



Publication series "Afrika-Studien" edited by Ifo-Institut für Wirtschaftsforschung e. V., München, in connexion with

Prof. Dr. PETER VON BLANCKENBURG, Berlin

Prof. Dr. HEINRICH KRAUT, Dortmund

Prof. Dr. OTTO NEULOH, Saarbrücken

Prof. Dr. Dr. h. c. RUDOLF STUCKEN, Erlangen

Prof. Dr. HANS WILBRANDT, Göttingen

Prof. Dr. EMIL WOERMANN, Göttingen

Editors in Chief:

Dr. phil. WILHELM MARQUARDT, München

Afrika-Studienstelle im Ifo-Institut

Prof. Dr. HANS RUTHENBERG, Stuttgart-Hohenheim,

Institut für Ausländische Landwirtschaft

Lit.112

Investigations into Health and Nutrition in East Africa

with 132 tables and 70 figures

By

H. KRAUT / H.-D. CREMER (Eds.)

with contributions of

M. G. ATTEMS

H. KASPER

W. KELLER

R. KORTE

Y. KREYSLER

E. MUSKAT

W. POEPLAU

H. J. SCHAEFER

C. SCHLAGE

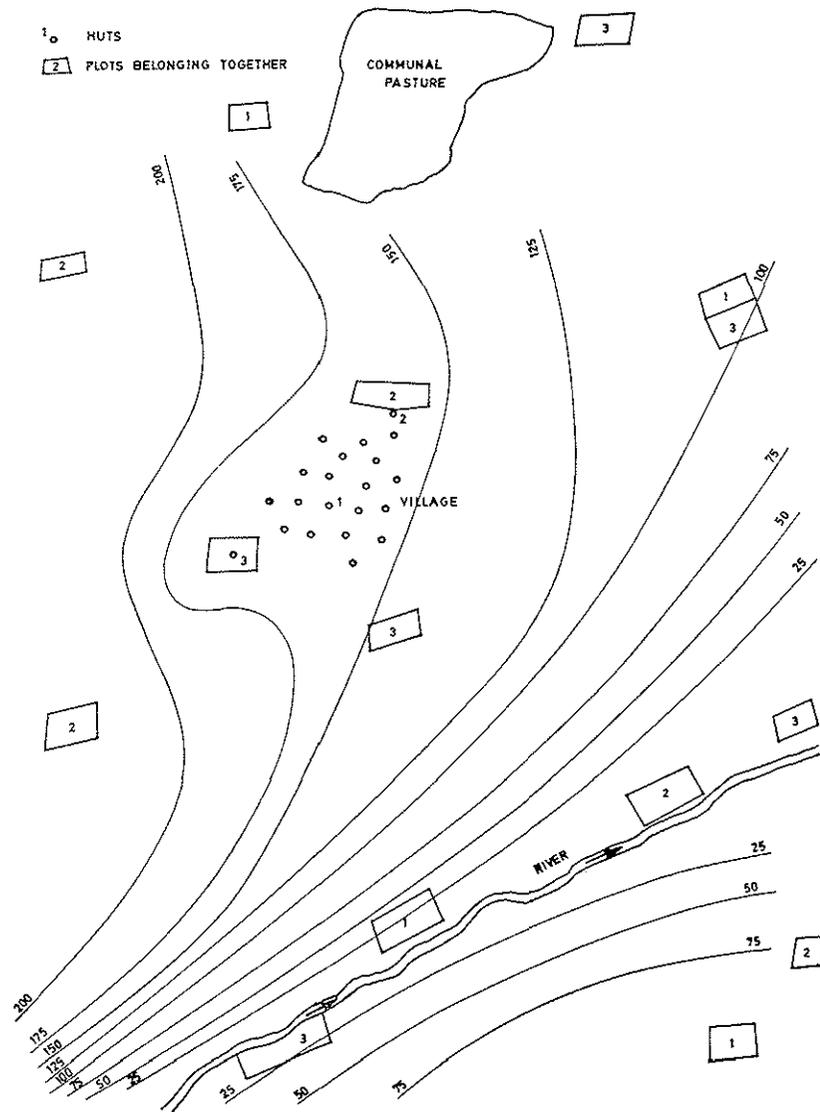
P. THEERMANN

W. VALDER



WELTFORUM VERLAG · MÜNCHEN

Map. 1. *Shambala Holdings (model)*



cialized the more persons are living on the farm. In Mulungui (subsistence farming) there were on an average 5.0 persons in a family; in Soni (cash crop farms) 6.9 (see Table 2). The main reason for this difference is that with subsistence farming workers tend to move elsewhere when possible, whereas commercialized farms probably take in workers (relatives) from outside. The

work potential¹¹ of the average family under review is 2.2 man equivalents (ME). Families in Soni and Bumbuli have 2.4 ME each whereas Mulungui has an average of 1.9 ME per farm. Manpower therefore depends on the degree of commercialization.

3. Utilisation of the Land

Agriculture comprises a subsistence-sphere and a market-sphere. Today the priority is definitely still on producing food for the family's own use. The farmers decide their cropping on the basis of providing the household with as regular a supply of foodstuffs throughout the year as possible. Palatable food such as maize is definitely preferred in Usambara agriculture. The Shambala cultivate both arable and perennial crops, and one usually finds both types on one plot. There seems to be no recognisable connection between the type of cultivation and the distance from the dwellings.

