in honour of a guest (male). Women taste them seldom and taboos exist, especially during pregnancy and lactation, but the plain fact is that supplies are too limited to leave any over for them anyway. Birds are cooked like meat.

132. *Eggs* are needed for hatching and are rarely eaten except for the addled ones left after a clutch has hatched. Some women fear them, but in any case opportunities for eating them are at present too rare to make a taboo nutritionally important. When eaten, they are boiled, shelled and cooked with one of the usual sauces for eating with porridge. Pythons' eggs are also eaten.

133. *Fish* is enjoyed with relish by most families during the short dry season, but a sufficient number are unaccustomed to it to cause protest at first over its introduction in the boarding schools. Small quantities brought in from outside the district appeared to be bought up quickly in the bushshops which I knew best. It was used for stews like meat, dried fish sometimes being pounded to powder first.

134. Among *insects*, termites are a supreme delicacy to the Zande. The most important ones are the night-flying species swarming as the rains break (*Macrotermes natalensis* Hav.) and in May and June (*Macrotermes bellicosus* Smeath). Oil is expressed only from the former. They may be eaten roasted and sun-dried, with salt, or ground to a stiff black paste and eaten with salt, or ground and made into a sauce for a stew. They may also be ground raw, perhaps with leaves of sweet potatoes or cassava to " make them sour," and then lumps of the paste will be boiled with salt or potash or both. They are tasty but extremely rich.

135. Other insects eaten occasionally are caterpillars, some of which have quite a vogue in their season, grasshoppers, locusts, crickets and ants. Particulars will be found in Appendix II.

LEAFY VEGETABLES (40-67*c*)

136. *Leafy vegetables* enjoy a real popularity among the Zande and are not, as so often, merely a stopgap in the menu. Their absence, except unpopular kinds, in the dry season is lamented and the matter remedied as soon as weather permits.

137. Out of the twenty-nine varieties listed in Appendix II, a few only are of importance. They are amaranths (48), Jew's mallow (53), solanum (60), pumpkin (43, 44), cassava, sweet potato rosella (56) and deccan hemp (58). The last is eaten only, and rosella mainly, by the Balanda.

138. The sight of luxuriant mixed greenery surrounding a Zande home during the long rainy season has given rise to a belief that their supplies of such leafy vegetables as amaranths, Jew's mallow and pumpkin leaves are continuously abundant through that period, with a surplus which could be dried for the benefit of less fortunate neighbouring districts. It was found in fact that the more popular kinds only come on in irregular flushes, though in some cases maintaining a trickle through the whole season. The patches of plenty varied from place to place according to quite chance circumstances. Sweet potato and cassava

leaves fill in the gaps, neither of them being popular, and when only these are available the frequency of use of leafy vegetables drops decisively, and people say, " We have nothing to eat with our porridge." Table 10 shows the seasonal variation at Taba, indicating which kinds of leaves accounted for more than 20% of the total entries of leafy vegetables week by week. For the groups in which food recording was done for short periods, the corresponding information is as follows, the vegetables in each instance being mentioned in descending order of frequency.

Peasant (*Zande*)		
Mupoi	September	Solanum
		Pumpkin leaves
Madi	October	Solanum
		Pumpkin leaves
Momboi	October	Solanum
		Jew's mallow
Ukua	November	Solanum
Ibba	December	Sweet potato leaves
		Cassava leaves
Momboi	March	Cassava leaves
Ukua	March	Cassava leaves
		Sweet potato leaves
Peasant (*Balanda*)		
Bakiri	August	Jew's mallow
		Solanum
Bo Road	Sept./Oct.	Rosella leaves
		Pumpkin leaves
Bo Road	Feb./March	Cassava leaves
		Sweet Potato leaves
Wage-earners		
Yubu	September	Solanum
		Jew's mallow
		Pumpkin leaves
Yambio Police	January	Cassava leaves
Yubu	January	Sweet potato leaves
Nutrition staff	January	Sweet potato leaves
		Cassava leaves
Yubu	April	Sweet potato leaves
		Cassava leaves

Preferences expressed ranged among the following :—

Zande	*Balanda*
Jew's mallow (53)	Rosella (56)
Solanum (60)	Deccan hemp (58)
Amaranths (48)	
Pumpkin leaves (43,44)	

The discussion would usually start off by an emphatic declaration that of course okras were better than any leafy vegetables. The Balanda preferences were not due to unfamiliarity with the other kinds, which they grew and ate as well. On the other hand, the Zande regarded

the Balanda's preferences as outlandish ; they liked rosella moderately well with a fish stew, but considered deccan hemp inedible. Some families will not touch cassava leaves, declaring that they make them ill. Others say, and it may well be true, that this is due to insufficient pounding of the leaves or insufficient cooking. It may be noted in passing that Raymond (xx) found the hydrocyanic content of raw cassava leaves to be between 24.5 and 28.6 mg. HCN per 100 g. ; this was almost gone after fifteen minutes cooking and entirely gone after half an hour. At the same time, vitamin C losses on cooking were extraordinarily small, possibly due to the high natural acidity of this leaf.

139. Some Zande families dry a little solanum and Jew's mallow in November, and possibly also amaranths. Tender leaves, calyx and young fruits of rosella are dried by the Balanda and some Zande for use in the dry season.

140. Leafy vegetables are seldom eaten without a sauce of ground oilseeds and sometimes okras. Potash is used when necessary to break down fibres and shorten cooking time. Generally leaves are eaten in small quantities as part of the side-dish accompanying porridge, but the women sometimes cook larger quantities, especially of cassava leaves, as a meal in themselves without porridge. Amaranths and pumpkin leaves when plentiful are usually reserved for side-dishes in which leaves are to be the main feature ; otherwise small amounts of leaves, often mixed, may be added to any kind of stew. Leaves which go slimy, notably Jew's mallow, are liked for the consistency they give to the dish. Cassava leaves or solanum may be mixed with an oilseed paste, wrapped in leaves and boiled, making a convenient " packed food " for a journey or to take as a present.

OTHER VEGETABLES

141. *Cucurbits* (70-74, 76) used as vegetables are pumpkins, gourds, calabashes, and cucumbers. Pumpkins are divided into two classes, plain and flecked, the latter being much preferred for flavour and texture. The fruits of gourds may be eaten young and, among the Balanda, where cucurbits are less abundant, even mature gourds are eaten when not too bitter. Young fruits and pumpkin flowers are included in vegetable stews. Mature pumpkins are cooked and eaten alone, or mashed with an oilseed paste. The kernels of the boiled seeds may be extracted and eaten, and any cucurbit seeds may on occasion be roasted and ground as other oilseeds.

142. *Okras* (78), said to be an innovation of recent years, are now the most popular and widely used of all vegetables. A few people dislike their sliminess, but the great majority prize them for the consistency they give to a stew. Fresh, they are sliced and cooked in any other usual side-dish ; dried, they are pounded or ground to powder as a sauce ingredient, being stored in sufficient quantity to see the year round till the fresh ones come in again.

143. *Fungi* (126) : These are popular as a stew ingredient when available, but at no season did they figure prominently in the records. They are seldom dried and stored.

144. *Other vegetables* appear in peasant homes occasionally in insignificant quantities—spring onions, tomatoes, fruits of *Hymenocardia acida*. More sophisticated families may sometimes get ordinary onions, brinjals and other introduced vegetables.

FRUITS (79-125) AND STEMS (128-130)

145. Here, as for leafy vegetables, the list is long but the number making an effective appearance in the diet is even smaller than for leaves. In fact, it amounts to mangoes (107) only. These, found everywhere in profusion, are universally eaten in very large quantities during their three-month season, thousands remaining to rot below the trees. They and other fruits[1] are eaten only as they are, without any form of preparation. In the case of very fibrous wild fruits like borassus palm, the pulp is merely sucked and spat out. No great interest is taken in wild fruits as a whole, and often they may be seen untouched close by the houses. Children have a few favourites, *e.g. warawarakpa* (125), and travellers, hunters and other people temporarily outside the normal domestic pattern eat them when they come across them.

146. Cultivated fruits other than mangoes hardly exist outside Government and Mission stations, except for a few *limes* (112) here and there, especially near bush-shops making an unfermented lime and honey drink for sale to travellers. The juice of limes mixed with powdered chillies was seen very occasionally in peasant homes.

147. Chewing *sweet sorghum* stems is everywhere popular, and *sugar-cane* is seen occasionally in the south. The stem of a *wild fig* is known for its refreshing juice.

MISCELLANEOUS

148. Some examples were noted of wild ingredients for the stew, used only rarely when ordinary ingredients were scarce. They were fruits of an *Irvingia* sp., yielding a kernel which could be ground to paste ; a creeper, *Cissus populnea*, whose crushed stem yields a slimy juice used to make a sauce with groundnut paste ; green sticks of *Grewia mollis* pounded to give a termite sauce a slimy consistency ; young root bark of borassus used in a stew.

149. The only common flavouring used is *chillies*, fresh most of the year, but dried and used as a powder for a short time while out of season. *Mint* is very occasionally found, as a recent introduction.

150. *Honey*, mostly collected for the export market, may be stirred into rice, any kind of pap, or the dough for maize or cassava " bread." Its use with lime juice has been mentioned under Fruits. With a starter of bulrush millet, it also makes a refreshing but heady alcoholic drink, *duma*.

151. *Sugar* was not seen outside more or less sophisticated homes, and there in small quantities.

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[1] Except sometimes bananas (see under Starchy Roots and Fruits) and limes (see below).

BEVERAGES

152. *Beer* (and the spirit distilled from it) has a special section (Section IX). *Tea* and *coffee* appear in the homes of a few wage-earners only. *Honey*—see above. *Cooking-water* from sweet potatoes and cowpeas has a pleasant flavour and is often drunk.

MINERALS

153. *Potash*, or native " salt," is made from the ashes of many plants (136-162). It is prepared by allowing water to seep through the ashes. The liquid obtained may be added to stews. In production on a large scale for sale or storage, it is concentrated by boiling the resulting lump of " salt " is set aside in a broken pot, covered with ashes, and left to dry out. It separates into two fractions, a soft inner powdery portion of poor savour and a hard outer crystalline fraction of good sharp flavour.

154. These products were examined and reported (xxi) to " consist essentially of a mixture of the chlorides and sulphate of potassium and sodium with the potassium and chloride radicles predominating in each case. Both contain a small but appreciable amount of carbonate and the aqueous solution of each is appreciably alkaline. The superior sample contains no calcium, the inferior sample contains a little calcium carbonate but no water-soluble calcium. It also contains an appreciable amount of earthy matter mixed with the calcium carbonate. The superior sample is practically free from this."

Analytical figures will be found in Table 11.

155. *Earths*: Earth-eating does not appear to be a recognised practice in this area, and the survey records do not suggest the likelihood of a need for such mineral supplementation.

B.—PRINCIPAL METHODS OF PREPARATION AND COOKING

156. Treatment of foodstuffs is important (*a*) from the nutritional point of view for its effects on nutritive value, (*b*) in relation to the food balance-sheet for its effects on utilisation and waste, and (*c*) in relation to the general food economy for its costs in terms of energy and time. The following pages deal with the principal techniques only; the treatment of specific foodstuffs will be found in the earlier part of this section or in Appendix II, and a description of brewing methods is given in Section IX.

FLOUR

157. Good flour is the foundation of a Zande cook's reputation as surely as bad flour is the foundation of the Zande's low opinion of the various forms of institutional feeding with which he is now acquainted—schools, hospitals, prison.

158. Grain is stored in the head. It has first to be threshed and winnowed. For food, this is done day by day as required, and in these small quantities it is threshed by pounding in mortars. Larger quantities, for beer or sale, are flailed with sticks. Winnowing is done, preferably with the help of the wind, by shaking in shallow baskets The heads have to be thoroughly dried before threshing, so large jobs are left till a suitably sunny day but small amounts may be dried in a pot on a low fire. The flailing method takes 100′ per 10 kgs. or about 170 man-hours per ton of grain. Pounding requires 150′ per 10 kgs. or 250 man-hours per ton, and by breaking some of the seeds anticipates the next stage in making flour. This renders the grain unsuitable for beer, as it interferes with germination; the flailing method is therefore always used for grain for beer.

