "pombe" consumption, but every tribe does have a favorite native beer. Customs as to who may drink it are variable: often women are not permitted to consume beer or "pombe". Many Christians abstain from beer drinking. The general consensus is that a good deal of beer and "pombe" are consumed from time to time.

Only sixteen of the 149 subjects said they would refuse to eat wild game. Most, however, specified what kind of game was edible and nearly everyone excluded the clawed animals, lion, leopard and cheetah; most also excluded hyena; some excluded monkeys. Nearly all of the Kisii, Abaluhya and some of the Luo excluded zebra on the basis that, "Zebra is like an ass, one doesn't eat asses." All of the Kikuyu and Wakamba included zebra. This is of interest because when Merwin Cowie (1969) was establishing the National Parks in Kenya he sometimes stored meat on platforms or in trees to be fed to the animals periodically. He discovered that the Africans helped themselves to the meat if it was beef, but left it strictly alone if it was zebra. The area where Mr. Cowie was establishing

feeding platforms was most probably frequented by the Kikuyu, Wakamba or Masai. Therefore, there is a contradiction between Cowie's observations and the informants' statements. The Luo and Abaluhya people eat flying ants and locusts on the few days each year when they migrate and are available.

All of the tribes studied use salt and curry powder as a seasoning in most of the stews they prepare. If small children are not going to eat the dish being prepared, they often use red chili powder. These stews are quite salty, but not very spicy. The "ugali" eaten with the stew is unsalted. Since the stew is so very salty, this might limit the amount eaten and act to increase the quantity of "ugali" eaten with it. The ingredients of the stew portion are much more expensive than the "ugali"; heavy salting the stew would be a money-saving manner of preparing the food. The Mijikenda people use a great variety of spices, especially in preparing pilau.

Food Sources and Costs:

Table 63 shows the number of these wage earning Africans who have "shambas" (gardens), the average size of the holdings, and cash realized from the cash crops. Seventy-four percent of the subjects had "shambas" and 64% of all of the subjects raised cash crops. The average size of the gardens was 10.2 acres; this was affected by a few larger holdings. Table 10 shows that 65% of the people in Central Province (largely Kikuyu) had farm holdings of less than 3.0 acres. The Kikuyu we interviewed held an average farm of 6.5 acres. Similarly, Table 10 shows that 62% of the people in Nyanza Province held "shambas" of less than 8.0 acres; the Luo, Abaluhya and Kisii we interviewed had holdings

TABLE 63 - INFORMATION ABOUT FARMS HELD BY WAGE EARNING KENYA AFRICANS

<u>Tribe</u>	<u>No.</u>	<u>No. with Gardens</u>	<u>No. with Cash Crops</u>	<u>Average Size (Acres)</u>	<u>Range of Size (Acres)</u>	<u>Average Annual Income (Cash Crops) (K. Shs)</u>	<u>Median Annual Income (Cash Crops) (K. Shs.)</u>	<u>Major Cash Crops Raised</u>
Kikuyu	28	20	18	6.5	2.5-15.0	900 (U.S. \$126.00)	400 (U.S. \$56.00)	Coffee Pyrethrum Milk
Wakamba	24	20	20	7.0	2.0-17.0	1300 (U.S. \$182.00)	1500 (U.S. \$210.00)	Coffee Cotton Sisal
Mijikenda	30	15	13	15.0	0.3-36.0	580 (U.S. \$81.20)	475 (U.S. \$66.50)	Cashew nuts, Cotton, Simsim, Sugarcane Bixa
Luo	30	25 18 7	16 9 7	13.0 6.0 29.0	0.3-70.0 0.3-10.0 15.0-70.0	- 510 6800 (U.S. \$71.40) (U.S. \$952.00)	- 300 6800 (U.S. \$42.00) (U.S. \$952.00)	Plantains Milk Sugarcane Cotton, Coffee Groundnuts
Abaluhya	19	13 8 5	13 8 5	13.0 6.0 43.0	2.0-90.0 2.0-10.0 20.0-90.0	500 (U.S. \$70.00) 2400 (U.S. \$336.00)	450 (U.S. \$63.00) 2100 (U.S. \$294.00)	Coffee, Cotton Groundnuts Soybeans Milk, Maize
Kisii	18	18 3 12 3	15 small kitchen gardens 12 3	4.5 4.5 30.0	2.0-8.0 2.0-8.0 17.0-48.0	1600 (U.S. \$224.00)	1200 (U.S. \$168.00)	Pyrethrum Tea, Coffee, Maize, Wimbi
TOTAL	149	111	95	10.2		1030 (U.S. \$144.20)	845 (U.S. \$118.30)	

averaging 13.0 acres. The average annual income from the cash crops was 1030/- and the median income was 845/-. No nationwide information is available on the income that farmers earn from their cash crops.

Since the numbers studied were small, and since we know this is a high middle income group, these results probably are not representative of the country as a whole nor of each tribe.

In addition to the cash crops listed in Table 63, many of the people sell excess production of food crops. All of the people said they raised maize and one or more of the legumes for family food consumption. The types of legumes raised varied throughout the country although nearly everyone said he raised some type of bean, pigeon peas (*Cajanas cajan*), and cow peas (*Vigna sinensis*). People in the lower altitude areas raised groundnuts, green grams and sesame seeds. Soybeans were recently introduced and a few of the Abaluhya and Luo people raised them. Some of the home economists were teaching the people how to prepare them for family food consumption. Based on their experience in this work, they expressed discouragement at the lack of acceptance by the people of eating soybeans. Nearly all of the people also raised bananas, cabbages, green leaves of various kinds, onions, plantains, potatoes, sweet potatoes and tomatoes.

Over half the people all over the country said they grow arrowroot, carrots, cassava, marrow, pumpkins and yams. One-fourth of the informants said that they raised bullrush millet, finger millet, millet, sorghum, wimbi, lemons, oranges, passion fruit, pawpaw or green peas. One-fourth of the people living at the lower altitudes of the coast or Lake Victoria said they raised guavas, limes, mangoes, pineapple or sugarcane. More of these people also raise the other fruits listed above. As has already been mentioned the tomato

tree fruit is grown in Kikuyuland. The coastal people were the only group who said they grow coconuts, and nearly all of them grow these as they are used in food preparation; as well as for "pombe" over half the coastal subjects said they raised brinjils, red chillies and rice.

Among the people interviewed, the "shambas" were usually located "at home," which meant "in the reserve." This is a distance of a few miles to 100 or more miles from the places of employment. This often means that the wife and pre-school children live "at home," the father and primary school children live "in town" near his employment place, and the secondary school children are away at boarding school. There is a great deal of coming and going between the reserve and the town. If the man is near enough, he visits the reserve over the week-end. He is likely to return with a good supply of food from the home garden. Of course, the wife and younger children spend some time in town when the demands of looking after the "shamba" are light. If the "shamba" is very large, the man will employ people (usually relatives) to assist in attending to it.

Table 64 summarizes the information on the amount of money spent for food by this group of informants. Table 65 shows the United States dollar equivalents for the Kenya shillings shown in Table 64. The average amount of money spent for food was 34.20 /- per person per month. The distribution appeared to be bimodal for all groups except the Wakamba, and divided into those who spent more and those who spent less for food. About one-third of the total number spent over two and one-half times more per person per month for food than the other two-thirds of the people. The incomes of those spending more for food were almost one and three-fourths times as large as those spending less for food; however, the percentage of the income spent for food was slightly larger for the

TABLE 64

INFORMATION ABOUT THE AMOUNT OF MONEY SPENT FOR FOOD

<u>All</u>	<u>Total</u>	<u>Kikuyu</u>	<u>Wakamba</u>	<u>Mijikenda</u>	<u>Luo</u>	<u>Abaluhya</u>	<u>Kisii</u>
28	149	28	24	30	30	19	18
Average Amt. Spent for Food K./Shs./Person/Month	34.0	33.50	16.00	46.00	42.50	31.50	28.80
<u>Those Who Spent Less</u>							
No.	99	19	24	17	15	11	13
Average Amount Spent for Food K. Shs./Person/Month	21.60	22 (10-40)	16 (4-30)	33 (17-47)	23 (10-33)	18 (12-29)	18 (7-31)
Average Salary K. Shs./Mo.	534	550	470	585	560	675	410
Average Family Size	6.1	6.4	4.1	5.7	7.0	9.7	6.0
Percent with Gardens	81	76	83	60	82	91	100
Average Garden Size (Acres)	10.5	7.6	7.0	13.5	12.0	22.7	5.2
Percent of Salary Spent for Food	26	28	16	34	29	26	28
<u>Those Who Spent More</u>							
No.	50	9	-	13	15	8	5
Average Amount Spent for Food K./Shs./Person/Month	59.10	58 (50-75)	-	63 (50-100)	62 (43-100)	50 (40-60)	57
Average Salary K. Shs./Mo.	900	850	-	725	1200	875	580
Average Family Size	4.6	5.5	-	4.0	5.2	4.8	2.0
Percent with Gardens	60	75	-	25	75	50	100
Average Garden Size (Acres)	11.2	4.0	-	7.3	20.0	9.7	10.0
Percent of Salary Spent for Food	29	36	-	32	27	23	22

Table 65

U.S. \$ Equivalents for Kenya Shillings used in Table 64
(May 1969)

<u>K. Shs.</u>	<u>U.S. \$ Equivalents</u>	<u>K. Shs.</u>	<u>U.S. \$ Equivalents</u>
1	0.14	47	6.58
4	0.56	50	7.00
7	1.00	57	7.98
10	1.40	58	8.12
12	1.68	59.10	8.27
16	2.24	60	8.40
17	2.38	62	8.68
18	2.52	63	8.82
21.60	3.02	75	10.50
22	3.08	100	14.00
23	3.22	410	57.40
28.80	4.03	470	65.80
29	4.06	534	74.76
30	4.20	550	77.00
31	4.34	560	78.40
31.50	4.41	580	81.20
33	4.62	585	81.90
33.50	4.69	675	94.50
34.20	4.79	725	101.50
40	5.60	850	119.00
42.50	5.95	875	122.50
43	6.02	900	126.00
46	6.44	1200	168.00

group spending more money for food.

Of the people spending more for food there were 20% fewer who had gardens, and this group had an average of 1.5 fewer people sharing the food than the group who spent less for food.

Using March 1969 Nairobi food costs, devising the most inexpensive nutritionally adequate diet possible, and assuming all food is purchased, it cost a little less than 1 shilling per day per person for food. Since 80% of the people who spent less for food had gardens and raised some of their own food, most of them could probably just about meet their nutrient requirements with the amount of money they were spending for food.

The Wakamba people were spending the least for food; they spent an average of 16 shillings per person per month. The informants said that unless the weather was really bad, they raised an adequate supply of the basic cereals, except maize flour, and enough of the legumes to fulfill the family requirements from harvest to harvest. This is in contrast to most of the rest of the people who said they did not usually raise enough food to last from one harvest to the next. The Wakamba also raised a greater variety of the cereals than any other group. Nearly all of them had their own cattle for milk and chickens for eggs.

The Mijikenda people spent the largest amount of money per person per day for food. Only 50% of them had gardens; the smallest percentage having gardens in the other tribes studied was 70%. This, together with their "gourmet" tastes and preference for the more expensive rice versus "ugali," probably accounts for their spending.

All of the subjects said they purchased the basic commodities including tea, coffee (some bought cocoa, ovaltine or milo), salt, sugar, curry powder, wheat flour, and bread. They also purchased salad oil, hydrogenated vegetable fat, "drippings," margarine, ghee, and/or butter. Most families also bought "posho" at least part of the time, as well as millet or sorghum flours occasionally.

Meat was purchased one to three times per week and eaten on the day of purchase in one or two meals. The average amount purchased was 4 - 6 oz. per person per week, raw with bones. The average amount of milk purchased was 6 - 8 oz. per person per day. The average number of eggs purchased by the people who bought eggs was 1-1/2 per person per week. Chicken is purchased for special occasions; the Mijikenda, Luo and Abaluhya frequently buy fish in lieu of meat and the Wakamba sometimes do.

"Kunde" and other greens are available in the markets and are purchased by the people in this sample when the garden supply is exhausted and by those without gardens. This purchase pattern holds for all the other food items as well.

One monthly shopping list for a family of sixteen people consisting of four adults, six school-age children, six preschool children and one infant is given in Table 66. (This is a polygamous family). They spent 250 shillings per month for food, the salary was 1000 shillings per month, and the average spent per person per month was 16 shillings. The "shamba" worked by the three wives was 30 acres.

Table 66

Food Shopping List for One Month for a Family of 16

<u>Item</u>	<u>Amount Purchased</u>	<u>Available Per Person Per Day</u>
"Posho" (maize flour)	1-1/2 bags (one bag = 200 lbs.)	10 oz.
Sugar	40 lbs.	1-3/4 oz.
Tea	1 lb.	
Coffee	1 lb.	
Meat (usually beef, with bones)	16 lbs./week	2 ⁺ oz. (raw, including bones)
Milk	3 pts./day	4 ⁻ oz.
Eggs ("they are hard to get")	10/week	
Oil, salt, curry powder		

Pregnancy and Food Habits:

Traditionally, throughout much of Kenya, it was believed that a pregnant woman should not eat too much for fear the fetus would become too large and the delivery would be difficult. As several people phrased it, "She does not want too big a baby - she'd be defeated at delivery" It may be recalled that many Bantu tribes have a practice of circumcizing their women: this often leads to difficult deliveries due to the formation of inelastic scar tissue. Thus, many Kenya women have a very good reason for wanting to have a small baby. The beliefs about which foods are especially fattening during pregnancy and the comments by the informants about how strongly they think these beliefs are held and practiced varied from tribe to tribe and are reported here on a tribal basis. In general, there were no beliefs about the inclusion of any particular foods for pregnancy. As one informant said, "There are no special foods for pregnancy, she eats what the husband eats or what she prefers."

Among the Kikuyu it was believed that ripe bananas and fatty foods should not be eaten and that meat should be eaten infrequently and in small amounts. Nearly all those interviewed knew these beliefs and nearly all said they are not believed today.

The Wakamba pregnant lady also fears that her baby may grow too large and her delivery be difficult. Those interviewed think this is quite a general and strong belief. Towards the time of delivery, a pregnant Wakamba lady eats very little food. Eating honey, sugary things and "too much" of any kind of food is discouraged throughout pregnancy. Some Wakamba people believe that eggs will make the fetus grow

too big. All young women are discouraged from drinking fresh milk, although it is all right for them to drink sour milk. Fresh milk is believed to make a woman infertile and it is believed to be especially dangerous for a pregnant woman to drink fresh milk. (The informants could supply no reason.) The older women advise a pregnant woman to drink "uji" and eat "ugali" made from "wimbi". They say that this will "make her body build the source of milk."

The Coastal people traditionally believed that a pregnant woman should not eat too much of the "starchy foods," which they identified as cassava and maize. It was believed that mutton might make the mother swell and/or the baby grow too fat. The mother was instructed that she should not eat left-over foods. Salt was restricted during pregnancy because it was believed that it made the mother swell. Eggs were thought to make the baby fat and cause the "baby to be born without hair like a European baby". A certain type of fish("mpokomo" or mud fish), which was described as "having no juice and hibernating in the bottom of the lake during the dry season like a snake," should be avoided during pregnancy because it may cause pains in the mother's stomach and maternal skin lesions. Mijikenda informants said that the medicine man's advice to a pregnant woman often involved food. Reportedly, the medicine man tells the pregnant woman to avoid milk, eggs, salt and meat, except for roasted meat and roasted fish. The types of meat and fish that are roasted are expensive and used only on special occasions.

Among the Luo people the list of foods believed to cause the fetus (and mother) to become too fat varied. Several people said meat and eggs would cause the baby to become too fat. Groundnuts, sweet bananas, sugar and sugarcane were listed by several informants as foods

which would make the fetus fat. Other, less frequently mentioned, "fattening foods" included cabbage, "ugali", butter, milk, kidney, cassava, tea, bread and chapatties. In addition to making the fetus too fat, there is a belief that meat may cause illness in the mother and illness or death in the unborn baby. It is believed that the maternal consumption of eggs will delay the baby in learning to speak. Traditionally, it was believed that if a pregnant woman ate an animal killed by a leopard she might have an abortion. "Pombe" consumption during pregnancy was discouraged for fear of the delivery of a "stupid child."

