

EXTRACTED FROM:

# THE HUMAN BIOLOGY OF ENVIRONMENTAL CHANGE

---

PROCEEDINGS OF A CONFERENCE HELD IN BLANTYRE, MALAWI  
April 5-12, 1971

*edited by*

**D. J. M. VORSTER**

*Chairman, South African IBP Human  
Adaptability Committee*

Organized by the Malawi National IBP Committee  
(Chairman, Dr. N. P. Mwanza) and the Convener of the  
Human Adaptability Section of the IBP (Prof. J. S. Weiner)

INTERNATIONAL BIOLOGICAL PROGRAMME  
7 MARYLEBONE ROAD, LONDON, NW1 5HB, ENGLAND

# Comparison of Nutrient Intakes in East Africa

Ulrich S. Oltersdorf

*Lushoto Integrated Development Project Branch, Max Planck Nutrition Research Unit, Bumbuli, Soti, Tanzania.*

## INTRODUCTION

East Africa consists of three countries—Kenya, Tanzania and Uganda. The population is increasing fairly rapidly at a rate of 2-3% per annum.

There are different ecological zones: coastal regions, river and lake zones, dry steppes and fertile highlands. In these zones live almost 200 different tribes and each tribe is again divided into a number of clans, all with different tradi-

respectively. In general, Tanzania seems to have the lowest nutrient intake.

More than 75% of calories come from staple cereals and starch foods and in some parts of Uganda up to 90% and more are derived from these sources. Protein, vitamin B, niacin, vitamin A, calcium, phosphorus and iron too are derived solely from cereals. Fat comes almost exclusively from plants. The estimated calcium intake is 300-400 mg (19, 27) which is low but fair. Rowland (30) estimated that the Tanzanian average

	Area (in 1000 km <sup>2</sup> )	Population (in millions)		Density (people/km <sup>2</sup> )	Number of tribes
		1925	1971 (estimated)		
Kenya	585	2.6	10.8	18.5	40
Tanzania	945	4.5	12.2	12.9	125
Uganda	245	3.0	9.0	36.8	30
Total	1.775	10.1	32.0	18.0	195

tions. It is therefore rather difficult to make general statements for East Africa as a whole.

The following sources of information are used (a) food balance sheets and (b) general description of tribes and areas, including reports on food habits, nutritional status, consumption and diets.

For a comparison of the nutrient intake the information has to be considered according to the demographic structure. More than 90% of the population lives in rural areas, only 4-5% have regular employment and only 45% (between the ages of 16 and 45) are responsible for the Gross National Production.

## FOOD PATTERNS AND NUTRIENT INTAKES

Impressions rather than quantitative data are given here since precise data are still difficult to collect, especially with regard to the individual. Food balance sheets give an indication of the average consumption per country or region over a given period but they do not show geographical, seasonal or demographic distribution. If the input—food production, trade, etc.—is right, then of course the average consumption shown will be a true reflection of the position. But in East Africa, most people live as subsistence farmers and there is little exact information about yields, storage losses consumption of wild leaves and berries. The results have to be judged accordingly.

Table 1 shows the amount of food available for human consumption and Table 2 shows the nutrient intake in the three countries for different years. The rather wide variation not only reflects differences in production but also the difficulties in obtaining accurate data from subsistence farmers with small, scattered plots. Differences are particularly marked for starchy foods, vegetables and cereals. Cash-crop yields are more easily assessed, but here too the results are of doubtful accuracy. It would appear that the average intake per head per day is approximately 2200-2300 Cal. and 60-80 g protein. The intake of animal protein and fat is too low, especially for Tanzania—with 8 and 25 g per person per day

iron intake was 27 mg per person per day, which is excellent.

Some records show an uneven food distribution. Tables 3 and 4 indicate the availability of calories and protein for the four regions of Uganda and from which region foods are derived. The northern and eastern regions, with an average daily in-

TABLE 1: Net yield of food crops (in 1000 tons)

	Kenya		Tanzania		Uganda			
	1957	1962	1957	1960	1962	1957	1960	1963
Maize	1260		610	809		108	77	108
Millet, Sorghum	343		916	310		543	294	287
Cereal, total	1610	1440	1611	1384	1340	651	398	416
Bean, peas	315		173	155		106	115	130
Legumes, nuts total	334	85	223	189	230	227	217	238
Plantain	342		562	484		2894	1225	2138
Sweet potato	340		6	293		1367	926	571
Cassava	431		1015	528		1259	703	825
Starchy foods total	1208	290	1583	1363	670	5474	2945	3634
Beef	93		125	127		47	66	114
Milk	250		315	180		158	139	101
Fish	2		2	60		40	57	70
Animal foods total	379	585	475	411	470	247	312	285
Fat		25		1	10		15	13
Vegetable, fruit		195		345	1340		200	142

TABLE 2: Nutrient intake (per head per day) calculated from food balance sheets

	Year	Calories	Total Protein (g)	Animal Protein (g)	Fat (g)
Kenya	1957	3640	117.4	9.5	45.2
	1962	2240	63.0	12.0	
	1968	2118			
Tanzania	1957	2557	71.6	8.3	30.4
	1960	2138	61.2	11.0	24.5
	1962	2175	59.0	8.0	
	1968	2102			
Uganda	1950		87.6	4.1	
	1951	4037	84.8	8.9	43.6
	1957	3699	71.6	7.8	39.4
	1958	4134	86.2	10.2	
	1959	4399	92.1	11.8	
	1960	2310	58.4	10.9	43.0
	1963	2356	58.0	12.9	
	1968	2068			

