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Memoire de l'IRA

THE FARMING SYSTEMS of the SOUTH WEST PROVINCE OF CAMEROON

Susan W. Almy, Manfred T. Besong and B. Bakia

TESTING AND LIAISON UNIT, IRA–EKONA

MINISTERE DE L'ENSEIGNEMENT SUPERIEUR, DE L'INFORMATIQUE

ET DE LA RECHERCHE SCIENTIFIQUE

(MESIRES)

INSTITUT DE LA RECHERCHE AGRONOMIQUE B.P. 2123 YAOUNDE, CAMEROON

IRA EKONA, P.M.B. 25 BUEA, CAMEROON

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Executive Summary

The South West Province (SWP) is a productive agricultural region of great importance for Cameroon's future. Extremely diverse in soils, climates,markets and peoples, it is both a challenge and an opportunity to the agricultural researchers of the Institute of Agricultural Research, IRA, and to the extension service of the Ministry of Agriculture, MINAGRI. This report synthesizes the insights from the four divisional farming systems surveys carried out by the Testing and Liaison Unit (TLU) of IRA-Ekona during 1986-88. Directed towards program planners and administrators, it also includes a synthesis for breeders and agronomists of the characteristics and variability of the most important crops in the province.

SWP falls into Zone II (Lowland Forest) and partially into Zone I (Western Highlands) of the IRA classification system. The TLU has distinguished 23 micro-zones within the province, and identified six zones as priorities for research and extension for the 1990's. These are:

1. the Lower Volcanic, the fertile zone south and east of Mount Cameroon,home of large numbers of smallholders oriented towards the commercial production of staple crops (cocoyams, plantains, taro and fresh maize) as well as specialty crops for the Douala and local urban markets;

2. the Kumba Corridor across central Meme, also densely populated, highly dedicated to cocoa, and struggling to feed a large local urban population from the encapsulated food fields, it still exports large quantities of plantains,cocoyams and some fresh maize to Littoral, but has growing soil problems;

3. the Highland Savanna, two isolated highland micro-zones on the border with Littoral (Bangem) and West (Fontem), Fontem densely populated, productive,with limited market access to Dschang and threatening soil erosion problems,Bangem already depleted with an emigrated population, disease and nutrient deficiency problems;

4. Mamfe, the most densely populated of the granitic soil zones, with the greatest market potential, but still cut off by bad roads from the southern and Bamenda markets, and with a potential of ecological disaster if large markets are opened up to stimulate production without corrective soil maintenance programs;

5. the Sands, two micro-zones around Ekondo Titi and the Moungo river shed that are relatively small in population but market large quantities of cassava and egusi, and are badly impacted by declining fertility wherever population densities have increased; and

6. the Mountain Forest, three microzones on Mounts Cameroon, Koupe and the Rumpis, which produce large quantities of cocoyams and plantains and are maintaining a stable system under forest cover, which will benefit greatly from the future IRA interventions in these two crops.

SWP food-crop farming is a multi-staple system, with cocoyams, cassava, plantains, maize, and secondarily taro and yams making major contributions. IRA

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B

has now developed cassava and maize varieties that are well suited to many of the zones and microzones, and is working on cocoyam varieties. The problems of plantain in the province are likely to be more susceptible to agronomic than breeding solutions, and work should be increased in this direction.

The worst labor bottleneck in farming is land preparation. Substantial effort and cash, when available, enters into this operation and it limits farmer productivity. Exploratory research in this area has been started by the TLU. Engineers working on small tools should also be directed to work on the problem of reducing the labor involved.

Infrastructural development is needed in the areas of extension, markets, and credit.

The extension service compares favorably with that in many other areas,but there are deficiencies in agent education, training, and supervision, due to the large number of untrained demonstrators and lack of funds and system for problem-oriented workshops and supervisor field visits. The orientation has been almost exclusively towards cash crops. There is also a lack of transport in many parts of the province where the fields are widely scattered. The National Extension and Training Program is expected to alleviate these conditions but is presently scheduled only to work in Meme, which has received the bulk of the benefit of the previous Belgian cocoa-coffee project. Manyu and Ndian in particular have been granted almost no assistance in the past. Any extension program including food crops must target the women farmers,which can best be done through groups and with the assistance of community development agents. The division of responsibility for women's organizations between two or three ministries is deleterious to this objective.

There are two principal problems in marketing, provision of inputs and roads. Agricultural inputs (improved seed and seedlings, chemicals and fertilizers) are almost totally absent from the province, and even basic tools from hoes to sprayers and carts are scanty. Present licensing arrangements for agricultural vendors, and the lack of a functional national certification system for seed and chemicals, restrict the entry of private enterprise in this area. Either licensing must be made easier, or the cash crop cooperatives must be revived and expanded to include food crops (preferably both). In the area of food crop marketing, the present profusion of small traders very adequately serves the need of the farmers and urban population, while creating employment, in the accessible areas of the province. However, much of the province is connected by roads that become impassible in rainy season. Road upgrading is badly needed. The cooperatives could help in the interim by group purchase and transport of rainy-season crops, and possibly group storage. The worst present storage constraint in the province is that of maize,which is primarily sold fresh to avoid drying and storage problems.