Only a few of the older Abaluhya informants knew that there was an old tradition which demanded that a woman omit fats and fatty meats during pregnancy for fear the fetus might become too fat. The few informants who knew of this tradition assured us that it was no longer observed. There was also an old tradition which dictated that women, pregnant or not, and children must not eat chicken. It appears that most women under 35 years do eat chicken today; children are given chicken. The older women today do continue to observe this taboo and do not eat chicken. This is true of the Kikuyu people also.

Not one of the Kisii informants mentioned a traditional fear that the fetus might become too large and delivery be difficult; however, there are some food beliefs among the Kisii related to foods to be eaten and avoided in pregnancy. Women are told they should eat "ugali" and "uji" made from "wimbi" and that they should eat cooked blood mixed with fermented milk. Some of the informants said their wives followed these practices, although the habit of eating

blood is dying out. There is a traditional taboo for a pregnant woman against eating eggs, chicken, the chest of a goat and the colostrum of a cow. If a pregnant woman ate these foods, it was believed the child might not learn to talk.

There was some interesting information from the nine informants who did not belong to the six tribes on which we are focusing most of this study. Among the Masai, the women from mid-pregnancy are "very much looked after and they cannot take food when they wish. The food must be measured food. Women must not eat too much. The day or two before delivery, the woman may refuse all food. The diet consists primarily of milk with a little meat and occasional vegetables or cereals. Fruits are specifically forbidden." In Taita tradition, women could not eat an animal killed by a poisoned arrow when they were pregnant (no reason provided, "it was the custom"), nor could they eat elephant for fear the baby would look like one.

Eighty-seven percent of the informants said that they or their wives experienced cravings for soil and/or various foods during their pregnancies. The women subjects we interviewed were employed almost entirely in working with other women, e.g., as midwives, social workers or home economists. They reported that pica is very common in pregnancy; in some places red soil is sold in the shops. As for items of food craved in pregnancy, these were highly individual and varied. Most women craved more than one item and cravings were experienced for prenatal taboo items. Nearly all of the usually eaten foods were described as craved in pregnancy by one woman or another in one pregnancy or another. Almost every woman mentioned craving one of the animal proteins as well as a high carbohydrate food. Sixty percent of the women said they craved the

green leaves, especially the bitter ones. Fruits were also frequently mentioned, especially bananas, oranges, and mangoes.

Nearly all of the Kikuyu informants and about half the Coastal informants initially answered the questions about prenatal nutrition with nutrition education feed-back. The reasons they gave for the foods for pregnancy were, "to give her starch, minerals and protein," or "to help the baby grow, for blood improvement and vitamins." The foods usually mentioned for pregnancy included milk, meat, dry beans, green vegetables and sometimes fruits. Several informants capped this information with, "not many bother to eat differently during pregnancy" or, "during my pregnancies I ate like I always do. I know I should have more milk, meat and vegetables for these are rich in building foods, but we don't have enough money."

Foods for Lactation:

There are traditions in all the cultures represented by the people we interviewed about the foods to provide for the new mother after delivery. Special foods are provided which are believed to start or increase the milk flow, replace the maternal blood loss of delivery, relieve the mother's stomach pains, rebuild her body, and give her energy. The beliefs and practices of the Luo people regarding the foods to give a new mother seem to be the most generally held and observed throughout the country, although there are some exceptions which will be noted.

After a Luo woman has had a baby, a ram, ewe or goat should be slaughtered. The blood is cooked with sour milk and consumed as such or in combination with "ugali" for the first few days after delivery. This food is believed to assist in replacing the blood loss. The slaughtered animal's rear quarters are cooked in a soup which the mother eats to relieve the stomach pains, help replace the blood

loss, and rebuild her body. Several other foods were suggested by some of the informants as good for a mother after delivery. These included: "ugali" with green vegetables, meat fish or eggs; rice with fish or chicken; and plantains. Two of the older informants related a tradition which is apparently rarely followed today: the new mother should be given the cooked fatty chest of the cow to give her strength, help her produce more milk and make her "in a state that she may conceive again two months after this parturition."

"Uji", (especially that made from finger millet flour and sour milk), green leaves and milk are believed to be especially important foods for the new mother to help her establish a large supply of milk. Other foods believed to be helpful in increasing the maternal milk supply were beverages; especially tea with "lots of milk," cocoa, and soup. A puree of green grams and a small amount of maize was mentioned by a few as good for the new mother.

The Abaluhya people live adjacent to and intermingled with the Luo and subscribe to the same general beliefs about foods for a newly delivered woman. However, they believe that the soup and meat that is especially good is made from the hump of the humped cattle (reportedly an especially fatty meat). Millet "ugali," green vegetables and plantains were mentioned frequently by the Abaluhya informants as foods to help the mother regain her strength after delivery. Beverages such as "wimbi" or millet "uji," fermented milk flavored with charcoal and herbs, tea "with a lot of milk in it," meat soup, ginger ale, fruit juices, cocoa and coffee were believed to help initiate the milk flow and increase the milk production in a newly delivered mother.

The Kisii had similar beliefs: traditionally a goat was killed - the liver, stomach and intestines, ribs and chest were for the

new mother; the legs and head were for the men. Meat and bone soup were also recommended for the new mother. The Kisii also believed that "wimbi" or millet "uji" and green leaves which were boiled with "magadi" soda helped initiate and increase the milk flow. One older Kisii person said that, traditionally, a little "pombe" was given the mother immediately after delivery, for it was believed this "helped clear the blood from the mother's stomach."

The Wakamba people also believed in millet or "wimbi" "uji" for the new mother and in soup made from the meat and blood of a goat. They also believed that sugar cane and roasted green maize should be eaten by the new mother, for this was credited with the power "to give a lot to suck for the baby."

The Mijikenda believed in "uji" and soup for the new mother, but they usually specified chicken soup. They said, however, that meat or fish soup could be used. Two older Mijikenda informants described an old tradition that is rarely followed now: there is a green leaf which is very bitter and when cut it bleeds a milky substance. This was given to the mother to start the milk flow. Some of the Mijikenda said that cassava, which is white in color, is good for a lactating woman because it helps her make lots of milk; green maize was also thought to be good for milk production because it contains a white milky substance.

Among the Kikuyu informants, four items were specified by everyone as important in the feeding of new mothers. Fermented "uji" made from millet flour should be given first. Soup made from soup bones, with special attention to see that the new mother receives the marrow, should be given soon after delivery. The new mother's friends make and bring her "njahi." This is eaten in large

quantities by the new mother and shared with any women visitors. Plain "githeri" (maize and beans) is avoided, for it is believed that this food has no ability to increase the production and flow of milk. The Kikuyu did not mention slaughtering an animal when a new baby arrives.

The Masai tradition requires that three days after delivery a cow should be killed and the new mother given soup made from the bones and some meat. She is not supposed to eat the soup unless it does have meat. The Masai mother is forced to eat more than she wants of the meat soup and fat. There are specific cuts of the cow selected for her and she must avoid eating "other tribes' foods."

Infant Feeding and Weaning Practices:

By the time a baby is six months old the quantity of milk a mother can produce is no longer nutritionally adequate as the only food for an infant. Most pediatric nutritionists and pediatricians recommend starting a normal infant on some food by his fourth month so that when the baby reaches his sixth month he is accustomed to eating enough of an adequate variety of the semi-solid foods that his nutrient requirements will be met. (Many experts prefer to have a mother initiate semi-solid foods much earlier than the fourth month). In developing nations, a conflict exists between the dangers of the infant being given contaminated foods and the infant's nutrient needs. Dirty water or milk used to dilute food, contaminated food, dirty containers, and/or unclean feeding utensils or, more likely, dirty fingers used to feed the baby are common. The figures of the very high incidence of gastroenteritis among infants and children were presented in Table 14. A normal infant, in a developed or developing nation, needs clean semi-solid foods at about four months old.

At the risk of over-simplification, the traditional method

of introducing mixed feeding to babies in Kenya was to give the baby "uji" made with milk when the baby was nine to ten months old and mashed potatoes and/or plantains at twelve months. Traditionally, all babies were breast fed, often into the third year. The practices of infant feeding and introduction of solids to babies in Kenya seem to be in a transitional stage. At the present time, the feeding practices cover the entire range from traditional to modern.

All of the people we interviewed said their babies were breast fed. In a few unusual cases where the mother died or for some other reason was unable to breast feed her infant, weaning was as early as one and one-half months old. Table 67 summarizes the normal duration of breast feeding these informants said they practiced.

Table 67

Duration of Breast Feeding

<u>Tribe</u>	<u>Length of Breast Feeding (months)</u>	<u>Range of Breast Feeding (months)</u>
Kikuyu	9	4 - 12
Wakamba	14	9 - 17
Mijikenda	11	6 - 24
Luo	10	5 - 24
Abaluhya	10.5	6 - 24
Kisii	<u>12</u>	<u>4 - 18</u>
TOTAL	11.1	4 - 24

The Kikuyu and Mijikenda people divided into three groups based on the time at which they introduced mixed feedings. Group 1 is called "modern," group 2 is called "intermediate," and group 3 is called "late." Table 68 summarizes the time when, and item which, the Kikuyu people of these three groups introduced mixed feedings. Although it is not shown in Table 68, one-half of the Kikuyu women did use Nestum, Farex or Lactogen. These foods were introduced between the second and eight month. They are reportedly used in small amounts, probably due to their cost. Table 69 describes these foods together with some others which the Mijikenda people used in infant feeding.

The Mijikenda women divided into 44% "Modern," 8% "Intermediate," and 48% "Late" based on the time at which they introduced semi-solid foods to their babies. The modern Mijikenda woman introduced one of the items shown in Table 69 when her baby was two to four months old. She also introduced fresh orange juice, "uji", mashed potatoes with meat soup, and/or rice cooked in milk. A few of the women also introduced eggs. They progressively introduced items on this list as the baby grew older.

The "Intermediate" Mijikenda mothers chose "uji" with milk at three months, fresh orange juice at four months, and soft custard at six months.

The "Late" group of Mijikenda mothers introduced "uji" at an average of slightly over seven months (range 5 - 12 months). When the baby was eleven months old (range 8 - 12 months), the mother introduced soft "ugali," rice with milk and ghee, potatoes with butter, yams, cassava, bananas or oranges.

Table 68

Age of Infants at Which Semi-Solid Foods
Were Introduced - Kikuyu

	<u>Age of Infant (months)</u>	<u>Items Introduced</u>
"Modern" Group (22% of the whole group)	3	Eggs and milk, beaten together
	4	"Uji" made from millet with milk
	6	Potato mixed with egg and milk
	8-9	Potato or rice with cream and/or meat soup, and/or soft "irio"
"Intermediate" Group (28% of the whole group)	5	"Uji" made from millet with milk
	6	A mixture of vegetables with butter
	8	Bananas, potatoes, carrots cooked together or separately
"Late" Group (50% of the whole group)	9-10	"Uji" made with millet and milk
	12	Mashed plantain and/or mashed potatoes
	14	Mashed rice

Table 69

Description of Infant Foods Introduced by Twelve "Modern"
Mijenda Mothers When Their Infants Were Two to Four Months Old

Cow & Gate Milk-Food:

A dry, vitamin-enriched powder which, when reconstituted according to directions, closely resembles the nutritive value of cow's milk;

Packed in Kenya by Cow & Gate, Ltd., Guildford, England;
Packed in 14 oz. tin, it retails in Kenya at 5.25/- (U.S.\$0.74)

Lactogen:

A dry, vitamin and iron-enriched milk formula made from slightly defatted cow's milk with carbohydrates;

Packed in Kenya under agreement with Nestlé Products, Ltd., Nassau; Packed in 1 lb. tin, it retails in Kenya at 6.20/- (U.S.\$0.87); Packed in 2-1/2 lb. tin, it retails in Kenya at 12.95/- (U.S.\$1.81).

SMA:

A dry product made from skim milk powder, lactose, vegetable oils, vitamin and iron-enriched;

Packed in England by John Wyeth & Bros., Ltd.;
Packed in 1 lb. tin, it retails in Kenya at 7.50/- (U.S.\$1.07).

Nestum:

Cereal flakes containing a mixture of wheat, barley and oats to which soya protein and milk casein have been added. It is vitamin and calcium-enriched;

Packed in Belgium by Nestlé S.A., Bruxelles;
Packed in 8 oz. cardboard, it retails in Kenya at 4.95/- (U.S.\$0.69)

Cérelac:

An instant food for infants made from whole milk, pre-cooked wheat flour, sugar and vitamin-enriched;

Packed in Belgium by Nestlé's Products, Ltd., Nassau;
Packed in 400 gm. (14 oz.) cardboard, it retails in Kenya at 7.50/- (U.S.\$1.07).

Farex:

A pre-cooked blend of wheat, barley and maize flours, with milk protein, bone meal, iron, iodine and vitamins added;

Packed in Kenya by Glaxo-Allenburys (East Africa) Ltd.;
Packed in 10 oz. cardboard with cellophane, it retails in Kenya for 2.90/- (U.S.\$0.41); Packed in 10 oz. tin, it retails in Kenya for 3.75/- (U.S.\$0.52).

Nearly all of the mothers of the other tribes fell into an "Intermediate" or "Late" classification according to the time at which they introduced semi-solid foods to their infants. Table 70 shows the infant's age, the percentage of the women introducing the item and the item introduced to the infants by mothers in the other four tribes. In all six tribes, an infant is usually entirely on the family foods by the time he is two years old.

In most of the tribes, weaning was accomplished voluntarily with gentle persuasion from the mother as she gradually decreased the frequency of breast feedings and offered "uji," or cow's milk at intervals. If the mother was pregnant and abrupt weaning was believed necessary, or if the baby didn't cooperate and voluntarily give up the breasts as rapidly as the mother wished, she would apply fat and pepper or other "bitter stuff" to her breasts. Only among the Luo was it customary for a mother to leave her baby for two or three days when she wished to wean the infant. Usually, she visited her own home at this time and her mother-in-law or other relatives cared for the infant.

Foods considered bad for babies were described as "hard" foods and identified by the informants as maize, beans, adult "ugali," cassava, chapatties and arrowroot. The foods mentioned most often as good to give a baby included: "uji" made from millet, sorghum or "wimbi," with milk; milk; egg; plantains; potatoes; soft rice and cream or butter. Farex, Nestum and Lactogen were also mentioned as being good for a baby. About 35% of the informants believed that babies should receive their first semi-solid food when they are 8 - 12 months old, 55% believed the first food should be given when the baby

Table 70

Infant's Age, Percentage of the Mothers
Introducing a Food, and the Food Introduced
by Wakamba, Luo, Abaluhya and Kisii Mothers

<u>Tribe</u>	<u>Age of Infant (months)</u>	<u>% of Mothers Introducing Item</u>	<u>Items Introduced</u>
Wakamba	4	50	Cow's milk with equal amount of water.
	6	100	"Uji" with milk.
	8	25	Eggs.
		25	Soft "ugali" diluted with meat, soup or milk.
		50	Mashed potatoes, pumpkins and/or plantains.
Luo	5	50	"Uji" with milk.
		30	Lactogen.
		20	Fruit juice, tea or cow's milk.
		40	Eggs.
	8-1/2	33	Soup of plantain or vegetables.
		16	Farex.
		11	Mashed yams or mashed potatoes.
12	100	"Ugali" diluted with soup or milk.	
Abaluhya	5	100	"Uji" or cow's milk.
	9	100	Mashed potatoes, plantain, or "ugali".
Kisii	6	100	"Uji" with milk, or cow's milk.
	8-1/2	50	Soft "ugali" with sour milk or vegetable soup.
		25	Eggs.
		25	Potatoes, sweet potatoes, plantains, all mashed.

is six months old and ten percent when the baby is two to four months old.

Knowledge About Kwashiorkor:

Sixty-five percent of the informants correctly identified the clinical signs of kwashiorkor and suitable treatment for its cure. Thirty-five percent did not know the cause or cure, usually said so and did not give unrelated or incorrect information. Table 71 summarizes the knowledge, or lack of knowledge, the informants in each tribe about kwashiorkor and its cure.