It can be seen from Table 4, that the commercial farms of Soni have the highest percentage of arable land and therefore the smallest amount of land under permanent cropping. In Mulungui, the percentage of arable land is higher than in Bumbuli.

Table 4. *Distribution of Arable and Permanent Crops in the Investigated Areas and in the Total Investigation*

	Soni	Bumbuli	Mulungui	Total (Average)
Total area surveyed (acre)				
Size of holdings (acre)	2.65	2.73	1.65	2.35
Arable land, acres/holding	2.02	1.45	1.03	1.50
Land occupied with permanent crops, acre/holding	0.63	1.25	0.60	0.83
% of arable land	76.1	53.5	63.0	64.2
% of land with permanent crops	23.5	46.3	36.2	35.2
Total	99.6	99.8	99.2	99.4
Desert	0.4	0.2	0.8	0.6
Total	100.0	100.0	100.0	100.0

¹¹ Calculations on work potential are based on COLLINSON's Key for man equivalents (ME):

Age group	under 10	10-14	15-18	19-50	over 50
Male	-	0.25	0.67	1.00	0.67
Female	-	0.25	0.50	0.67	0.50

Source: M. P. COLLINSON: Farm Management Survey No. 3, Shinyanga Region, Ministry of Agriculture, Tanganyika, p. 21.

a) Shambala's Main Annual Crop: Maize

Most of the land and working time is devoted to maize. The land is prepared by hoe-cultivation without ridging. Pocket drilling is the usual planting method. 5 seeds are put into each pocket. Sometimes the seeds are pre-germinated by docking them overnight in water. The distance between rows varies from plot to plot from 0.8 yards to 1.4 yards, but is usually 1.1 yard. The sowing of 5 seeds in one hole is an age-old practice but is still carried on as a matter of course. It was impossible to find out whether this practice serves a useful purpose or not. It stems from an old tribal custom. The custom reads as the following:

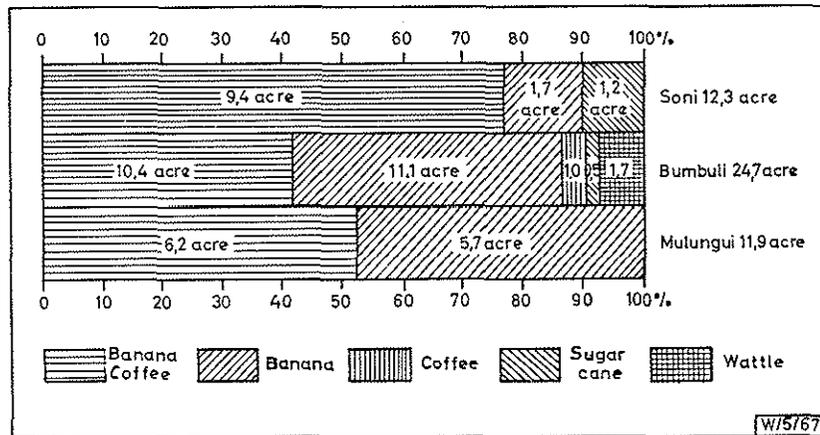
“One seed for the god (Muongo),
 One for the birds,
 One for the stalk-borer,
 One because they will not all germinate, and
 One for the harvest.”

b) Size and Structure of Cropping

The Shambala farmers have so little land that almost all of it is under cultivation and only in rare instances does one find fallow-land. Considering the small size of the farms, the amount of available labour force per unit of land is high. In the total area there is nearly 1 man equivalent per acre of cultivated land.

The high proportion of maize-land is worthy of note. In the whole area it takes up nearly 50% of the arable total land. Cassava take up 25%, vegetables 13%, pulses 10%, sweet potatoes and taro together 6%. The structure of cropping of each individual survey area is shown in Diagram 2.

Diagram 2. Share of Various Permanent Crops in the Survey Area



c) Differentiation in Cropping According to Location

Usually a Shambala farm comprises many scattered plots of land, but nearly all of them bear the same type of main crops (maize and cassava). There is scarcely any differentiation in cropping because one plot is further away than another. Two exceptions are bananas and tobacco which are grown near the dwelling. Cassava is seldom grown on the very outlying plots. In this respect, Shambala cultivation differs considerably from the shifting cultivation of East and West Africa, where such differentiation is normal.

Similarly, in the Usambara Mts. there is scarcely any differentiation due to the type of soil in land utilisation. Land utilisation elsewhere is usually on a catena-pattern. Almost all the plots belonging to one farm, whether at the top of the slope or at the bottom, whether on a north slope or on a south slope, are planted with maize and cassava. There is a difference however with regard to the valleys. At the outer rims, bananas and sugar-cane are often grown. In the bed of small streams some varieties of cocoyam are planted. The valley basins are usually used as pasture. Very wet basins will not be used at all. Some smaller and not quite so wet areas are sometimes drained in the dry season, and planted with maize (Kitivo maize).