Credit is needed in small amounts (50,000 to 200,000 francs) to many people, not in large amounts to a few. Possible arrangements could include group loans to local meetings on the guarantee of the group, instead of collateral; or small individual loans based on the crop as collateral. The experience of other countries in these and other credit arrangements should be carefully considered.

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ACKNOWLEDGMENTS

We wish to thank the interview teams (Ministry of Agriculture, IRA and Fako group) of the original four surveys, the divisional and especially sub-divisional staff of MINAGRI who helped to introduce and guide us over the years; the extension agents, chiefs and farmers in the survey villages; and the IRA staff of Roots & Tubers, Soils, Plantains, Cereals, Farming Systems, the Administration, and especially the remainder of our Testing &Liaison Unit (Dr. Tsegazeab Woldetatios, Mrs. C. F. Poubom, Mrs C. Ateh and Mr. M. Mboussi) who contributed technically and logistically. Special thanks go to Drs. Baker of IRA Nkolbisson and Spencer of IITA, Ibadan, whose comments on the original reports have guided the evolution of this synthesis; and to George Gamze of the TLU for the maps and printing assistance.

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I. INTRODUCTION

The South West Province of Cameroon is a productive agricultural region of great importance for Cameroon's future. Extremely diverse in soils, climates, markets and peoples, it is both a challenge and an opportunity to the agricultural researchers of the Institute of Agricultural Research, IRA, and to the extension service of the Ministry of Agriculture. A challenge, because solutions that increase productivity or reverse fertility decline in one zone may work poorly or not at all in another. An opportunity, both because farmers and extension agents, in response to this variability, have invented new solutions that may be valuable elsewhere; and because the region offers conditions for testing simultaneously across a wide variety of environments.

Little of this diversity was known, and less understood, before the Testing and Liaison Unit (TLU) was founded at the Centre for Agronomic Research,Ekona, in 1986. From 1986 to 1988, the TLU conducted surveys division by division across the province. Each of these was printed as a separate technical report (Almy and Besong 1987, Almy 1988, Almy and Besong 1989a,b). This volume consolidates and analyzes those reports.

A. Background information:

The TLU of IRA-Ekona is charged with determining the utility of the technology developed by the Institute of Agricultural Research (IRA) for food-crop farmers in the South West and Littoral provinces, and with bridging the gaps between IRA researchers on the one hand, and farmers and extension agents on the other. These two provinces are in the root-crop and plantain region,and the Ekona TLU has been charged with addressing the problems of the entire system, although with an emphasis on maize, the predominant cereal.

Until the TLU began work in this area, cereals researchers operating from Nkolbisson had to extrapolate from conditions in the Centre-South to decide what to test in the coastal lowlands. Information on other food crops was some what more available, because Ekona Plantains and Root Crop researchers had access to local farmers. But their principal contacts tended to come from the Ekona subsection of the Lower Volcanic zone. Statistics on provincial and divisional production and sales became available with the 1988 publication of the Ministry of Agriculture's Agricultural Census of 1984, but this provides no diagnostic information and also cannot address the variety of ecological and socio-economic

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systems to be found inside the province.

Early attempts at a rapid reconnaissance survey of Fako Division, in which Ekona is located, convinced the TLU researchers that the variability was too great for a general description without statistical determination of the most common attributes. Description of food-crop farming systems, and determination of those most important in demographic and production terms, was imperative for IRA's work both on-station and off.

Limited by resources, the Ekona TLU started in Fako Division in 1986, and took on other divisions in succeeding years. The Meme Division Survey was carried out in October-November 1987, and data collection for the Manyu and Ndian surveys was jointly conducted in April-May 1988.

B. Objectives:

1) to provide information on cropping systems and cultivation practices of principal food crops to guide on-farm and on-station agronomy and variety trials for the Division;

2) to provide information to the breeders (maize, cocoyam[1], cassava) on existing varieties, cropping systems, treatment in production and post-harvest, field and storage problems and preferences;

3) to establish contact with the Ministry of Agriculture extension service and with interested farmers, in preparation for on-farm trials and training;

4) to collect information of interest to the Divisional and Provincial Delegations of the Ministry of Agriculture, to aid in their work.

C. Research Methodology:

This section is written for those with a particular interest in survey methodology or in the validity of the surveys. Others may skip to the next section.

Secondary data were collected to map soils, altitudes, rainfall, roads, villages and towns, and supplemented by discussions and road tours with staff from the Divisional and Sub-Divisional Delegations of the Ministry of Agriculture. These data were used to delineate potentially different agro-ecological zones, and, in later surveys, to make modifications in the original questionnaire as applied in Fako Division, to fit local circumstances. The questionnaire used in each division was very close in form and method of administration to each of the others.

The final instrument is eight pages long and takes an experienced

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[1] Throughout this report, Xanthosoma sagittifolium is referred to as cocoyam, and Colocasia esculenta as taro,

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enumerator an hour to an hour and a half to administer, depending on the farmer's understanding and the complexity of his/her crops. It covers all food and cash crops, their cropping system, land use and fallow, and for food crops, agronomic methods, field losses and harvests, type and source of inputs, input needs, storage, processing and marketing methods and difficulties, labour and cash bottle necks and solutions, extension contacts, and demographic data. The original questionnaire was developed from international farming systems models, an early Bambui TLU maize survey and the Fako rapid reconnaissance results, and pre-tested with local farmers.