Table 71

Number of Informants Correctly and Incorrectly
Describing Kwashiorkor and Its Cure

<u>Tribe</u>	<u>No.</u>	<u>No. Knowing</u>	<u>No. Not Knowing</u>
Kikuyu	28	28	0
Wkamaba	24	17	7
Mijikenda	30	16	14
Luo	30	15	15
Abaluhya	19	10	9
Kisii	18	11	7
TOTAL	149	97	52
PERCENT	100	65	35

All of the Kikuyu informants correctly identified the clinical symptoms and cause of kwashiorkor and connected the cure with feeding the baby milk, eggs and meat; they almost always included green vegetables with the other food items which were important for curing kwashiorkor. There is a vernacular word in Kikuyu (the Kikuyu

language) which describes the clinical symptoms characteristic of kwashiorkor. Translated the word means "the disease of the kidneys." We had little success when we attempted to determine when this word became a part of the vernacular vocabulary and hence when kwashiorkor was recognized as a separate disease entity. The elders said they had always known the word, that their parents and grandparents knew the word, and that as far as they knew it had always carried the same meaning. If this is true, the disease must have been recognized for a very long time. One of the clinical signs of kwashiorkor is edema of the legs; edema is a characteristic symptom of many kidney complaints. Several people have suggested that the early colonial physicians (around 1920) observed the disease in children, commented that it must be some type of kidney disease, and this information found its way into the language. These two explanations for the introduction of this word into Kikikuyu are recognized to be in conflict with one another; solution to the conflict awaits further work.

Kikamba (the language of the Wakamba) includes the word "wonzy" which the elders knew as children and which describes the clinical symptoms of kwashiorkor. "Wonzy" is believed by many to be caused either by witchcraft or a contradiction of the customs by one or the other of the ill child's parents. In this case a contradiction of the customs means that the child's mother has sexual intercourse with any man other than her husband; or the child's father has sexual relations with a woman who could not qualify to become his second wife (specifically, an already married woman, or one belonging to a clan or bloodline forbidden to the man). One of the most knowledgeable of the Wakamba informants said, "Kwashiorkor was not a problem in the past. The Wakamba kept cattle, there was no system of milk marketing, they

all drank milk; they had lots of cattle and goats and many, many ceremonies when a cow or a goat was slaughtered and they had lots of meat, although it was spasmodic." One of the unpublished WHO studies showed that ceremonial meat was an important source of protein to one of the tribes (Meru, Tharaka area) living adjacent to the Wakamba. The study showed that the people received fairly generous amount of meat on two or three days at a time on an average of eighteen times per year. Such ceremonial meat is rarely given to infants under 18 - 24 months old.

Kiluo (the Luo language) also contains two words: "akuodi" meaning swelling and "chirra" meaning contradiction of the customs. These words are used to describe the clinical condition in infants and small children which fits the clinical picture of kwashiorkor. One of the words indicates that the cause of the infant's difficulties is infidelity on the part of one or the other of the parents. A few of our informants believed witchcraft caused kwashiorkor; nearly all of them said that the people in the reserve believe that witchcraft or the contradictions of the customs caused this infant illness. One Luo home economist working at a Farmer's Training Center said vehemently, "Kwashirokor is caused by ignorance, people do not know what food to give a baby. There is not one simple home without a laying hen, so they have eggs and nearly all the people have a cow."

Kiluhya (the language of the Abaluhya) also contains two words which describe the clinical condition we call kwashiorkor: these words are "lini" and "obwengu." Nine, or about half of the Abaluhya informants

did not know the cause or cure of kwashiorkor, even when the vernacular words were used. Several of these people said that evil magic causes the condition. Half of the Abaluhya correctly described the disease and many of these were working in the 300-bed New Nyanza Hospital where in January 1969 there were 30 in-patient cases of kwashiorkor.

Preferred and Status Foods:

Seventy-three percent of the subjects said they would like more food or particular foods more often. Table 72 shows the percentages by tribes who said they would and would not like more foods.

Table 72

Percentage of the People by Tribe Who Would Like More Food or a Particular Food More Often

<u>Tribe</u>	<u>No.</u>	<u>Would Like More</u> <u>%</u>	<u>Would Not Like More</u> <u>%</u>
Kikuyu	28	90	10
Wakamba	24	50	50
Mijikenda	30	83	17
Luo	30	70	30
Abaluhya	19	63	37
Kisii	18	78	22
TOTAL	149	73	27

What kinds of foods did they say they would like to have in larger quantity or more often? All of the people said they would like more of the foods which they usually eat. Thus, the Kikuyu would like more "githeri," "irio," and "kitoweo na ugali"; the Wakamba would like more "chenga" and "muthokoi"; and the

people of the other tribes would like more "ugali" with their favorite stew. These were also the particular items mentioned by nearly everyone when asked about his favorite foods.

When a respected guest arrives at his host's home, he will usually be offered tea, often with bread and butter. The meal planned for the guest usually features a chicken stew, although a meat stew is also acceptable. The accompanying carbohydrate varies: the Kikuyu and Mijikenda would serve rice; the members of the other tribes selected "ugali." Chapatties were sometimes chosen as the carbohydrate to serve by informants from each of the tribes. If the guest was known to enjoy "pombe" or beer it would be provided. Most people said that when meat or chicken is served it is not necessary to serve any vegetables. A few people said they would serve ripe bananas or pawpaw for dessert, but most said they would not do this and that it was not necessary. Members of various tribes often said that in addition to the special meal planned, their most frequently eaten food would also be served; the Kikuyu would serve "irio," and the Wakamba would serve "chenga," made from green maize and pigeon peas.

Foods served at a ceremony are dependent on the type of ceremony and the wealth of the people supplying the food. For most of the people an ox is the most prestigious animal to slaughter, followed closely by other beef animals. (For some ceremonies a cow is the more correct selection.) A less wealthy man will slaughter a ram or sheep and the poorer man will provide a goat. For an important ceremony involving the attendance of a great many people, chickens would also be slaughtered; in the tribes who eat fish, this would be prepared. Usually, "ugali," "pombe," and tea would be

served. Ripe bananas would be available in quantity. Each tribe follows special food preparation techniques and uses special ingredients for ceremonial occasions. They also serve the foods which are usually included in their diets.

A great many informants distinguished between foods served at a traditional ceremony held in the reserve or a modern or very modern ceremony. The previous paragraph generalizes on the kinds of foods most of the tribes would serve at a traditional ceremony. When modern foods are served they include rice and/or chapatties with a meat and vegetable stew; tea with bread and butter, and cakes; European beer and sodas. Very modern foods at a ceremony seem to mean what we think of as a tea party and include: coffee and tea; bread, butter and jam; and cakes. All of the informants gave the impression that they preferred the traditional foods and ceremonies.

Changes of Food Practices:

There are several published sources, plus the present study, spaced over a period of years from 1902 which include sufficient details about the food practices of the Kikuyu so that some comments may be made about changes in food practices.

Kikuyu elders living today remember as children that millet and sorghum were the cereals they had to eat. By 1902, Routledge lists maize, sorghum and finger millet as the most important grains which were used by the Kikuyu. Routledge says that a chief he questioned "told us his grandfather would have refused to touch maize, which is now the mainstay of the people." According to Routledge the other foods grown by the Kikuyu from 1902 - 1907 included: "njahi", "njugu", arum lily (arrowroot), sweet potatoes, sugarcane,

manioc (cassava), and bananas, He makes no mention of the use of wild or cultivated green leaves. Most Kikuyu had a certain number of goats and sheep while cattle were the valued property of a few. The cows and calves were separated at night. In the morning the cow was partially milked with one hand while the other hand was used to hold the half calabash which served as a milk pail. In the evening the calves were turned loose as the herd approached home and had the whole day's milk. Routledge writes, "Nothing but dire starvation will induce the Akikuyu to try to eat wild meat . . . birds, reptiles, insects, and grubs of any sort are never eaten: the locust and the white flying-ant are not recognized as edible. As regards to fish, it is specifically laid down, by customs and tradition, that the eating of it makes a person ceremonially unclean. Eggs, too, are not used as food."

Routledge says that Kikuyu may be looked upon as essentially vegetarian. Meat is the luxury of the few, and only partaken of in small quantity on occasions of sacrifice or festival. In 1902 Routledge observed the people boiling maize kernels with beans. He observed that the only formal meal of the day was eaten at sundown, that the morning meal was food left over from the previous evening, and that men and women never ate together. "Uji" was made from millet flours but never from maize flours; as a matter of fact he never saw maize ground to make a flour. Native beer was popular, and was made from sugarcane or honey.

Proctor described the Kikuyu food practices in 1926 and 1927. The same cereals, legumes, roots and tubers were being used at this time as in the earlier period. The white potato was a new addition. Proctor says the European potatoes, "are now much grown and in frequent use among the Kikuyu." "Uji" was made from the flour of any grain,

including ground maize, and this is an innovation from the earlier period. A little salt and fat, if they were available, were added to the "uji". Proctor observed that only men and children drank curdled milk. Proctor says, "Fruits begin and end with bananas, but of these there are many varieties" - an observation consistent with the earlier period. Proctor also mentions the use of green leaves, especially by the women. He mentioned "irio" made from maize, beans, green leaves, "mgadi" soda and bananas. Proctor observed the Kikuyu eating "njenga." This is maize which has been pounded and which is used today in the preparation of "muthokoi" and "chenga" by the Wakamba people, but not by the Kikuyu people. About meat, Proctor says, "Meat forms a very small part of the Kikuyu diet. Meat eating is chiefly confined to the elders and a few old women, and occurs usually in connexion with some sacrificial ceremony." Proctor describes three fermented beverages which were popular: one made from millet or maize, one from sugarcane and one from honey. Using cereals to prepare beer was not mentioned in the 1902 period, but is popular today.

Orr and Gilks' (1931) classical study "The Physique and Health of Two African Tribes" (the Kikuyu and Masai) describes the Kikuyu diet as chiefly vegetarian. They say, "Beef may be almost entirely discounted from the diet; game, fish, birds and eggs are ignored, and the eating of goats and sheep is almost confined to the old men . . . very little cow's milk is available."

Orr and Gilks make an interesting distinction between the usual food of the men and women. They observed that 60% of the men's food was maize or millet and 25% was sweet potatoes. While

the women also subsist chiefly on these articles, they add more liberal quantities of legumes and plantains and have a virtual monopoly of the green leaves. Thus, the pattern of 1931 is very similar to that of the earlier periods.

Anderson reported on the "Kikuyu Diet" in 1937 under two headings; (1) The Old Kikuyu Diet and (2) Recent Additions to the Diet. Under the "Old Kikuyu Diet" we find the familiar favorite, "irio," but now potatoes are included in the recipe, which is a change from the earlier periods. The "Old Kikuyu Diet" also included the perennial "uji," made with maize and/or millet flour and taken in the mornings as the only food at that time. This seems to be the time when taking "uji" for breakfast began. Anderson includes a discussion of the principal dietary items all of which were also recorded in the earlier days but for the first time onions, carrots, cabbage, cauliflower and peas are mentioned as being widely used. Tea, coffee, ghee, salt and sugar are also listed as available in most shops. Wheat flour in the form of chapatties and European bread are mentioned for the first time as available for those who can afford them." Beef is available in butcher shops at this time and in the earlier studies it was mentioned as being conspicuous by its absence. Anderson said that the educated were beginning to understand the importance of milk for children.

Anderson makes an observation which may be of considerable importance, the quotation follows:

"It has been noticed that the women, or probably only the young women, are better nourished than the men. The young women undoubtedly eat a greater quantity of food than the men, and before marriage do less manual work.

The reason for this custom is probably connected with the aesthetic values in the marriage market of rounded curves due to a generous sub-cutaneous adipose deposit."

The major change in the Kikuyu food habits apparently occurred somewhat before the turn of the century and involved maize gradually replacing millet and sorghum. Other changes have involved the addition of new foods. Potatoes were added so that by 1937 they were common feature of the diets. Cabbage, cauliflower, onions, peas and tomatoes were apparently introduced at about this time and are widely used today. No longer are bananas the beginning and end of the list of fruits used, although they are certainly used in the largest quantity and most frequently. Oranges, guavas, mangoes, lemons, pineapples, pawpaw and tomato tree fruits are all enjoyed in season today although fruits are eaten only occasionally. Wheat flour in the form of chapatties and bread were added to the traditional diet but only occasionally. There has been a change in the attitude towards eggs: women of the grandmother vintage refuse eggs today, but mothers, children and all men eat them whenever the opportunity arises. Meat is eaten in small quantities as frequently as people can afford it. Traditionally women and children received one hind leg and the viscera, today - at least among the educated - there is a more democratic sharing although women believe that men need more meat than they need. Meat and chicken are both high status foods. Sometime between 1902 and 1926 "uji" became a common item for breakfast and "uji" made from maize flour replaced that made from millet flour. Tea unfortunately is beginning to be used in place of "uji" as a breakfast beverage. The three-meal-a-day practice is a recent change and the large meal at night is still universal. There are areas in Kikuyu reserve

where only one large evening meal and a breakfast of the left-overs, "uji" or tea constitute the entire day's food. The milking practices and care of cows and calves Routledge observed in 1902 can still be seen alongside modern dairy practices. Although some Kikuyu farmers have started fish ponds, in general the Kikuyu do not like fish. Two taste test panels including two different items containing fish were conducted using predominately Kikuyu tasters. Both items received very low ratings. It was already noted that the Kikuyu did not enjoy the Luo fish stew prepared in the laboratory.

The Kikuyu's "core" diet of today was the basic diet of 1902; however, today we see a great many additions to the foods eaten in 1902.

Lindblom (1920) studied the Wakamba people from 1910 to 1912. He observed that the "Products of the field form the basis of the Kamba people's food" and that "they do not want to kill off their herds."

Lindblom observed that the cereals, sorghum, maize, millet and wimbi; the legumes especially cowpeas, pigeon peas and beans of various sorts; roots and tubers including sweet potatoes, yams, cassava and arrowroot; bananas; pumpkins, marrows and green leaves; milk and occasional meat were the foods the people grew and ate. He specifically mentioned; "isyo," "uji" and a maize flour bread as important dietary items. He also observed that the blood of cattle either by itself or mixed with milk, millet flour and fat was popular.

Today's food practices of the Wakamba have added items such as white potatoes, onion, tomatoes, carrots, oranges, and other fruits to the food practices of 1910 - 1912 which Lindblom described. The basic diet of today, and its method of preparation seem very similar.

There is one curious difference: Lindblom states that fresh milk was consumed only by women and children, although everyone preferred sour milk, the men kept entirely to it. Our informants told us just the opposite. In the reserve, milk sours very quickly since it is put into a calabash that has recently stored sour milk and since it is fairly warm in most of the areas where the Wakamba live. In 1910 - 1912 the Wakamba preferred sour milk and it appears that this is true today.

An Agricultural Report of 1946 said that the staple foods of the northern Nyika were maize meal, cow peas and millet and that adjuncts to the diet included cassava, bananas and sweet potatoes. The "northern Nyika" probably refer principally to the Giriam although it might include the five small tribes: Chonyi, Jibana, Kambe, Kauma and Ribe. Barrett (1911) reported that the Giriana drink both fresh and sour cow's milk but preferred to drink beer made from the coconut palm or honey or made from a combination of sugarcane, and eleusine (millet), sorghum or maize. Barrett also reported that the meat of an oxen or goat was occasionally eaten and the blood was collected and cooked with the meat.

Griffiths (1935) reported that the Duruma cooked twice a day and their major food was maize or millet "ugali" with a stew or cooked leaves, beans, fish and/or milk. Prins (1952, 1961) quotes Bauman (1891) as reporting that the Digo ate cassava flour "ugali" and when it was obtainable they ate dried fish with it.

It is difficult to make any comments on dietary change among the Mijikenda people on the basis of the information that is available. Apparently rice has become a more important staple of the diet than

it used to be, at least among this group of wage-earning Africans; however, the foods listed as popular by the different observers at various periods in their history from the 1890's are still of major importance today.

Callahan (1926 - 1927) reported on the foodstuffs of the Luo people. He observed that "ugali" eaten with meat, native vegetables, buttermilk, blood, fish, chickens, or eggs were the staple foods. Wimbi was eaten in a similar way. "Nyoyo," sweet potatoes, beer, wild birds, and "uji" were also eaten. "Uji" was made with maize and wimbi flour mixed with water or buttermilk to which cow's urine had been added. Our informants told us that cow's urine is no longer used and the practice of eating blood is dying out. Callahan does not mention the Luo eating plantains or bananas or any other fruits which they do eat today. Cassava is also used today and is not mentioned in 1926 - 1927. In this earlier period women were not permitted to eat sheep, elephant, rhinoceros and hippopotamus. Only one of the thirty Luo informants we interviewed would refuse to eat wild animals; the informant was a woman.