159. Sorghum is threshed in the same ways.

160. For food the grain has then to be cleaned and ground. Cleaning *eleusine* consists in parching it in pots, pounding to loosen the seed coats and again winnowing. Grinding is done by hand, the women kneeling before a large flat stone and grinding with a small one with a backwards and forwards motion, the work being done on the forward push. The result will be flour, good, bad or indifferent, its quality depending on the care and energy put into it by the women. To do it well is really hard work. Hence the bad flour in the institutions using paid or prison labour. The alternative institutional method in use at present is putting it through a Colonist hand-mill, with or without a subsequent hand-grinding by the women. The mill alone cannot grind it to a satisfactory texture, and the women's subsequent efforts, though they greatly improve it, stop a long way short of the standard which would be expected of them in their own homes. Sometimes too large a task may be set, and then they have to hurry too much to get through; or again, stones may be kept in use beyond the point when they should be scrapped. But over and above this, there is the plain fact that the women have no interest in the result and no intention of putting themselves out to get a good one.

161. In their own homes, they may grind once carefully if the stone is a good one, or they may grind a second time to ensure fineness. Time taken and percentage loss were found to vary widely; a fair figure to take would be 350′ per 10 kg. (600 man-hours per ton) and 10% loss on the original grain(1).

162. Experiments were also done on the time required to bring the flour at present used in Yubu Hospital up to a standard more acceptable to those who have to eat it. After cleaning it was being coarsely milled and then ground by hand, at a total time-cost of 380′ per 10 kg. or 630 man-hours per ton. This flour was taken and sieved in an ordinary wire sieve, separating out a coarse fraction of 18% which was re-ground by hand and returned to the main portion. The extra time taken was 50′ per 10 kg. or 85 man-hours per ton of final product, making an increase of 13% in total time-cost. The flour was then of good quality by Zande domestic standards. When the same operation, however, was done with a Zande basket-work sieve the product was

(1) This is actual loss after allowing for mere moisture loss in parching.

still unacceptable because the sieve proved too coarse and did not separate out all the fraction needing re-grinding.

163. It being nutritionally desirable that greater use should be made of germinated grains (para. 1 (3)), experiments were done on preparing and using flour after germination. Two methods were tried :—

(*a*) grain cleaned without parching, then sprouted, dried and ground ;

(*b*) grain sprouted, dried, then parched, cleaned and ground in the ordinary way.

Excluding time required for sprouting and drying, method (*a*) took roughly the same time as the usual method of preparing flour, but method (*b*) took 25% longer. A big weight-loss was found after drying the sprouted grain, and losses in grinding were much heavier than with ordinary grain, the two together amounting to about 50% of the original weight of grain. These were only first attempts at an unfamiliar process, and without going further into details, there is reason to think that the losses and time-costs could both be substantially reduced by further experiment. The actual grinding was easy compared with ordinary grain, the time being taken up by other stages of the process. The porridge and pap made from this flour was sweet, especially the flour made by method (*b*) ; method (*a*) made rather gritty porridge owing to inefficient cleaning in the absence of the preliminary parching. Its sweetness evoked considerable interest (" Is there honey in it ? ") in all those who tasted it, but it was too dark in colour to please them and was regarded with greater favour if mixed with a little cassava flour to lighten the colour.

164. As it stands, losses and time-costs combined would more than outweigh any advantage gained in the nutritional value of the finished product, but it is an example of a line of enquiry which should be followed up in an experimental kitchen (para. 9).

165. Two methods of grinding sorghum were seen, one as eleusine, and the other a wet method in which the grain is first pounded to loosen the husks, winnowed, and then put in water overnight. It is ground wet the next day, set aside for another night and then sun-dried into small lumps which can be stored and are quickly and easily ground to flour. This method is preferred because it makes grinding easier and gives a slightly sour taste to the flour. No time tests were done.

166. *Maize* flour is prepared only by wet methods. The simplest and much the quickest is the ordinary peasant method. The whole grain is soaked for twenty-four hours and then ground wet three times. The working time recorded was only 45′ for 10 kg. of the original dry grain, but with interruptions and chatting it actually took about double this time. The dough is not dried but made at once into porridge. Two more complicated methods were recorded in more sophisticated families, both heavy in time-costs (Appendix III).

167. *Cassava* flour is prepared by soaking the tubers in water till soft, peeling and removing large fibres, pulping in a mortar, setting the wet mass aside for twenty-four hours " to run together," and spreading in the sun to dry out in small lumps. This is the retail or storage stage. When required the lumps are easily and quickly ground to flour.

168. The soaking period varies with the dryness of the tubers, averaging four days in the rainy season and seven in the dry, or even longer after fire has swept through the gardens. If taken to a stream, the tubers are soaked whole ; if soaked in pots at the house they are first peeled and cut into convenient pieces. The working time, as distinct from the total period over which flour preparation is spread, depends on distance from water and a suitable place for spreading out the pulp to dry. A fair average for these variables is 60′ per 10 kg. of dried cassava, and for digging the tubers, peeling, pounding and incidentals, 100′. This gives a total of 160′ per 10 kg. or 270 man-hours per ton of the dried product, retail stage. Only 40′ per 10 kg. or 70 man-hours per ton is then required to grind the lumps to flour. The process of flour-making may be rated at about 350 man-hours per ton finished product, compared with 600 for cleaning and grinding eleusine without the preliminary threshing and winnowing.

169. The intensity of the work is also very different, threshing and grinding eleusine being hard as well as slow work, while preparing cassava is relatively light and easy. Carrying it, spreading it out and so on do not require any great effort, it is soft for the final grinding and the pounding is quite different from that for eleusine, which is done standing up and with a good deal of muscular effort. A cassava mortar lies lengthwise on the ground and it has a depression in its side to receive the soaked tubers. The woman squats on one end of it with a thick short pestle which she holds in one hand, making short rapid but not forceful strokes.

170. The weight of flour to original tuber naturally varies with the dryness of the tubers, but 40 : 100 may be taken as a fair average. The loss in the final grinding of the lumps is only about 5%.

171. This method of preparation is notorious for the foul-smelling pools it creates in the streams. Actually the cassava itself does not smell foul on removal from the water ; it has then only a faint odour of prussic acid : the smell comes from the waste left to decompose in and around the pool. The sour smell associated with dry cassava develops when the pulp is set aside before drying, and it is dissipated in cooking so that the porridge has no such flavour.

172. The opinion has often been expressed that this is probably a very wasteful method of preparation owing to leaching of nutrients during soaking. Analysis of dried cassava prepared with soaking (peeled and cut up, as likely to cause most loss by leaching) and without, proved this theory to be unfounded. There is very little to choose between them. Results on *gbazamangi*, the staple of the southern sub-district, are given below, per cent. (xxiii) (ii).

	Sun-dried	*Soaked and Sun-dried*
Moisture	8.82	8.18
Crude fibre	1.61	1.71
Protein	1.25	1.69
Fat	0.47	0.48
Ash	2.46	1.74
CaO	0.12	0.13
P_2O_5	0.19	0.17

	Sun-dried	*Soaked and Sun-dried*
Carbohydrate by difference	85.39	86.20
Aneurin (vitamin B_1)	†(1)	†(1)
Riboflavin	0	0
Nicotinic acid	no data	0.0008

173. This disposes of the idea of any great nutritional advantage to be gained by the much more laborious South American method of preparation, the introduction of which was at one time attempted, its supposed virtue lying in the avoidance of soaking. The fresh tubers are peeled and grated. The juice is then pressed out by any convenient device and pulp spread out in the sun to dry into small lumps, which are ground to flour when required. If the juice is allowed to stand, a precipitate of starch can be recovered and the liquid itself can then be concentrated by boiling to form cassareep(2). The latter was enthusiastically received by my staff, not as a savoury condiment for sauces but as a sweetmeat (mixed with honey). As a method of flour preparation this is appallingly laborious, requiring over 20 man-hours per 10 kg. or 2,000 man-hours per ton of finished product, excluding digging up the tubers, incidentals of drying and dealing with the cassareep. The pressing involves considerable muscular effort and is difficult for one person to do alone. Moreover, the ratio of flour to original tuber obtained experimentally was under 25 : 100. Small wonder then that this method failed to commend itself to the Zande housewives. In addition, of course, they at first fear the product, believing that cassava cannot be made fit for consumption without soaking. Their fears are, however, much more easily disposed of by demonstration than their very reasonable objection to the labour and time-costs. The only good words said for the method were that grinding was even easier than for ordinary cassava, and the flour finer and free from any smell.

FLOUR PRODUCTS

174. Flour is used mainly(3) for making the stiff porridge (*bakinde*) which is the traditional main dish. For this the proportions of flour and water vary widely, but 2 flour : 1 water may be taken as typical. The flour is stirred quickly into boiling water and cooked for a few moments only, stirring briskly all the time. Pap (*dingbo*) is similarly prepared but with different proportions of flour and water, viz. 1-2 flour ; 3 water.

175. A slightly different method of making maize pap from flour prepared by the first method described in Appendix III was also recorded. The quantities were 600 g. flour and 2,100 cc. water, ending with pap weighing 1800 g., *i.e.* 600 g. flour and 1,200 g. water.

(1) † = under 1%.

(2) Precipitate of starch not measured. The cassareep was only 0.004% of the weight of the original tubers.

(3) For the more sophisticated *kisra* see para. 115, Appendix II under Sorghum and Appendix III.

2,750 cc. of water were heated to 60°C. and a thin layer of flour was sprinkled on the surface " to make it boil well." When it was nearly boiling, 1,250 cc. of water were removed. The flour was stirred into the boiling remainder in two portions, with a few seconds' cooking between. This pap was cooked an unusually long time, 10'-11', and stirred vigorously all the time. Some of the discarded water was added as required, 600 cc. in all. Preparation time :—20'. The pap, very smooth and almost tasteless, was eaten unaccompanied as a special treat.

176. A minor use of maize or cassava flour is to make *kpakuta*, an unleavened bread made of a stiff dough shaped into long rolls and wrapped up in banana leaves securely tied at each end. It is put into sufficient warm water (52°C.) to cover, covered with more banana leaves, brought to the boil and boiled till the water is nearly all gone (about one hour). Before cooking, the flour is mixed with water, 1 kg. flour to 500 cc. water, and ground for 15'. Honey or mashed ripe bananas may be mixed into the dough, and if the mixture is then too wet more flour may be kneaded in. Preparation time for 1 kg. flour :—grinding 15', preparation and cooking 90'. It may be eaten hot or cold, alone or with roasted groundnuts or sesame or the pastes made of them. Its special purpose is as food for a journey.

PULSES

177. *Cowpeas* and *mung beans* are shelled by lightly pounding in a mortar after thorough sun-drying. They are then winnowed and picked over by hand. Time :—cowpeas 25' per kg. of finished product ; *mung beans*, 40' per kg. of finished product. They are cooked in two ways by boiling or by roasting and grinding to make a sauce. The latter (*apirinda*) is rare, especially among the younger women.

178. *Earthnuts* — no data on shelling. Cooked by boiling only.

OILSEED PASTES AND SAUCES

179. Oilseeds are roasted and ground to a thick paste, which may be eaten as such or diluted to make sauces for stews or leafy vegetables or, when stew materials are scarce, to serve as a broth without other additions.

180. *Groundnuts* require 60' per kg. (of nuts in shell) for shelling and another 45' for roasting, removing red skins and picking over to remove overdone nuts (which will usually be eaten by some member of the household). The waste and weight loss to this point amount to 35% of the original gross weight. To make the paste, the nuts are then ground at least twice or, for the best results, four times. Per kg. of finished product (paste) the grinding-times are :—

2 grindings	50'
3 "	65'
4 "	75'

Preparation time from the original nuts to the paste : roughly 4 hours per kg. of finished product (4 grindings) or 2.5 hours per kg. of original nuts in shell.

eagerness about food in general, though admitting special cases, such as meat and white ants. Good manners prescribe an air of indifference as to when there is going to be something to eat, hungry though one may be.