The enumerators were IRA and Ministry of Agriculture technicians from the division involved, except in the first survey in Fako, which was carried out with school-leavers. In each case, two days of training were done, and questionnaire answers were reviewed by the researcher nightly in the field, and the interviewers were made to clarify and fill in inadequate responses wherever feasible. During analysis, answers to dubious variables were compared among team members, and sometimes one interviewer's answers to a particular set of questions, showing major bias, were eliminated from analysis. Extreme responses from any individual respondent were closely scrutinized and eliminated if not reasonable within their circumstances.

Sampling was stratified by eco-zone and randomized within villages. Usually, three to five villages or town quarters were selected per zone according to population size. Villages were selected to cover the geographical range of the zone and the variety of village sizes. Local extension agents did the internal sampling, following instructions to start at one end of the village or town quarter and select every tenth house, or its neighbor if the tenth had no food-crop farmer working at least half-time. In Fako, we developed lists of farming households with the village chiefs, and then sampled every Nth family from this in order to reach 5 (for villages) and 10 (for towns) houses. The listing process proved so time-consuming, and suspect, that we abandoned it thereafter.

Three hundred and ninety-three households were interviewed, 134 in Fako, 120 in Meme, 95 in Manyu and 54 in Ndian. Although a national Population Census was carried out in 1987, the results will not be released for several years. In order to estimate the total population of farming households per zone, we worked from the Agricultural Census estimates (MINAGRI 1988) of number of farmers per division, less 10% (since the Census includes very small part-time farmers in urban or formal employment). We used the Nominal Rolls to total the number of tax-payers in all the villages of each zone, factored in the percentage of non-farmers encountered in each zone during the sampling[2], and estimated the percentage of all divisional farmers in each zone.

In Fako, we compared the chiefs' lists with the Nominal Rolls, and arrived at a correction factor for the latter for each sub zone, which we then used to estimate farming population. This gave us a total farming population about 50%

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[2] And an estimate, derived from Meme towns, that approximately 67% of households in the capital were engaged in farming, and 95% in the Sub-Divisional towns.

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that of the Agricultural Census estimate for Fako, a fact we believe to be due to our exclusion of farmers living in plantation camps from the survey. Since, in Fako, some of these plantation workers are also large and productive farmers, the production statistics and representation of the Lower Volcanic zone of Fako inside this report are likely to be understated.

All results reported here are weighted by the estimated size of farming population in each zone relative to the zonal sample. That is, the answers of a single Eyumojock or West Coast farmer count less than those of a single Lower Volcanic or Manyu Highlands farmer. Also, the totals reported reflect only the areas surveyed, and exclude the 13% of population living in remote areas to which we could not reach (most of Akwaya Sub-Division, Upper Mbo, the back of Mount Cameroon, and most of Korup Forest). Among these areas, only Upper Mbo is thought to contain a significant population, and none has a present potential for commercialization of food crops.

Attempts were made to interview the farming couple together, and, failing this, the woman, since she is the primary food-crop farmer. This was usually successful, although at times the men were not present when needed for cash-crop information. Thirty-nine percent of the respondents were women alone, and 18% were men alone. Individual respondents were continually reminded to answer for their Spouses' concerns as well. In Manyu polygamy is wide spread; the husband's labour may be shared between 2-4 women's households, co-wives may work fields jointly or separately, have common hearths or separate ones. We defined the "household" which we interviewed as the core group that both worked fields together and shared a house, whether a couple or a man and two wives and a mother or a widowed woman with grandchildren. The man was still included if he did not contribute to the farm but lived in the house.

While the interviewers were administering the survey questionnaire in five farmers' homes, the team leader visited one to two fields picked as typical by the local extension agent, together with the latter and the farmer. Crop association patterns were described, densities measured, soil taken for analysis, and the cropping and fallow history of the field, clearing, land preparation, planting, weeding and harvesting sequence described. Pests and diseases were described and often sampled. Farmer and agent were also asked about local marketing, transport, access to inputs and whether particular cultural practices were common to the area. Usually several other fields and fallows en route were also described in brief.

We tried to approximate production and land area for purposes of weighing the relative importance of different crops and cropping patterns. South West farmers have no conception of land area, and it was impossible to follow the Agricultural Census procedures (visiting every farm to measure it). A proxy chosen was very unreliable, and while these are reported in the divisional surveys, they are not included here.

Production was measured by self-report of the farmers of the previous year's harvests. Units were the volumes carried out of the field or filled at home: baskets, standard market basins and tins, hand-trucks, mokutas (jute bags used for cocoa bean sales) and 20-10-10 50kg fertilizer bags. Baskets and non-standard basins were equated to one of the other measures by the farmer.

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Experimentation with dried grain and truck measurements led us to make an equation of one fertilizer bag to 2 tins, 1.43 basins, .39 of a mokuta (worn, stretched type) and .17 of a hand-truck. Finally, volumetric units appropriate to each crop were weighed in the market to arrive at approximate production figures. (The Agricultural Census of 1984 followed a similar procedure but weighed the units in the village and took reports of harvested quantities three times in the year.)