TABLE 3: Nutrient intake (per head per day) calculated from food balance sheets in different provinces of Uganda

	Year	Calories	Total Protein (g)	Animal Protein (g)
Buganda	1958	2752	56.1	11.5
	1959	3077	64.8	13.7
East	1958	5912	112.0	12.0
	1959	6583	121.9	13.1
North	1958	4090	112.8	12.2
	1959	4032	117.4	14.2
West	1958	3648	68.1	4.9
	1959	3591	67.2	5.8

TABLE 4: Percentage of calories and protein derived from different foods in different provinces of Uganda, for 1959

	Buganda		East		North		West	
	Calo-ries	Pro-teïn	Calo-ries	Pro-teïn	Calo-ries	Pro-teïn	Calo-ries	Pro-teïn
Animals	4	21	3	11	5	12	2	9
Pulses	10	29	7	23	24	46	6	23
Cereals	11	14	28	34	39	32	21	30
Starchy Foods	75	36	62	32	32	10	71	38

take of 115 g protein, are almost double the amount for Buganda and the western region, with 65 g per head, due to higher cereal and lower plantain production.

In Tanzania people living in the southern parts can only afford 5 g meat per person per week, whereas the Masai have a consumption up to 9 g per person per week.

Insufficient storage facilities and rain failures lead to marked seasonal shortages and malnutrition is aggravated by failure in the distribution of food. For the average family of 5.5 members, at least 1.6 ha. is needed to ensure food for the year; but for this, plot sizes are mostly insufficient. The average income is 40 shillings per month, all of which should be spent on food to achieve the calculated adequate diet.

Figure 1 (a-c) gives information on the staple food patterns. Plantains are most common in Uganda around Lake Victoria and in the west and the Kilimanjaro regions of Tanzania. Millet is common in the eastern and northern parts of Uganda, in the Nyanza region of Kenya, and in Tanzania from south of Lake Victoria up to the Central Region. The remaining regions have maize as the staple food—in the West Nile Region in Uganda, Rift Valley, Central Region, and in large sections of the Eastern Region in Kenya and in a belt which stretches from Pare and Usambara mountains in the north, taking in the central parts to the South of Tanzania. Rice areas are at the coast, on islands and in some riverine areas like Tana in Kenya and Rufiji in Tanzania. Cassava plays an important role in many parts—mostly as a reserve food. Meat and milk are only significant among pastoral people like the Masai, Samburu and Turkana who live on the dry steppes. The areas of the white settlers are sparsely populated.

The general custom is to have two main meals a day. Often breakfast is omitted and during planting and harvest time there is only time for one main meal. The women are responsible for both house-work and field-work and the fields are scattered. The main dishes are cereal porridge or stew plantain—a diet which contains rather little fat. Spices are added, and rarely, milk. Legumes, green leaves and some other vegetables and, more rarely, fish or meat are supplementary items of the diet. Fruit is not commonly eaten; it is used for snacks by the children. The diet is more or less monotonous, especially among pastoral people. In times of food shortage only the staple food is available.

Such a diet of cereals, lacking in fat, is insufficient for an adult; a portion of porridge provides about 1000 Cal. The monotony of the diet too is harmful as it lacks balance and results in malnutrition.

Nutritional status surveys were carried out in various parts (Figure 2). Many children show retardation in development beginning with the weaning period. The adults have mostly a lower weight than Europeans. There is a calorie shortage but not a severe one. The incidence of kwashiorkor due to protein shortage is higher in the starchy food producing areas, such as Buganda and near Kilimanjaro. There is hardly any evidence of deficiency in vitamin D or vitamin C. Nor is there lack of calcium, in spite of the low food intake. Vitamin B<sub>1</sub> deficiency is rare. Evidence of Vitamin A deficiency is found mostly in the dry areas like the Central Region of Tanzania. The most common deficiencies noted are in vitamin B<sub>2</sub>, niacin and in multiple-vitamin B. The incidence of iron deficiency is quite high in spite of a high iron intake, this deficiency being due to the presence of parasites and lack of protein. Iodine deficiency is common in the south of Tanzania (19) and the areas from Kericho (Rift Valley) to Nyeri (Central Province) in Kenya.

The dietary surveys of various investigations summarized in Figure 2 and Tables 5 to 7, complete the picture. Here too it is difficult to give general valid information for larger zones. The results vary even in similar and nearby areas. This no doubt is due to technical difficulties in recording, different sampling techniques or different seasons as well as real variations in consumption.

The calorie intake is often below the recommended intake but in several areas it is, nevertheless, quite sufficient. The intake range—the variance from day to day—is quite narrow compared with dietary surveys in Europe. The main reason is the simpler food pattern. The lower calorie intake should be considered in relation to the general weight level of the African population; calorie intake is closely related to weight.

The protein intake is quite often below what is recommended. A comparison between plantain areas (Table 5-a) and areas with millet and legume consumption (Table 5b-c) shows 32-66 g and 54-93 g protein, with the higher protein intake in the millet areas. Animal protein intake in almost every rural area surveyed was under 10 g per head per day, except, of course, among pastoral people like the Karamoja in Uganda, where one person can consume 220 g animal protein at a meal (11) or the Masai who eat between 150 and 300 g animal protein per adult per day (25).