The vegetable plots of Soni present another exception — an exception even within the farms. They do not follow the traditional rotation of crops. Modern principles of agriculture are employed. In short, the Soni market-gardeners employ on their farms a sort of dualism between modern and traditional agriculture.

d) Distribution of Cropping over the Three Rainy Seasons

The outstanding characteristic of Shambala agriculture is not, however, the horizontal differentiation in land use. The decisive element lies rather in the time differentiation, and in particular, in the variation of the planting seasons for maize. In contrast to other areas of East Africa, where there are one or two rainy seasons, in Usambara there are three rainy seasons, and hence three planting seasons. The Shambala make use of this peculiarity accordingly. They are aware that in the three rainy seasons the precipitation varies from place to place, and they plant in a way which is best suited to make the most favourable use of different rainy periods. On one slope, maize will grow best when sown at the beginning of the main rainy season. On another slope, it is advisable to sow during the short rains. And on yet a third slope, the period between rainy seasons is preferable. Added to all that, some acreages get enough rain to make two maize-plantings possible in one year, whereas in others the rainfall is sufficient only in one rainy season to allow maize-planting. In any event, there are no possibilities of planting successfully maize crops in all three rainy periods.

The farmers are well acquainted with the relative advantage of a particular plot and of a particular rain period for maize-planting. In so far as possible and advisable, farmers plant when and where the possibility of the greatest maize harvest exists. Apparently, their methods are based on decades of "trial and error". The procedure of choosing the planting-time most suitable to the particular area is in no way rigidly fixed. In talking with the farmers, it was discovered that generally the young Shambala were prepared to break away from the traditional planting-times, and to experiment with the hope of discovering whether what the older generation practiced and then passed on corresponded with the facts. In any case, increase in yield is by no means the only object in planning their cultivation programme. As the planting is distributed over various plots and during various rainy seasons, there is security against yield-risks. Moreover, there are efforts to provide a regular supply of food to the household as well as a satisfactory distribution of the work entailed.

Table 5 shows that in Soni the majority of the plots were planted with maize during the short rains of December. On the other hand, in Bumbuli and Mulungui maize was principally planted in the long rains of March. Thus, the main planting-times vary from place to place.

Table 5. *Maize (main) Planting Season in the Survey Areas*
(Number of Plots)

	Soni ^a	Bumbuli	Mulungui
Long rainfall	14	30	36
Between rainfall	5	9	2
Short rainfall	45	3	2

^a Irrigation is not taken into account.

e) Rotation of Crops

Amongst the Shambala, the planting of the different crops goes in certain cycles, which one can rightly call a crop rotation. Cassava plays an important role as regulator of the planting cycle. Almost all the plots are planted at more less regular intervals with cassava with the exception of the outermost strips because these are often damaged by cattle. We found a rotation of maize and cassava running over a period of years. After one year or several years' planting of maize (mostly in the same rainy season, when the maize is sometimes interplanted with pulses), come several years of cassava including one, two or three cassava cycles, each of three years duration. The sequence is one or several years of maize succeeded by cassava. There is a wide variation in the lengths of the maize-cassava interval, and questions put to the

farmers produced no exact data, although three main factors appeared to be decisive.

- One important factor is how much cassava is still standing at the moment when planting should begin. If, in the farmer's opinion, there is still a sufficient amount for his needs, then only a little is planted; if, however, there is too little standing, then comparatively larger patches will be planted. In the first case only a few cassava years follow many maize years. In the second case the reverse applies.
- The bigger the farm, the bigger the crop of maize and the less need there is to live on the less palatable cassava. The urgent need to maintain a reserve stock of cassava does not arise. On smaller farms, the time interval between plantings of cassava are kept short (i.e. after only a few years of maize there follows a cassava planting), and the acreage under cassava is large. In those periods when there is no maize on hand, there is a rise in the consumption of cassava.
- Farmers who have a high cash income due either to growing cash crops or doing off-farm work, are in a position (if a maize harvest fails) to purchase foodstuffs. They are not forced to plant large areas of cassava. Hence, the time lapse between the cassava cycles is longer than with the poorer farmers.

The investigation showed, that an increase in the size of the holding, as well as an increase in income, brought along a smaller amount of land planted with cassava (see Table 6). Cassava is planted and consumed by the impoverished subsistence farmers with small holdings.