194. The food for the whole family is cooked together, but the sexes eat apart except sometimes where husband and wife constitute the whole household. The lion's share goes to the men, especially of the more savoury dishes. The stiff porridge is served in shallow wooden bowls or platters (or sometimes now on metal plates), and is carefully smoothed into a neat lump and covered with large soft leaves such as *Bauhinia*. The stew, cooked first, is served in the pot, the women setting a little aside for themselves and finishing up anything the men may leave. Food, hot, tepid, cold, it seems to be a matter of indifference. It may be cooked hours before anyone turns up to eat it; or a hungry family may be hanging about talking of this and that with seeming indifference but with interest in fact focussed on the cooking fire. It is bad manners for the women to eat their share before the men have had theirs. When through unexpected guests, limited supplies *e.g.* of meat, or shameless appetite, there is no stew left, or through food taboos they cannot eat it, the women afterwards prepare an additional sidedish, and if the porridge has also run low, some supplementary roasted foods, for themselves. They seldom grind more flour than needed for the one meal, and would not wait to grind more to make more porridge. Only occasionally a little porridge is left over to be mixed in with the next day's cooking, and even more rarely a sidedish will not be finished up at the time but kept for another meal.

195. Food is eaten with the hands, the stiff porridge or cooked tubers being dipped in the sauce or paste. Any new foods would have at present to be presented in forms suitable for eating without implements, a small but sometimes not unimportant practical point.

196. Boys feed with the men, girls and young children with the women. The girls usually look very much better nourished than the boys and they are much more regular in their attendance at meals, the boys coming and going at will, often absent and foraging for themselves. At some time in their teens they merge into the privileged class of young unmarried men (para. 95).

197. As might be expected, there are a number of superstitious customs connected with the handling of food, *e.g.* firstfruits ceremonies, but they need not be detailed.

198. Feasting breaks across the normal feeding pattern, and groups of related households will brew and cook jointly for this. All the feasts I attended or heard of, except two, were connected with death—a hasty improvised feast at the actual burial, a full-scale mourning feast at a convenient interval afterwards (sometimes a year or more), repairing family graves, sympathy feasts for the death of a relative living somewhere else. The only explanation vouchsafed to me was that a man "shows how much he loved his brother by his willingness to spoil much food in his honour." The two exceptions were Chief Madi's week-long feast on return from several months in

hospital, and the celebration of someone's return from a long sojourn in gaol.

199. On a feast-day cooking was recorded in one homestead as many as twenty-five times in one day, not including food brought in from other homes. This would be shared by a great many people, in relatively small amounts, for when beer is flowing, people eat much less ordinary food than usual, and good manners demand moderation in guests. The beer supplies will be carefully supervised behind the scenes by the master of the feast, calabashes being circulated among the crowd as he directs. An honoured guest receives a special personal invitation to enter the house where the beer pots are standing, where he will be handed a brimming calabash of the best beer. After tasting a mouthful or two and praising it, he passes it on to his companions, among whom it circulates. A little and a little may make up a plenty before the day is out, but to take a lot at a time is the height of bad manners. How much, if any, extra consumption in terms of grain per head a feast really represents there is no means of knowing, but having seen how drastically the normal home consumption drops on such occasions, my guess is that it is much less than is usually supposed.

200. Primitive as the domestic arrangements are, there is more regard (up to a point) for cleanliness in relation to food than is sometimes thought by outsiders, but of course homes vary in their standards as in any community. The hands should be washed before touching food, either cooking or eating it; cooked food should be carefully covered to protect from dust, pots and platters should be well washed (a very variable item); and a good cook is meticulously careful about cleaning and preparing the materials and picking them over. People often talk as though primitive cooking consisted of any old flour, any old porridge, any old mess in a stewpot, and as if distinctions of quality were unknown. They could not be more wrong. The scope of Zande cooking is limited in the extreme, but within its limits housewifely reputations are won and lost no less than among the students of Mrs. Beeton.

201. No detailed figures for women's domestic activities are available from the attempted work records, but only an estimate that on an average 2.5 hours per woman are devoted daily to the preparation of food, 30-60 minutes to carrying water and perhaps 20 minutes to firewood. To achieve the consumption target set out in para. 13 would require some 40 minutes daily *per head of population* for preparing flour and groundnuts alone, or 700 woman-hours daily per 1000 of population. On the present composition of the Zande population, this means nearly 2 hours per woman for these two tasks alone.

202. Laws of hospitality, social restrictions on who may cook for whom or on cooking for others at all while under certain magical influences, individual taboos and other customary practices modify the details of everyday feeding in varying degrees and may at times seriously affect the well-being of individual persons or households. But their importance to the Zande community as a whole can easily be exaggerated by observers with an eye for social oddities or anthropological curiosities.

203. At the same time, continuous observation of families brought out very strikingly their vulnerability to chance happenings and the

swiftness with which changes in their fortunes were reflected in their general well-being. They seemed to have no reserves of physical well-being to draw on or of morale to support them. Following the fortunes of the same families through the year, it was astonishing how much they changed, and changed again. The whole pattern of life in the homestead could speedily fall to bits through either physical mischance or psychological fear. I saw people put on years in age or go haggard in a few weeks, and some months later they would hardly be recognisable as they shed their apparent years, rounded out again in body and restored their usual manner of living. Among other signs of stress was, of course, haphazard feeding, not bothering, or not being able, to prepare and cook proper meals. The general impression is one of a precariously maintained balance between a state of relative well-being and states of stress, complex in both origin and manifestation.

SPECIAL CLASSES

204. There is not a great deal to record about the feeding of special classes. To go into the matter minutely would require closely detailed studies of individual cases which could not, in the circumstances in which the survey was carried out, be combined with the demands made on time and attention by the wider group study which was my main objective.

205. Of food for *the sick*, there is very little to say. A sesame paste or broth is frequently the recognised vehicle for medicines, and the usual porridge (*bakinde*) may be replaced by a soft pap (*dingbo*). Otherwise, apart from concoctions drunk as medicines, the ingredients of some of which will be found listed in Appendix I, invalids fast or share the ordinary food as appetite dictates.

206. Leafy vegetables are recognised as particularly good for helping *lactating* women to maintain their flow of milk ; also a soured pap made of cassava fibres and eleusine malt. The practice of setting up lactation in a woman who is to foster a motherless infant is known among the Zande as among primitive tribes the world over (iv), though no such emergency occurred for me to observe. The woman, they say, need not ever have had a child herself, but her breasts " must be fat and hanging down." It is said that certain plants are used as galactagogues, *akiri* ants are set to bite the breasts, the child is constantly put to suck, and the woman takes plenty of the soured pap. This information came to light too late in my work for me to collect a plant particularly mentioned, *bamerandu*, whose stem is pounded and made into pap with eleusine malt while some of it is infused in cold water for external application to the breasts. They reckon five days to establish the milk, which is similar to what I myself saw in an actual case in Tanganyika (iv). The infant is meanwhile kept alive on the soured cassava and eleusine pap or sweet sorghum juice.

207. Mothers were shy on the subject of *infant feeding*, fearing interference. What direct information I could get about the babies I saw, suggested no settled practice and I suspect that the age at which any step is taken and the precise nature of the step depend largely on

oracles and medicine men on the one hand and the condition of the mother and her milk supply on the other. Infants for the most part seemed to be plump, with excellent skins, but were often unexpectedly flabby to feel when one picked them up. As in so many tribes, their real troubles come after weaning, especially if circumstances force the mother to do this earlier than the normal two to three years. The ones I saw suffered a severe setback in weight and general well-being. Unwieldy pot-bellies commonly develop at this stage, and persist till the age of eight or nine.

208. The following information on infants is summarised from various informants. After the birth, the mother bathes her breasts with hot water to stimulate the milk, and stays quietly indoors for six days. If the flow is delayed, her baby is given sweet sorghum juice and water, while the mother continues to bathe her breasts and takes soured pap. The infant is suckled at any time, especially if it cries. The age at which supplementary feeding starts varies widely. Some women give it from the very beginning, others start at three months or six months, or even later still. Soft paps of various flours are given ; rice when available is highly thought of for this purpose. Some will use only one flour, others only another, and no reasons for choice could be elicited. Mashed ripe bananas may be given, and the soured cassava and eleusine pap is considered very good. Gradually the child begins to take a little of the sauces and stews eaten by the family, and small lumps of ordinary porridge dipped into them. And whenever it is able to handle things it is given bits of this and that to chew at, *e.g.* a roast maize cob with a few grains still on it. Long before it is finally weaned (unless the suckling period has to be curtailed), it is eating the same things as the family but with the invaluable, even if by now small, supplement from its mother, which, to judge by the setback in weight and general well-being in the few cases I saw at the weaning period, is nutritionally significant out of all proportion to its amount.

209. The food records discussed in later sections deal with the samples on a group basis only. Some families, of course, do better than others, but in the peasant groups it was more a matter of greater stability in the larger establishments than of any marked *social distinctions* in feeding pattern. Sub-chiefs, headmen, members of the royal clan, partial wage-earners, people associated with a bushshop—there was little to distinguish them from any of the others in their daily menus, except that they tended to have a somewhat larger share than others of foods which were both less common and highly prized. But even they had their ups and downs.

210. A class into which many people pass temporarily can only be called *displaced*, *i.e.* those who are out of the ordinary domestic pattern. This class includes all temporary labour, all bachelor wage-earners, and many married ones (generally in the lower grades) who through lack of continuity in their work and place of residence do not build up a proper domestic life. The food records do not cover these, and it is certain that they feed worse and in a much more hand-to-mouth fashion than the ordinary families corresponding to them in general standard of living. The survey records thus show only the best

of the picture—the domestic unit. The numbers of those temporarily, or even for long periods, displaced from normal family life, are growing with the expansion of wage-earning of various kinds.

VIII.—FOOD CONSUMPTION — QUALITATIVE DATA

211. The information collected under this head relates to the frequency with which foods were used, irrespective of quantity. It gives a general indication of seasonal variation and differences in food habits. The records have been subjected to careful examination, comparison and checking with other information, and it is considered that on the whole they were well kept, except that minor accessories such as sorghum stems, potash or chillies, and rare items such as fruits, tended at times to be overlooked—by certain members of the team in particular. The results may, however, be taken as a reliable picture of the main features of the feeding pattern through the year.

212. In the Taba group, qualitative records were maintained continuously for 54 weeks, from 16/6/47 to 27/6/48. The results (1) are presented graphically in Fig. (*c*), each column representing one week. The average number of successful house visits each week was 243, and the frequency of use of a food is shown as a percentage of the week's total of such visits (= house-days), ignoring the number of times a given food might be eaten on any one day.

213. The most striking points in Fig. (*c*) are :—

(*a*) the much greater emphasis on cassava than on cereals;
(*b*) the key position of groundnuts among the principal protein foods;
(*c*) the virtual absence of (i) pulses, (ii) oils (as distinct from oilseeds);
(*d*) the alternation of fishing with other activities reflected in the figures for fish from November on;
(*e*) the extent to which fish and sesame were linked;
(*f*) the not very impressive showing of termites in February and March compared with the excitement and to-do associated with their capture;
(*g*) the small showing of yams and cucurbits compared with the impression made by the sight of rampant yam and cucurbit vines in the homesteads;
(*h*) the relative proportions of cucurbits and okras;
(*i*) the insignificance of the cucurbit seeds to which a good deal of attention had been directed locally and which proved so unimportant an item as to be included, along with hyptis, among the " other " oilseeds;
(*j*) the roughly reciprocal nature of the following pairs of curves—eleusine/cassava; maize/sweet potatoes; leafy vegetables/okras.

(1) None of the tables presented in this Section includes beer, for which see Section IX.

214. The question at once arises, how far was the sample typical ? Though considered in this report as one of the Zande series, it was mixed with elements from further north, and moreover its peasant character was modified by a certain amount of wage-earning. Table 13 shows, however, that its pattern was essentially similar to that of the other Zande peasant samples, except that, as was borne out by the production figures, the swing away from eleusine was more pronounced than in the southern groups. Slight local variations appeared, such as in the relative popularity of the different cucurbit seeds, which, however, were nowhere found to play so large a part as I had been led to expect. Or again, local as well as seasonal differences appeared in the emphasis on sesame. Some of the Mupoi figures, *e.g.* oils, meat, were affected by the inclusion of a few wage-earning families and their association with the Catholic Mission Station there. The effects of resettlement in Momboi and Ukua are described elsewhere (paras. 5-8, 59, 65-66). It may be noted here that the absence of mangoes in March in Ukua was only partly due to immaturity of the trees; there were bearing trees in the settlement, but they were all late in ripening.