The calcium intake is mostly below the requirement, but nutritional status surveys seldom reveal deficiency symptoms.

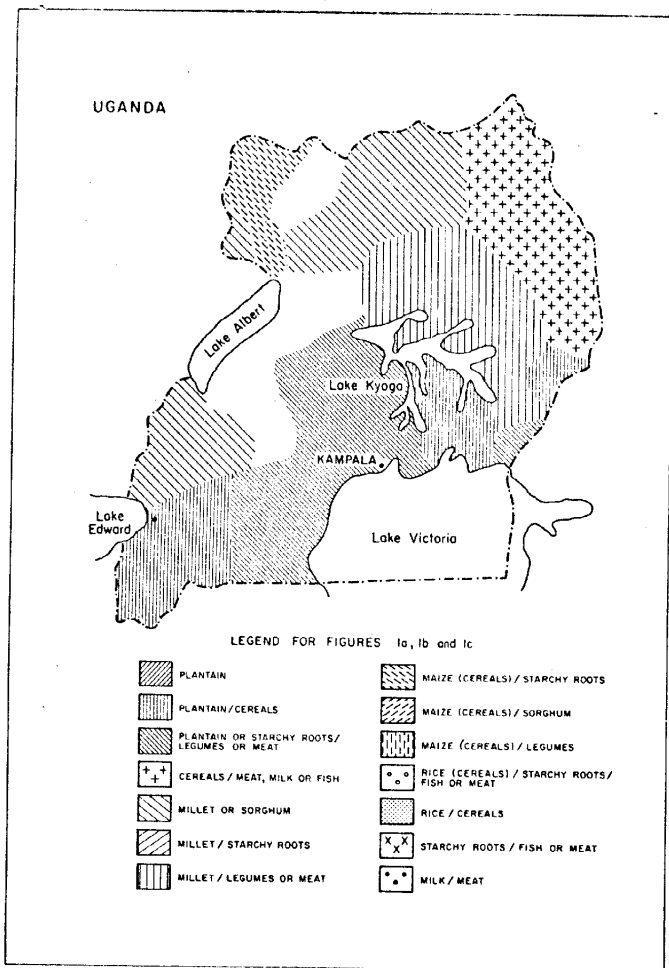


Fig. 1a

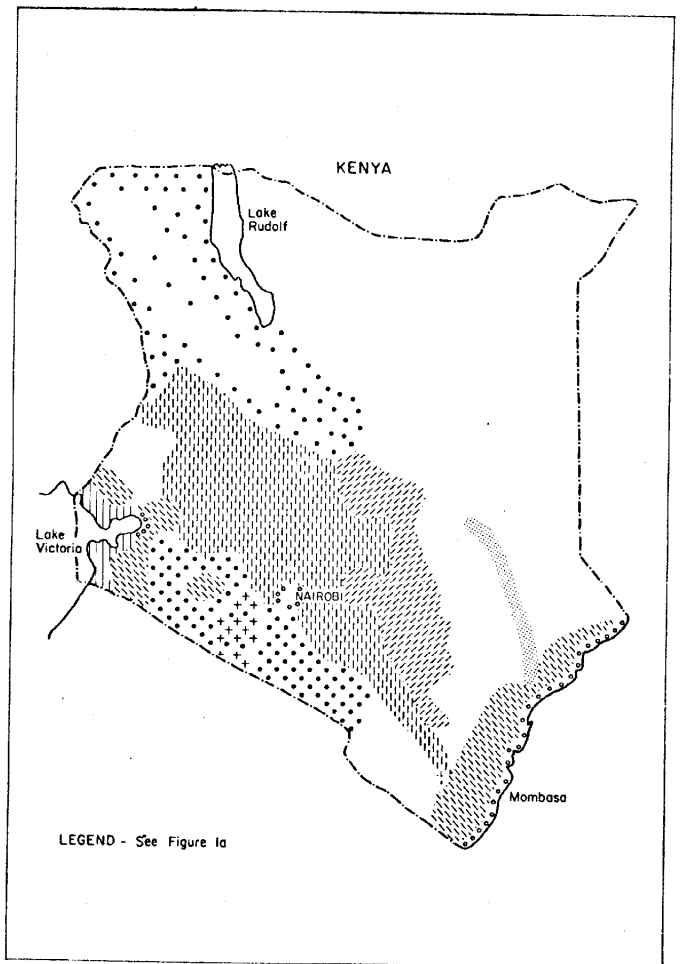


Fig. 1b

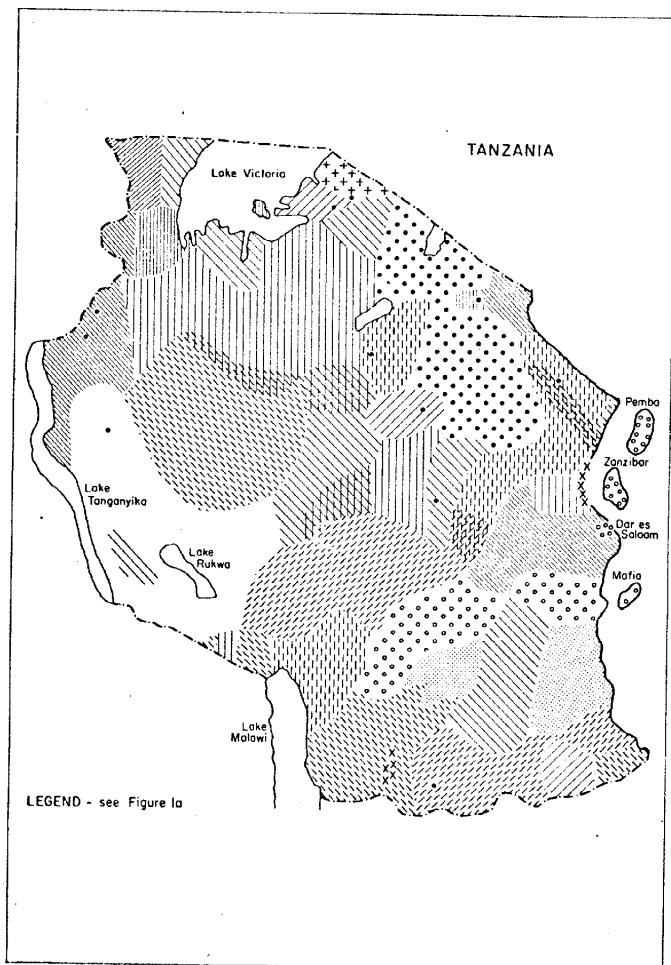


Fig. 1c

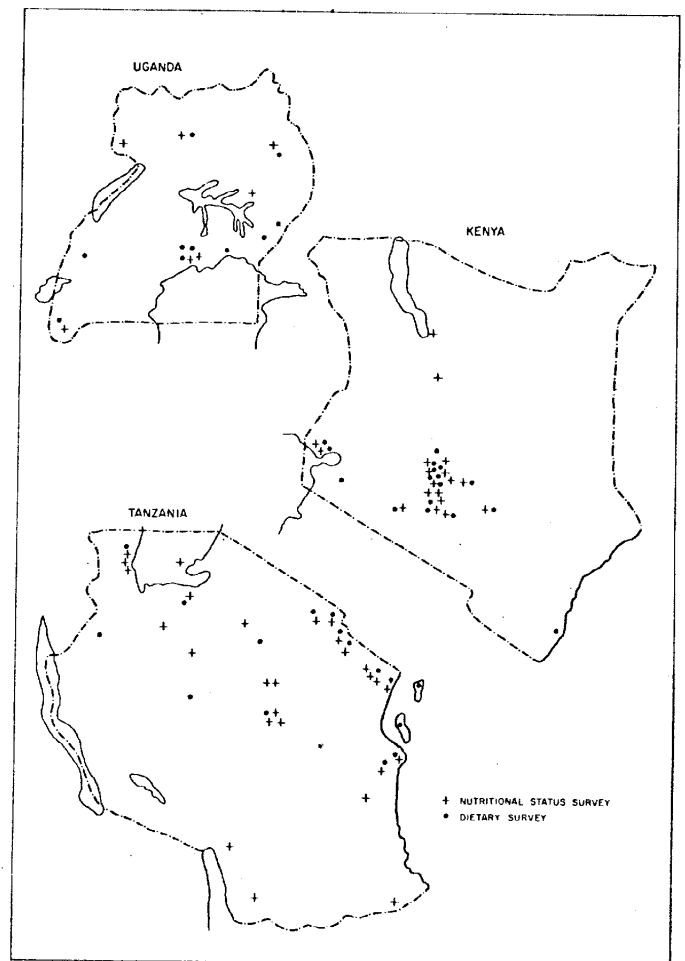


Fig. 2

TABLE 5: Results of family dietary surveys  
(a) In areas where the major staple food is plantain

Area	Cal	Protein (g)		Ca (mg)	Fe (mg)	Vitamin					Remarks
		Total	Animal			A(IU)	B <sub>1</sub> (mg)	B <sub>2</sub> (mg)	Niacin (mg)	C(mg)	
Baganda	1945	32	9.0			4725		0.76			
Banyarunda in Buganda	1610	39	0.7			2720		0.68			
Bukishu	1500	36	2.0			6100		0.66			
Bukoba	2145	66	25.0	516	22	5080	1.46	1.45	15	191	
Kilimanjaro	2525	60	25.0	300		1100		1.00		24	

(b) In areas where the major food is millet

Acholi	1945	54	3.0			2610		0.59			
Bukedi	1795	41	5.0			4275		0.49			
Kwimba	1735	60		392	19	7760	1.32	0.70	12	73	
Toro	2200	50	2.5			2500		0.62			

(c) In areas where the staple foods are millet with legumes and/or some meat

Kibondo	2606	93		532	45	17390	2.98	1.74	16	246	
Nyanza	2531	88		770	39	13850	2.42	1.39	18	119	
	2484	80	21.0	750	25	1250	1.90	1.05	16	77	Two harvests
	1570	54	16.0	332	14	650	1.30	0.67	11	66	Only one harvest

(d) In areas where the staple foods are maize, some other cereals and starchy food

Kiambu	2593	81	3.0	555	30	1073	2.52	1.11	18	256	In 1937
	1906	57	6.0	408	18	1358	2.54	1.00	15	163	Near Nairobi
Nyeri	1394	37	2.0	193	13	903	1.51	0.61	9	67	Village Settlement
Tabora	1940	47		445	13	690	0.89	0.55	12	60	
Taveta/ Pare	2501	78		539	29	5165	1.88	1.48	14	96	
	1460	35		330	14	5380	0.93	0.71	7	56	During Ramadhan
Usambara	1700	38		150	12	1200	0.94	0.56	7	70	