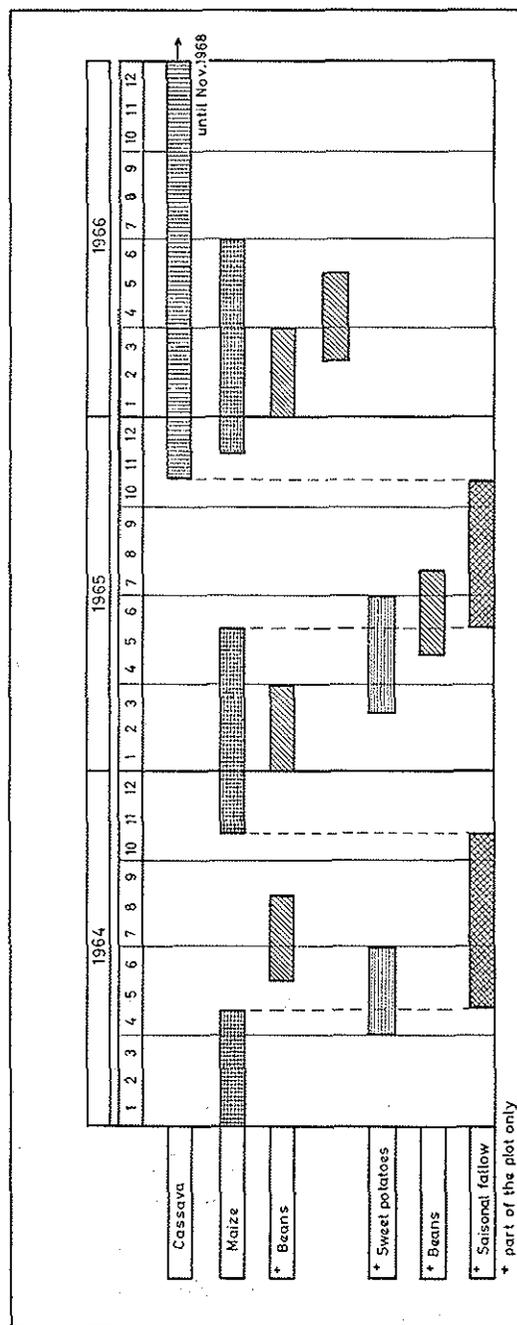
Table 6. *The Relationship between Cassava Cultivation, Arable Land and Family Income*

	Soni	Bumbuli	Mulungui
Hectares per farm	2.02	1.45	1.03
% of ground under cassava	29	31	43
Family income in shs per farm including off-farm work	2,856	1,937	835

Maize competes with cassava on the limited strips of land. Even where the space allotted to maize is larger, the extent of maize planting is related to the space for cassava. More maize is planted so long as the general income or the security of existence through cassava reserves allows it. In detail (where utilisation of the ground depends on the cassava cycles), maize-planting is arranged as follows:

- Generally when new cassava planting takes place, maize will also be planted in mixed stands. If the labour situation allows, cassava will be harvested first, and then the maize. Frequently cassava is planted in the

Diagram 3. Maize-Cassava Rotation and Phased Planting of Several Crops on a Plot



rainy season which precedes maize planting (the main planting season). If delay occurs, or if the rains come unexpectedly early, then the maize is planted first, and the cassava is planted only when the maize has reached the three to four leaf stage. It is also usual to interplant beans in the same or the following rainy period.

- If at the end of a cassava cycle, the farmer does not intend to plant fresh cassava, then the plot will be put under maize. In the same rainy season on another part of the same plot more beans or sweet potatoes will be planted. Then, depending on the area, in the third rainy period on yet another patch of the same plot more beans or sweet potatoes are planted amongst the maize plants from which the cobs have already been harvested.

One remarkable thing about maize-planting is the timing of the sowing to fit in with the most favourable rainy period. The above-mentioned characteristics of cassava- and maize-planting apply to every plot of land, irrespective of which of the three rainy seasons the main maize-planting falls in. Owing to the preference for the consumption of maize, one of the main reasons for organising the utilisation of land is to allow for the planting of maize at the best season on plots of land not occupied by old cassava plants. Making sure the basis of nutrition being cassava, and ensuring a maximum harvest of maize, which, although tasty to eat, is not a sure cropper, are the over-riding factors in organising farm-management.

f) Staggering of Planting Times, Single-Stand and Inter-Cropping

Another principle held by the Shambala, and current throughout the indigenous agriculture in East Africa, is the staggered planting of different crops on one piece of land. Maize-planting takes precedence in time over all other crops. The main planting time at Bumbuli, for instance, is the long rainy season, but maize-planting begins already in January during the early rains (Mshiko-Muaka). In March and April one part of the plot (where maize is already growing) is planted with beans. Thus mixed cultivation of maize and beans is the result. In August in between rains more beans are planted on another part of the plot. Another strip of the same plot is planted with sweet potatoes during the short rains in November. By then, the maize has already been harvested as have the other crops, so the area not put under sweet potatoes lies fallow (see plan 2).

Staggered planting is thus an instrument of (1) using the land more intensively, (2) of covering the land longer, (3) of securing a well-distributed supply of food and (4) of work.

In the Usambara Mts., the farmers usually prefer mixed cropping. Where by nature the plants are more demanding, single-crop cultivation is preferred. On the whole, the pertinent regulations indicate that the Shambala farmers

are quite aware of the advantages and disadvantages of single- and mixed-cropping.

g) Irrigation-Farming (Vegetable Cultivation)

Field irrigation amongst the Shambala is indigenous and has long been in use. Irrigation plays a larger part in the border areas of the Usambaras where they have only two rainy seasons. Thus, in Soni, according to the survey, 38% of the land (all under vegetable cultivation) is watered.

Irrigation is done entirely by furrows. Using gravity, water is led off from the numerous riverlets that flow all the year round. The water is directed to its goal by means of side-ditches, or dams built of concrete or stone, and then brought to the fields by furrows.

Vegetable growing developed in Soni in the last ten years, but along quite different lines from the traditional methods of cultivation. The main vegetables grown are cabbages, onions, cauliflowers, carrots, tomatoes, cucumbers and peas. Smaller quantities of lettuce, red peppers, European potatoes, aubergines and leeks are grown.