Discussion

Food Habits and High Protein Products:

The results of the food habit study showed that although there are some similarities in the basic foods eaten throughout Kenya, the differences are great between the tribes in the foods consumed. On a nationwide basis, the foods eaten in the largest quantities most often by most of the people include "uji," tea with sugar and milk, "ugali" with an accompanying stew, mixtures of maize and beans, and green leaves. These may be classed as Kenya's "core" foods. "Secondary" foods include roots and tubers, plantains, bananas and perhaps coffee. "Peripheral" foods are: chapatties, soda, milo, ovaltine, cocoa, fruits such as oranges, pawpaw and mangoes, and vegetables such as carrots, pumpkins, green peas and marrows. In attempting to make generalizations for the whole country, we encounter difficulties for there are tribal variations of major importance. For example, rice would be classed as a "core" food for the Mijikenda people, a "secondary" food for the Kikuyu tribe and "peripheral" for the others. A similar problem exists with bread; in the group of wage earning Africans studied here, bread is certainly a "secondary," if not a "core" food, but for the unsalaried Africans, it is rarely consumed and would be a "peripheral" food. When one breaks the classification of roots and tubers to its constituents, one finds cassava of considerably greater importance to the coastal and western people, and of less consequence to the people in the central part of the country. About food changes in Africa, Latham (1965) points out that "maize, cassava, potatoes, and some other now important African foods originated outside the continent. A few hundred years ago none of

these foods was being eaten . . ." He sees a tendency in Africa as far as staple foods are concerned to change from: (1) yams, millet, sorghum, to (2) cassava or maize to (3) rice to (4) bread and wheat products. This does appear to be the overall trend in Kenya. In taste test panels and from other impressions, however, maize and sorghum are still much better liked by most of the people than are rice or wheat products.

In the recipes which include maize and beans as their primary ingredients, each tribe takes great pride in its own additional ingredients and manner of preparation. Whether or not potatoes, plantains, and green leaves are included; whether or not the maize is whole or pounded; and whether or not the whole mixture is mashed characterize the food to a particular tribal group. There seem to be strong feelings concerning the distinctness and individuality of the final product.

This large amount of variability in foods eaten in different parts of Kenya presents some difficulties in the search for a vehicle for a high protein product(s). If we hope to make a dramatic impact on the nutritional condition of the people, we need to select a food that most of the people eat regularly. For practical reasons it needs to be a food that is eaten in fair quantity in contrast to seasonings, which cannot be supplemented with adequate quantities of protein to make a worthwhile contribution. This means choosing one of the "core" foods, knowing that any change in the product may result in its rejection. Alternatively, one can choose a "secondary" or "peripheral" food and

anticipate less difficulty with its acceptance at the same time that one anticipates making a less meaningful impact on the nutritional status. Or one may attempt to introduce an unfamiliar product and with adequate education and promotion convince the people of its worth. Lastly, one may decide to attempt to persuade the people to use somewhat more of some of the foods they are already eating to balance their dietary intakes more adequately.

A protein-enriched flour for making "uji" and "ugali," protein-enriched products to add to the stews and to the maize-beans dishes; if economically feasible and if acceptable to the people; seem positive avenues to pursue. In addition, good infant weaning products are also necessary.

Unga Ltd. makes a product called Simba which is maize flour with 15% dry milk solids added. This product is eminently suitable for making "uji," can be used for making "ugali," from all indications is liked by the Africans. However, it is not selling in adequate quantities to make as much of an impact on the nutritional status as it might. This is probably because it must sell at a higher price than "posho," because of the cost of fortification. The smallest package is a 5 pound bag. Further, a great many Africans raise their own maize to use for "ugali" and "uji."

Supro is a product which can be used as "uji" or as an additive to stews or maize bean mixtures. It was started on a commercial basis with equal financing from Oxfam, Supro Laboratories Ltd. and Afcot, Ltd. (a local commercial company). The product contains 50% maize flour, 25% imported Torula yeast, 17.5% skim milk powder, and 7.5% salt, condiments, etc. The recommended intake of 14 grams per day provides 46 calories and 3.0 grams of protein and costs 10 cents (Kenya currency) when pur-

chased in quantity. An "uji" made with 45% maize flour, 5% millet flour, 25% sugar and 25% dry skim milk provided 130 calories, 4.2 grams of protein and costs 5¢ per serving at retail prices.

(Figures based on skim milk powder purchased at retail which cost 2.50 shillings per lb.). In 1966 the costs of Supro and dry skim milk were compared on a wholesale basis. Supro cost 1.28 Kenya shillings per pound while skim milk powder available in Kenya was offered to the Catholic Relief Services at 1.00 Kenya shilling per lb. The comparison of the protein contents of the two products showed that skim milk powder was 35% protein of good quality - Supro was 25% protein. The WHO Kenya group did some preliminary testing from a nutrition point of view on Supro. They tested a product which contained barley flour instead of maize flour. They acknowledged difficulty in acquiring appropriate rat strains for the testing. The WHO Team also did some tests in kwashiorkor recovery and child growth. All results are inconclusive, tentative and preliminary. At present they are testing the maize containing product via school lunch feeding.

Nestlé is well established in East Africa and they probably provide 75% of all the milk-based infant and children's products commercially distributed. The two products they make which are most popular in Kenya are Nestum and Lactogen. They are priced at 4.95 shillings per 8 oz. package and 6.20 shillings per 1 lb. tin respectively (U.S. \$0.70 and 0.87). Nestum is 30% protein; Lactogen

is 22% protein. Farex (Glaxo-Allenburys East Africa Ltd.) is an infant cereal blend with milk protein. It is made in Kenya and is popular. It is 14% protein and a 10 oz. package retails at 2.90 shillings (U.S. \$0.41).

Research is underway to investigate the feasibility of cropping some of Kenya's wild game for meat consumption and for their skins. Preliminary results indicate that some game animals produce more protein per acre grazed than do most domestic animals. They are often more disease resistant and require less water than domestic animals. In conditions which are not ideal for domestic stock, wild-life sometimes does quite well. Before wild game becomes a source of protein of major importance, a number of problems must be resolved. The on-going research may provide many of the necessary answers.

By way of summary, to date the experiences of attempting to introduce high protein products in Kenya all seem to be complicated by the extra cost involved in fortifying basic staples with added protein.

Food Habits in Pregnancy and Lactation:

A pregnant African lady fears that her baby may grow too big and her delivery be difficult. That this fear is based on reality due to the female circumcision tradition in many Kenya tribes has been mentioned. The pregnant Kenya lady's culture tells her she should avoid eating certain foods and should eat sparingly of all foods. These findings of our study confirm the work of Ojiambo (1957a, 1968b) in a remote section of Western Kenya, as well as those of Trant (1954), Lema (1936) and Rwegelera (1963) in areas bordering Kenya. From the information available,

it appears that many of the tribes throughout all of East Africa may share the fear of producing too large a baby and share the existence of prenatal food taboos. It is our impression that these taboos are deeply rooted and generally observed. In places where nutrition education has been attempted, it appears to have had negligible impact or failed altogether. As important as good prenatal nutrition is to the health of both the infant and mother, as long as these prenatal food taboos are held by many African women, prenatal nutritional education programs may be expected to have little effect. Our information shows that the tradition of circumcizing girls is beginning to die. If the assumption that the fear of a difficult delivery is associated in the people's minds with the customs of female circumcision - and we have no basis for making this assumption - then when the majority of Kenya's women are not circumcized, it may be possible to launch an effective prenatal nutrition education program. It is clear that any prenatal nutrition program should focus on producing a better healthier baby at birth and not on producing a bigger baby.

Pica and cravings were very common in pregnant African Kenya women. Whether these are related to an instinctive attempt to correct dietary deficiencies or to behavioral or cultural factors or to some combination of these is not known. In regards to pica, phosphorus-deficient cattle have been reported to have osteophagia which responds to dietary phosphorus supplementation and can be caused by dietary phosphorus deprivation (Cooper, 1957). Foster (1927), who worked in Kenya, drew the analogy of pica among animals to humans: he suggested tentatively that the underlying factor in human pica lay in dietary deficiencies of the inorganic constituents.

A quotation from Lowenberg et al. (1968, pp. 87) seems especially applicable to prenatal nutrition in Kenya today. "Those food habits and customs which have become meaningful to the group are carefully held and not quickly changed. It follows, therefore, that anyone who would change a food habit must first understand the deep meanings of the particular habit to the people. Those food habits which do not have deep meanings may be changed rather easily."

Having been deprived of food throughout pregnancy, the newly delivered woman is provided with generous quantities of food. Nutritionally, the quality of the foods seems superior. Here is an example of a traditional practice that is excellent and should be encouraged.

Infant Feed Habits:

Among our study group of middle-income, educated Africans, the information they gave us on the time at which they introduced mixed feedings, and the choices of items they used, showed that they have had very little education on appropriate infant feeding. There does seem to be a belief that an infant has a delicate digestive system and one must be careful how much and what kinds of foods are given a baby. These do not appear to be deeply-rooted or strongly held beliefs. Indeed, since a small percentage of people are changing their infant feeding practices, this provides some sound evidence to show that others might also be induced to alter infant feeding practices. In contrast

to what Masesa (1968) found in Tanzania, our study shows that there is a concept of special foods for infants. The particular foods may not be nutritionally the best possible choices, but the concept does exist.

Our study showed that the babies were breast fed for an average of eleven months; the WHO study of rural, low-income Africans showed that these babies were breast fed for an average of fifteen months. This is an expected difference on the basis of the differences in the two study samples. However, it might also be a temporal difference. The WHO data were collected from 1962-1966, while our data was collected in the winter of 1968-1969. It is well-documented that there is a shortening of the duration of breast feeding in the developing nations: this is one of the developed nations poorer habits that the people of the developing nations seem to be adopting rather quickly.

The WHO study showed that the average age at which semi-solid foods were introduced was five months with a range of from slightly after birth to 24 months. The study showed that 56% of the mothers introduced a purely carbohydrate food first, usually bananas, potatoes, or "uji" without milk. Thirty-six per cent introduced a carbohydrate food mixed with an animal or vegetable protein, most often one of the three foods just mentioned with milk. The other 8% of the mothers first introduced Farex, Nestum, or tinned baby foods. Thirty-seven percent of the mothers did not introduce any semi-solid food until after the sixth month in the WHO sample studied. Our study supports these findings in general, with two rather important differences. Fifty percent of the sample we studied waited until the sixth month to introduce semi-solid food, but the items introduced almost always were diluted with milk.

Our results and the WHO results differ from Ebrahim's (1968)

results in Tanzania. He observed that a thin "uji" was usually introduced after the age of 6 months. The "uji" used in Kenya for babies is not thin and when it is supplemented with milk it is especially suitable for infants.

Our study supports Jelliffe (1966b), who concluded, "The principal need in combatting protein-calorie malnutrition in much of Africa is often the problem of achieving minor-seeming modifications of patterns of child feeding."

Sixty-five percent of the subjects we studied correctly identified the accepted cause and cure for kwashiorkor: 46% of the subjects of the WHO study connected the cause of kwashiorkor with the diet. Namboze (1967) found that 66% of the Baganda subjects he studied in Uganda correctly identified the cause and cure of kwashiorkor. The subjects we studied were probably better educated than the subjects of the WHO study. Furthermore, many of our subjects were working in government positions where they would have had in-service training about kwashiorkor. Namboze's subjects were drawn from women attending clinics in Kampala. The Luo and Abaluhya tribes were the groups most likely to subscribe to the beliefs that kwashiorkor was related to some unnatural phenomenon.

Preferred Foods:

It is not clear just what significance should be attached to the findings that the usually eaten foods are the foods people would like to have more often or in larger quantities; that these same foods are the favorite foods and with the addition of chicken, meat or a slaughtered animal they are the foods used to serve a respected guest or at ceremonies.

The repetitiveness of the typical African's diets is obvious from the results presented. This is succinctly shown in the report of the diet of the Kipsigis people of Kenya (WHO, 1962). During a one week study of 20 families, 140 people, only ten different foods were recorded as having been used, the average number eaten by one family during the week was seven, and four foods provided most of the nutritive value. The Coastal people were the only group studied to exhibit variety in food and food preparation techniques. Lee (1957) wrote, "We have societies, however, where what is valued is sameness; where monotony is good and sought." Niehoff (1969) said "Tradition keeps groups from falling into . . . a patternless state, and thus does serve a definite positive function."

This section of the report contains a very brief and superficial review of the principal activities in Kenya involving nutrition research and/or nutrition education programs.

Nutrition Research:

Dr. H. Foy and Dr. A. Kondi have devoted many years to research, much of it in Kenya. As hematologists a good deal of their work has been focused on specific problems within this specialization. Their work on iron-deficiency anemia, iron losses in sweat among dock workers at Mombasa, and their work on riboflavin and folic acid deficiencies are of special interest to nutritionists. Their work on riboflavin deficiency is continuing: their major support is by the Wellcome Research Foundation. The questions of aflatoxin, especially in groundnuts in Kenya, is being investigated in these laboratories.

Dr. A. Wiersinga, Dutch Medical Research Institute is continuing research which has already been reported. She is also working on megaloblastic anemias. The biochemist with the WHO Team is continuing his investigation of some of the biochemical methods of measuring nutritional status.

Occasional specialists visit Kenya to do a specific piece of research, usually because of unique characteristics of some of the populations in Kenya. Dr. George V. Mann has studied cardiovascular disease among the Masai because their natural diets include high cholesterol intakes and their natural way of life includes a high level of exercise. Several research workers have been studying the skeletal changes of a very remote tribe who have exceedingly high fluoride intakes. Dr. S. B. Levy has recently studied tribal

hemoglobin differences in Kenya. Kenya medical officers and pediatricians do occasional pieces of research related to nutrition.

The University of Nairobi has had a diploma course in domestic science for a number of years. In 1968 a degree course in home economics was instituted. In the course of strengthening the program, there is keen interest in initiating nutrition research. The new Medical School at the University may also be interested in nutrition research. Anthropological research at the University is an area where food habit studies may be included in the ethnological studies underway. This is also true of the research on the history of specific tribes.

Nutrition Education Programs:

There are thirty-six Farmer's Training Centers in Kenya and a few are under construction or being planned. Nearly all of these centers have one or two home economists on their teaching faculties. These women present information on nutrition, child care and other home economics subjects to the Africans who attend these centers for one to several weeks of general or specialized training in agriculture. There are approximately 200 home economists stationed at district agricultural offices who work directly with the people. These programs were greatly expanded and many were initiated by a very excellent USAID program. There are two well qualified home economists in the national Ministry of Agriculture offices who administer these programs, arrange for in-service training, and program materials.

The community development workers started programs in domestic science, health and agriculture for the wives of Africans who returned from military service after World War II. The community

development assistants working in the field receive six to twelve months of training: a portion includes information about nutrition, home economics, health and agriculture. The total number of community development assistants in the country is about 450. Their programs include the operation of nursery schools, youth groups, women's clubs (Mandoleo ya Wanawake), as well as other types of social work. There is a dynamic woman responsible for home economics at the national level.

In June 1969 the Ministry of Health had forty field nutrition workers employed. Most of these women had been nurses or midwives and received six months of special nutrition training. They are usually located at hospitals and have been especially active in out-patient department prenatal clinics and child health conferences. Plans are underway for them to become responsible for the free food distribution now being done by both the Catholic Relief Society and the Ministry of Health. There are two African nutritionists: both are graduates of the University of Nairobi's home economics diploma course and the London-Ibadan training program.

The Catholic Relief Society carries on a nutrition education program combined with a food distribution program for infants and children six months to five years old. In October 1968, they were distributing food to 56,000 infants and children through 56 hospitals, clinics or dispensaries. The plans anticipated providing supplementary food for 325,000 infants and children through 300 centers in one or two years. The Catholic Relief Society employs six African women who are especially involved in the nutrition education aspects of the program, although they also do some administrative work. The Catholic Relief Society has insisted, as a part of the contract, that the center distributing

food must undertake a nutrition education program for the mothers at the time the food is issued each month. Any child in the appropriate age group may participate if the mother brings the child to the clinic each month. All children are weighed and the mothers keep the weight charts. In three years time, the Catholic Relief Society plans a progressive two-year withdrawal of their responsibilities for the administration of this program. They hope to turn it over to the Kenya Government. The Ministry of Health's field nutritionist may receive this responsibility.

Food is also distributed to infants and children showing clinical signs of kwashiorkor through the Ministry of Health.

In April 1969, there were 23,000 school children participating in school feeding schemes; the previous year 4,332 children participated. Oxfam, a voluntary society, has helped with some of the financing necessary in initiating a school lunch feeding program. The Catholic Relief Society, County Councils, Ministry of Health, World Health Organization, and Ministry of Education have all participated in establishing school feeding in various parts of the country. Parents do pay for the lunches, charges have been 9 shillings per term (27 shillings per year), which figures to 15 Kenya cents (U.S. \$0.02) per day.