(e) In areas where the staple foods are maize, some other cereals, legumes and some meat

Fort Hall	1933	83	4.0	391	27	400	2.11	0.96	11		High density
Kigezi	2050	102	0.2			1300		0.96			
Kitui	2265	70	7.0	263	17	383	2.09	0.94	13	4	Low density
Machakos	1426	45	2.5	250	15	1179	1.20	0.64	8	84	Famine relief
Mbulu	2232	86	9.7	210	34	330	2.16	1.15	10	7	
Meru/ Tanzania	1640	52		225	15	1080	1.38	0.86	7	40	
	2114	66	17.0	210	28	810	1.65	1.15	15	35	
Mwea	2604	95		321	28	308	2.70	1.00	16	21	Settlement
Nairobi	1790	62	20.0	510	17	1327	1.81	1.17	12	81	Low-middle income
Nyeri	1727	48	2.0	259	17	1538	1.40	0.84	10	130	Pure subsistence
	1558	56	3.7	313	18	527	1.60	0.85	12	90	Some employees
Pare	1350	52		135	15	1750	1.03	0.56	7	70	
	2221	51	13.1	700	17	1291	1.50			168	

(f) In areas where the staple foods are rice, cassava and fish

Kisarawe	1941	27	9.0	429	13	379	0.65	0.43	7	31	
Mombasa	1744	36		809	19	1040	0.43	0.68	3	93	
Tanga	1810	42		145	13	150	0.86	0.46	7	60	Less rice
Zanzibar	3587	98	27.0	449	22	972	1.76	1.37	19	251	1935, less cassava
Requirement for families	2100	60		500	11	3000	1.10	1.25	11	60	

TABLE 6: Results of dietary survey from children (per day and child)

Area	Type	Staple Food	Cal	Protein		Vitamin A (IU)
				Total	Animal	
Baganda	Village					
	2 years					
	Farmers	Plantain	762	22.7	9.6	
	Educated People	Potato	1128	35.0	16.0	
Gogo	Village	Maize/Millet				
	9 months		396	9.8	—	482
	18 months		656	20.5	6.8	3290
	4 years		1261	37.7	10.0	5277
	8 years		1784	52.6	14.2	7156
Requirement		1 — 3 years	1170	36.0		1800
		4 — 6 years	1530	45.0		2200
		7 — 9 years	1900	54.0		3100

TABLE 7: Results of dietary survey amongst labourers (per day and person)

Type	Cal	Protein (g)	Ca (mg)	Fe (mg)	Vitamin				
					A (IU)	B <sub>1</sub> (mg)	B <sub>2</sub> (mg)	Niacin (mg)	C (mg)
Kenya/Uganda railway workers	2808	92	602	36	6200	2.24		16	20
Nairobi railway workers	2797	91	667	33	2343	2.22	1.64	16	122
Requirement	2900	63	700	9	4500	1.40	1.60	19	68

This may be due to the presence of calcium in the water; one litre of water can contain 150 mg Ca, or it may be that the population has adapted to a low calcium intake, related to a lower rate of growth in the children. Earlier work by Orr and Gilks (25) comparing the Kikuyu and the Masai confirm the last suggestion; the Masai have an intake of 2000 mg/day and are the taller people at all ages.

The iron intake in all areas is more than sufficient and reaches values higher than 30 mg per day.

The intake of vitamins A and C differs widely, depending on the area and the season. Mostly, the requirement is fulfilled but attention has to be paid to the following: carotenes from vegetable and fruits are often the sole source of vitamin A and the low fat content of the diet may reduce the resorption of carotene. Due to excessive cooking, vitamin losses may be very high, especially in vitamin C. In dry areas the intake is low, at least for several months of the year.

Cereals are the main source of B-vitamins. In almost all areas the intake of vitamin B<sub>1</sub> is very good. Intake of niacin falls below 10 mg per day in several maize growing areas (see Tables 5d-e). A general trend is for inadequate intake of vitamin B<sub>2</sub>, often only 50% of the requirement. It is only in the millet areas and among people who eat more meat or legumes that the intake is normal.

Results of dietary surveys among children (Table 6) show that the younger children especially get too little protein and calories.

The nutrition of labourers is quite satisfactory, according to the two investigations on which Table 7 is based.

Information on food intakes shows that there is just enough food available for the East African population. Poor distribution is the cause of existing problems. The nutrition is not yet optimal. Feeding trials—giving a well balanced diet—very often reveal an improvement in weight and in learning and work capacity.<sup>1</sup>

<sup>1</sup> Kenya Department of Agriculture: Report for 1933—Meat consumption in Nairobi. Government Printer: Nairobi. p. 234

#### CHANGES IN FOOD PATTERNS AND NUTRIENT INTAKE

The food pattern, without doubt, has changed in the past few decades. But baseline data is lacking. A comparison, therefore, with former times is difficult. Knowledge on nutrition has increased enormously in recent times. Nevertheless there is evidence of a lower incidence of vitamin deficiency in the past and of less protein-calorie deficiency. Cases of goitre too have increased.