Modern methods are used for vegetable growing as a matter of course. These were the same methods that the agricultural administration of the colonial powers had from the very beginning striven in vain to foster.

- Vegetables are grown mainly on terraces,
- Vegetables are manured with stable dung,
- Vegetables are practically always being grown as single crops, and principally in rows,
- Certain vegetables are usually transplanted of seed beds,
- The vegetable grower regularly buys seeds.

Strangely enough these methods apply only to vegetable growing. In Soni maize, beans and cassava are grown in exactly the same way as anywhere else in Usambara. Traditional agriculture amongst the Shambala does not include the principle of manuring the soil. The spreading of the vegetable strips with manure is particularly striking. In Soni there is a noticeable scarcity of manure as the farmers own few animals and the cattle are not littered down in huts. So far no policy has been introduced for stable-manure and fodder production which would greatly increase the quantity and quality of the manure.

It is equally astonishing that the vegetable strips are generally terraced. The terraces, originally constructed under police-like supervision according to the terms of the Usambara Development Scheme, were removed by the angry population who had considered terracing a symbol of oppression by the colonial rulers. All the same, some vegetable growers have returned to terraced land. But, they have no intention of terracing land for the traditional crops.

Probably somewhere in their minds lurks the idea that there are different standards for cash crops and subsistence crops.

Yet vegetable growing is by no means uniformly carried out along the lines of modern farm-management. The spacing of the plants, for instance, is not systematic and, just as with their traditional cultivation, is very seldom correct. Another weakness of vegetable growing is the absence of mineral fertilizers.

Nevertheless several important principles of modern husbandry have established themselves in vegetable growing, but they have not yet been put into practice for traditional crops. Thus, the situation is rather different from the one in the highlands of Kenya, where mineral fertilizers and cultivation in rows of subsistence crops have been accepted by many. It is also worthy to note that the farmers have organised the vegetable marketing without the help of a co-operative association, and that the marketing of their produce is so satisfactory. At the peak of the harvest, lorries are hired to transport the vegetables to Tanga and to a limited extent also to Dar-es-Salaam.

h) Fallow Land

Like ROTENHAN¹², we put a wider meaning on the expression "fallow land" than is popular in the temperate zones. In the Usambaras we found the following distinctions:

- *Proper fallow* exists if no crops are grown on the land during a whole year. In our survey area cases of proper fallows were rare (only 8% of the farm acreage). In Usambara, proper fallow is generally accidental i.e. through illness of the farmer or shortage of labour, and is usually no longer than one year.
- *Seasonal fallow* is the result of having three rainy seasons. Most plots of land are planted only in one or two of the rainy seasons, and there is no planting during the third. At that time a natural grass cover develops.

Generally fallow land today plays no great part in Shambala agriculture. The yields remain at a low level, just as they do in so many other tropical areas with permanent cropping. The Shambala do not practice any other method of preserving soil fertility. Manuring is unknown with the one exception of vegetables. Characteristic is the continuous transfer of nutrients from the fields to the dwellings. Huts and dwelling places are permanent. Thus, the fertility accumulated around the huts is not utilized. Tribes which frequently change the hut site do utilize fertility. Systematic collection of compost is not practiced. Thus the problem of getting and maintaining soil fertility has remained unsolved amongst the Shambala.

¹² D. v. ROTENHAN: Bodennutzung und Viehhaltung in Sukumaland, Tanzania. Ifo-Institut für Wirtschaftsforschung, "Afrika-Studien" Nr. 11, Springer Verlag, Berlin, Heidelberg, New York 1966.

i) Permanent Crops

Besides their arable crops the farmers in the Usambaras also cultivate a number of perennials. In various parts of the survey areas, sugar-cane, trees, tomatoes, pineapples and wattle are cultivated. Development efforts made by the British led to numerous small coffee plantations, and in some areas tea has been planted recently. Banana-growing is the most important. Whereas in other parts of East Africa e.g. near Bukoba or Mt. Kilimanjaro, population increase has led to the extension of banana planting, the reverse process has taken place in the Usambara Mts. With increased population density, cultivation of cassava and maize has probably increased at the expense of bananas. It was, however, difficult to confirm this hypothesis, as statistics concerning the extent of earlier banana production were unreliable. Our present investigation showed that generally less than one third of the land in the 60 survey farms was under banana cultivation. According to reports made at the time of the German Administration, larger areas were cultivated with bananas. It could be that the decrease in banana production is attributable to two factors.

- The cool climate and the poor soil fertility led to low banana yields. A harvest of 100 bunches (each weighing 45 lbs.) shows a yield of 2.0 tons per acre. Allowing 50% for stalk and skin leaves, that is 1.0 ton of fruit. Cassava, on the other hand, gives 2.4 tons after 2 years, which means 1.2 tons of dried cassava in one year. Allowing 10% for skin leaves, that is 1.2 tons of cassava for consumption, compared with 1.1 tons of bananas. Reckoning 200 calories per 100 g of bananas and 306 cal. per 100 g of cassava, then the yield, measured in calories, is 66% higher with cassava than with bananas.
- The bananas grown in the Usambara Mts. are mostly cooking bananas (plantain) which are not found palatable by the farmers. They prefer maize and cassava. They are not aware, as are the Wachagga and the Bahaya, that bananas can be a basic foodstuff.