215. Table 14, relating to non-Zande groups in the northern area, offers some interesting points of comparison and contrast. Seasonal changes being in general more sharply defined in this area, there was a pronounced (and different) hungry season and a pre-harvest shortage of cereals which prior to the introduction of cassava would have been a matter of serious concern. I had been told beforehand that cassava was still only in process of introduction into this area, and that it was not yet grown in sufficient quantity to fill the gap. The large extent to which it figured in the records was therefore a surprise, but it was borne out by my personal observation on fields, gardens and domestic affairs, and may be accepted with confidence.

216. Sweet potatoes were in fact more important than they appear in this table, because the best of their season, which tailed off earlier than in the southern areas, fell between the recording periods.

217. It will be seen that the relative importance of groundnuts and sesame was reversed in these groups, and that very little use was made of the cucurbit seeds favoured by the Zande (*lagenaria, citrullus, luffa*), though it was claimed by some people in the Bo sample that *citrullus* (*datiro*) had been much eaten in the past (see para. 105). More hyptis was grown and eaten than further south.

218. The oils included more meni oil than in other samples. The season for collecting these nuts was in full swing during the second recording period in the Bo Road. Shea trees were equally common in that area, in contrast with the Zande country, and at my last visit in March people were looking forward to the shea-nut season in April. But these oils were a seasonal treat rather than a regular item of diet, and here as elsewhere the part played by oils, as such, was insignificant in the diet as a whole.

219. In Table 15 will be found records on several groups of wage-earners. They are as remarkable for the contrasts among themselves as between them and the peasant groups; see, for instance, the C.M.S. teachers' records (kept by themselves) in regard to eleusine, cucurbit

seeds, animal products, honey and tea, compared with the records for Yubu Station at the same time of the year. Wage-earning families thus varied in their habits and feeding patterns much more than peasant families (cf. para. 2). As might be expected, the range of foods which appeared often enough to warrant a place in the table was slightly extended, there was greater emphasis on animal products and rather more variety in the oilseeds used, while in some cases more use was made of oils. Sugar should probably follow the figures for tea, but as it was rarely actually mentioned it had to go down under the head of " Occasional Use."

IX.—BEER (AND OTHER ALCOHOLIC BEVERAGES)

TYPES OF BEER AND METHODS OF PREPARATION

220. The records in the foregoing section deal only with food. To them must be added beer of various grains, commonly bulked up with cassava. An idea of the varieties found and their proportions can be obtained from Table 16.

221. Zande beers fall into two main classes—strained and thick. Far and away the most popular is *gbangara*, a strained red beer made of eleusine alone, but it is heavy on the eleusine stocks and is more complicated to prepare than the ordinary thick beers. Next in estimation comes strained red beer of eleusine diluted with maize, and after that the various ordinary thick beers, white or reddish according to the mixture. The addition of some malted eleusine improves any beer, even if it be only the dried residues from a brewing of *gbangara*, but other sprouted grains will serve. At the bottom of the scale of esteem come nondescript mixtures perhaps better described as soured or fermented paps than deserving of the name of beer.

222. Eleusine malt is made at any convenient time and stored till required, sometimes for a year and more. The grain, winnowed but not further cleaned (para. 158), is put to soak overnight, then the water is drained off and the damp grain carefully covered and left for two or three days to sprout. It develops tangles of grey mould in the process. It is then spread out in the sun to dry; in wet weather this may take a week or more, the grain being returned, still damp, to its basket at night or during storms. Temperatures from 31°C. to 40°C. were recorded in the centre of the basket compared with air temperatures of 24°C. to 28°C. The malt requires some grinding before use, but this is light work compared with grinding the unsprouted grain.

223. *Gbangara*, the favourite beer, is made by lightly grinding malted eleusine, putting it into cold water (roughly 8 litres to 10 kg. of the original grain), bringing it slowly to the boil and then boiling briskly for eight or nine hours. More water is added as necessary, in all about as much as was first put in. The liquid, a reddish brown, is then poured off and the sludge put into a large wickerwork inverted cone lined with grass and leaves, where it is left overnight to drip into a pot placed underneath. In the morning the liquid so filtered out is mixed

with the rest, and the beer is boiled again for another five hours or so. At this point it is very slightly sweet but otherwise almost tasteless. It is brownish and fairly clear. It is then poured off into smaller pots and hoisted into the store to stand for at least two days. The residue is dried and either used as malt for inferior thick beers or mixed with a proportion of new malt for another brewing of *gbangara*.

224. Methods of making thick beers vary in detail, but the principle is the same in all—sprout the grain, grind it wet or dry, boil and set to stand with or without the addition of malted eleusine. A few examples from the records may be given:

(*a*) Maize was sprouted, ground wet, soaked for two more days, dried in the sun and stored till needed; then the lumps were ground down and boiled for several hours, malted eleusine was added, and the brew set to stand overnight or a little longer.

(*b*) Mixed maize and sorghum was sprouted, ground wet, and the mush put into a basket for two days, then dried and stored. To brew, the dried lumps were ground, boiled for several hours and allowed to stand for twenty-four hours; no malted eleusine was added.

(*c*) Maize was soaked for two days and ground wet, then mixed with malted eleusine and the mush put into a pot for three days to sour. It was then dried, and for brewing was later ground and boiled, more malted eleusine was added, and the brew put to stand for one or two days.

(*d*) Mixed sorghum and eleusine were sprouted, dried, ground, boiled for an hour and allowed to cool. Early in the morning the liquid was poured into another pot. Water was poured on to the residue and worked into it with the hands. Both pots were then left to stand all day, for drinking that evening.

225. The above examples were seen among the Zande. The Balanda laid more emphasis on sorghum in their brewing and apparently made no *gbangara* or other clear beers. Their methods of making thick beers were similar to those of the Zande, with the addition of the following method not noted elsewhere:—

> Maize and sorghum were sprouted, ground wet, soaked for two days, dried and ground. The flour was put into a big pot with only just enough water to prevent it from burning, and heated with careful stirring for between fifteen and thirty minutes, till the woman judged it to be sufficiently cooked. It was then put into boiling water and stirred and cooked like porridge for a few moments. Cold water and malt were added, either sorghum or eleusine, and the brew set to stand till next day.

226. Cassava, it was said, would only make a sort of soured pap, not a proper beer, but it could be used as a make-weight in thick beers and the Taba records showed that it did not appear until some time after the main maize harvest, *i.e.* when grain stocks began to need nursing a little. Only the course fibrous part appeared to be used, and some people said it had to be sweet cassava.

OTHER ALCOHOLIC DRINKS

227. Crude spirit, *araki*, might be distilled from any beer, but usually only inferior white beers would be so used. The still consisted of the beer pot with a smaller pot inverted over it, its neck inserted in that of the first and the joint sealed with clay or cold porridge. From a hole in the upper pot a metal pipe led to a bottle, the joints being similarly sealed. This being a very delicate subject, no further details were obtained.

228. The honey drink, *duma*, is made with a ferment of bulrush millet obtained ready prepared from Wau. The residue of one brew can also serve as a starter for the next. When demonstrated to me, about 60 g. of ferment was used to two (beer) bottles of honey. The ferment was first stirred into 600 cc. of cold water, of which half was then poured away. 100 cc. of warm water (46°C.) was added and the powdered ferment allowed to settle for a minute. Then as much water was poured off as was possible without taking any of the sludge with it. Some hot water was then cooled to 42°C. by adding cold to it, and nearly 800 cc. of this was added, followed by the honey and 1,150 cc. of cold water. After it had been well mixed, the pot was set out in the sun for several hours. It was said that this was a much better brew, with a higher proportion of honey, than that sold in places like Juba. It seemed to be rare in Zandeland, and was not seen by me in any ordinary Zande homes.

PRODUCTION AND CONSUMPTION

229. Beer sells by the calabash, itself a variable measure and sold at variable prices. Price ranges observed were as follows:—

	For 1 *P.T.*
Gbangara	600-1,000 cc.
White beers	1,000-1,600 cc.

Information collected in Yambio suggested that an expenditure of 10 P.T. on eleusine bought out in the countryside would produce about 60 litres of beer. Brewed and sold in the town, this would mean a handsome rate of profit even allowing for cash purchases of firewood and payment in beer to assistants and hangers-on.

230. It goes without saying that records of individual consumption were not to be hoped for, but an attempt was made to get an estimate of the order of magnitude for a group by means of recording the pots of beer seen on sale or in the homesteads, together with any ndirect information which would help in interpretation. When the people realised that we did not intend to interfere they raised no objection to our enquiries, and the time came when even distilling was not always hidden from us.

231. The following estimates do not, of course, pretend to do more than indicate the order of magnitude, and are based on an average pot of 25 litres. For *Taba*, the year's production was around 15,000 litres for a group of homesteads slightly larger than that of the survey families, as it was not practicable to record the beer for these alone.

With a fluctuating population of around 200, this represented 75 litres per head, or roughly 200 cc. per head per day. Its composition and the purposes for which it was brewed are shown in Table 16. It is probable that some of the 5% recorded as brewed for private entertainment was in fact distilled, because in the early part of the survey I was naturally not allowed to know of such activities.

232. A large proportion of the 70% sold would be consumed by people from Yubu Station or passers-by along the road. Against this must be set beer obtained by members of the Taba households at mourning feasts or other brewing occasions outside the group, but as a matter of opinion I doubt if this equalled the amount sold " out." Consumption per head per day for this group may therefore be estimated at between 100 and 200 cc. (say 50-100 calories) per head per day for the year, and, in this case, fairly evenly spread through the year. It was not, of course, by any means evenly spread per head.

233. Owing to variation in processing methods and degree of dilution, and to the frequent use of old beer residues with fresh malt, it is difficult to assess the above production in terms of grain. Some demonstrations came out with a 1 : 1 ratio of kg. of grain to litres of beer, others less than 1 : 3. Assuming the grain : beer ratio to average 1 : 2, we get an annual grain requirement of 40 kg. per head, or for the group, a total of 8 tons of mixed grain, chiefly eleusine and maize (ignoring the addition of cassava, as a make-weight). This may be compared with the estimated production of eleusine and maize, *viz.* 50 kg. and 55 kg. per head respectively (Table 8).

234. It was impracticable to maintain similar continuous recording all over Yubu Station, but sampling suggested that there was something like 75 litres of beer a day to be seen somewhere about its roads and homesteads, very nearly all of it white beer, *i.e.* varying mixtures of maize, eleusine and cassava. This may be taken as representing some 14.5 tons of grain for the year.

235. For other groups, it is only possible to indicate what was happening during the various recording periods.

236. When recording began at the end of September at *Madi*, a cluster of homesteads round the home of Chief Madi himself, they were in the final three days of a week's feast to celebrate the Chief's return after many months in hospital. About 1,500 litres of beer were seen during the month, divided as shown in Table 17. In the circumstances, of course, part of it was consumed by outsiders, but consumption by the survey families during this month might be estimated at about 300 cc. per head per day.

237. *Momboi*, as a first-year settlement, was having an austere year. In October brewing only amounted to 150 litres (kind and purpose not recorded), or some 50 cc. per head per day. In March, despite the preceding poor harvest, they brewed about 650 litres or 200 cc. per head per day, divided as shown in Table 17. It is probable that some of the production recorded as private entertainment was for working-parties planting maize and groundnuts on the previous season's cotton patches, for spurred on by the somewhat depleted state of the store-huts they were pushing ahead with this as soon as weather conditions permitted.

238. *Ukua*, second-year settlement, was feasting during November and brewing mainly for distilling during March. 1,600 litres of beer were seen on the first occasion, or about 600 cc. per head per day, predominantly red beer of eleusine and maize. The purposes for which it was brewed are shown in Table 17. In March, in addition to 650 litres of beer, 40 bottles of araki were recorded, say about 25 litres. With crude methods of distilling, this might represent roughly 1,000 litres of beer, making the brewing for the month 1,650 in all (see Table 17).

239. Beer was available in the *Yambio Police Lines* on ten of the fourteen days recorded in January, but with outsiders constantly coming and going and other beer easily accessible around the town, no clue to consumption can be found here (cf. para. 4).

240. In the northern areas, some brewing of various kinds (sorghum, bulrush millet, eleusine, maize) was going on at *Bakiri* in August for last-minute working-parties to finish sowing the eleusine crop, but during a month's recording in September-October in the *Bo Road* group, only 100 litres of beer were seen, say 20 cc. per head per day. I even attended a mourning-feast at which there was meat but no beer at all. Of the 100 litres, 75 were of maize and sorghum and 25 maize and cassava. In February-March, however, it was a different story. This was the season to which, as far as possible, all mourning-feasts were postponed, and they were in progress all round. Attempts at recording broke down because there was so much coming and going. The beer being used was made of sorghum and eleusine, or eleusine bulked up with cassava.