There is a Freedom from Hunger Committee in Kenya. The Red Cross has conducted nutrition education programs in the past. The Ministry of Education is involved in some nutrition education activities in their teacher training colleges. There are eighteen home economics training centers in Kenya which gives three to six

months training. These are financed by County Councils. From time to time, Kenya Cooperative Creameries have employed one or two dairy council nutritionists. Unga Ltd.'s home economists have already been mentioned. East African Power and Lighting also conducts programs from time to time, usually on food preparation. There are other isolated programs of various sorts, often under the leadership and sponsorship of interested volunteers. Kenya newspapers often carry articles on programs and problems about nutrition in Kenya.

Nearly all of the field workers who have received training in nutrition have been trained by the method developed by Margaret A. Powers. Mrs. Powers wrote two books, a Teachers Handbook and a Students Handbook called "Feeding the Family." There are also pictures of foods suitable for flannel graph illustrations. These books have had very widespread use in Kenya. The supplies were exhausted in September 1968 and new funding was sought for publishing copies so desperately needed. As of June 1969, funds had been located, but the books were not yet available.

MARKET RESEARCH INVESTIGATIONS AS TO ECONOMIC FEASIBILITY
OF SELLING FORMULATED PROTEIN FOOD PRODUCTS IN KENYA

Introduction

The marketing research investigations conducted within Kenya for the purpose of assaying the economic feasibility of selling formulated protein food product(s) were conducted along several broad categories as follows:

1. Retailing practices
2. Present advertising and promotional practices
3. Radio and television coverage
4. Distribution, handling and storage facilities
5. Food products of significant volume
6. Purchasing habits and practices
7. Marketing of formulated protein food products.

During the investigations the four major market areas in Kenya (Nairobi, Mombasa, Nakuru and Kisumu) and thirty-two other individual market points were visited.

Retailing Practices

Retail stores in Kenya presently catering to the general public are largely owned, operated and controlled by Asians. The general run of retailers, especially the smaller stores, are supplied by wholesalers who again are almost 100% Asian. The larger retail outlets buy in many instances direct from the manufacturer's agent or broker and sometimes operate both as a retailer and a wholesaler. This is particularly true in smaller towns where no established wholesaler exists and the retailer is adequately financed.

The supermarket type of store, self service, in Kenya is usually limited to the larger cities. Even these are small in size by comparative standards, and are usually crowded for space. Some of them attempt to solve their space problem by using the floor to ceiling shelf approach, which results in a dual type of market operation. Most of the retail stores, however, are still service type stores with clerks serving the customer.

In the smaller towns practically all of the retail outlets are general line stores carrying a variety of merchandise ranging from food-stuffs, hardware, soft goods, paint, toys, clothing, etc.

African stores, "dukas", are generally extremely small. In the urban markets they are usually located in shopping squares with competitive stores immediately adjacent to one another. All stores seem to carry similar items and price on the same basis as their competitors. Kerosene, cooking oils, beer, soap, packaged maize of various types, jams, tea, soft drinks, some tomato paste, catsup, butter, ghee, bread and salt are the standard items. The big volume item is maize flour, both packaged and in bulk, and is available in quantity in all stores. Most stores also have various varieties of beans, peas and dried cereal items available in bulk. African "dukas" all carry ample supplies of soft drinks such as Coca-Cola, Fanta, Pepsi Cola, and other flavored soft drinks, most of which are consumed on the premises to avoid bottle deposit. Cigarettes are also stocked in fair quantity.

These stores are usually supplied in small quantities by the wholesaler at more or less regular intervals. In some instances driver salesman's vans representing agents for manufacturers make routine calls and sell direct from the van, generally on a cash basis. Some manufacturers' trucks make similar direct contact on regularly established routes featuring mainly tobacco and beer.

In the rural areas the same pattern exists except that the African "duka" is usually located in a village shopping area and draws its trade from considerable distances, mostly from people living in isolated areas not served by roads. These stores again are supplied in the manner mentioned above.

Practically all stores, large or small, as well as the African "duka", have one thing in common. With very few exceptions they stock baby foods of some description. Farex, Lactogen, Nestum and Cerelac appeared to be the most popular, with a scattering of other brands in many of the stores. These are priced ranging from 6/50 East Africa shillings (91¢ U.S.) per lb. for Lactogen, 4/95 (69¢ U.S.) for Nestum 10 oz. can to 3/75 (52½¢ U.S.) for Cerelac 10 oz. can. These are in various formulas and packed in tins. Farex packed by Glaxo-Allenburys (East Africa) Ltd. is priced at 2/90 (40¢ U.S.) for 10 oz. cellophane wrapped packed in Kenya.

Wholesalers, as mentioned, are almost entirely Asian. They generally cater to the smaller stores, both Asian and African, who are not in a position to buy direct from the agents. Most wholesalers maintain a display room where local retailers select their requirements. The items they carry represent a wide variety of merchandise, food (canned and dried), textiles, tinware, clothing, drug supplies, etc. A good percentage of business is done by phone or mail. Most wholesalers circulate price lists at irregular intervals. Many import certain items directly; others import particular lines through an agent. Very few wholesalers operate their own trucks for delivery. Most wholesalers operate on cash or very limited credit terms to established customers.

Agents sell direct to wholesalers and in some instances the larger retailers. Established credit terms apply to such buyers. The agent's

function usually includes warehousing normal supplies at depots for distribution to various points, delivering to customers and assuming credit risks.

Open air markets predominate throughout Kenya. They are located in all sections both urban and rural. The people patronizing open markets in the rural towns come from vast distances carrying their products such as bananas, maize, charcoal, sugar cane, potatoes and carrots by various means. The greater portion is moved by women; fantastic head loads and backloads are carried by the individual. Other means of transport used are bicycle, oxcart, wheel cart, donkey cart, motor car, lorry and bus. Market days in the rural area are held two or three times a week. In urban districts, open air markets are open daily. These products are sold as well as made available for barter purposes. Market days, especially in the rural areas, are also an occasion for social participation and are extremely well attended.

Present Advertising and Promotional Practices

The usual established advertising media facilities are available in Kenya such as newspapers and other publications covering trade, technical and professional areas. Radio and limited television are available to the public.

Newspapers and Periodicals

Newspapers - The following English language newspapers are published in Kenya.

- Dailies
1. Daily Nation - Widely read by Europeans, Asians and Africans
 2. East African Standard - Multiracial paper read mostly by upper income groups

- Weeklies
1. East African Standard (Friday Edition - widely read by all groups)
 2. Sunday Nation - Highest circulated Sunday paper - read by upper income groups
 3. Sunday Post - Read by all races
 4. Kenya Weekly News - Published for the Kenya farming community
- Fortnightly
1. Reporter - News magazine read by higher income groups

Following are the principal vernacular newspapers:

- Dailies
1. Taifa Leo (Swahili) - Read by Africans of all walks of life
- Weeklies
1. Baraza (Swahili) - Best coverage of African market
 2. Taifa (Swahili) - Saturday Edition - Read by Africans of all walks of life
 3. Santi ya Mwafrica - Circulated mostly to women's club members (Mandoleo ya Wanawake)
 4. Africa Samachar - Best coverage of E.A. Gujerati (Asian) Market
 5. Nyanza Times (Luo) - Coverage - Luo language people.

A wide variety of trade and technical journals is also published, most of them monthly. A number of publications are also distributed regularly by the Ministry of Information and Broadcasting, covering such areas as farming, teaching, and items of general interest.

Radio and Television

Radio broadcasting and television are operated under the control of the Kenya government through the Ministry of Information and Broadcasting. This is known as the Voice of Kenya (V.O.K.). Radio programs for the whole country are centralized in Nairobi with regional stations maintained at Kisumu

and Mombasa. Two services are provided -- the General Service in English and the National Service in Swahili and Hindustani. Programs also go on the air in 16 vernacular languages.

With the advent of the low cost Japanese produced transistor radio which has become a status symbol to the African, increasingly large numbers have been exposed to this medium. Net imports of radios as of November 1967 amounted to 594,000 sets. Approximately 70,000 licenses are issued each year. This does not tell the story as a great percentage of radios used are reportedly operated without license application having been made. Reportedly radio listeners total over 3,500,000 people.

Television, launched late in 1962, is steadily rising in favor with licenses recorded increasing constantly. Since 1966, when approximately 10,000 licenses were recorded, that figure has grown to 15,600 sets based on the latest report. Present transmission does not cover all areas in Kenya. However, future plans include extending the service to the coast by establishing a station at Mombasa. A permanent transmitter has already been installed to serve Western Kenya. Broadcasts are made in both English and Swahili. Television exposure hours are limited from 5:30 P.M. to about 10:30 P.M. -- two nights a week to 11:30 P.M.

Both sound and television by Voice of Kenya incorporate commercial programs, and advertising is reported to be increasing steadily.

Prevailing rates applicable on both radio and television appear reasonable and vernacular services can be arranged to fit the need.

Future trends indicate a growing use of both radio and television services for advertising and promotional approaches, especially as the coverage is extended. This would particularly apply to television as currently it is estimated that only about 75,000 to 80,000 people are exposed to the television broadcasts. With increased service and the audio-visual approach

possible, greater possibilities exist for advertising and promoting through this medium. The use of radio as an advertising means is bound to increase as the economy develops and more people are able to purchase sets. The visual approach, however, is missing in radio and, in semi-literate areas, audio-visual presentation is a big factor in putting over any educational or promotional idea.

Other Media

In addition to the above-mentioned common means of advertising, the Mobile Cinema is available for use in all areas of Kenya. This service, operating on trucks, displays films at the various smaller outlying communities. Clients are able, during the showing of the film, to insert their particular advertising plugs visually to their audiences, which in most instances would never see it over television or hear it by means of radio. This particular service offers possibilities to reach the mass population not covered through ordinary media. This approach could be a method used in the introduction of a high protein item with the proper production.

Cinema slides can also be arranged through established cinema outlets. These would be effective in some areas with the African trade but the coverage would necessarily be limited.

Distribution, Handling and Storage Facilities

The distribution facilities in Kenya are located in the four major cities -- Nairobi, Mombasa, Nakuru and Kisumu -- as far as the food industry is concerned.

Agents representing various major concerns have established depots in these points with adequate warehouse and storage facilities. Cold storage is available at all these distribution points.

Merchandise assembled at these depots is filtered out to the smaller markets by various means -- rail, trucks, buses, salesman/driver vans, and by wholesalers or larger retailers using their own conveyances.

Rail is used whenever possible due to the existing rate structure which is considerably under truck competition. There are approximately 1270 route miles of railway operated by the East African Railways and Harbors in Kenya. Rail service in Kenya is not without delays and inconveniences. This condition is especially prevalent during the wet weather season.

Trucks are probably the most used means of transport, regardless of rates, on account of the time element involved. Kenya has about 26,000 miles of public road, the majority of which are not tarmac. Road development is going on consistently, however, in support of the development programs for agriculture, settlement and tourism, and truck transport is profiting accordingly. Road transport is largely in the hands of private enterprise but this is controlled by a licensing system under the Road Transport Licensing Board.

Heavy long distance transport is undertaken by three types of haulers. First, there are companies that have their own transport fleets to convey their own goods. Second, there are a large number of smaller enterprises with a few trucks either hauling their own goods or undertaking local or long distance contracting. Finally, there are the big transport operators.

The largest transport operators are:

- | | |
|--|-----------------------------------|
| 1. Express Transport Co., Ltd.) |) Both have warehousing interests |
| 2. Peck-Barber, Ltd.) | |
| 3. Kenatco Transport Co., Ltd.) | |
| 4. Bulwark Transport East Africa Ltd.) | |

Kenatco is concentrating on railroad links in collaboration with East African Railways & Harbors. The government has some investment in this enterprise.

Buses - Smaller shipments of various types of merchandise are often made by bus, especially to the smaller outlying areas. There are an abnormally large number of privately owned buses in operation in Kenya. The top of the bus is used to transport every conceivable type of merchandise -- produce, charcoal, bicycles, furniture, store supplies, and a host of other materials required in every day living.

Taxis - There are also a number of individual taxis operating between the smaller local markets. These operators carry not only passengers but also deliver smaller items of merchandise to local retailers as fill-in supplies.

Driver/Salesman Vans - Many agents and some manufacturers operate this type of vehicle over regularly established routes. This form of distribution caters largely to the smaller stores and especially African "dukas" which are widely scattered. They are usually panel type trucks designed to carry the lighter weight quick turnover items such as pharmaceuticals, tobacco and cigarettes. The salesman thus has the opportunity of keeping the smaller buyer in supply and at the same time taking orders for larger shipments to be forwarded by commercial means. Practically all of this business is done on a cash basis.

Storage facilities at all depot points are readily available, both standard accommodations and cold storage. Warehouses are usually provided for by the individual manufacturer's agents, or commercial facilities can be obtained without difficulty. Some of the larger transporters have their own warehouses to accommodate their regular clientele.

In addition to the above methods of distribution, a great deal of merchandise is moved individually by bicycle, pushcarts, oxcarts, donkey carts, wheelbarrow, head and back loads, especially to isolated "dukas". In the larger towns it is not uncommon to move quantities of various types of merchandise from the godowns (warehouses) to the individual shopkeeper by pushcart.

Food Products of Significant Volume

The maize and wheat crops from 1967 plantings were approximately 3.2 and 2.6 million bags respectively, well above domestic requirements. These figures refer to that proportion of the crop sold to the Maize and Produce Board. A much larger quantity is retained by the small farmers for self consumption.

Every year about one million small scale farmers in Kenya grow maize worth nearly 25,000,000 Pounds (roughly \$70,000,000 U.S.), of which they barter or eat 95%. (One Kenya Pound equals \$2.80 U.S. currency.) The remainder goes to market, together with an equivalent amount grown on the large scale farms. Thus, in a typical year, only about one tenth of all maize produced in Kenya goes to the Maize or Produce Board.

The production of maize is, therefore, controlled by thousands of small farmers who market their crop, and by a few hundred large scale farmers.

Up to 1965, the Maize Marketing Board has statutory powers to buy the entire marketed maize crop. It acted through agents; in the former African areas there were Produce Boards, and in the Rift Valley the agent was the settler's own cooperative, the Kenya Farmers Association (Cooperative) Ltd.

In 1966 a reorganized Maize and Produce Board was established in place of the Maize Marketing Board and the former Produce Boards. It has statutory powers to purchase, store, distribute and sell maize and other produce. The Board is designed as a meeting place where producers and processors can meet with government representatives to iron out policy with regard to the nation's basic foods.

Gross farm revenue from marketed production as reported in the Economic Survey of June 1968 shows a decided uptrend in favor of the small farm sector. Small holders increased their incomes in 1967 by 6% whereas total cash incomes for the overall farm sector declined by a fraction of one percent.

Kenya's wheat crop in 1967 was sold for slightly over 4,000,000 Pounds (roughly \$11,000,000 U.S.). Based on a report from the Kenya Wheat Board, 1965/67, Africans accounted for 25% of the acreage under wheat in 1966. Plans are under way to increase the wheat areas in Masai districts where 27,800 acres were planted in 1967, most of which was undertaken by private enterprise sharecropping contractors, with the Agriculture Development Corporation and a Government Machinery Unit controlling about 9,000 acres. In June 1968 the Minister for Agriculture created a Wheat Development Board to promote these projects.

The responsibilities of the Board are to control the movement, storage and marketing of wheat. Under the Wheat Act all wheat must be delivered to the Board's agents (Kenya Farmers Association (Cooperative) Ltd.) for marketing in Kenya and the East Africa Community. The price of wheat is fixed annually by the Minister.

Kenya's meat industry in 1967 brought in a gross revenue to farmers amounting to 10,829,000 Pounds (over \$30,000,000 U.S. annually). Large ranges employing over 50 received about 25% of this figure and small farms the balance. Three quarters of Kenya's beef production never finds its way to market, but is locally consumed. Half of the remainder comes from the commercial ranches, and the other half from pastoral areas.

In 1967 Kenya's dairy products were worth about 7,731,000 Pounds (almost \$22,000,000 U.S.) to the farmers. The total marketed milk was over 45 million gallons. Kenya Cooperative Creameries, Ltd., a cooperative society owned by the producers, handles 93% of dairy product sales in Kenya. In 1967 it had 1,509 supplying members of which about 600 were individual African farmers and 198 African cooperatives. African dairy farmers for the year ending February 28, 1967 received more than half the pay out of 4,400,000 Pounds dairy product value. Considerable portion of the dairy products produced in Kenya are exported to Uganda and Tanzania.