Early European travellers reported that the African had a good diet. Livingstone was surprised to see the variety of foods eaten by the Wagogo in Central Tanzania (31). Several sound eating habits were observed—plenty of green leaves were eaten, salt was prepared from leaves, millet was much more common (13). But food shortages were already common in former times. The general lines of change have been examined by Allen (1), Burgess (6), Latham (18) and Laurie (20) and reported upon by the committee on Nutrition in the Colonial Empire<sup>2</sup> and the Ministry of Health, Entebbe<sup>3</sup>. Millet and sorghum are diminishing, maize and cassava are increasing; instead of wild leaves more European vegetables are used; the thin porridge ('uji') for breakfast is often replaced by tea; more foods are bought; the food taboos are disappearing (1, 6, 18, 20).

Outside influences have brought about these changes. Arabs and Europeans have introduced new ideas, methods, crops, religions, health services and work opportunities. The ecological balance has been disturbed. The death rate had decreased. The population has become concentrated around estates and towns. Money and taxation have been introduced, new ethics established, roads built, epidemic diseases eradicated, etc.

Often the local people failed to respond fully to these external

<sup>2</sup> Economic Advisory Council: Summary of information regarding nutrition in the Colonial Empire; 1st Report, Part II, H.M. Stat. Office (1939).

<sup>3</sup> Advisory Committee on Human Nutrition: Protein Supplies Bulletin No. 1, July (1962).

influences. Because of traditional attitudes they were slow to adapt and even today agricultural methods are antiquated, soil conservation and maintenance neglected and the land fragmented. The manpower too is not properly used. Cattle are still regarded as capital to be held rather than as a source of food. Taboos prevent the use of certain foods. Perhaps because of a friendly climate there is little emphasis on food storage. A fatalistic attitude, too, restricts human resourcefulness and results in resistance to change. Yet changes are coming because of factors detailed below.

### POPULATION AND LAND PRESSURE

Most of the people are living in climatically favourable areas. Three quarters of the population of Kenya are living in the Rift Valley and the Central Regions, which cover one quarter of the area of Kenya. The population is increasing fast and food is becoming scarce. The simple expedient of seeking more land to cultivate has been followed, rather than improving the methods of farming. Overgrazing and bad soil management have resulted in lower yields. The choice of less labour-intensive crops and higher yields has resulted in a switch-over to maize and cassava from millet, which is more nutritious. Improved agricultural methods such as inter-planting and the use of fertilizers brings slower benefits, but in some instances the people have adapted well to such changes, as with the Wasukuma living on an island in Lake Victoria and the Wakara people in Zanzibar (18, 20).

Depending on local conditions an increase in population up to a certain level brings little change, provided there is a reserve of land. This explains why a higher density of population has not influenced the local diet<sup>4</sup>(6). But the trend is dangerous. Several reports already show decreasing nutrient intake related to denser population<sup>5</sup> (8, 12, 13, 15, 17, 20, 22, 28, 34).

If a family is bigger it needs more food but there are more people to look for food. Especially in rural areas these two factors tend to cancel each other out and there is no correlation between nutrition and family size. In more densely populated areas and in towns there is a tendency for food intake to decrease with an increase in the number of dependants<sup>6, 7</sup> (9).

### WEALTH

Wealth is determined by size of land, number of cattle and cash income from crops or employment. Normally one would expect that more money would mean better food or at least a greater variety in the diet and indeed one finds this relationship (6, 14, 16, 23, 32, 33). But there are instances where this does not apply. In rural areas where tradition is strong, there has to be a big difference in income before the diet changes, such as the difference between the income of a chief and a farmer. When wealth increases there is a tendency for money to be spent initially on other things than food (2). There is ignorance on food values and people spend their money on cattle or purchase of land or else they put their money into savings. They may also go for prestige spending—iron roofing, radios etc. or they may engage a servant so as to enjoy more leisure. The kind of food purchased too may be lacking in nutrition. Sugared tea may replace 'uji' for breakfast and soda water, white bread and tinned milk are bought. A breakfast with tea, sugar, bread and a little milk can cost 20% of the food allowance for a day and

give only 230 calories and 2.8 g protein or 10% of the recommended daily intake. Valuable foods like milk, eggs and legumes are sold in order to obtain money and low value foods are consumed<sup>8</sup> (20, 34). There is a transition time with no difference between the nutrition of people with different earnings. A higher percentage of the income will be spent on food if the income is small since it is necessary to maintain a minimum calorie level. If the income increases, the amount spent on food increases but the percentage of the income drops. More cereals and protein-rich foods are consumed in place of starchy foods (14). The correlation between income and protein-intake is closer than between income and calorie-intake (7). The percentage spent on food in rural areas is between 60 and 85% and in towns it is between 55 and 70%.

### FOOD PRICE

There is always a big fluctuation in the price of food because of seasonal changes in availability. Cassava and maize are the cheapest sources of calories, followed by plantain, coconut, potato, groundnuts and sugar, in that order. Rice and bread come after, being from 1.5 to 5 times dearer than the first group. Meat is 8 times to 18 times dearer than maize and fish, vegetable and fruit are still more expensive if price is weighed against calories.

With price increases, there is a greater demand for the cheaper foods and a falling off in nutritional value. Higher prices obtained for cash crops encourage the farmer to plant more of such crops while his family eats less nutritious foods.