X.—FOOD CONSUMPTION — QUANTITATIVE DATA

FOOD INTAKE

241. Quantitative records were run for three days at a time on each domestic unit (see para. 57), closely related units being visited on the same days to simplify the question of reciprocal visiting. In other cases, visitors' shares were deducted from each meal or snack on the basis of equal distribution per head, in all groups except Yubu Station and the Yambio Police, where casual visiting was so constant and indiscriminate that it was impossible to keep track of it ; arbitrary deductions were therefore made in these cases, after considering all information bearing on the point. Members of the family feeding away were allowed for in the person-days. Men or boys living on their own but getting their main meals in a neighbouring homestead were rated at two-thirds of a person in that homestead, no attempt being made to account for the supplementary foods which they ate in their own huts and which were arbitrarily estimated at a flat rate of one-third of their total intake for all nutrients. The families were persuaded for the space of three days to agree beforehand what time they would cook, and on the whole they kept to it. They also proved co-operative in agreeing to keep all waste from any extra foods or supplementary meals which might be eaten between the recorders' visits, and from the

weight (or number) of these it was possible to estimate the approximate amount consumed.

242. The results in terms of grammes of raw edible portion per head per day are given in Tables 18-20. They show up a number of the points already noted in the qualitative records (Section VIII). The March records for Ukua were found to smell strongly of alcohol, and are entered with reserve after knocking off all major knobs and excrescences.

EVALUATION

243. Tables 18-20 are evaluated on a per head per day basis in Table 21-23, allowance being made for pot-waste where necessary. The values used are given in Appendix IV. For several reasons it was not practicable to record distribution within the family, and the merely qualitative observation that the men get a relatively large share, especially of stews and delicacies, is all that can be offered. Further, the records deal with feeding in the homesteads only, not with days spent outside the domestic circle, which except in so far as they were spent in some other home would be likely to fall below the domestic level of feeding. This affects particularly the boys (para. 196) at any season, and the family as a whole in the dry weather when the occupations of the season keep people moving about. At this period everybody's meals were much more irregular and haphazard than my records, confined to the times when they were at home, could show. The quantitative records therefore reflect the family's feeding at its best, the distortion being greatest in the dry season.

244. The *Taba* figures (Table 21) follow a curve in general agreement with other observations, if it be allowed that the February calorie level is appreciably higher than the true average for the reason just stated. From para. 232 it would be reasonable to add 50-100 calories to the figures shown at each season, and possibly 1-2 g. protein.

245. The *Madi* figures (Table 21) are almost certainly somewhat lower than they should be because just then the people were away all day harvesting fields at some distance, and there is a strong probability that some supplementary snacks in the fields went unrecorded. They were certainly much more prosperous in appearance than is suggested by a calorie level of 2,050. Beer (para. 236) might have contributed another 150 Calories and 3 g. protein.

246. At *Momboi* the October figures (Table 21), to which there is no appreciable contribution from beer to be added (para. 237), are in keeping with the state of affairs seen there, but the March figures are at first sight surprising in view of the weight losses recorded. The explanation lies only partly in the distortion referred to in para. 243. To a greater extent, it is to be found in the fact that, transport difficulties having caused unfortunate delays in the dry-season recording, the repeat visit to Momboi did not take place until the first storms had broken and the termites were flying. This temporarily bumped up the calorie level considerably[1], not only by direct augmentation but because,

[1] Cf. Fig. (*d*) for the contribution from animal products, mainly termites.

as was agreed on all sides, people were cooking more porridge than they had done at the height of the dry season now that they had a more plentiful supply of good sauce materials. Moreover, though short of sweet potatoes all the season, they were at this time hastily digging up and eating the remainder before they rotted in the ground. The beer seen during this visit might add about 100 calories and 2 g. protein per head per day.

247. The *Ukua* settlement was feasting as to both food and drink during the first visit, and the high calorie figure (Table 21) is not impossible, while the protein level reflects the unwonted plentifulness of groundnuts (para. 99) and the use of more eleusine relative to cassava (cf. Fig. (*e*)), these two items accounting for 50% of the total protein. The beer seen might add another 250 calories and 5 g. protein. The March figures are too doubtful for discussion, except to say that here again the termites were flying, and that I saw for myself that the people were in fact feeding well at the start of this recording period. The beer seen, other than for distilling, might add 100 calories and 2 g. protein ; there is no indication as to how much of the *araki* was drunk during the recording period, how much was for sale out of the group, and how much for local consumption at a later period.

248. The *Bo Road* figures in Table 22 should not be compared directly with those for the Zande groups owing to the different age composition of this group, with its higher percentage of children. There was no beer to add in September-October and unknown amounts in February-March.

249. The figures for *wage-earners* in Table 23 are in general agreement with qualitative observations, and will receive further attention in paras. 252, 296, 299, 301. Records on a small group of clerks in Yambio have not been included because their numbers were too small and the range of variation too great.

250. The interpretation of these tables is reserved till Section XII, but it may be pointed out here that the vitamin C value is an estimate of actual intake after allowing for all losses, and that the protein-carbohydrate ratio is given because of its importance in relation to liver damage (xviii).

SOURCES OF NUTRIENTS

251. The information set out diagrammatically in Figs. (*d*)—(i) shows why all the food categories are necessary, and why, to the frequent irritation of enquirers, the only reply which a nutritionist can make to questions about what should be the average consumption of any given food, is, " It all depends." The foods overlap in their contributions, which dovetail into one another, so that nutritional advice can usually be summed up in one word—variety.

252. *Calories* (Fig. (*d*)) : In all cases cassava was the principal source. The proportion from cereals varied with season and locality ; the severe seasonal shortage in the Bo Road, the small consumption by the Yubu wage-earners and the total absence of cereals from the nutrition-staff diet in January should be noted. The last group was an excellent example of " displaced " consumers, most of them without

relatives in the place, without womenfolk to grind for them, and in any case unable to get eleusine, since none was available for purchase in the market. Yubu Station staff was divided between :—

(*a*) permanent residents who grew some eleusine, but mainly for beer, and shared in the general tendency of the northern sub-district to lean more on cassava than the south ;

(*b*) staff liable to transfer and consequently not inclined to do more than a little mixed cultivation round the houses; and

(*c*) young bachelors (or men whose wives were absent) getting their main meals in other people's houses, if fortunate enough to have some link of kinship or friendship with an established home, otherwise eating irregularly and uncertainly.

The police, on the other hand, had holdings in a settlement outside the town where their families grew food supplies of all kinds, and there was a marked difference between the feeding in families thus established and recruits still waiting to get holdings, the latter being genuinely hungry before the monthly pay-day. Whether they need have been, had they been more circumspect in apportioning their spending through the month and less subject to tradition in regard to hospitality, is another matter. It is worth nothing, however, that in our own country few workers are expected to cope with budgeting for so long a period as a month.

253. Returning to Fig. (*d*) it will be seen that in all groups oilseeds contributed a substantial proportion of the calories, and so did sweet potatoes for half the year[1]. Attention has already been drawn to the termites in March (paras. 246).

254. *Protein* (*Fig.* (*e*)) : Taking the year as a whole, oilseeds were the most important source of protein ; animal products were variable, but not as small as might have been expected. They were boosted in March by the termites. The low protein content of cassava is emphasised by the small size of its contribution relative to the amounts eaten. The protein in the diet is well mixed in its origins, with several vegetable sources of good quality—groundnuts, sesame, cassava[2] and a small but qualitatively valuable contribution from leafy vegetables. In view of the supplementary action of different proteins, these diets seem likely to score unexpectedly well in respect of quality.

255. *Fat* (*Fig.* (*e*)) : Oilseeds (and termites in their season) contributed practically the whole amount.

256. *Calcium* (*Fig.* (*f*)) : The very rich sources were fish (because long stewing rendered the softer bones edible), sesame and eleusine, so that these foods made very large contributions to calcium intake relative to the amounts eaten, and in varying degrees the satisfactory totals for calcium were founded upon them. Cassava, on account of the large amounts eaten, also made substantial contributions.

257. The *iron* intake (Fig. (*f*)) was derived from a mixture of sources, and was heavily augmented by termites in their season.

258. *Vitamin* B_1 (*Fig.* (*g*)): It will be noticed that cassava is entirely absent from this diagram, and that the oilseeds in all cases

(1) For Bo Road, see para. 216.
(2) What little protein there is in cassava is said to be of good quality (xxii).

but one made the largest single contribution, compensation for the deficiency of cassava and maintaining intake at a generally satisfactory level (see para. 309).

25.9 *Riboflavin* (*Fig.* (*h*)) came from mixed sources. The relative importance of sweet potatoes is perhaps a somewhat surprising feature of this diagram. The cassava contribution came entirely from fresh tubers, the dried product having been found to contain none.

260. The level of *nicotinic acid* intake (Fig. (*h*)) depended overwhelmingly upon the groundnut supply.

261. (*Note.* The diagrams of the above three nutrients do not include termites, for which no vitamin values were available.)

262. Leafy vegetables were the principal source of *vitamin A* (Fig. (*i*)), with mangoes in their season. The contribution of sweet potatoes is questionable. In view of para. 122, a low value was adopted for coloured varieties, but it is more than likely that sweet potatoes recorded as coloured were often only red-skinned.

263. The chief point to be noticed in the *vitamin C* diagram (Fig. (*i*)) is the way in which the seasons of leafy vegetables, sweet potatoes and mangoes dove-tailed to maintain the supply of this vitamin through the year.

XI.—THE PEOPLE THEMSELVES

HEIGHTS AND WEIGHTS

Adults

264. *Height*: The mean height of 374 men was 167.5 cm. and 415 women, 157.5 cm. The group averages all fell within 167-169 cm. for men and 156.5-159 cm. for women, the non-Zande groups from north of Tambura included.

265. *Weight*: I was not able to ensure that the same people all turned up to be weighed each time, and out of the whole series of weights taken at different times only a proportion were repeats on the same subjects. The weight changes in this smaller series are given in Table 24. The Zande groups gained 4% (men) and 3% (women) during the late rainy season (August to December), subsequently losing 2% and 1% respectively during the dry season (December to April). A little later (May) I noticed that some families appeared to be losing weight rapidly, but only a few check weighings were feasible. These supported the qualitative impression that the losses were occurring mainly in small households where there was only one woman to see to both domestic and field duties. The small Balanda group showed gains of 1% and 2% for men and women respectively for the period October to February, the early part of the longer dry season of that northern area.

266. For the series as a whole, the average weights of non-identical groups weighed in the course of the survey are presented on the basis of weight for a given height in Fig. (*j*), the number in each sample being shown in brackets. They indicate trends similar to Table 24 for the

Zande men and the Balanda, though less defined for the Zande women. They are in line also with qualitative observations in the field.

267. On the whole, then, it appears that the Zande were gaining during the latter half of the rainy season, from maize harvest onwards, and losing during the dry weather when, as qualitative observations showed, their feeding was "ragged" and haphazard, with a temporary improvement at the swarming of the *akiodo* termites preceding the period of heaviest work, lowest feeding and falling weights in the early rains. This overall pattern hides a great deal of individual variation, for with the vulnerability of the families to misfortunes (para. 203), the effects of individual circumstances readily overrode the general seasonal trend.

268. The seasonal trend among the Balanda appeared to be different, for qualitative observation supported by the few figures obtained indicated the late rainy season with its severe pre-harvest shortage as a period of weight loss. With the later start to their cultivating season, their first crops began to come in later than further south, and their period of relative prosperity was the dry season, when besides the post-harvest plenty they enjoyed better supplies of meat and fish than other peasant groups. It was not possible to visit them during the busy season after the onset of the rains in April.

269. Wage-earners studied at Yubu were not distinguishable from the peasant families and have been included with them. The Yambio police families, on the other hand, were markedly heavier and are shown separately in Fig. (*j*). If it had been the men alone one would have supposed it to be a matter of selection, but it held good for the women too, and thus linked up with other evidence of their general well-being, except for the hungry period experienced in the recruit families towards the end of the month (para. 252).