In previous reports we used the median of farmers' reports of prices during principal sales time to calculate total value. This time, we used the mean prices from the 1988-89 survey of 12 provincial markets (Almy, Besong and Bakia 1990). Apparently farmers had inflated the prices they thought they were receiving for plantains (men sell most of the plantains, bananas and yams, and women the other crops), because this new procedure radically changed the position of plantains in the farmers' financial budgets. Where there were alternative sales forms, the one used most commonly by farmer-sellers themselves was taken. The maize price used was that of fresh maize, with both bag weights and price converted to fresh units. The cassava price used was that for gari, with the weight converted from tubers at 30% (Besong 1989). The prices of white, water and sweet yams were averaged. Groundnuts and egusi were calculated at unshelled prices.

All statistics provided in the text refer to the questionnaire data, unless otherwise indicated. The descriptive material from the field visit sample was used to interpret the numbers rather than to provide them, since by its very nature this sample was less representative of the population. "Survey" information means questionnaire data, throughout the text.

Zoning was refined after each survey. Villages originally assigned to a zone were compared with each other, with neighboring villages in other zones, and with their zonal totals on a series of indicators: main crops, number of crops, timing and nature of field operations, fallowing, densities, crop losses, ethnicity and household size. Those differing from each other more than from their neighbors were recombined, and neighboring zones were compared to determine if they should be merged.

II. The Ecology

A. Geography:

South West Province stretches from the Atlantic Ocean, between Douala and Nigeria, to the lower hills of the highlands of North West and West Provinces. The province covers an area of 24,720 square kilometers with an estimated population of 620,515 people (MINEP 1976). Kumba Town is the largest center, and the commercial and industrial hub, Buea is the provincial capital, and there is a growing industrial belt along the Tiko-Limbe road. Administratively the Province is divided into Divisions: Manyu to the north (Mamfe Central, Eyumojock, Fontem and Akwaya sub-divisions), Ndian to the west (Mundemba, Bamusso, Ekondo Titi, and two non-farming sub-divisions), Meme in the center (Kumba Central, Tombel, Nguti and Bangem sub-divisions), and Fako to the south (Buea, Limbe, Tiko and Mayuka sub-divisions). Rivers and rugged hills interrupt the terrain

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throughout the province, and make transport difficult. The main rivers are the Manyu, the Meme and the Ndian, after which the three northern divisions are named.

Fako Division is named after Mount Fako, known to the rest of the world as Mount Cameroon, the tallest peak in Western Africa at 4072m above sea level. The other highlands are the rugged Rumpi Hills on the Ndian/Meme border, rising to 1788m at Mount Rata, Mount Koupe (2050m) and Mount Manengouba (2396m) on the Littoral border in Tombel and Bangem Sub-Divisions, and the jagged heights of Fontem Sub-Division on the border with Western Province, extending at one point up to 2711m. However, the province is essentially lowland: 86% of habitable land (that not occupied by swamp or bare mountain rock) and 79% of farmers live below 800m (Table 1). Population densities in the highlands are higher, 4.0 farming households per square kilometer as vs. 2.5 for the lowlands, but the most urbanized lowland zone has the highest farm household density (12.3, Lower Volcanic).

B. **Climate:**

Rainfall is unimodal, from March-April through October-November. They usually begin lightly, and may interrupt for several weeks, and reach a peak from July to August or September. During the high rains, floods race down the hill slopes and many rivers become impassible, blocking access to farms and some sub-divisions. Absolute quantities of rain and their concentration into a few months vary widely, with most of Fako and Meme having the best distribution, the West Coast of Fako and most of Ndian the highest rainfall, Ekondo Titi a high concentration in a short period, and Manyu a later season than the rest (Chart 1).

It appears that an antarctic front of cold, wet winds hits Cameroon at Bundscha Point on the West Coast, and sweeps mostly northwest of the mountain through Ndian. Ekondo Titi and Muyuka are partially sheltered by Mount Fako. Lowland Mamfe weather, including Akwaya's seems to come up from Calabar in Nigeria. Fontem weather approximates that of Dschang in West Province. The remainder of the province enjoys the common patterns of Southern Cameroon, but with higher overall levels of rain than the Center-South, and little or no mid-season break. In fact, in the high rains it is impossible to establish newly sowed plants in most zones due to lack of sunlight and heavy rain.

The mean temperature is 23o C., and mean annual relative humidity ranges between 76% and 89%. Temperatures are higher in Mamfe Central, Eyumojock and Muyuka sub-divisions, and lowest on the slopes of Mount Cameroon, lower than at comparable elevations inland. The Upper Volcanic sub-zone of Fako is defined by being within a fog belt during 2-3 months of high rains, that reduces sunlight to extremely low levels.