In addition to the above, dried pulses (seeds of beans, peas and ground nuts) and rice are in evidence but do not make up the volume of the above-named products.

Further details on foods and usages have already been elaborated on pages 66 and 116.

Purchasing Habits and Practices

Three factors have a predominating influence on purchasing habits and practices involved in Kenya. These may be listed as population, population make-up, and earnings.

By the latest estimate June 30, 1967, there were 9,948,000 inhabitants, with by far the majority of the population (97.2%) of African origin:

TABLE 73
KENYA POPULATION

African and Somali	9,671,000	97.2%
Asian	192,000	1.9%
European	42,000	0.4%
Arab	39,000	0.4%
Other	4,000	0.1%

The majority of the African population lives in rural areas and approximately 40 tribal groups make up the population. At the time of the last census in 1962, 92.2% of the population lived outside urban areas. In 1966 it was estimated there were one million small farm holdings. The majority of the owners were subsistence crop farmers with or without some cash crops. The non-African population is mainly in towns and cities, with more than 90% of the Asians residing in places of more than 5,000 inhabitants. More than 60% of the Europeans live in populated places of more than 5,000 as do about 75% of the persons classified as Arabs.

Total wage employment as reported in the Economic Survey of June 1968 is approximately 600,000. Employment by major sector in 1967 is shown in Table 74.

TABLE 74
EMPLOYMENT BY SECTOR

Agriculture and Forestry	- 196,900
Private Industry and Commerce	- 202,500
Public Sector	- <u>198,000</u>
	597,400

These figures do not include the self-employed farmer who is getting on a cash crop basis in many instances. Based on 1967 estimates, the total wage employment was close to 1,000,000 people, of which 93% were Africans and about 30% of these representing rural small holdings outside of settlement schemes.

The estimated total wage employment in 1967 was:

1. Per above	597,400
2. Addition for domestic servants, etc.	33,900
3. Rural non-agricultural	60,600
4. Small holdings outside settlement schemes	<u>284,700</u>
	976,000

Of the 976,600, 922,500 are estimated as African.

Average yearly earnings per employee in 1967 were reported as follows in Table 75.

TABLE 75
AVERAGE YEARLY EARNINGS PER EMPLOYEE

<u>The Private Sector</u>	<u>Kenya Pounds</u>	<u>U. S.</u>
Agriculture and Forestry	66.50	\$ 186.20
Mining and Quarrying	291.7	816.76
Manufacturing and Repairs	296.0	828.80
Building and Construction	141.2	395.36
Electricity and Water	368.9	1,032.92
Commerce	495.4	1,387.12
Transport and Communications	334.9	937.72
Other Services	228.2	638.96
Public Service	308.6	864.08

From the above, it is apparent that purchasing habits cover a full spectrum. There is supermarket shopping in the major cities where

sufficient food would be purchased for the home for a period of time, filling in with a few essentials, until the next volume of purchase took place. Contrastingly, the same supermarket would be servicing hand-to-mouth buying where only the essential immediate needs of the moment or of the day would be purchased. Purchases from the "dukas" and open-air markets would generally follow the latter pattern and barter exchange might take place at either, generally involving the subsistence farmers. The "dukas" and open markets would be the source of food purchases by the greater percentage of the population.

Marketing as Related to the Introduction of Protein Formulated Products

The evaluation of the concept of the economic feasibility of the production and selling of protein fortified food product(s) covers several facets directly or indirectly related to marketing. Reduced to its simplest terms, the question is whether sufficient volume of product(s) can be sold at a price so that the expected returns will be such as to pay for the capital, production, advertising and promotion expenditures and return a profit as normally expected within the food processing industry, or at the minimum, provide a no loss operation.

Under the concept of the study, prototype products were formulated based on those material sources indigenous to Kenya (with soya from Uganda), and of food grade quality which could be used in food formulation. Materials available for use in formulations were maize, wheat and rice products, dehydrated vegetables with spray dried skim milk and soya flour as protein additives using pertinent seasonings and flavorings. Preliminary taste testing evaluations in Kenya on such products as extruded chips, flavored drinks, gruels and dry soup mixes were somewhat less than encouraging. Manufacturing costs developed on the above indicated these items not

inexpensive as finished products and as compared to the basic staples in the Kenyan diet.

It is apparent from the number of people employed and the average earnings that the market for formulated or processed foods over-all in Kenya is small. The demand for protein formulated products is further complicated by the different eating habits between tribes and areas of the country which would mean no one formulated product could expect over-all general acceptance in all areas. To be considered also is the fact that a sizable portion of the population, because of their subsistence nature, are totally outside the potential market.

Means available for advertising and promoting the introduction of new formulated protein products have already been discussed. The expenditures in this respect are estimated as sizable for products of this concept in order that they might be brought to the attention of the buying public and in order that the nutrition education message in respect to the product might be made known. This is especially complicated with the many languages involved.

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APPENDIX I

RECIPES COMMONLY USED IN KENYA

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UGALI

Ugali is to many of the people of Kenya what rice is to the Chinese, or potatoes and bread to the Anglo-Saxons. Ugali is most commonly made from white Maize flour ("posho") cooked in only enough water to make a stiff bread-like porridge. It is cooked in a round aluminum kettle ("sufira") over direct heat. When it is done it is turned out onto a tray where it cools. The "ugali" may be cut into wedge shaped servings. It is usually eaten by breaking off pieces with the fingers, and dipping them into, or wrapping the "ugali" around, an accompanying stew. It is eaten both hot and cold. Salt is never included when preparing "ugali".

Probably every African who has a garden grows white maize. Traditionally, the maize flour was hand ground by the wife, who also raised and harvested the maize. Nowadays the maize usually is taken to a neighborhood miller where it is ground there for a small fee. Every African market has numerous women who sell whole maize and maize flour. A commercial firm, Unga Ltd., produces and markets three types of maize flour. One is the whole ground maize flour, very similar to the product described above. A second is a sifted maize flour which excludes most of the germ of the kernel and is higher in price. This is the type which is preferred by Africans when they think they have adequate funds. A third is sifted maize flour mixed with 15% dry skim milk.

"Ugali" means cooked maize flour, "posho" means the uncooked product in Kiswahili. Africans use these terms in this way although they almost always refer to the raw product as "Jagoo" which is one of the brand names for the sifted flour. A ration of 45 lbs. of "posho" per laborer per month used to be a routine portion of the wages (and still is provided by some employers). Thus the word "posho" has a connotation of colonialism; as one African told me, "Posho is an old slave term".

"Ugali" may be made with any flour. The people of Western Kenya and

the Meru are especially fond of Ugali made from millet flour. It is not unusual to see a woman kneeling and grinding millet flour, stone against stone. "Ugali" may also be made with cassava flour or with a combination of millet and cassava, millet and maize flours or millet, cassava and maize flours. When asked, "Can you make ugali from wheat flour?" the answer is "Yes". If the question is rephrased to, "Do you make ugali from wheat flour?" the answer is "No".

Whichever flour is used, the preparation process is the same although the cooking time varies. In all cases, there is a good deal of "ugali" stuck to the bottom and side of the "sufira". The children dig most of this off and eat it, rather like American children given a frosting dish.

UGALI (preferred by urban Africans)

Ingredients

Kenya /-

Water, boiling	5 qts.	
Maize flour, sifted type	4 lb. 13 oz.	<u>2.00</u>
	<u>Total</u>	<u>2.00</u>

Method

1. Add maize flour to boiling water, stirring and turning while cooking over hot flame for 12 minutes.

Yield

7 servings

size of portion - woman's = 1 lb. 5 oz.
man's = 1 lb. 14 oz.

cost per serving .286 Kenya,

cost per serving .04 U.S. \$

UGALI (using "Posho", ground maize flour, from the reserve)

<u>Ingredients</u>		<u>Kenya /-</u>
Water, boiling	5 qts.	
Posho	5 lb. 12 oz.	<u>1.44</u>
		<u>Total 1.44</u>

Method

1. Sift maize flour ("posho"). The siftings from 8 lbs. of maize flour weighed 1/2 oz. and were discarded.
2. Pour maize flour into boiling water. Stir and turn while it cooks for 8 minutes.
3. Cover and cook over low heat 15 - 20 minutes.

Yield

Serves 8 - 9 adults

Adult portions - woman's = 21 oz.
 - man's = 30 oz.

Cost per serving: .17 Kenya

Cost per serving: .024 U.S.\$

Cooked weight: 13 lb. 6 oz.

This is the type of "Ugali" the great majority of the people usually eat.

UGALI of millet flour (Baluyia and Luo Tribes of Western Kenya
and Meru of Central Province)

<u>Ingredients</u>		<u>Kenya /-</u>
Water	2 liters	
Millet flour	2 lb.	<u>1.00</u>
		<u>Total 1.00</u>

Method

1. Cook stirring and turning for 10 minutes.

Yield

Serves 4 people

Cost per serving .26 Kenya

Cooked weight 5 lbs.

UGALI of millet and cassava flours (Western Kenya)

This is a special occasion ugali of Western Kenya. The cassava is sun dried and pounded to a flour, the millet is either hand stone ground or taken to the mill for grinding. The two flours are combined: proportions depend on the relative availability of each flour, which depends on the amount grown in the shamba, or the quantity left in the storage. Most informants say that usually $\frac{3}{4}$ millet and $\frac{1}{4}$ cassava flour is used. I take this to be the desirable ration and that cassava is likely to be more available than millet and the proportions are sometimes half and half. Maize flour may also be a constituent. We purchased the maize and cassava flour all prepared in the Nairobi African market, and hence the proportions of the two flours are not known.

Ingredients

	<u>Kenya /-</u>
Millet and cassava flour (Nairobi) 2 lb. 2 oz.	4.00
Boiling water (Kisumu)	<u>1.88</u>
	<u>Total 5.88</u>

Method

1. Cook stirring and turning with wooden spoon, for 5 minutes.

Yield

Serves 5 -6 adults

Kisumu cost per serving .34 Kenya/-

UGALI na MAZIWA LAIA (Maziwa = milk, Lala = sleep: Sour milk)

UGALI

Ingredients

Water	172 oz. (5 qts. and 12 oz.)	
Maize flour , sifted	4 lb. 13 oz.	2.00

Method

1. Add maize flour to boiling water, stir and turn while cooking 10 min.

Yield

Serves 8 people
Average portion = 24 oz.
Cost per serving = .25 Kenya /-
.035 U.S.\$

MAZIWA LAIA

Ingredients

		<u>Kenya /-</u>
Sour milk	2 pts. Imperial	1.50
Sugar	2 oz.	<u>.09</u>
	<u>Total</u>	<u>1.59</u>

Method

1. The naturally soured milk and sugar are beaten together with a native egg beater.

Yield

Serves 4 adults
Average portion 10 oz.
Cost per portion .40 Kenya /-
.056 U.S.\$

Cost of 1 portion ugali na maziwa lala .65 Kenya /
.09 U.S.\$

This is consumed by eating the ugali with the fingers and drinking the sweetened milk from a glass or by dipping the ugali in the milk.

Portions are: woman 21 oz. ugali and 7 oz. milk
 man 30 oz. ugali and 14 oz. milk

Ugali na maziwa lala is given to infants and small children. A 22 month old infant would be given 8 oz. of ugali with 6 oz. of sour milk poured over and mixed with it so that it looks like cream of wheat with milk. He would be spoon fed.

UJI

Like "ugali", "uji" is universally consumed by the people of Kenya and like "ugali" it is usually made from maize flour and water. It also contains sugar. "Uji" is a moderately stiff atole or gruel which when cold sets like cream of wheat does. "Uji" is the only food consumed in the mornings by many people and it is often drunk from a half calabash in the afternoons. Some people are using tea to replace "uji." One gets the impression that tea has greater status; that families who drink early morning and afternoon tea are considered on a higher social level than those who drink "uji." One also gets the definite impression that most people prefer "uji". "Uji" is the only food considered by everyone as suitable, safe and desirable to give to infants and small children; "uji" given to infants in supplemented with milk if the family can possibly afford it. Millet flour alone or in combination with maize flour may be used to make "uji". Unga Ltd.'s product "Simba" is maize flour plus 15% dry skim milk and is used by some people for preparing "uji". Most Africans are accustomed to using the same bag of "posho" to make "ugali" and "uji". The smallest unit in which Simba is packaged is 5 lbs. Africans do not seem to consider Simba suitable for making "ugali."

"Uji" also may be prepared so that it is partially fermented and this product is a real favorite. The informants told us that the fermented "uji" is not usually given to children of less than 5 or 6 years, although in the reserves I have frequently seen servings from a calabash of fermented "uji" given the whole family, including infants.

Africans say "uji" may be made from wheat flour but that this is rare. Unga Ltd. is presently undertaking a marketing project to increase the use of "uji" and "ugali" made from wheat flour.

UJI - Plain

<u>Ingredients</u>		<u>Kenya /-</u>
Water - boiling	5 pts. 6 oz. (86 oz.)	.125
Maize flour (from Reserve)	8 oz.	
Water - cold	16 oz.	
Sugar	2-1/4 oz.	<u>.10</u>
	<u>Total</u>	<u>.225</u>

Method

1. Mix maize flour with cold water, add to boiling water, stirring.
2. Boil over low heat for 30 minutes.
3. Add sugar and stir it in.
4. Remove from heat and cool to lukewarm. Serve.

Yield

Size of portion for breakfast - Woman's: 21 oz., man's: 28 oz.

Cost per serving, .073 K /- - .010 U.S.\$

UJI - For Adults

<u>Ingredients</u>		<u>Kenya / -</u>
Water - boiling	2-1/2 gals	
Maize flour, sifted	6 oz.	.150
Millet flour	2 oz.	.069
Water - cold	1 pint	
Sugar	5 oz.	.219
Milk	10 oz.	<u>.375</u>
	<u>Total</u>	<u>.813</u>

Method

1. Mix two flours with 1 pint cold water.
2. Pour this mixture into boiling water, stirring.
3. Boil 25 minutes.
4. Add 10 oz. water.
5. Add 5 oz. sugar and 10 oz. milk.
6. Bring to boil.
7. Remove from heat, cool to lukewarm, serve.

Yield

Serves 5 adults.

Size of portion - woman's: 20 oz., man's: 30 oz.

Cost per serving, .163 K /- - .023 U.S.\$

UJI - For Children

<u>Ingredients</u>		<u>Kenya /-</u>
Water - boiling	4 qts.	
Millet flour	8 oz.	.276
Water - cold	1 pint	
Sugar	6 oz.	.263
Milk	10 oz.	<u>.375</u>
	<u>Total</u>	<u>.914</u>

Method

1. Mix millet flour with 1 pint cold water.
2. Pour this mixture into boiling water, stirring.
3. Boil 10 minutes.
4. Add sugar and milk, boil 25 minutes.
5. Cool to lukewarm, serve.

Yield

Serves 5 to 6 children for breakfast

Cost per serving, .166 Kenya /-

Cost per serving, .023 U.S.\$

Size of serving, about 24 oz. for 2 - 6 years

UJI - Fermented 1

<u>Ingredients</u>		<u>Kenya /-</u>
Maize Flour	1 lb.	.25
Millet flour	8 oz.	.28
Water	64 oz.	
Water - boiling	6 qts.	
Sugar	8-1/2 oz.	<u>.37</u>
	<u>Total</u>	<u>.90</u>

Method

1. Mix the two flours and 64 oz. water, place in container and cover loosely.
2. Leave for 3 -4 days at room temperature (about 70°F.).
3. Stir fermenting brew and add to boiling water.
4. Add sugar, boil 15 minutes.
5. Cool and serve.

Yield

Serves 9 adults

Size of serving - woman's 21 oz.
man's 28 oz.

Cost per serving, .10 Kenya /-
.014 U.S.\$

Normally eaten for breakfast. A lying-in woman drinks large amounts frequently, especially after she eats Njahi.

UJI - Fermented 2

<u>Ingredients</u>		<u>Kenya /-</u>
Millet flour	8 oz.	.280
Water	1 pint	
Water, boiling	37 oz.	
Sugar	4 oz.	<u>.175</u>
	<u>Total</u>	<u>.455</u>

Method

1. Mix millet flour with 1 pint of water and set aside at room temperature (70°F.) for two days.
2. Stir, add to boiling water, boil 10 minutes.
3. Add sugar.
4. Cool and serve.

Yield

Servings, 3 - 4

Size of portion - woman's 14 oz.
man's 20 oz.