Children

270. As with the adults, only a proportion of the subjects was seen more than once. Moreover, it was possible to obtain ages for only a fraction of the total. These two considerations have determined the method of presenting the findings.

271. *Height*: Except in para. 275, boys over 160 cm. and girls over 150 cm. have been excluded because the latter subjects might have already reached their final stature.

272. Growth appeared to be erratic in the boys, steadier in the girls. The same was true of the association of growth with weight changes in the two sexes. Among the boys, 11% showed growth but no gain or even a loss in weight, and 15% gained weight but failed to grow. The corresponding figures for the girls were 9% and 3% respectively. For 11% of the boys and 5% of the girls no growth and a stationary or declining weight were recorded, and only 63% of the boys compared with 83% of the girls both grew and gained weight.

273. The two periods covered by the records were the late rainy season and the dry season. Neither could be called better than the other in respect of growth, the pattern of which showed no correlation with season, some children failing to grow in the one, some in the other and some throughout. It thus appeared that any seasonal effect there

might be was masked by overriding individual or family factors (cf. para. 203).

274. In the boarding schools at the two mission stations in the northern sub-district, over the period September to April (almost evenly divided between term and holidays) 32% of the boys and 5% of the girls failed to grow in the one (Mupoi), and only 2% and 0 in the other (Yubu). The schools at the Yambio Mission were visited in December and April, nearly all the intervening period being spent by the children at their homes; in that time 13% of the boys and 0 of the girls had failed to grow.

275. A rather surprising difference in height distribution came to light between the schools of the two sub-districts. They were all measured twice, in different school years which meant that between the visits there were considerable changes with many pupils leaving and others coming. On both occasions the Yambio series of boys came out markedly taller than either of the other two, although the educational authorities stated that the age composition of the three schools might reasonably be expected to be comparable. The percentage distribution by height groups of 10 cm. is shown in Fig. (*k*). The same was found for the girls in 1947, but, girls being more erratic in their schooling than boys, the comparability of the three girls' schools is more doubtful. Certainly for 1948 the age composition of Yambio differed from the others, with a greater proportion of younger girls than usual, and this is reflected in the height distribution curve in Fig. (*k*).

276. The average height of adults in all areas was found to vary very little, so that if the schools are in fact comparable in age composition, these curves suggest a tendency to later development in the north relative to the south. Some scanty information about the age of first menstruation (Table 25), relating to the few girls whose ages were definitely ascertainable from mission records or about whom the headmistress knew enough to offer an estimate of age with reasonable assurance, tends in the same direction.

277. Attention is drawn to these observations simply as points of interest, without begging any questions as to their significance, if any, in regard to nutrition.

278. *Weight*: Taking first the data on those individuals who were seen more than once, the percentage weight changes will be found in Table 24. Unfortunately the girls were much more difficult to get hold of in any numbers than the boys, and their series is regrettably small.

279. For the southern (Zande) series, the boys again showed more variability than the girls, gaining 13% in the late rainy season and only 1% over a similar period in the dry season, compared with 8% and 4% for the girls. The children in the small northern series were gaining at a better rate during the dry season than the southern groups. These findings are consistent with those on the adults.

280. In the boarding schools, rates of weight gain (boys) per four months were Yubu 3%, Mupoi 2% and Yambio 1%, but the first two are the average four-monthly gain over a total period of eight months comprising both term and holidays, while the last is for one four-month period of holidays only(1).

(1) By an unfortunate mishap, the corresponding figures for the girls have been lost.

281. The results for the whole series of children weighed at different times irrespective of their identity are shown in Fig. (l) on a weight-for-height basis, omitting height groups under 120 cm., and all the Balanda except August, because their numbers were too small. The figures have been adjusted to the mid-point of the height range in each grade. As with the adults, a more pronounced curve shows up for the males than the females. It may be referred to the more irregular feeding habits of the boys (para. 196), and the diagram suggests that this phase begins approximately when the boys pass the 130 cm. mark—? say seven to eight years.

CLINICAL EVIDENCE

282. Clinical examination of survey families, some school groups, and samples taken from those attending sleeping-sickness inspections, were made by several doctors (para. 42), and they will no doubt be writing up their data later(1).

283. No gross nutritional disease was recorded. The minor signs most commonly seen were some of the changes in skin and mouth(2) usually regarded as indicating shortages of factors of the B vitamin group and/or certain amino-acids, but the nutritional significance of some at least of them was considered questionable under local conditions. A little clinical anaemia was recorded, but mostly of mild degree, especially by comparison with conditions in neighbouring districts. Dental caries was widespread.

284. The following brief preliminary notes are taken from official reports.

285. The Medical Inspector, Li Yubu (Dr. I. A. Hussein), in reporting on his school medical examinations for 1948, recorded the following incidence, in totals of approximately 200, of possible deficiency signs:—

	% *Mupoi*	% *Yubu*
Thickened conjunctivae	48	54
Folliculosis	38	47
Dyssebacia	1.5	3
Hypertrophied papillae of the tongue	48	45
Crackled skin	68	70
Dry skin	73	72
Tropical ulcer scars	48	50

To set these in the context of the general examination made at the same time, the principal items in the latter are listed below:—

	% *Mupoi*	% *Yubu*
Bilharzia	15	9
Ankylostomiasis	11	7
Enlarged spleen	58	53
Enlarged liver	64	63
Scabies	8	17
Taenia	6	14
Tropical ulcer	2	6

(1) Dr. Abbot's findings are give on p. 157.
(2) Angular stomatitis and cheilosis were not among them.

286. The Medical Inspector, Li Rangu (Dr. P. H. Abbott), examined a total of 603 subjects in five groups as follows[1] :—

Boys 5-16 years (estimated ages)	185
Girls 5-16 years (estimated ages)	154
Adult men (excluding old men)	92
Adult women (excluding old women)	122
Pregnant and nursing women	50
	603

The signs most commonly seen were :—

	%
Thickened conjunctivae	62
Folliculosis	18
Dyssebacia	34
Hypertrophied papillae of the tongue	61
Gingivitis	27
" Permanent goose-flesh "	32
Crackled skin	35
Dry skin (legs)	69

287. From the point of view of the dietary investigation, the absence of any glaring incompatibility between clinical and dietary evidence encourages confidence in the latter. Such a check is particularly necessary in an investigation among peasants and with field staff of low capacity, circumstances in which it would not be at all difficult to run into serious error. Without the reassurance of the clinical check, the food records could be presented only with the utmost diffidence, and the help given by the doctors and their willingness to give it on top of their usual work are very much appreciated.

XII. COMPARISON OF REQUIREMENTS, INTAKE AND PRODUCTION

REQUIREMENTS

288. The allowances given as an immediate objective in Platt's Report on Nutrition in the British West Indies (xvii) have been followed as a general guide. It is important to remember that they are applicable not to any one age or sex group but to a mixed population considered on a per head per day basis. The allowances are :—

Calories	2,500
Protein, g.	60
Ca, g.	0.8
Fe, mg.	20
Vitamin A as carotene, I.U.	5,000
Aneurin (vitamin B_1), mg.	1.5
Riboflavin, mg.	1.8
Nicotinic acid, mg.	12
Ascorbic acid (vitamin C), mg.	30

[1] For details see Dr. Abbot's note on p. 157.

An average body-weight of 60 kg. is assumed, which is well above the average of any Zande group, and iron is stated to be placed higher than usual to meet requirements under conditions of a high incidence of infestation with parasites.

289. As regards Vitamin C, in the present report diets have been rated as adequate if over the Medical Research Council's "minimal protective dose" of 10 mg. and abundant if over its recommended allowance of 30 mg. (xxv). For calories and protein, assessments have been made in two ways, based on the height and weight data :—

(*a*) On the average weight of the group, on the basis of 2,500 calories for an average weight of 60 kg. and *pro rata*, and 1 g. protein per kg. body-weight (xvii) ;

(*b*) According to the age and sex composition of the group. For calories, an assessment on the lines of Platt's unpublished report on nutrition in Nyasaland (xv) was made, based on body-surface area of adults, heights of children, weights of babies, with allowances for specific dynamic action, growth, and activities both routine and seasonal. Protein was calculated as follows, based on the rates for weight and age recommended by the National Research Council (xii) :—

	g./kg. body-weight
Adults, normal	1.0
Women in late pregnancy	1.5
& lactation	1.8
Adolescents	1.6
Children 7-12 years	2.0
Children 2-6 years	2.5
Babies under 2 years	3.5

The results by both methods are given in Table 26 with the intake figures for comparison.

290. The calculations would, of course, be thrown out in so far as any group deviated from its normal weight, but with the probable exception of Momboi (para. 293), these may be taken as reasonable allowances *at the present rate of living*.

CALORIES

291. In the light of the weight curves and intake figures, the more detailed assessment (B in Table 26) would appear to be nearer the mark—as it should be.

292. The *Taba* intake figures should be 50-100 calories higher with beer (para. 232), but this does not much affect the comparison. The third intake figure, 2,400 calories, is probably higher than the true average level of feeding at that season (para. 243). In general, the figure-of-eight described by the requirements (B) and intake curves agrees very well with the weight trends—up at period 2, declining at period 3, falling sharply at period 4.

293. The Momboi intake figures adjusted for beer would be 2,075 and 2,550 calories (para. 237), and the reasons for the latter high figure have already been pointed out (para. 246). The fact that most people had lost weight between the two visits indicates that the rise

in intake had only recently occurred(1). The low average weight in this group is partly due to a relatively high proportion of small children, partly to the fact that though comparable with other groups in height, the adults were below the Zande average in weight, for the whole year had been a hard one for them. Their allowances should therefore be rather higher than shown in Table 26.

294. *Ukua*, as already stated (para. 247), was feasting at the first recording period and feeding well at the second, with plenty of beer to be added to the totals given in Table 26. How continuous this had been I cannot tell, but the fact that for the group as a whole weights had not greatly changed, though individuals had varied considerably both up and down, suggests that the November feasting had been a short-lived phenomenon. As to the second visit, a little over a month later the people had begun to cry " Hunger ! " in the ears of the District Commissioner.

295. The adults of the Bo Road were rather light in weight compared with the Zande, though comparable in height, and the group average was further lowered by the bigger proportion of children. The relation shown between calorie intake and requirements (B) is probably more or less correct. The beer available at the second period (para. 240) would fill the gap and more, while all the evidence pointed to the season of the first visit as a hunger period. The variation in the weight changes of individuals was particularly striking in this group, where the people were all living pretty near the bone and even slight setbacks or pieces of better fortune produced a marked effect on the well-being of the family.

296. The *police* as a group were prosperous and well fed, and being, as a result, considerably heavier than the peasant groups, their basic energy requirements were higher. The group figures conceal a wide range of variation in intake between the homes of the most prosperous senior men and the recruit families with, as yet, no home-grown supplies to stabilise their monthly food budgets (para. 252), but from general observations it would seem that the latter suffered more from violent fluctuations than from any serious shortfall on the average for the whole month. The amount which should be allowed for beer is unknown (para. 239).

297. In the other groups for which intake records are available, the lack of adequate height and weight data precludes an estimate of requirements on the lines of Table 26, but it is possible to consider the dietary findings in the light of that Table.

298. The only peasant group was *Madi*. Its energy requirements might be equated with those of Taba in the second period, 2,200 calories. The recorded intake was about that level (with beer), with probably some unrecorded extras in the harvest fields (para. 245), and the appearance of the group was prosperous.

299. Only a few of the Yubu *wage-earners* and their families were weighed, and that only once and with some difficulty. They did not wish to be weighed, and the matter was too troublesome to be

(1) The average weights for this group in Table 26 are not necessarily inconsistent with this, because the two samples are not identical.

worth pursuing. The sample weighed fitted into the ordinary peasant series and was in no way outstanding like the police. Similarly their level of feeding was qualitatively and quantitatively lower than that of the police. The amount to be added for beer is unknown. From their appearance these families were meeting their energy requirements, and considering the levels at which requirements run in Table 26, and allowing for beer, their food records would appear to be reasonably complete.