Important Perennial Crops

- *The Banana* (*Musa acuminata*, *Musa balbisiana*, *Musa paradisiaca* and bananas of the *Ensete* species¹³).

The Shambala are not acquainted with proper banana husbandry e.g. the division of the suckers, a method used with care by the Bahaya. After the harvest, the stems are not cut out in most cases but left to rot where they have grown. Consequently, the banana groves give the impression of having grown wild, and the yield is only moderate in quantity and quality. If coffee is

13 R. BAKER and N. SIMMONDS: *Visit to British East Africa, Cultivated and Wild Bananas*, p. 4 ff.

planted, it is almost always planted in the banana fields. The usual mulching of the coffee plants makes the mixed coffee-banana plantations better cared for than the bananas grown alone.

• *Coffee* (*coffea arabica*)

The farmers set their coffee plants generally more closely together than recommended by the agricultural Advisory Offices. There are usually 600 plants to an acre. In Usambara single-stem cultivation is customary. Coffee is not well husbanded. The plants are pruned very seldom, if at all, and then too late in the year. Spraying is likewise too little and too late.

Extent and Structure of Cultivation of Perennial Crops

In the investigated area, cultivation of perennial crops was almost as important as the growing of arable crops. In fact more than one third of the cultivated land was cultivated with perennials (see Table 7). Remarkably, large plantations of perennials were found in the holdings of the Bumbuli farmers, and that was certainly not happening incidentally. Obviously some income obtained from non-agricultural work was invested in bananas and coffee plantations. In Soni and Mulungui, less agricultural land was cultivated with perennials. Some 90% of the total permanent crop acreage is planted with bananas, sometimes mixed with coffee. The proportion of bananas intercropped with coffee in Soni is particularly high. The growing of vegetable cash crops has in no way led to a reduction of growing coffee for marketing. Banana growing is highest in the subsistence farms of Mulungui. The proportion of the other perennial crops is shown on Diagram 2.

Single Stands and Intercropping

Over half the perennial crop land is under mixed cultivation of bananas and coffee. Like the Chagga on the Kilimanjaro slopes, the Usambara farmers point out the fact that the total yields from mixed cultivation of coffee and bananas are larger than from separate cultivation and necessitate less work. The high proportion of banana growing as single crop in Usambara is unusual. The possibility of planting coffee in already existing banana groves is not used by the Shambala to the same extent as by the other East African tribes.

4. Animal Husbandry

The average per 10 farms is 14 cattle, 15 goats and sheep, and 37 poultry (see Table 7). In Soni the number of cattle is relatively high. Evidently most of the proceeds from the sale of vegetables are invested in cattle. Cattle are considered "property" in East Africa to be held as insurance against times of need. In Bumbuli many families find work outside their farms, and it is

not necessary for them to buy cattle as an insurance against hard times. In contrast, the farmers in Mulungui are too poor to be able to have much live-stock.

Table 7. *Stocking Rate per 10 Farms*

	Soni	Bumbuli	Mulungui	Total
Cattle	24	8	9	14
Goats/Sheep	24	10	11	15
Livestock Units ^a	23	8	9	13
Poultry	54	34	22	37

^a The number of livestock units (L.S.U.) is worked out as follows:

cows and bulls = 1.00 L.S.U.
calves and young animals = 0.40 L.S.U.
goats and sheep = 0.12 L.S.U.

See M. P. COLLINSON: Farm Management Survey, Report No. 3, Shinyanga Region, Ministry of Agriculture, Tanganyika 1962/63, p. 35.

Agriculture and animal husbandry in the Usambaras, as in many other parts of East Africa, are separate activities. The Shambala know nothing of fodder growth of the grass is impeded. There are more and more patches of bare soil. farms. The communal pasture lands provide most of the fodder. Animal husbandry is caught up in a vicious circle. Over-stocking on communal grazings causes insufficient fodder. The grass-cover is damaged and further growth of the grass is impeded. There are more and more patches of bare soil. The result is serious and wide-spread erosion. This again leads to a reduction in grazing areas.

Animal husbandry is by no means carried on mainly for the household or for cash, but basically as a socio-cultural obligation. It is also practiced to provide a reserve supply for hard times. If, through a good harvest, the farmers have a surplus, then they invest it in cattle. The Shambala lay great value on accumulating cattle. The number of head of cattle owned by the family is the yardstick of social standing. The farmer with a large herd is considered a rich man. By lending out their beasts, the farmers win friends, dependants and assistants. The following Shambala saying exemplifies this custom. "Those who live with the cattle are not the wealthy but the poor." As with many other East African tribes, an important role is played by the price of a bride, which varies according to the district and the bride. In Usambara the price lies between one and five head of cattle. Recently it has become usual to pay the price in cash.

Another characteristic of Shambala farming is the maintenance of goats and poultry. They represent small units which are more suited to small farms. They allow a better arrangement of slaughter-days and meat-eating. A cow

or a bull provides too big a unit for the type of small farm usually found in Usambara. The reason for favouring goats could also be, apart from the preference of using them in certain rites, that they are in a better position than cattle to find food on over-grazed and bush-grown land.