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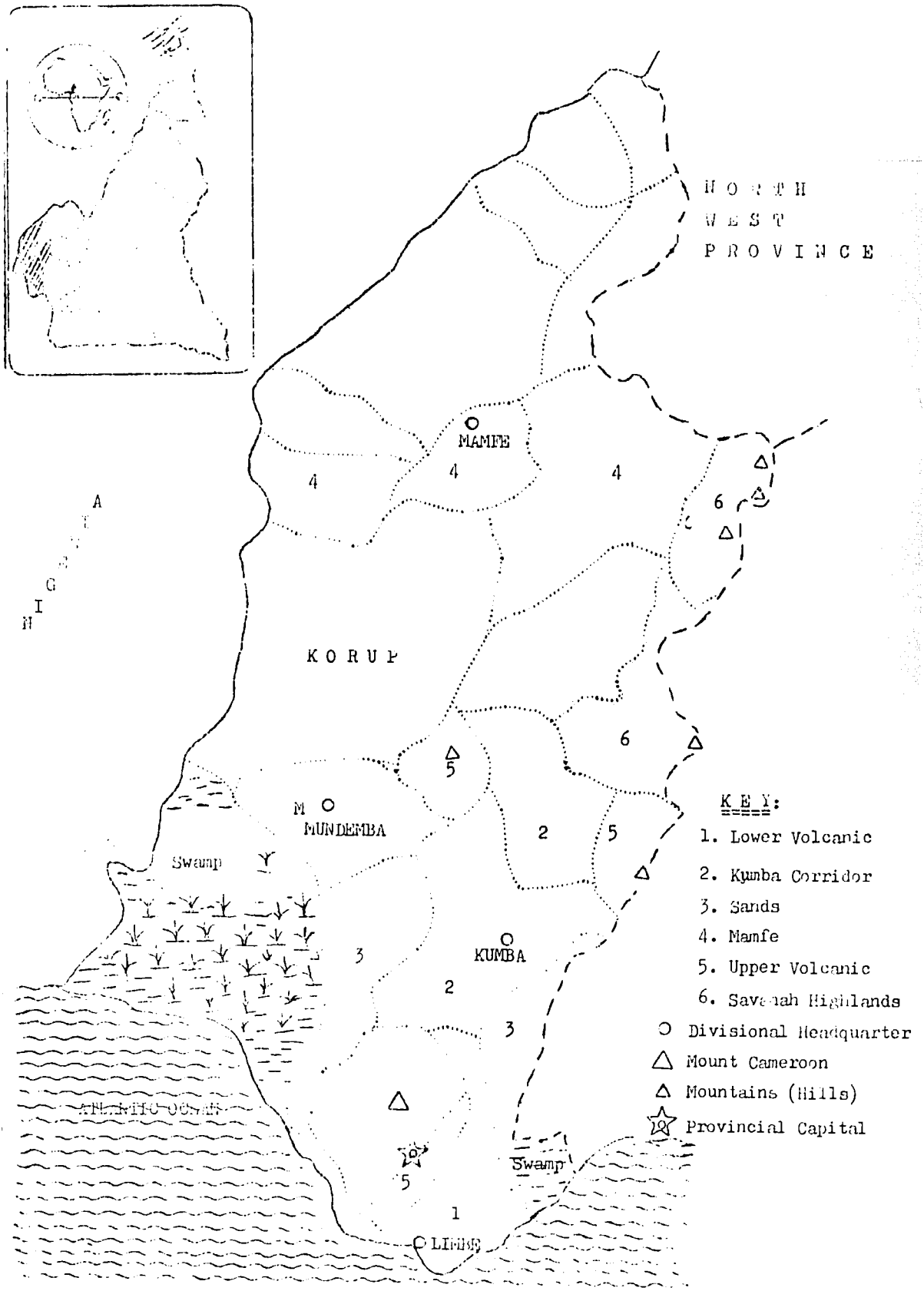

MAP 1: A[illegible] of North [illegible] Province.

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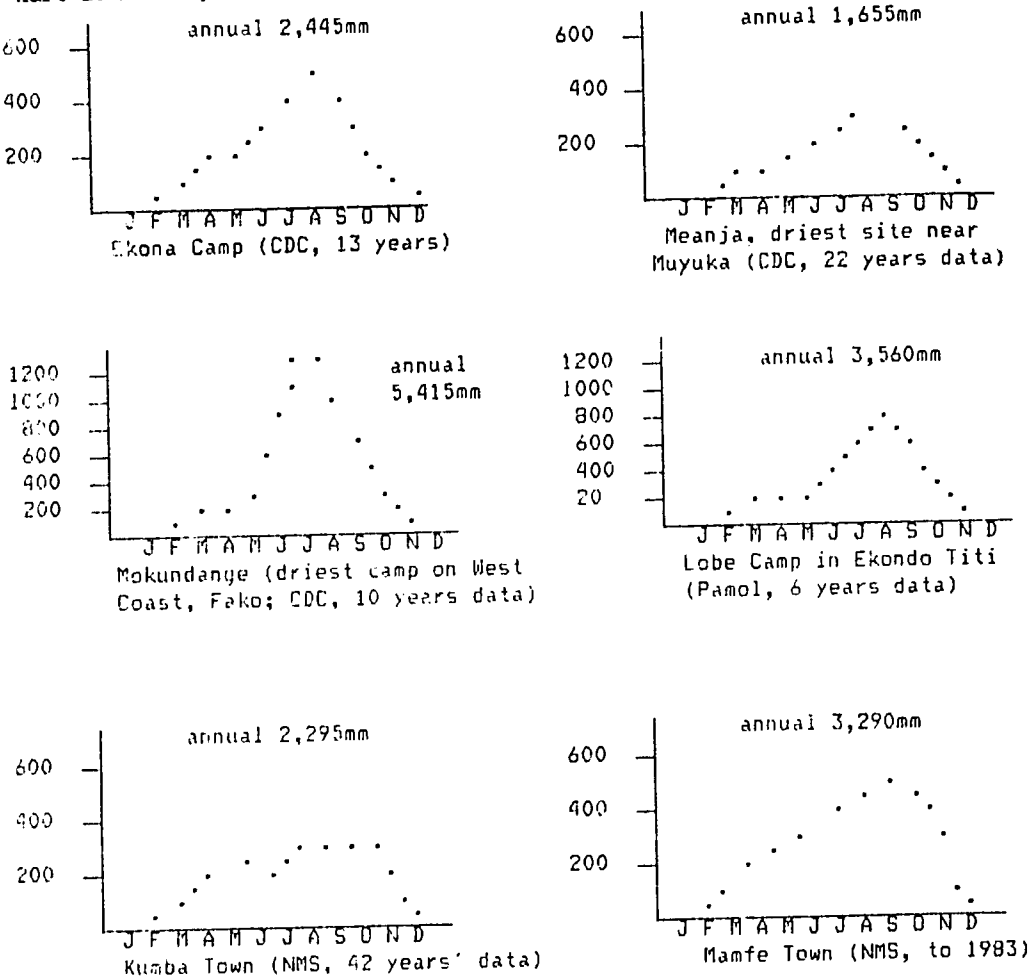
Chart 1: Monthly Rainfall Variations at Selected Sites in South West Province[3]:



[3] Sources: National Meteorological Service (NMS), Cameroon Development Corporation (CDC), Pamol Corporation; all collected and evaluated by the FAO project at CNS/Ekona 1984-5.

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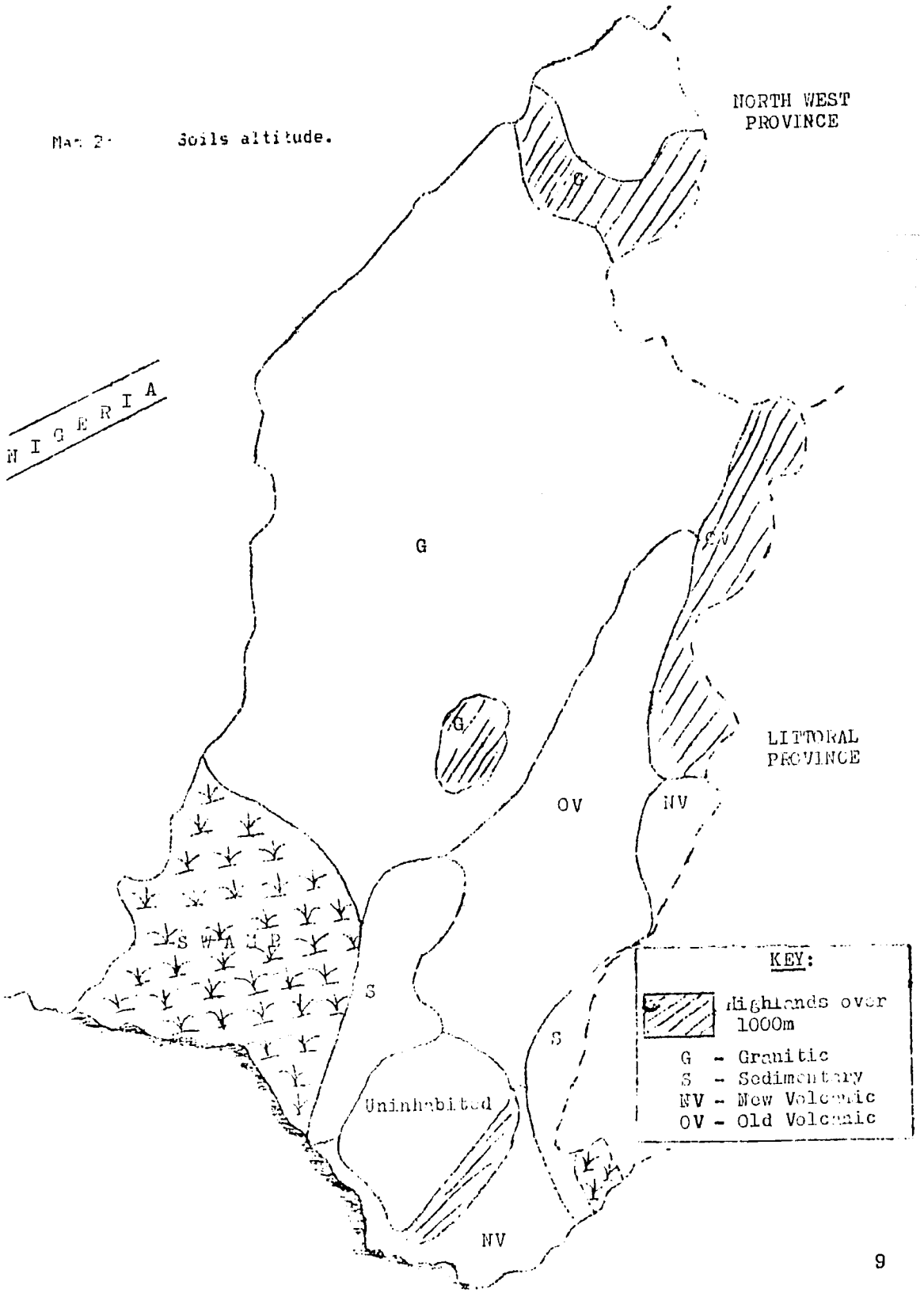
Map 2: Soils altitude.



MAP 2: Soils Altitudo.

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C. **Soils:**

Soil types have been tentatively identified as granitic (31% of farming households and 65% of habitable land, Table 1), sandy sedimentary (11% and6%), older volcanic (34% and 19%) and recent volcanic (24% and 10%). There is wide variation within these types and no proper soil survey has been done for most of the province.