### ENVIRONMENT AND INFRASTRUCTURE

In areas of fertile soil and favourable climate the diet is better. Because of a greater consumption of fish in villages near the sea or on rivers there is a greater intake of protein. But unless the communications are good, fish cannot be sold far from the source, being limited to a distance of a day's walk (10 to 20 miles).

With improved communications due to the building of roads to reach big settlements there is a marked improvement in the diet of adjacent villages. Investigations made by our team in the Pangani basin in northern Tanzania showed that people living in the dry lowlands close to the main road between Dar-es-Salaam and Nairobi were better nourished than their relatives in the fertile highlands.<sup>9</sup>

### RURAL AND URBAN AREAS

Changes in dietary habits are accelerated in towns although the changes are not always beneficial. White bread, highly refined cereals, bottle-feeding of infants and the consumption of soft drinks replace the healthier rural diets. Food supplies reason it is found that the town-dweller is more poorly nourished than his country cousin and it has been found that certain town customs are spreading to the country districts e.g. bottle feeding instead of breast feeding (3).

On the other hand urbanization is breaking down taboos. People are getting accustomed to new foods. Food supplies are more regular and varied. In spite of this adaptation tribal preferences in food remain (35, 36).

### EMERGENCIES

Seasonal shortages, famines, epidemics, expulsion and resettlement and wars result in changes in diet (4) and the

<sup>4</sup> Report to the Ministry of Health of Kenya on the WHO/FAO/UNICEF assisted project: Nutritional survey and campaign against malnutrition in Kenya (1964-1968). Bohda, M; Gibbs, N. E. and Simmons, W. K.

<sup>5</sup> E. A. High Commission: East African Medical Survey Annual Report, 1951.

<sup>6</sup> Tanzania Human Nutrition Unit: Tanz. Nutrition Committee Report Series No 6—Report of a dietary survey in the Kilimanjaro District 1968; ditto Kisarawa District; ditto Kilosa District.

<sup>7</sup> Zanzibar Protectorate: Nutritional Review of the Natives of Zanzibar. Government Printer, Zanzibar (1937). pp 1-20.

<sup>8</sup> E. A. Bureau of Research in Medicine & Hygiene, Nairobi: Report on dietary surveys and nutritional assessment in East Africa. Stencilled paper (1953).

<sup>9</sup> IFO—Institut für Wirtschaftsforschung, München Afrika-Studien Nr. 42, Weltforum-Verlag, München (1969). Kraut, H.: Cremer, H. D. Investigations into health and nutrition in East Africa.

foods in such an emergency are sometimes permanently adopted.

Sometimes this leads to disastrous change, as with the Wagoni in the south of Tanzania (18, 28).

### FOOD PREFERENCES AND ATTITUDES

Rather little is known of food preferences among Africans. Spices are little used. Rice is said to leave a feeling of hunger after the meal. White flour is readily adopted. Quantity rather than quality is sought.

Food preferences are rooted in the environment and history of a people and where changes are made they are related to foods. For instance the Baganda, who are used to eating plantains, take readily to potatoes; while tribes who are used to millet accept maize. In some instances taboos exist because of the association of certain foods with a despised group—as with milk, which is drunk freely by the Bahima—a pastoral people held in little regard by the Baganda, who consequently shun milk. A similar 'snob prohibition' is found among the Wasukuma with regard to goat's milk. A high prestige food, on the other hand, is readily accepted and these prestige foods are not always the most nutritious.

Food preferences are usually those influenced by religion. The fasting months of the Moslems influence food intake, special foods are forbidden and feasts result in high food consumption.

Aesthetic values also come into the choice of food. The Kikuyu like stout women and therefore the nutritional status of Kikuyu women is better than that of the men (25, 26). The availability of food can depend on the status of the individual in the family, the father usually has first choice, the mother and children coming later.

### EDUCATION

With education, opportunities for employment are increasing. There is therefore a trend for the educated person to become the town dweller. Educated people eat more and have a more varied diet, although the quality of the food is not necessarily better. A rather high level of education is necessary before the selection of foods is related to more nutritious foods.

Improved agricultural methods, irrigation schemes, road building, resettlement schemes are all beneficial and should ultimately result in improved nutrition. Such schemes however, must run parallel with education before the adaptation to change leads to better health.