300. The same may be said about the *nutrition staff* and its hangers-on in the form of small " servants."

PROTEIN

301. Protein allowances naturally come out higher (Table 26) by the more detailed assessment (B) than on the simple basis of 1 g./kg. body-weight (A). Intake will be seen to be extremely variable, generally falling short of the allowances in the rainy season and reaching them in the dry season. On consideration of all the evidence on intake it seems likely that for the whole year it is somewhat below the weighted allowances though not by nearly as wide a margin as many people would expect in a stockless community. The wage-earning groups did not always do better than others, *vide* Yubu Station in September, for market supplies were irregular and uncertain. Owing to uneven distribution, it is likely that the protein intake of some families, and still more of individuals within families, was never adequate.

302. All in all, the total protein intake may be described as fair, but a probably more important point is the protein-carbohydrate ratio, which should not fall below 1 : 10 (xviii). The position as revealed in these records is therefore precarious (Tables 21-23). When uneven distribution as between families on the one hand and individuals within them on the other is taken into account, this may be considered the principal danger-point in the diet, and its possible contribution (para. 250) to the extremely high incidence of enlarged liver (para. 285) merits attention. The imbalance might, moreover, easily be aggravated, *e.g.* by further encroachment of cassava, or by unwise sale of groundnuts, which make a double contribution in this matter, first through their very high protein-carbohydrate ratio and secondly through the energy value of their oil, the loss of which would probably be made good by increased consumption of starchy foods.

FAT

303. The proportion of fat in the diet is reasonable.

CALCIUM

304. In order to see how far it might differ from the overall allowance of 0.8 mg. per head (para. 288), an estimate was made on the basis of 1 g. for each child and for women in late pregnancy, 1.5 g. for lactating women, and 0.7 for all other adults. The results came out to 0.8 g. per head for all groups except the Bo Road 0.9 and the police families and nutrition staff, 0.7.

305. There need be no anxiety about calcium intake in the diet as it is at present, but if the decline of eleusine continues, intake will fall, other things being equal.

IRON

306. Iron intake tended to be higher in the peasant than in the wage-earning groups (except police); the latter groups fell short of the high allowance of 20 mg., but reached levels which would normally be considered adequate.

VITAMIN A

307. The estimated vitamin A intake in so far as it depends on sweet potatoes (Fig. (i)) is open to question (para. 122). It is clear from the records that intake was in any case inadequate in the dry season. The two richest sources then available—leaves of cassava and sweet potato—are unpopular and therefore only moderate use is made of them. For the rest, intake at that season depends on the use of suitable types of sweet potatoes until the mangoes come in March. In the absence of signs of vitamin A deficiency, it is to be presumed that intake during the rainy season is sufficient to carry the people over the period of shortage.

308. A point worth noting, however, is that the dry season brings a condition known to the Zande as *vurute*, which, they say, means "white skin." It is a dry flaky dustiness of the skin, found particularly among the boys.

ANEURIN (VITAMIN B_1)

309. Taking the allowance as 0.6 mg. per 1,000 non-fat calories, requirements for the different groups work out as below, recorded intake being set alongside for comparison.

		Aneurin, mg.	
Zande Peasant		*Requirement*	*Recorded Intake*
Taba	August	1.1	1.2
Madi	October	1.1	1.3
Momboi	October	1.1	1.5
Taba	November	1.4	1.8
Ukua	November	1.5	2.3
Taba	February	1.2	1.4
Momboi	March	1.1	1.1
Ukua	March	(1.1)	(1.4)
Taba	May	1.0	0.9
Balanda Peasant			
Bo Road	Sept.-Oct.	0.8	0.7
Bo Road	Feb.-March	1.0	1.1
Wage-earners			
Yubu	September	1.1	0.9
Police	January	1.4	1.5
Yubu Nutrition Staff	January	1.2	1.2
Yubu	January	1.1	0.8
	April	0.9	1.1

Thus all reached the stated requirement level, except Taba in May, Bo Road in September-October, Yubu Station in September, and the nutrition staff in January (cf. para. 252). That these levels were reached in spite of the absence of this nutrient from the staple food is an achievement attributable in the main to groundnuts (Fig. (g)), making yet another reason why any tendency in the direction of selling groundnuts and filling up on cassava (para. 101) is a danger signal. With a grain staple, the position would be a great deal less vulnerable.

310. The Balanda, with sesame in place of groundnuts, are more vulnerable than the Zande, as is shown by the Bo Road figures for the season when grain supplies were at their lowest.

RIBOFLAVIN

311. In Tables 21-23, intake of riboflavin falls ludicrously far short of the recommended allowance, para. 288, and it is still so even if a restricted allowance of 1.2 mg. be adopted as the standard of comparison, though beer is likely to make a useful contribution towards filling this gap (vii and xix). That minimum requirements are not fully met is suggested by the clinical evidence, but it does not appear that there is more than a minor degree of deficiency. It would seem that either the recommended allowance is extremely generous or some of the analytical figures used are too low.

NICOTINIC ACID

312. So long as groundnut consumption is maintained, there need be no anxiety over nicotinic acid. The Balanda, again, are in a more vulnerable position than the Zande.

ASCORBIC ACID (VITAMIN C)

313. Recorded intake ranged from adequate to abundant.

PROVISION FOR LABOUR AND OTHER WAGE-EARNING GROUPS

314. Development projects involve a sustained output of energy at a level unknown in peasant life. Their effort is intermittent; spasmodic bouts of output, maybe at a high rate while they last, are interspersed with periods of very low activity, the balance between output and intake being struck at a low level (Table 26).

315. The extra effort demanded of wage-earners, slow and inefficient though they may be by western standards, means hungrier men. Before the days of development, the essential labour requirements of the area were met by drawing off a few hundred men from their homes each month to do one month's paid service. In 1948, with development projects not yet by any means in their stride, the labour force had risen to 2,000, of whom 80% were temporary employees on the old basis, and some 400 were regular wage-earners. This was already creating a feeding problem. On the old scale of operations, the men found no difficulty in making their own arrangements, lodging or feeding with relatives and drawing on the reserve of food in the ground round any settlement (abandoned cassava run wild). With the ever-expanding demand, however, and its tendency to concentration at

certain centres, by 1948, the situation had become difficult, and steps were being taken to organise better arrangements. The needs of a body of permanent labour in the industrial concerns have now to be considered, and on top of that, the question of supplies for a small group of Northern artisans with different tastes and customs.

316. The gap between the average requirements of the men in ordinary peasant life and of men doing manual labour for an employer is estimated at about 400 calories a day. In the peasant groups, the energy requirements of the men alone averaged 2,500 calories, ranging from 2,400 to 2,700 calories according to season. Combining the peasant groups into one series, the men's requirements for a merely pottering existence come out at 2,100 calories estimated by method B (para. 289). For employed labour, 800 additional calories would allow for a moderate working day with a fluctuating output of energy. Sustained heavy work would require more, but 800 is probably a fair average for Zande gangs. This makes 2,900 calories against the peasant's 2,500. For a labour force of 2,000, the additional 400 calories per head per day represent an increased requirement of 10 tons of flour (or its energy equivalent) per month *over and above* normal food consumption.

317. Similarly a bigger food demand is arising from small groups of other wage-earners here and there, cf. the police families' records, not to speak of schools, hospitals and prisons aiming at a better standard for pupils and patients or at meeting requirements for hard work. All these things mean a heavier demand on the subsistence food economy, which in the first place is not designed or organised to produce a regular surplus and in the second place has to stretch itself to meet these new demands despite a steady (even if still small) draining away of producers to become mainly or wholly consumers. Even without the attractions of a very high market for foodstuffs outside the district altogether, the traditional food economy is under increasing pressure. To this may be added, in, say, the next decade, the burden of a population overweighted in the upper age grades (para. 33).

318. The production of special plots of food crops for market (instead of cotton) was beginning in the survey year, and was the first organised step in adapting the traditional food economy to the changing conditions.

INTAKE AND PRODUCTION

319. If the relevant items in Table 18 are evaluated on the same basis as the items in Table 8, we get the following results :—

Group	*Month*	*Calories*	*Protein, g.*
Ukua	November	2,175	55
	March	(1,300)	(39)
Momboi	October	1,075	37
	March	1,025	25
Taba	August	850	26
	November	1,325	44
	February	1,200	34
	May	600	17
Bo Road	Sept.-Oct.	600	29
	Feb.-Mar.	875	29

These are a long way below the tentative estimate of production made in Table 8, but the comparison is not a direct one.

320. First, the seasonal swing in the consumption of these particular items has to be considered, and there is insufficient data to show where the true average for the year may lie. Secondly, the figures in Table 8 are extremely tentative; for instance, unproven rates of yield for the mixed plantings of the peasants, qualitative estimates of the proportion of " Additional Plantings " (Table 7) to measurable plots, and the assumptions made about maize (para. 63), are all obviously vulnerable points. Thirdly, the percentage of loss (apart from waste in the actual processing) between field and cooking pot is an entirely unknown factor, and data collected by the Nyasaland Nutrition Survey (xv) indicate that it may well be large. Fourthly, sales of produce and amounts used in brewing have to be deducted from Table 8. The only data on either of these points refer to brewing at Taba, where it was estimated that approximately 40 kg. of grain (eleusine and maize) per head were devoted to beer.

321. This halting attempt to relate consumption to production has not got very far, but its shortcomings are themselves informative.

LIST OF REFERENCES

(i) Analyses of Sudan Foodstuffs. Report of the Government Analyst, 1947.

(ii) Chemical Laboratory, Dar es Salaam. Information given in correspondence.

(iii) Cravioto et al. Mexican Foods. J. Nut. 1945. **29**, 317.

(iv) Culwick, A. T. & G. M. Fostermothers in Ulanga. Tang. N. & R. 1946, **1**, 19.

(v) Filios, A. M. & Esselen, W. B. (Jr.). The Vitamin Content of Canned and Cooked Fresh Mushrooms. J. Amer. Nut. Ass. 1946, **22**, 772.

(vi) Fox, F. W. & Golberg, L. South African Food Tables. S. Afr. Inst. for Med. Res. 1944.

(vii) Golberg, L. & Thorp, J. M. A survey of Vitamins in African Foodstuffs. VI. Thiamin, Riboflavin and Nicotinic Acid in Sprouted and Fermented Cereal Foods. S. Afr. J. Med. Sci. 1946, **11**, 177.

(viii) Equatorial Province Handbook Vol. 1. Sudan Government Memoranda No. 4, 1936.

(ix) International African Institute. The Food and Nutrition of African Natives. Memo. 13, 1937.

(x) Kent-Jones, D. W. & Amos, A. J. Information given in correspondence.

(xi) McCall, A. A note on the Agriculture of the Azande. (Unpublished.)

(xii) National Research Council. Recommended Daily Allowances. Revised 1948. U.S.A.

(xiii) Nicholls, L. Tropical Nutrition. 2nd edition, London, 1945.

(xiv) Nutritive Value of Indian Foods and the Planning of Satisfactory Diets, The. Health Bull. No. 23. Delhi. 1938.

(xv) Platt, B. S. Report of the Nyasaland Nutrition Survey (1938-39). (Unpublished.)

(xvi) Platt, B. S. Tables of Representative Values of Food Commonly Used in Tropical Countries. M.R.C. Spec. Rept. Ser. No. 253. H.M.S.O. 1945.

(xvii) Platt, B. S. Report on Nutrition in the British West Indies. Col. No. 195. H.M.S.O. 1946.
(xviii) Platt, B. S. Personal Communication.
(xix) Platt, B. S. & Webb, R. A. Fermentation and Human Nutrition. Proc. Nut. Soc. 1946, **4.** 132.
(xx) Raymond, W. D. et al. The Nutritive Value of Some Tanganyika Foods. II. Cassava. E. Afr. Agric. J. 1941. p. 154.
(xxi) Research Division, Department of Agriculture and Forests, Sudan. Information given in correspondence.
(xxii) Sreeramamurthy, V. V. Investigations on the Nutritive Value of Tapioca (*Manihot utilissima*). Ind. J. Med. Res. 1945, **33.** 229.
(xxiii) Wellcome Chemical Laboratories, Sudan Medical Services. Information given in correspondence.
(xxiv) Woodman, H. M. Nutrition of the African in Tsetse-fly Areas. E. Afr. Med. J. 1947, **24.** No. 9.
(xxv) Preliminary Report by the Vitamin C Sub-Committee of the Accessory Food Factors Committee of the Medical Research Council. Lancet No. 6510, p. 853. 1948.

Also plant lists and other unpublished material available locally.

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APPENDIX I.