The granitic soils vary from extremely porous sediments to very heavy clay, and are low in pH and essential nutrients, although they can often be corrected by using beds or mounds as planting surfaces (Chart 2). The sandy sedimentary soils are in the Moungo and Ndian river sheds, are low in nutrients but good for yams and cassava; the soils of Ekondo Titi, where fallows of 4years are still employed, are richer than those of the Fako-Meme Sands despite much heavier rainfall. The older volcanic soils vary from mildly to extremely heavy clay, with pebbly under-layers that prevent tuber growth unless beds and mounds are employed; they lack sufficient phosphorus and are lower than recent volcanic soils in other nutrients as well. The recent volcanic soils are usually very rich, although we have seen sites with severe nutrient depletion in highly cultivated areas. They are very susceptible to drought, and vary from pyroclastic to ash to normal lava material, the latter, which is extremely rocky, being most common.

D. **Zoning:**

South West Province falls into two national ecological regions, primarily the Coastal humid Forest (zone II of IRA's classification) and a piece of the Highlands (zone I). Agro-ecozones are sub-regions that are sufficiently distinct in their farming resources and methods that they should be considered separately in decisions on appropriate technology and extension at provincial level. The surveys distinguished 23 sub-zones[4], too many for the research resources available. Therefore six zones (Chart 2) were created by consolidating sub-zones that we felt were similar enough for results from one to be generally applicable to the other[5]. Twelve of the sub-zones were omitted from the zone classification, because they are not similar enough to be included,contain relatively small farming populations, and have low present marketing potential. The six zones are: Lower Volcanic (its own sub-zone), Kumba Corridor (Kumba Corridor plus Supe sub-zones), Sands (Sands I and Ekondo Titi),Mamfe (Mamfe West, Mamfe Forest and Eyumojock), Highland Savanna (Manyu Highlands and Bangem) and Mountain Forest (Upper Volcanic, Koupe and Rumpi).

The 23 sub-zones are detailed in Appendix B.

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[4] They are called zones in the original reports, and in earlier reports the units we call "zones" here were called superzones.

[5] Whenever possible, we carry out some research in all sub-zones of a zone.

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Chart 2: General Characteristics of Key Zones

	Kumba Corridor	Lower Volcanic	Mamfe	
Importance:				
% food production[6]:	19	22	14	
% farmers:	21	12	14	
major crops:	plantain maize,cassava	cocoyam plantain,taro	cassava,cocoyam plantain,maize	
Demography:				
rural density[7]:	35	103	16	
% immigrants	65	94	2	
% no main land	18	9	13	
Ecology:				
altitude (m):	100-400	0-600	0-300	
rainfall (mm):	2.2-2.500	3-4.500	(3.200)	
soils[8]: base:	old vol.	new vol.	granitic	
			Mounds[9]	flat
mean org. C:	4.0%	6.4%	4.8%	3.3%
mean N:	.24%	.44%	.29%	.17%
mean P:	10	28	23	10
mean K+ meq:	.29	.77	.28	.21
mean pH (H2O):	5.5	5.8	5.2	4.9
mean CEC meq/100g:	14.5	32.6	15.3	13.1
Land preparation:				
fallow:	<1 yr.	1-2 yrs.	2-5 yrs.	
clearing:	burn/mulch	burn/mulch	burn/mulch	
form:	beds	flat	mounds	
Cropping system:				
densities:	high	medium	high	
associations[10]:	mz+tr+cy+gn +(cs/ym);pl+cc	mz+cs+(cy/tr); mz;cf+pl	cy+tr+mz+cs+gn+ eg+ym;cc;cc+pl	
Marketing (0-5):				
internal:	5	5	1	
exports:	5	5	1	

[6] In terms of total cash value, if all food crops were sold at 1988-89 prices; major crops are also ranked in terms of cash value.

[7] Persons per square kilometer, calculated from Table 1 plus average household size for the zone.

[8] Number of sites (0-30cm, in farmers' fields and onfarm trials): Lower Volcanic 42, Kumba Corridor 51, Sands 38, Mamfe 52, Highland Savanna 10, Mountain Forest 9 (5 volcanic, 4 granitic). Latter two are few because only survey data exists, no onfarm trials having been done.

[9] Mound analyses and analyses of soil taken from the flat are reported separately because onfarm trials were usually sampled from mounds in Mamfe. Everywhere else, trial and survey analyses are from flat; however, mounds and beds are usually higher in nutrients than flat everywhere.

[10] Crops: maize (mz), cassava (cs), cocoyam (cy), taro (tr), plantain(pl), yam (ym), groundnut (gn), egusi (eg), bean (be), cocoa (cc), coffee (cf).