Woman with a new baby, 20 oz.

Cost per serving, .13 Kenya /-
.018 U.S.\$.

ARROWROOT

<u>Ingredients</u>		<u>Kenya /-</u>
Raw arrowroot	6 lb. 8 oz.	1.50
Salt	2 tbsp.	<u>0.016</u>
<u>Total</u>		<u>1.516</u>

Method

1. Wash arrowroot, boil in water to cover for one hour.

Yield

Makes 4 1/2 adult servings

Eat with tea, at breakfast or with afternoon tea, considered a snack food.

Cost per serving .33 Kenya /-
.05 U.S.\$

Cooked arrowroot 4 lbs. 1 oz.

Cooked peels 3 lbs. 5 oz.

CHAPPATIS

<u>Ingredients</u>		<u>Kenya /-</u>
Wheat flour	5 lbs.	2.80
Water	32 oz.	
Salad Oil	16-1/2 oz.	1.37
Salt	2 tbsp.	<u>.02</u>
		<u>Total 4.19</u>

Method

1. Mix 4 lbs. 6 oz. flour (use the rest of flour in rolling) into water, constantly kneading and punching with hands.
2. Add 2 tbsp. salt.
3. Knead 3 oz. salad oil in with hands.
4. Break off ball of dough, about 8 oz. form into ball working in more flour with hands. Roll with a rolling pin into a circle 7" in diameter and 3/8" thick, spread with oil.
5. Roll chappati into a rope and roll between hands to work oil in.
6. Flour board and roll chappati into a circle 8" in diameter and 3/8" thick.
7. Oil hot griddle generously.
8. Cook chappati on one side, about 7 minutes, cook other side 5 minutes. Spread with one tbsp. oil, turn and spread other side with 1 tbsp. oil. Cook 2 minutes longer.

Yield

Adult serving, 2 chappatis each
 Makes 13 chappatis 8-1/2" x 3/8"
 Eat by breaking off pieces and dipping into kitweo
 Cooked weight, 6 lbs. 10 oz.
 Cost per serving .26 Kenya /- (.036 U.S.\$)
 Cost per chappati .13 Kenya /- (.018 U.S.\$)

RICE

<u>Ingredients</u>		<u>Kenya /-</u>
Rice	2 lb.	1.60
Water	4 qt.	
Salt	1 tbsp.	<u>0.008</u>
		<u>Total 1.608</u>

Method

1. Wash rice, boil 25 minutes, pour off excess water and boil down a bit.

Yield

Serves 7 adults 1 serving for woman = 16 oz.

1 serving for man = 21 oz.

Eat with Kitoweo

Cost per serving .23 Kenya /-
.032 U.S.\$

Cooked weight 7 lb. 4 oz.

GITHERI

<u>Ingredients</u>		<u>Kenya /-</u>
Plantains, cut lengthwise and in small pieces	5 lb. 11 oz. (waste 6 lb. 8 oz.)	3.00
Beef cut in 1" pieces	1 lb.	2.00
Tomato wedged	1 lb. 4 oz.	.30
Onion tops, ringed	3 oz. (waste 1/2 oz.)	.06
Potatoes cut in small pieces	8 lb. 5 oz.	2.00
Ghee (any fat may be used)	6 oz.	1.20
Curry powder	1 oz.	
Chili powder, rounded	1 tbsp.	.10
Salt		
		<u>Total 8.64</u>

Method

1. Brown onions in ghee, add meat and brown.
2. Add 2 slightly rounded tbsp. (1 oz.) curry powder, chili powder, 1 level tbsp. salt. (Remove piece of meat, taste for salt).
3. Add tomatoes, potatoes, plantain, 3 tbsp. salt, 5 qt. water.
4. Boil 1-1/2 hours.

Yield

One adult woman's serving = 24 oz.
 One adult man's serving = 32 oz.
 Cost per adult portion .72 Kenya /-
 Cost per adult portion .10 U.S.\$
 Cooked weight 21 lbs. 2 oz. (338 oz.)

Amount of all ingredients vary, depending on prevailing cost and available money. Can be made without any meat or with more meat.

Fourteen month old baby eats this. Most would have started giving the baby only the potatoes and bananas from this dish when the baby was about 6 months old.

GITHERI NA VIAZIIngredients

"Mbembe" is a mixture of dry red kidney beans and dry white maize sold by gourd measurements (13 small gourd measures for 1 Kenya /-) in the African market. We purchased 2 /- worth and separated the maize and beans to determine the proportion of each in this commonly eaten, popular Kikuyu dish.

		<u>Kenya /-</u>
<u>Mbembe</u>		2.00
Dry kidney beans	1 lb. 10 oz.	
Dry white maize	4 lb. 3 oz.	
Water	60 qts.	
Boil together 2-1/2 hours, adding water as required (we added 10 qts.) (There was no excess water, had there been it would have been discarded).		
Hydrogenated vegetable fat	3 oz.	.45
Onions, chopped 1-1/2 oz.	1-1/2 oz. (waste 1/2 oz.)	.05
Tomatoes, wedged	1 lb.	.50
Curry powder	1 rounded tbsp.	.12
Chili powder	1 rounded tbsp.	.12
Salt	2 tbsp.	.02
Potatoes	3 lbs. 12 oz. cut in 1" x 1" pieces (waste 1 lb. 4 oz)	1.00
		<hr/>
		<u>Total 4.26</u>

Method

1. Brown onions in fat for 5 minutes.
2. Add chili and curry powders, salt and tomatoes.
3. Add 4 qts. of water and potatoes. Boil 20 minutes. Add to and mix through cooked Mbembe.

Yield

Serves 8 adults
 1 woman's serving is 1 lb. 10 oz.
 1 man's serving is 2 lb. 4 oz.
 Cost per serving .53 Kenya /-
 Cost per serving .074 U.S.\$

GITHERI NA NJUGU

<u>Ingredients</u>		<u>Kenya /-</u>
Pigeons peas	4 lb. 15 oz. (waste 1 oz.)	2.00
Maize, dry	3 lb. 15 oz. (waste 1 oz.)	1.00
Onions, (large scallions with tops)	2 oz. chopped (waste 1 oz.)	.05
Tomatoes, wedged	12-1/2 oz. (waste 1/2 oz.)	.30
Cabbage, chopped, not fine	2 - 5" x 1/2 - 1" 3 lb. (waste 5 oz.)	.50
Hydrogenated vegetable fat	4 oz.	.60
Potatoes	3 lb. 14 oz. (waste 1 lb 8 oz.)	1.00
Curry powder	2 rounded tbsp. (2/5 of 2 oz. tin)	.20
Salt	3-1/2 tbsp.	<u>.03</u>
	<u>Total</u>	<u>5.68</u>

Method

1. Pick over pigeon peas and dry maize and wash.
2. Put in kettle, add 35 quarts of water, boil 2 hours 25 minutes adding water as necessary. (We added 55 quarts of water during cooking).
3. Brown onions in fat seven minutes, add potatoes, curry powder, tomatoes, cabbage and salt, stir after each addition of each item.
4. Add 5 quarts of water and boil ten minutes. Add 5 quarts more water, boil 25 minutes. Add mixture of cooked maize and beans and heat.

Yield

14 adult servings
 1 woman's serving = 2 lb.
 1 man's serving = 2 lb. 5 oz.
 Cost per serving .406 Kenya /-
 Cost per serving .057 U.S.\$
 Cooked weight 30 lb. 4 oz.

Ingredients

			<u>Kenya /-</u>
Ndizi Kiganda (plantains-12)	2 lb.	(waste 2 lb. 3 oz)	1.00
Mahindi (mature white corn-3ears)	1 lb. 9 oz.	(waste 1 lb. 2 oz) Kernels	.90
Minji (dry peas)	2 lb. 15 oz.	(waste 1 oz)	1.50
Njugu (pigeon peas, dry)	4 lb. 12-1/2 oz.	(waste 3-1/2 oz)	2.00
Viazi (potatoes)	4 lb. 11 oz.	(waste 1 lb. 5 oz)	<u>1.50</u>
		<u>Total</u>	<u>6.90</u>

Method

1. Pick over peas and pigeon peas and wash them.
2. Hush corn and remove kernels from cobs.
3. Place peas, pigeon peas, corn in kettle, add 24 qt. of water, cover, boil for 1-3/4 hours, adding water as required. (We boiled this in a steam kettle and added 42 qts. of water during the cooking).
4. Add peeled potatoes and plantains cut in 1-1/2" pieces. Boil 3/4 hr. adding water as necessary. (we added 12 qts.)
5. When potatoes and plantains are tender, evaporate any excess water off.
6. Pound with a wooden stick so that potatoes and plantains are blended into the mixture which is solid, sticky, heavy and brown.

Yield

Serves 18 adults
 Serving for young man = 26 oz.
 Serving for older men and women = 20 oz.
 Cost per person = .38 Kenya /-
 .053 U.S.\$.
 Cooked weight 26 lbs.

Green leaves are often added to this 1/2 hour before the Irio has finished cooking. In the beating process the cooked leaves are distributed throughout the Irio.

KITOWEO na KUKU (Vegetables and Chicken)

<u>Ingredients</u>		<u>Kenya /-</u>
Peas	2 lbs. 6 oz. (waste 3 lbs. 8 oz.)	2.00
Potatoes	6 lbs. 11 oz. (waste 1 lbs. 5 oz.)	2.00
Carrots	3 lbs. 3 oz. (waste 13 oz.)	1.00
Tomatoes	1 lbs.	.30
Onions	2 oz.	.06
Chicken	alive 5 lbs., dressed 2 lbs. 12 oz.	8.30
Hydrogenated Vegetable Oil	4-1/2 oz.	.68
Curry Powder	2 tbsp.	.16
Chili Powder	1 tbsp.	.08
Salt	3 tbsp.	.03
		<u>14.61</u>

Method

1. Cut chicken in small pieces (macerate).
2. Put onions and chicken (including lungs, heart, gizzard, liver) in hot fat, fry 4 minutes, turning chicken to brown all sides.
3. Add curry powder, chili powder, 1 tbsp. salt.
4. Remove liver for child to eat.
5. Add tomatoes, carrots, potatoes and peas.
6. Add 2 more tbsp. salt.
7. Add 4-1/2 qts. water. Boil 1 hour.

Yield

Serves 12 people
 Cost per serving 1.22 Kenya /-
 Cost per serving .17 U.S.\$
 Cooked weight 20 lbs. 2 oz.

KITOWEO na NYAMA 1 (Vegetables and Meat 1)

<u>Ingredients</u>		<u>Kenya /-</u>
Cabbage, coarsely chopped	3 lbs. 2 oz. (waste 5 oz)	.50
Tomatoes, wedged	12-1/2 oz. (waste 1/2 oz)	.30
Hydrogenated vegetable fat	4 oz.	.60
Onions, large scallions with tops, chooped	2 oz. (waste 3/4 oz.)	.05
Beef stew, 1" cubes	1 lbs.	2.00
Curry powder	1 1/3 tbsp.	.10
Salt	1 tbsp.	.01
Chili powder	1 1/2 tsp.	.04
		<hr/>
		3.60

Method

1. Brown onions in fat, add beef and brown. Total browning time 15 minutes (onions get a bit burned).
2. Add tomatoes, curry powder, 1-1/2 tsp. salt, chili powder, cabbage. Brown.
3. Add 1-1/2 tsp. salt, 1 pint (U.S.) water. Cook 25 minutes.

Yield

Makes 7 servings

1 serving for man = 10 oz.

1 serving for woman = 8 oz.

Cost per serving .51 Kenya (.07 U.S.\$)

Cooked weight 4 lbs. 4 oz.

Eat by dipping Ugali or chappatis into Kitoweo.

KITOWEO na NYAMA 2 (Vegetables and Meat 2)

<u>Ingredients</u>		<u>Kenya /-</u>
Hydrogenated vegetable fat	4 oz.	.60
Onions and tops, chopped	3 oz. (waste 1 oz.)	.10
Beef stue 1" pieces	1 lb.	2.00
Curry powder	1 tbsp.	.08
Chili powder	1/2 tbsp.	.04
Salt	1 tisp.	
Tomatoes, wedged	1 lb. 3 oz. (waste 1/4 oz.)	.50
Carrots 1/2" slices	1 lb. 6 oz. (waste 7 oz.)	.50
Potatoes	3 lb. 8 oz. (waste 1 lb. 8 oz.)	1.00
Peas	1 lb. 2 oz. (waste 1 lb. 2 oz.)	1.00
Salt	2 tbsp. (+ 1 thsp above)	0.02
Water	5 qts. (U.S.A.)	

	Total	5.84

Method

1. Add hydrogenated vegetable fat and onions and brown 5 minutes.
2. Add remaining ingredients, stir thoroughly after each addition.
3. Boil 50 minutes.

Yield

Serves 15 adults, adult woman's serving = 12 oz. adult man's serving = 15 oz.
 Eat by dipping Ugali or Chappatis in it or serve over rice
 Cost per serving 0.39 Kenya /-
 0.055 U.S.\$
 Cooked weight 12 lbs. 10 oz.

MATAHA MBOCO

<u>Ingredients</u>		<u>Kenya /-</u>
Maize, Dry	4 lb. 1 oz. (waste 1 oz.)	1.00
Beans, Dry (red flecked on white)	4 lb. 7 oz. (waste 1 oz.)	2.00
Kunde, (Green cowpea leaves)	4 lb. 2 oz. (waste 10 oz.)	1.00
Potatoes, cut in 1-1/2" pieces	3 lb. 11 oz.	1.00
Plantains	5 lb. 10 oz. (waste 5 lb. 7 oz.)	2.00
Salt	4 tbsp.	<u>.03</u>
	Total	7.03

Method

1. Pick dry maize and beans over, soak overnight (if convenient, if not cook longer).
2. Place in kettle with 15 gallons of water.
3. Boil 2 hours, adding water as required. (we added 15 qts.)
4. Pick stems off Kunde and discard. Wash Kunde and chop it fine.
5. Sprinkle 1 tbsp. course ground "magadi" (see page) over greens. Add them to maize and beans and boil 15 minutes.
6. Add potatoes and plantains and boil 1/2 hour.
7. Add salt.
8. Discard excess water (109 oz.)
9. Beat and turn with stick until potatoes and bananas are blended into mixture maize kernels are somewhat hard.

Yield

Serves 7 adults
 Size of portion woman's = 26 oz.
 man'a = 34 oz.
 Cost per serving .414 Kenya
 .058 U.S.\$
 Cooked weight 32 lbs. 1 oz.

SUKUMA WIKI (Stretches Weeks) a(Luo and Urban Kikuyu)

Sukuma Wiki	40.6 oz. (Waste 20.6 oz.)	K /-
	(Sukuma wiki is a sark green broad leaf of the cabbage family) (Have picture)	1.00
	Remove stems, wash, chop fairly fine (3/8" -1/2")	
	Pour off excess water. (64 oz. in this case).	
	(In the reserve a mineral called "magadi", which is largely sodium carbonate, is cooked with it.)	
Onions	1½ oz. (waste ½ oz.)	.05
Hydrogenated Vegetable Fat	4 oz.	.60
	Brown oiions in fat 5 minutes	
Add	Curry Powder 1 Tbsp.	.08
	Chili Powder 1 Tbsp.	.08
	Tomatoes, wedged 1 lb.	.50
	Salt 2½ Tbsp	.40
		<hr/>
	Total	2.35

Stir and cook 5 minutes
Add cooked sukuma wiki

Yield 8 adults
1 serving for woman - 7 oz.
1 serving-for man - 9 oz.

Cooked Weight 4 lbs. 3 oz.

Cost per serving .29 K/-
.04 U.S. \$

Eat by wrapping a small piece ugale around some sukuma wiki.

This is eaten very frequently.

NYAHI

This recipe is used as a part of the celebration after a baby is born. A friend of the newly delivered woman makes Nyahi and takes it to the home. The new mother, other visiting women and old men eat it. Young men will not touch it. A woman after delivery must "eat as much as a man"

When this recipe is made without the sweet bananas it is still rather "special" dish, everone eats and likes it.

<u>Ingredients</u>		<u>Kenya /-</u>
Njahi (Kikuyu Peas)	4 lb. 5 oz. (waste 1 oz.)	3.00
Maize	31 oz. (waste 14 oz.)	.70
Water		
Plantains	6 lb. 13 oz. (waste 5 lb. 11 oz.)	2.00
Sweet bananas (15)	3 lb. 14 oz. (waste 2 lb. 7 oz.)	1.00
Salt	2 tbsp.	
		<hr/>
	<u>Total</u>	<u>6.70</u>

Method

1. Soak Nuahi and maize overnight, this process is rarely done in the reserve.
2. Add 60 qts. water, boil 2 hours.
3. Add plantains, add 21-1/2 qts. water, boil 20 minutes.
4. Add sweet bananas, salt.
5. Cook 5 minutes or until sweet bananas are hot.
6. Blend sweet bananas into mixture by pounding and stirring with wooden stick.