### REFERENCES

1. ALLEN, K. W. (1955) The monotonous diet of the African. *E. A. Med. J.* 32: 95.
2. ATTEMS, M. G. (1969) *The Shambala system of agriculture (Usambara)*, IFO-Institut für Wirtschaftsforschung, München Afrika-Studien Nr. 42, Weltforum-Verlag, München. Investigations into Health and Nutrition in East Africa. H. Kraut and H. D. Cremer. (eds) p. 179.
3. BELL, S. (1955) The Ameru people of Kenya. *J. Trop. Med. Hyg.* 58: 223, 249, 281.
4. BENNETT, F. J., JELLIFFE, D. B., JELLIFFE, E. F. P. and MOFFAT, M. (1968) The nutrition and disease pattern of children in a refugee settlement. *E. A. Med. J.* 39: 449.
5. BURGESS, A. P. (1962) Calories and proteins available from local sources for Uganda Africans in 1958 and 1959. *E. A. Med. J.* 39: p. 449.
6. BURGESS, H. J. L. (1962) Protein-calorie malnutrition in Uganda, II—Busoga District, Bukedi District and Bugisu District. *E. A. Med. J.* 39: 362.
7. CLEAVE, J. H. (1968) Food consumption in Uganda. *E. A. J. Rural Development* I: 70.
8. COURCY-IRELAND M. G. de., HOSKING, H. R. and LOEWENTHAL, L. J. A. (1937) *An investigation into health and agriculture in Teso, Uganda*. Agricultural Survey Committee. Nutrition Report No. I-TESO. Government Printer, Entebbe.
9. DEMA, I. S. (1965) *Nutrition in relation to agricultural production* (Nigeria) FAO.
10. HOLMES, E. G., STANIER, M. W. and THOMPSON, M. D. (1955) The serum protein pattern of Africans in Uganda: Relation to diet and malaria. *Trans. Roy. Soc. Trop. Med. Hyg.* 49: 376.
11. HOMES, E. G., JONES, E. R. and STANIER, M. W. (1954) Malnutrition in African adults—2. Protein storage. *Brit. J. Nutrition* 8: 173.
12. JELLIFFE, D. B., BENNETT, F. J., STROUD, C. E., NOVOTNY, M. E., KARRACH, H. A., MUSOKE, L. K. and JELLIFFE, E. F. P. (1961) Field survey of the health of Bachiga children in the Kayonza District of Kigezi, Uganda. *Amer. J. Trop. Med. Hyg.* 10: 435.
13. JELLIFFE, D. B. *et al* (1964) Ecology of childhood disease in the Maramojong of Uganda. *Arch. Environmental Health.* 9: 25.
14. KANEDA, H. and JOHNSTON, B. F. (1961) Urban food expenditure patterns in tropical Africa. *Food Res. Inst. Studies.* 2: 229.
15. KELLER, R. (1965) *Studie zur Ernährung bei 2 Stämmen in Nord-Tanganyika*. Forschungsberichte Nordrhein/Westphalen No. 1445. Westdeutscher Verlag, Köln, Opladen, West Germany.
16. KIREMERWA, D. N. (1941) Deficiency diseases in Karimoja, Uganda. *E. A. Med. J.* 18: 242
17. KREYSLER, J. and SCHLAGE, C. (1969) *The nutrition situation in the Pangeni Basin*. IFO-Institut für Wirtschaftsforschung, München Afrika-Studien Nr. 42. p. 85. Weltforum-Verlag, München.
18. LATHAM, M. C. (1964) Malnutrition in East Africa. *J. Trop. Med. Hyg.* 67: 90.
19. LATHAM, M. C. (1967) Nutritional studies in Tanzania (Tanganyika) *World Rev. Nutrition Dietetics.* 7: 31.
20. LAURIE, W. and TRANT, H. (1954) *A health survey in Kwimba District, Tanganyika*. East African Medical Survey, Monograph No. 3. East African High Commission.
21. LAURIE, W. and TRANT, H. (1959) *Dietary Survey-Ukara*. S. A. Med. Survey. Annual Report, p. 37.
22. LEMA, N. T. (1963) Tribal customs in infant feeding II—Among the Chagga. *E. A. Med. J.* 40: 370.
23. LOEWENTHAL, J. A. (1935) An inquiry into vitamin deficiency among the population of Teso, Uganda, with special reference to school children. *Ann. Trop. Med. Parasitol.* 29: 349.
24. MAX PLANCK NUTRITION RESEARCH UNIT, Bumbuli; *Versuch einer Berechnung des Nahrungsverbrauches einer afrikanischen Familie in den Sud-Pare Bergen, Tanganyika*. Stencilled Paper.
25. ORR, J. R. and GILKS J. L. (1931) *The physique and health of two African tribes*. Special Report Series No. 155. Med. Res. Council, p. 17.
26. PROCTER, R. A. W. (1926) The Kikuyu market and Kikuyu diet. *Kenya Med. J.* 3: 15.
27. RAYMOND, W. D. (1941) *Reasons for a nutritional policy in Tanganyika*. Tanganyika Territory Med. Dep. Pamphlet No. 35. Government Printer, Dar es Salaam.
28. ROBSON, J. R. K. *et al* (1962) The district team approach to malnutrition—Maposeni Nutrition Scheme. *African Child Health. J. Trop. Pediat.* 8: 60.
29. ROBSON, J. R. K. (1962) Malnutrition in Tanganyika. *Tang. Notes & Records.* 58: 259.
30. ROWLAND, H. A. K. (1966) Anaemia in Dar-es-Salaam and methods for its investigation. *Trans. Roy. Soc. Trop. Med. Hyg.* 60: 143.



31. SHAFFER, R. D. and FINKLESTEIN, F. (1963) *The food and growth of Gogo children*. Stencilled paper.
32. SHAPER, A. G. and JONES, K. W. (1959) Serum-Cholesterol, diet and coronary heart disease in Africans and Asians in Uganda. *Lancet* ii: p. 534.
33. SMITH, H. W. and SMITH, E. M. (1935) Native Diet in Zanzibar. *E.A. Med. J.* 12: 246.
34. TANNER, R. E. S. (1956) A preliminary enquiry into Sukama diet in the Lake Province, Tanganyika Territory. *E.A. Med. J.* 33:305.
35. WELBOURN, H. F. (1955) Notes on differences between Baganda and Luo children in Kampala. *E.A. Med. J.* 32:291.
36. WELBOURN, H. F. (1958) Bottle feeding: A problem of modern civilisation. *J. Trop. Pediat.* 3:157.