ZANDE FOOD PLANTS (WITH SOME MEDICINE PLANTS AND OTHER USEFUL PLANTS)

1. In compiling the following lists I have drawn upon several prepared by other people, to whose work I have added my own investigation from the dietary point of view. The food list is, I hope, fairly complete as regards cultivated plants; there are certainly still omissions among the wild ones. The other two lists are sketchy, merely representing such information as was acquired incidentally during the food investigation.

2. The food list is classified as follows :—

Cereals
Starchy roots and fruits
Legumes
Oilseeds
Leafy vegetables
Other vegetables
Fruits
Miscellaneous
Minerals (" salt " plants).

Most of the wild plants mentioned, and a good many of the cultivated ones, are eaten only very occasionally. Where the use is known to be strictly local, this is indicated in a footnote. When several parts of a plant are used, or it appears in more than one of the lists, cross-references are given after the Zande name.

3. Medicinal and magical uses have as far as possible been separated, the one being entered in List 2 and the other in List 3, but of course the two are often confused.

4. Reference numbers run consecutively through the three lists.

5. The Zande use plant names very loosely. Different informants called the same plant by different names, or applied the same name to different plants. Sometimes differences in usage seem to have a fairly well-defined local application, but by no means always. Many of the names are allusive, *e.g.* " horns of buffalo," or " by the mouth of the hippo " ; such names in particular are liable to be used loosely. Prefixes and suffixes are freely used to associate and distinguish plants considered to be similar in some way. Examples of prefixes are *tita* = grandparent (*i.e.* large), *wiri* = child (*i.e.* small), *kpe* = leaf, *ngua* = tree, *ziga* = antidote ; and of suffixes, *di* denoting by the river and *pia* away from the river. The plants thus associated are not necessarily related botanically, though they sometimes are. All these factors contribute to the confusion over names in the various lists I have consulted, and for the present discrepancies seem to be unavoidable.

6. The lists were submitted in draft to the Chief Economic Botanist, Research Station, Wad Medani, for correction of botanical names in accordance with modern nomenclature and determination of a number of specimens. A few of the supplementary items (listed as addenda in the appropriate sections) have not been so submitted.

LIST I

ZANDE FOOD PLANTS

Food Category	No.	Zande Names	Other Names or Description	Botanical Name
Cereals	1	Koko (128)	Sweet dura	Sorghum sp.
	2	Mapunga	Rice	Oryza sp.
	3	Moru (151)	Finger-millet, Telebun	Eleusine coracana Gaertn.
	4	Ngbaya (154)	Maize	Zea mays L.
	5	Ngiria	Bulrush millet, Dukhn	Pennisetum Typhoides (Burm.) Stapf. & Hubbard.
	6	Penzi	Grass	Hyparrhenia sp.
	7	Tudu	Grass	
	8	Vunde	Sorghum, Dura	Sorghum spp.
Starchy Roots and Fruits	9	Abangbe (40)	Sweet potato	Ipomoea batatas Lam.
	10	Akpongodi		
	11	Bagbuza	Herb	Tacca pinnatifida Forst.
	12	Baime		
	13	(Baniongo (Y) (*a*) (Ngbaduge (T)	Wild Yam	Dioscorea schimperiana Hochst ex Kunth.
	14	Bu (97, 142, 236)	Banana, plantain	Musa spp.
	15	Gbanda, Tara (Y) (46)	Cassava, Manioc	Manihot esculenta Crantz.
	16	Gbara	Yam	Dioscorea spp.
	17	Manzi	Cocoyam	Xanthosoma sagittifolium Schott.
	18	Mere	Aerial yam	Dioscorea sp. cf. D. bulbifera.
		Addenda		
	18*a*	Bayungumba	Wild yam	Dioscorea dumetorum Pax.
Legumes	19	Abakpa	Mung beans, Green gram	Phaseolus mango L.
	20	Abangua	Climbing cowpea	Vigna sp.
	21	(Abapu (Y) (Ayanze (T)	Cowpea	Vigna unguiculata Walp. and other Vigna spp.
	22	Abaundu	Earthnut	Voandzeia subterranea Thouars.
	23	Adugo	Pigeon pea	Cajanus cajan Millsp.
	24	Akpokoworo	Lima bean	Phaseolus lunatus L.
		Addenda		
	24*a*	—	Climbing bean	Macuna deeringiana Small.
Oilseeds	25	Andeko	Hard simsim	Hyptis spicigera Lam.
	26	Awande	Groundnut, Peanut, Ful Sudani	Arachis hypogaea L.
	27	Bangombe	Cult. climber	Luffa sp.
	28	Besende (43, 70)	Pumpkin	Cucurbita maxima Duchesne
	29	Boko (44, 71)	Pumpkin	Cucurbita maxima Duchesne

LIST I (*Continued*)

Food Category	No.	Zande Names	Other Names or Description	Botanical Name
Oilseeds	30	Datiro	Inedible melon	Citrullus sp.
	31	Inga (47, 72, 263)	Calabash	Lagenaria siceraria (Molina) Standl.
	32	(Koforo (Y) (*b*) (73) (Mbuguru (T)	Cucumber	Cucumis spp.
	33	Kpagu (74)	Gourd	Lagenaria siceraria (Molina) Standl.
	34	Kpakari (102)	Shea nut, Lulu	Butyrospermum niloticum Kotschy.
	35	Mbiro (148)	Oil palm	Elaeis guineensis Jacq.
	36	Nagbanga (55, 76, 265)	Bottle gourd	Lagenaria siceraria (Molina) Standl.
	37	(Nzungu (Y) (59) (Nzungba (T)	Tree	
	38	Sere	Sesame, Simsim	Sesamum orientale L.
	39	Zawa	Meni oil tree	Lophira alata Banks.
		Addenda		
	39*a*	Puse	African breadfruit	Treculia africana Decne.
Leafy Vegetables	40	(Abagambo (Y) (136, 163) (Anyakanyali (T)	Blackjack	Bidens pilosa L.
	41	Abangbe (9)	Sweet potato	Ipomoea batatas Lam.
	42	Bakure	Tree	Pterocarpus lucens Lepr. ex Guill. & Perr.
	43	Besende (28, 70)	Pumpkin	Cucurbita maxima Duchesne.
	44	Boko (29, 71)	Pumpkin	Cucurbita maxima Duchesne.
	45	Danda	Purple-flowered simsim	Sesamum indicum d.
	46	Gbanda, Tara (Y) (15)	Cassava, Manioc	Manihot esculenta Crantz.
	47	Inga (31, 72, 263)	Calabash	Lagenaria siceraria (Molina) Standl.
	48	Kpedekpede	Amaranth, Wild spinach	Amaranthus spp. and Celosia spp.
	49	Kutukpa'gita	Purslane	Portulaca sp.
	50	(Mangayu (*c*) (Zande) (194) (Yango (Balanda)	Herb	Gynandropsis gynandra L. Briq.
	51	Mbazia (196, 229)	Herb	Acrocephalus lilacinus Oliv.
	52	Mboyo (75)	Ladies' fingers, Okra, Bamia	Hibiscus esculentus L.
	53	Morombida	Jew's Mallow, Molokhia	Corchorus olitorius L.
	54	Mvute	Herb	Conyza Aegyptiaca Ait.

LIST I (*Continued*)

Food Category	No.	Zande Names	Other Names or Description	Botanical Name
Leafy Vegetables	55	Nagbanga (36, 76, 265)	Bottle gourd	Lagenaria siceraria (Molina) Standl.
	56	Namba (77)	Red sorrel, Rosella	Hibiscus sabdariffa, L.
	57	Namba zire	Wild rosella	Hibiscus sabdariffa, L.
	58	Nzibi (*d*) (244)	Deccan hemp	Hibiscus cannabinus L.
	59	Nzungu (Y) (37) Nzungba (T)	Tree	
	60	Nzuo	Mock tomato	Solanum spp. including S. aethiopicum L.
	61	Nzuo bire	Wild mock tomato	Solanum nigrum L.
	62	Serenduka	Herb	
	63	Seresere Sesere	Purslane, Rigla	Portulaca oleracea L.
	64	Sure	Herb	Solanum sp.
	65	Tande (*e*)	Herb	Justicia insularis T. Anders
	66	Vura (268)	Kapok	Ceiba pentandra Gaertn.
	67	Vute		Gynura crepidroides Benth.
		Addenda		
	67*a*	Anongba (84,166)	Cucurbitaceous plant	
	67*b*	Riaria (134)	Red pepper, Shatta	Capsicum frutescens L.
	67*c*	Ngaliyo	Swamp plant	
Other Vegetables	68	Bagbodi (259*a*, 271)	Tree	Hymenocardia acida Tul.
	69	Basala	Spring onion	Allium fistulosum
	70	Besende (28, 43)	Pumpkin	Cucurbita maxima Duchesne.
	71	Boko (29, 44)	Pumpkin	Cucurbita maxima Duchesne.
	72	Inga (*f*) (31, 47, 263)	Calabash	Lagenaria siceraria (Molina) Standl.
	73	(Koforo (Y) (32) (Mbuguru (T)	Cucumber	Cucumis spp.
	74	Kpagu (33)	Gourd	Lagenaria siceraria (Molina) Standl.
	75	Mboyo (52)	Ladies' fingers, Okra, Bamia	Hibiscus esculentus L.
	76	Nagbanga (*f*) (36, 55, 265)	Bottle gourd	Lagenaria siceraria (Molina) Standl.
	77	Namba (56)	Red sorrel, Rosella	Hibiscus sabdariffa L.
	78	Tamatim	Tomato	Lycopersicum esculentum Mill.
Fruits	79	Abanga Mbiri	Tree	Canarium schweinfurthii Engl.
	80	Abangba	African locust bean	Parkia filicoidea Welw.
	81	Abanza	Tamarind	Tamarindus indica L.

LIST I (*Continued*)

Food Category	No.	Zande Names	Other Names or Description	Botanical Name
Fruits	82	Akua (133, 230) Ambassa	Borassus, Doleib	Borassus flabellifer L.
	83	Ananas	Pineapple	Annas comosus L.
	84	Anongba (67*a*, 166)	Cucurbitaceous plant	
	85	Anzeri (131)	Tree	Irvingia sp.
	86	Bagara (168, 260)	Wild custard apple	Annona senegalensis Pers.
	87	Bagipara Ndairoko Ndasu	Wild fig	Ficus sp. cf. F. capensis Thunb.
	88	Bakakwe (231)	Wild climber	Cissus populnea G. & P.
	89	Bambiso di Sendembori	Tree	Syzygium guineense DC.
	90	Bambiso pia (Y) Kpakpa (T)	Tree	Syzygium sp.
	91	Bamugu (273)	Herb	Acanthaceae
	92	Bandeni (*g*) Banyikoro	Tree	Prob. Parinari curatellifolia Planch.
	93	Barangbabaango	Wild cucurbit	
	94	Birikito (268*b*) Kanganongu Ngunge	Tree	Vitex cuneata Schum. & Thonn.
	95	Birikito ambiri	Tree	Vitex madiensis Oliv.
	96	Borodukani	Tangerine, Mandarin	Citrus nobilis Lour.
	97	Bu (14, 142, 236)	Banana	Musa spp.
	98	Gangalingo	Shrub	Carissa edulis Vahl.
	99	Gbarakuri (185,279)	Shrub	Asparagus racemosus Willd.
	100	Gengere (144,188)	Wild climber	Prob. Ampelocissus cinnamochroa Planch.
	101	Guava	Guava	Psidium guajava L.
	102	Kpakari (34)	Shea nut, Lulu	Butyrospermum niloticum Kotschy.
	103	Kpazamangu (246)	Shrub	Securinega virosa (Roxb.) Baill.
	104	Kpokpogi Rindikiwe	Shrub	Carissa edulis Vahl.
	105	Kpoyo (132*a*, 147, 268*c*, 281)	Tree	Grewia mollis Juss.
	106	Lolo	Tree	
	107	Manga	Mango	Mangifera indica L.
	108	Mbiombio (240)	Wild climber	Uvaria bukobensis Engler.
	109	Mbuma	Cape gooseberry	Physalis peruviana L.
	110	Mvuruma (130)	Wild fig	Ficus vallis-Choudae Del.
	111	Ndevu	Wild rubber	Landolphia florida Benth.
	112	Ndimu	1) Lime, 2) Lemon	Citrus medica L. 1) Subvar. acris 2) Subvar. Limetta Risso.