Yield

Serves 10 people
 Serving for woman who has given birth or old men = 3 lbs.
 (she drinks fermented Uji with it)
 Serving for other woman 2 lbs.
 Cost per serving .67 Kenya /-
 .094 U.S. \$
 Cooked weight 21 lb. 8 oz.

In the olden days Nyahi was used to take on journeys (without the sweet bananas in it), "even up to a week, it will not ferment".

MUTHOKOI (Wacamba)

<u>Ingredients</u>		<u>Kenya /-</u>
Njugu (whole dry pigeon peas)	7 lb. 5 oz. (waste 3 oz.)	3.00
Maize (whole, dry white)	9 lb. 9 oz. (waste 3 oz.)	2.50
Ghee	8 1/4 oz.	1.65
	<u>Total</u>	<u>7.15</u>

Method

1. Pound maize in Kimu (mortar, made from hallowed out log, wasit high).
2. Winnow. Pound and winnow a second time. The object of the pounding is to crack the outer transparent layer of the maize kernel and winnow it away and to break the kernel into fairly large particles.
3. Pick over Njugu (pigeon peas).

Maize and Njugu were soaked in water together overnight. This may or may not be done, the decision seems to be strickly at the convenience of the woman preparing the Muthokoi. If it is not soaked, it is cooked for a longer time.

4. Place in kettle, add 50 qts. water.
5. Boil one hour. Add 5 qts more water, boil another hour.
6. Add 3 tbsp. salt.

Yield

Serves 17
 Cooked weight 33 lbs. 8 oz.
 Serving: adult woman 26 oz., pour 2 spoons (.4 oz.) warm ghee over it
 adult man 36 oz., pour 3 spoons (.6 oz.) warm ghee over it
 Cost per serving .433 Kenya/-
 .061 U.S. \$

PREPARATION OF COCONUT WATER

(A liquid in which food is cooked in lieu of, or in addition to water)

A rule of thumb is that one coconut is used for each dish planned. The coconut is grated, on the average one coconut makes 11 oz. of fresh grated coconut meat. The grated meat from two coconuts was placed in the bottom of a "Kifumbu". (A "Kifumbu" is a tightly woven basket, about 18" long and 3" in diameter at the opened end. It tapers to a closed point at the other end). The "Kifumbu" and coconuts were wrung out over a bowl. Five ounces of lukewarm water was added and it was wrung out again. The process was repeated and the bowl contained about 1 quart of coconut water. This bowl of thick, milky, sweet coconut water was set aside and is referred to as the "first" or "sweet" coconut water. A fresh bowl was used to collect the "second" coconut water which was made by 6 additions of small amounts (5 oz. each time) of lukewarm water, wringing, the "Kifumbu" between each. The amount of second coconut measured 5-1/2 cups. The grated coconut was discarded and the "Kifumbu" washed after the preparation of the second coconut water, which is used in lieu of or in addition to water for cooking foods.

CHISHOMBO - Coastal Luncheon Dish

Ingredients

Plantains, peeled	1 lb. 7 oz.
Broad beans, shelled	1 $\frac{1}{4}$ oz.
Salt	$\frac{3}{4}$ tsp.
Onion, sliced	2 oz.

Method

1. Place in kettle and add enough water to half cover
2. Half way through cooking, add 1 cup second coconut water (may use only coconut water).

When almost done,

3. Add $\frac{1}{4}$ cup first coconut water and boil 3 mins.
4. Serve, may also be eaten cold.
5. Good to be taken on safari, keeps well for a few days.

Yield

Serves 2 people
 Cooked weight 2 lbs. 1 $\frac{1}{4}$ oz.

The modern might add 1 - 2 tomatoes.
 Can also add meat.

KACHUMBARIIngredients

Onion	1 sliced, 3 oz.
Salt	1 tsp.
Water	2 tbsp.
Tomatoes	10 oz. small wedges
Chili pepper	$\frac{1}{2}$ - 1 cut in small rings
Lemon juice or	1 lemon
Vinegar	2 tbsp.

Method

1. Soak onion, salt and water in small bowl, soak 5 - 10 minutes, rinse off with cold water.
2. Add tomatoes, chili pepper, salt and lemon and vinegar together, mix.

Yield

Serves 2 people

Eat with Pilau

KUNDE (Coast)Ingredients

Kunde (cow pea leaves)	10 oz.
Water	enough to cover
Tomatoes, wedged	6 oz.
Onions, sliced	3 oz.
Bell pepper, chopped, include seeds	1 whole - 5 oz.
Chili peppers, sliced	1 or 2 small
Coconut water, second	$\frac{1}{2}$ cup

Method

1. Boil Kunde and water for $\frac{1}{2}$ hour.
2. Add tomatoes, onions, bell pepper, chili peppers and second coconut water.
3. Boil 20 minutes or until Kunde is tender.
4. The water may be poured off but most people eat it by dipping Ugali or rice in it.

Yield

Serves 4 people
 Eat by dipping Ugali or rice in it
 Cooked weight 2 lbs. with water

MANGA WACHECHE (Cassava cooked in
coconut water) FOR LUNCH AT COAST

Ingredients

Cassava, peeled, cut in small pieces	18 oz.
Onion, sliced	2 oz.
Coconut water, second	10 oz.

Method

1. Boil $\frac{3}{4}$ hours
2. Add 1 tsp. salt
3. Add 2 oz. of first coconut water, heat.

Yield

Serves 1 person

Cooked weight, $1-\frac{1}{2}$ lbs.

Many people add 1 tsp. curry powder at the beginning and cook it with the cassava. This also may be cooked with broad beans, Kunde (cow pea leaves), or dry beans. It may also be eaten cold.

PILAU - Special Occasion Dish - CoastIngredients

Beef	1 lb. cut in small pieces
Oil	7 tbsp.
Onion	1 oz.
Cloves, whole	$\frac{1}{2}$ tbsp.
Garlic	2 buds sliced
Cinnamon bark	4 $\frac{1}{2}$ " pieces
Rice	11 oz.
Salt	$1\frac{1}{2}$ tsp.
Water	

Method

1. Boil beef stew in water $3\frac{3}{4}$ hr. with $1\frac{1}{2}$ tsp. salt.
2. Fry together oil, onion, cloves, garlic, cinnamon bark for 5 minutes
3. Add rice and fry 5 minutes.
4. Add meat and water in which it was cooked, additional water if necessary, 1 tsp. salt.
5. Stir and turn while rice cooks.
6. When rice is nearly tender, cover pan with charcoal (we put in oven, covered).
7. Brown top slightly.

Yield

Serves 2 people
 Eat with Kachumbari
 Cooked weight 2 lbs.

WALI (cooked rice)Ingredients

Second coconut water	2 cups
Rice	7 oz.
Salt	1 tsp.

Method

1. Add ingredients, boil 20 minutes stirring and turning during cooking.
2. Add $\frac{1}{2}$ cup of first (sweet) coconut water.
3. Cover with charcoal (we put in oven) until dry and slightly brown.

Yield

Serves 1 person

Cooked weight 1 lb. 2 oz.

GROUNDNUT SAUCEIngredients

Groundnuts	1 lb.	1.50 *
Milk	20 oz.	.75
		<u>2.25</u>

Method

1. Roast groundnuts (peanuts) over hot flame in frying pan for 5 minutes stirring to prevent burning.
2. Peel skins off and discard.
3. Mash in a mortar with pestle (blender works well).
4. Put in a pan with 20 oz. milk, 10 oz. water and 1 tbsp. salt.
5. Boil 2 minutes.

Yield

1 serving = 5 oz.

Recipe serves 9 adults

Eat by dipping cooked plantains and cooked sweet potatoes in the groundnut sauce.

Cooked weight, 2 lbs. 13 oz.

Cost per serving, .25 K /- .035 U.S. \$

* Groundnuts are more expensive in the Nairobi area which is where this price was taken, than they are in the Kisumu area, which is where this sauce is eaten by the Luo and Abaluyia tribes.

MATOKE and SWEET POTATOESIngredients

Sweet Potatoes (peeled)	5 lbs. 9 oz. (Peels 1 lb. 14 oz.)	K /- 2.00
Plantains (peeled)	9 lbs. (Peels 8 lbs. 12 oz.)	2.50
		<hr/> 4.50

Method

1. Cut potatoes in medium sized pieces (about $\frac{1}{2}$ the size of a medium sized white potato).
2. Boil in water 45 minutes.
3. Boil plantains 45 minutes.
4. Mix whole cooked plantains and potatoes.

Yield

Adult serving, 22 oz. (Bananas, 13 oz., sweet potatoes, 9 oz.)

Recipe makes 7-8 adult servings

Eat with fingers, dipping into groundnut sauce

Cooked weight, 10 lbs. 2 oz.

Cost per serving, .60 K /- (Nairobi cost) - .084 U.S. \$

SAMAKI STEWIngredients

		<u>Kenya /-</u>
Dry whole fish(6 pieces each 8" x 4")	13 oz.	4.00
Tomatoes	1 lb. 6 oz.	.67
Onions	2½ oz.	.10
Kimbo *	5 oz.*	.75
Curry Powder	1½ tbsp.	.12
Chili Powder	1 tbsp.	.08
Salt	1½ tbsp.	.01
	Nairobi - Total	5.73 **

Method

1. Pour 1 gallon boiling water over dry fish, soak ½ hour, discard water.
2. Fry onions in Kimbo, add cut up tomatoes, seasoning, fish.
3. Cook five minutes.
4. Add 1 liter water, boil 20 minutes

Yield

Adult serving, 6-7 adults
 Cooked weight 3 lb. 14 oz.
 Eat with millet Ugali (the samaki stew is
very salty)

Nairobi cost per serving

U.S. cost per serving ** .88 Kenya /-

* Hydrogenated cottonseed oil

** The Kisumu cost would be much lower,
 probably about half.

Simsim Na Kunde

(Western Kenya, Luo and Balhuya Tribes)

<u>Ingredients</u>		<u>K /-</u>
Simsim (sesame seeds)	7 oz.	0.65
Kunde (cowpea leaves)	3 lbs. 10 oz. (waste 6 lbs. 8 oz.)	1.00
Kimbo or other fat (Hydrogenated vegetable fat)	6 Oz.	.90
	<u>Total</u>	<u>2.25</u>

Method

1. Heat the simsim 10 - 15 minutes.
2. Grind in mortar and pestle to paste (blendor works well).
3. Boil the kunde in 1 gallon of water for 45 minutes.
4. Pour off the excess water.
5. Add 6 oz. fat (ghee is good).
6. Add simsim, mix over heat.
7. Add 2 tsp. salt.

Yield

Adult serving 8 oz.
 Recipe serves 7 people
 Eat with ugali (millet and cassava flour)
 Cooked weight, 3 lbs. 9 oz.
 Cost per serving, .364 Kenya /-
 .051 U.S.\$

APPENDIX II

Questionnaire Used in Food Habit Study

This questionnaire was formed with the assistance of several Africans. They decided both the phrasing and placement of questions. It was tested in a pilot study. The questionnaire was mimeographed on one side of seven legal sized pages and there was adequate room to record the replies on the protocol. The back of the page was sometimes used.

Kenya 1968-69

STUDY OF FOOD HABITS, PREFERENCES AND ATTITUDES
INFANT WEANING PRACTICES
QUESTIONNAIRE

Number _____

Date _____

I. Background

District: _____

Location: _____

Tribe: _____

Occupation: _____

Sex: Male _____ Female _____

Age: _____

Do you have children? _____

Ages of children _____

What about father? _____

What about mother? _____

II. Source of Food:

Garden: Yes _____ No _____

Approximate size _____

CropsFoodsCash
(estimate amount)

Food: purchased regularly (one time per month):

Approximate cost:

Food ItemFrequency
of PurchaseCost

Number _____

Date _____

What foods are recommended during lactation? Forbidden? Why?

For Lactation

Why?

Avoided in Lactation

Why?

Is there anything that will help start (or increase) milk flow?

Vl. Food Practices:

Do the members of the family eat the same food all the time?

What is your favorite food? How prepared?

1.

Next two favorite foods and preparation?

2.

3.

What vegetables (exclude maize and potatoes) do you use most often? How prepared?

Vegetables

Fruits

1. _____

2. _____

3. _____

4. _____

5. _____

Number _____

Date _____

Who decides what to buy?

Husband _____ Wife _____ Both _____ Other _____

Who purchased food?

Husband _____ Wife _____ Both _____ Other _____

Where is food purchased? (type of market)

III. Food Practices: 24-hour diet recall and how prepared

<u>Subject</u>	<u>School Child</u>	Youngest Infant (age _____)
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IV. Food Preferences:

What food(s) do you eat most of the time?

How prepared?

What are ngoma or ceremonial foods?

How prepared?

What foods would you serve to a respected guest?

How prepared?

V. Food for Pregnancy and Lactation:

What foods are preferred or recommended for pregnancy and disliked or discouraged for pregnancy? Why?

<u>For Pregnancy</u>	<u>Why?</u>
----------------------	-------------

<u>Avoided in Pregnancy</u>	<u>Why?</u>
-----------------------------	-------------

Are there foods that you especially like during pregnancy?

Foods craved in pregnancy?

Number _____

Date _____

How often do you use vegetables? Fruits?

Vegetables

Fruits

- _____ Everyday
- _____ 3-4 times per week
- _____ one time per week
- _____ other, specify

- _____ Everyday
- _____ 3-4 times per week
- _____ one time per week
- _____ other, specify

Have you ever used tinned vegetables?

_____ Yes _____ No

Have you ever used tinned fruits?

_____ Yes _____ No

What kind?

Vegetables

Fruits

Why not?

Vegetables

Fruits

Do you own a tin opener:

_____ Yes _____ No

What beverage do you use regularly (one time per week at least)?

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Number _____

Date _____

Do you use tomato sauce or catsup?

_____ Yes _____ No

How often or why not?

Are there any foods you would like to serve more often or in large quantities to your family? If so, to which family member?

Level of education

_____ None
 _____ 1 - 4 years
 _____ 4 - 8 years
 _____ Old Kenya Prelim
 _____ Certificate of Kasse Primary Education
 _____ School Certificate
 _____ Higher School Certificate
 _____ University, years completed

Technical

_____ Less than 1.1 years
 _____ 1.1 to 2.0 years
 _____ 2.1 to 3.0 years
 _____ 3.1 to 4.0 years

What is your salary or other income?

Your spouse's?

	per month	Your spouse's?		TOTAL
		Male	Female	
Less than shs. 200		_____	_____	_____
shs. 200 - 300		_____	_____	_____
shs. 400 - 599		_____	_____	_____
shs. 600 - 799		_____	_____	_____
shs. 800 - 999		_____	_____	_____
shs. 1000 - 1399		_____	_____	_____
shs. 1400 - 1700		_____	_____	_____
shs. over- 1800		_____	_____	_____

What amount of your income in money do you spend on purchasing food?

VII. Infant Feeding and Weaning

Breast-fed? _____ Yes _____ No

Duration _____

Day Started?

Day of delivery _____
 Day 1 _____
 Day 2 _____
 Other _____

(If Day 1, 2 or other, what was baby fed first?)

Number _____

Date _____

VIII. Infant Feeding and Weaning

If not breast-fed, how fed?

Milk used? _____

Dilution? _____

Uji? _____

Other items added? _____

Bottle? _____ Yes _____ No

First beverage (other than breast or bottle milk) given infant?

Age of infant? _____

First food or semi-solid given infant?

Age of infant? _____

Next two foods and ages?

At what age do you think it is good to start solid or semi-solid food for normal baby?

What kind of food or foods are best to start first?

Are there foods that are especially good for infants?
How prepared? Why?

Are there foods that are bad or should be avoided for infants? Why?

IX. Kwashiorkor, Food Beliefs, and Food Customs:

Do you know what "kwashiorkor" is?

What do you think are the symptoms?

What do you think causes kwashiorkor?

How do you think kwashiorkor can be cured?

How do you think kwashiorkor can be prevented?

Do the people you work with have any special food beliefs or customs?

Have you ever or would you eat wild animals? Kinds?

Where do you think they get most of their information regarding infant care?