5. Labour Economy

a) Work Schedule

In the Usambaras there are three rainy seasons, during which the precipitation within one community varies considerably. Hence, there are varying hoeing, planting and harvesting times. The agricultural year begins with the soil cultivation. After the first rainfall, maize is sown on the part of the field already prepared. As in many other areas of East Africa where cultivation is done with the hoe, a competition between cultivation and husbandry quickly develops. Usually cultivation wins and husbandry is neglected.

The harvest is definitely the most important work. A plot of land will be planted only when no urgent harvesting work has to be done. There is, therefore, a clear scale of priorities on a Shambala farm. Harvesting is considered more important than any other work, and cultivation enjoys priority over husbandry. Weeding is done only when no urgent harvesting work is to be done and when the planting is finished. As a result, the first weeding takes place far too late. This can be considered a very important yield-reducing factor.

b) Farming Techniques

Most of the hoeing work is done when the soil is properly moist after the first rainfall. The soil is worked on the plots just once a year in the main planting season. The hoeing is very thorough. If the plot is planted during the next rainy seasons, then the soil is not deep-hoed again but merely surface-hoed to remove the weeds. In Soni only those plots planted in rotation with maize and vegetables get a second deep hoeing.

On the slopes, the soil is worked from the lower parts to the upper without following any particular system. Steep slopes are similarly treated without any attempt to prevent soil erosion. The Shambala appear to understand the advantages of ridging. Sweet potatoes are usually ridged. We could not ascertain why ridging, which would increase the yield as well as conserve the soil, is not used for other crops. Many other East African tribes use ridging.

The Shambala sow their seeds by pocket drilling. Neither broadcast sowing nor row-cultivation are customary. There is no systematic spacing. Weeding is done very superficially. The weeds grow back very quickly. Timely weeding takes place when an additional crop is interplanted. Weeding is generally

Table 17. *Crops Grown in Usambara and Surroundings with their Autochthonous Names in Kisuheli and Kisambaa*

English	Kisuheli		Kisambaa		System	Family
	Fruit sing./plural	Plant sing./plural	Fruit sing./plural	Plant sing./plural		
Pineapples	nanasi-mananasi	mananas-minanas	nanasi-mananasi	mnanas-minanas	Ananas sativus Schult.	Bromeliaceae
Bananas	ndizi-ndizi	mgomba-migomba	tonte-matonte	tindi-matindi	Musa sapientium L.	Musaceae
Tree tomatoes	nyanya mshumaa	mnyanya msh.- min. msh.	goghwe-magoghwe	mgoghwe-mig.	Cyphomandra betacea	
Cotton	pamba-pamba	pamba-pamba	pamba-pamba	pamba-pamba	Gossypium spp.	Malvaceae
Couflower	coliflower	coliflower	coliflower	coliflower	Brassica botrytis	Cruciferae
Beans	haragi-maharagi	haragi-maharagi	haagi-mahaagi	haagi-mahaagi		Leguminosae
Egg fruit	biringani-mab.	mbiringani-mib.	biringani-mab.	mbiringani-mib.	Solanum melongena	Solanaceae
Peas	choroko pinzi	choroko pinzi	choroko pinzi	choroko pinzi		
Wattle	msanduku- misanduku	msanduku-mis.	wati or mtulaya- mitulaya	wati or mtulaya- mitulaya	Acacia mollissima	
Guava	pera-mapera	mpera-mipera	pea-mapea	mpeya-mipeya	Psidium guajava	
Cucumbers	tango-matango	tango-matango	tango-matango	tango-matango	Cucumis sativus	Cucurbitaceae
Coffee	cahava	cahava	cahava	cahava	Coffea arabica	Coffea spp.
Cacao	kakao-makakao	mkakao-mikakao	kakao-makakao	mkakao-mikakao	Theobroma cacao	Sterculiaceae
Kapok	sufi	msufi-misufi	sufi	msufi-misufi	Ceiba pentandra	Bombacaceae
Carrots	karroti	karroti	karroti	karroti	Daucus carota	Umbelliferae
Potatoes (Europ.)	kiazi ulaya-viazi ul.	kiazi ulaya-viazi ul.	kiazi ulaya-viazi ul.	kiazi ulaya-viazi ul.	Solanum tuberosum	Solanaceae
Castor	mbarika	mbarika-mimbarika	nyono	mnyono-min.	Ricinus communis	Euphorbiaceae

English	Kisuheli		Kisambaa		System	Family
	Fruit sing./plural	Plant sing./plural	Fruit sing./plural	Plant sing./plural		
Kautschuk		mpira-mipira		mpia-mipia	Hevea brasiliensis	Euphorbiaceae
Cabbage	kabichi-makabichi	kabichi-makabichi	kabichi-makabichi	kabichi-makabichi	Brassica capitata	Cruciferae
Cocos	nazi	mnazi-minazi	nazi	mnazi-minazi	Cocos nucifera	Palmae
Cow pea	kunde	kunde	nkunde	nkunde	Vigna unguiculata	
Pumpkin	boga-maboga	mboga-miboga	koko-makoko	ukoko-nkoko	Anthocleista orientalis Gilg.	
Maize	muhindi	muhindi	mpemba-mapemba	mpemba-mapemba	Zea mays L.	Graminae
Mango	embe-maembe	muembe-miembe	embe-maembe	muembe-miembe	Mangifera indica	Anacardiaceae
Maniok dried	muhogo-mihogo kopa-makopa	muhogo-mihogo	manga	manga	Manihot utilisima Pohl.	Manihot esculenta
Papaya	papao-mapapao	mpapai-mipapai	papayn-mapapayn	mpapayn-mip.	Carica papaya	Caricaceae
Passionfruit	kakara-makakara	mkakara-mikakara	kakara-makakara	mkakara-mikakara	Passiflora edulis	Sapotaceae
Pepper	pilipili	pilipili	pilipili	pilipili	Capsicum sp.	Rosaceae
Peaches			fyosiki-maf.	mfyosik-mifyosik	Prunus persica	Rosaceae
Prunes			faume-mafaume	mfaume-mifaume	Prunus domestica	Rosaceae
Pyrethrum			piretrumi	piretrumi	Anacyclus pyrethrum	
Rice	mchele	mpunga	mchee	mchungu	Oryza sativa	Gramineae
Salad	lettuce	lettuce	lettuce	lettuce	Lactuca sativa	Compositae
Sisal		katani-makatani		katani-makatani	Agave Sisalana	Amoryllidaceae
Sweat potatoes	kiazi kitamu- (sukari)	viazi vitamu (sukari)		kiogwe-viogwe kindoo-vindoo	Ipomea batata	Convolvulaceae

English	Kiswahili		Kishambaa		System	Family
	Fruit sing./plural	Plant sing./plural	Fruit sing./plural	Plant sing./plural		
Tobacco		tumbaku		gana	Nicotiana tabacum	Solanaceae
Fluted pumpkin	kweme	mkweme-mikweme	nkungui	ukungu-mik.	Telefaria pedata	Cucurbitaceae
Taro	hombo-mahombo	hombo-mahombo	ombo-maombo	ombo-maombo	Colocasia antiguorum	
Tea	chai	chai	chai	chai	Camellia sinensis	Theaceae
Tomatoes	nyanya	nyanya	nyanya	nyanya	Lycopersicum esculentum	Solanaceae
Wheat	ngano	ngano	ngano	ngano	Triticum sativum	Gramineae
Yams		kiazi kikuu-viazi vik.		koo-makoo	Dioscorea spp.	Dioscoreaceae
Sugar cane	mua-miua	mua-miua	nghua-mighua	nghua-mighua	Saccharum offi- cinarum L.	Gramineae
Onions	kitungu-vit.	kitungu-vit.	kitungu-vit.	kitungu-vit.	Allium cepa	Liliaceae
<i>Citrus:</i>						
Grape fruits					Citrus paradisi	Rutaceae
Lime	ndimu	ndimu-mindimu	ndimu	ndimu-mindimu	Citrus aurantiifolia	Rutaceae
Mandarine	chenza-machenza	mchenza-michenza	chenza-machenza	mchenza-mich.	Citrus nobilis	Rutaceae
Orange	chungwa-mach.	mchungwa-mich.	chungwa-mach.	mchungwa-mich.	Citrus aurantium	Rutaceae
					Citrus L. bitter, sinensis, sweet	
Lemon	limao-malimao	mlimao-milimao	imao-maimao	muimao-muimao	Citrus medica L. Citrus limonia	Rutaceae

References

- BAKER, R. and SIMMONDS, N.: Visit to British East Africa, Cultivated and Wild Bananas.
- BENNIGSEN: Die Versuchsstation Kwai in Hochusambara und das Pare Gebirge. In: Der Tropenpflanzer, Band 1, Berlin 1897.
- BUCHWALD, J.: Westusambara, die Vegetation und der wirtschaftliche Wert des Landes. In: Der Tropenpflanzer, Band 1, Berlin 1897.
- COLLINSON, M. P.: Farm Management Survey, Report No. 3, Shinyanga Region, Ministry of Agriculture, Tanganyika 1962/63.
- LANGHEINRICH, F.: Bananenkultur in Westusambara. In: Der Tropenpflanzer, Band 7, Berlin 1903.
- MEYERS Dr. Hans: Usambara Expedition. In: Mitteilungen aus Deutschen Schutzgebieten, Band 1, Berlin 1888.
- MÜLLENDORF, P. V.: Ost-Afrika im Aufstieg, G. D. Baedeker, Essen 1910.
- NEUBAUER: Die Besiedlungsfähigkeit von Westusambara. In: Der Tropenpflanzer, Band 6, Berlin 1902.
- ROTENHAN, D. v.: Bodennutzung und Viehhaltung in Sukumaland, Tanzania. Ifo-Institut für Wirtschaftsforschung, "Afrika-Studien" Nr. 11, Springer Verlag, Berlin, Heidelberg, New York 1966.
- STUHLMANN: Über die wirtschaftliche Entwicklung Deutsch-Ostafrikas. In: Der Tropenpflanzer, Band 2, Berlin 1898.
- WARBURG, O.: In: Mitteilungen aus Deutschen Schutzgebieten, Band 7, Berlin 1894.
- WOHLTMANN, F.: Die Aussichten der Kaffeebauern in den Usambara Bergen. In: Der Tropenpflanzer, Band 6, Berlin 1902.