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Chart 2, continued:

	Sands	Highland Savanna	Mountain Forest	
Importance:				
% food production:	10	13	8	
% farmers:	11	16	8	
major crops:	cassava yam	cocoyam maize Ir. potato	cocoyam plantain	
Demography:				
rural density	38	47	30	
% immigrants	41	0	17	
% no male head	27	9	26	
Ecology:				
altitude (m):	0-300	400-2500	400-1400	
rainfall (mm):	1.8-3.000	2.200	2.8-3.800	
soils: base:	sedimentary	old vol.	new vol.	granitic
mean org. C:	2.2%	5.0%	7.4%	5.5%
mean N:	.13%	.36%	.65%	.38%
mean P:	10	12	17	14
mean K+ meq:	.17	.68	1.19	.37
mean pH (H20):	5.7	5.2	5.6	4.5
mean CEC meq/100g:	5.8	27.7	46.6	34.0
Land preparation:				
fallow:	1-2 yrs.	3-4 yrs.	3-5 yrs.	
clearing:	burn	mulch	mulch	
form:	flat/mounds	beds/mounds	flat	
Cropping system:				
densities:	medium	med./high	medium	
associations:	cs+mz+(eg/gn); eg+ym+mz;cs;cc	mz+tr+cy+ be+gn;cf	cy+pl;cy; cf/cc+pl	
Marketing (0-5):				
internal:	4	2	3	
exports:	5	3	3	

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III. The Society

A. Village Organization:

Farmers' communities range in size from five to several thousand houses,usually being over 50 houses. Their internal organization is often complex and informal. There are at least 40 ethnic (dialect) groups in the province,18 indigenous. Most farmers live in villages that contain several of them, as well as cross-cutting religious groups, of which the Catholics (43%) and Presbyterians (35%) predominate. Villages are formally controlled by chiefs who rule by inheritance, served by a council of quarter heads that are picked to represent both the geographic neighborhoods and major ethnic groups. Most local authority resides above and outside the village. Most chiefs have little power on their own, except insofar as they intercept and reinterpret government directives and assistance.

Within the villages, farmers join different groups for saving money, exchanging farm work, helping the sick or their minister, and sometimes obtaining extension help. Members of one family might belong to up to four such groups, but 44% in the 1990 impact survey (TLU 1990) belonged to none, and only 27% reported cooperative membership. The cooperatives have always been regarded as a marketing arrangement rather than a group activity, and the economic crisis has disrupted marketing. Njanggi groups (labor and savings) are usually small, the work groups having 2-6 members in most places and the savings groups somewhat more. They are usually single-sex, ethnically based, and consist of friends and relatives that have picked each other for reliability. Work groups usually are involved in land clearing and preparation, weeding, and cocoa harvest.

Individual farmers and farmer groups also have ties to relatives living in other towns and provinces, and village markets are visited weekly by independent produce traders. Some agricultural information is passed through both of these external links.

B. Ethnicity:

Indigenous ethnic groups encountered during the survey include the Bakweri and Moungo of Fako, the Balong of Meme and Fako, the Bakundu, Bafaw, Bakossi, Bassossi, Mbo, and Barombi of Meme, the Balue, Ngolo and Barondo of Ndian and Meme, and the Bayang, Ejagham, Mundani, Obang, Awanti, Olitin, Kalimo, Bachebe, Tinta and Balin of Manyu.

The largest group of "strangers" (people outside their own place) is the people of North West Province, with 16% of the total farming population, and more than half the population in the Lower Volcanic zone. They are followed by those of West Province, ethnically closely allied to them, with 8% of the total population. Highlanders (North West and West) make up 62% of the Lower Volcanic farmers and 39% of Kumba Corridor ones. Nigerians (4% of the total)are concentrated in Kumba Corridor and the Sands, where yam growing is best,and Littoral farmers (1%) in the Sands and Lower Volcanic. Seven percent of the farming population are Manyu farmers outside their own division, mostly Bayang

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and especially in the Lower Volcanic. Two percent are Ndian farmers,all in Kumba Corridor. Altogether, only 6% of Lower Volcanic farmers and 22% of Kumba Corridor ones are native to their place; but 57% of Sands farmers,83% in the Mountain Forest, and 94% in Mamfe and the Highland Savanna are(Table 2).

Strangers began arriving in the south of the province in the early part of the century, pushed or pulled to plantation jobs by the colonialists. Once there, they realized that the land was better and more open than their own back home, and began calling relatives to come and buy plots. Even today, CDC workers are saving to buy land from the native villages and settle permanently. Only a few villages resist selling land, and in a few in the Lower and Upper Volcanic there is virtually no publicly owned land left.

Extra-provincial men average 23 years in the village they now occupy, and native villagers 27 years, although the average immigrant from other divisions has only 13 years' residence. Ethnicity has several implications for agricultural programs: for land, labor and food use.

Ninety-six percent of indigenes have guaranteed access to land, and to unused fallow land, so they can cultivate at longer intervals and less intensively. Strangers have to purchase land, or depend on rentals or charity, and so tend to over-use what they have. Eight-eight percent of those from other divisions, and 71% of extra-provincials, own some land, only 75% and 50% respectively owning all they farm. Those who purchase land are almost always men, since these have the authority, the cash-earning jobs and the cash-earning cocoa and coffee. Most highlanders have thus bought land first to plant men's crops, cocoa and coffee, and rented or borrowed land for food crops until they have more money. (Immigrant male low landers, often more interested in yam and cassava culture, tend to buy for food crops.)

Highlanders also have much stronger traditions of cooperation in field,work, and many more of them participate in labor-exchange ("njanggi") groups and in savings groups ("meetings") than of indigenes.

Food traditions also vary according to home place, although there has been a lot of blending of food cultures in recent years in the South. Low landers have regarded maize as a snack food at harvest time, while it is the staple of most highlander diets. Lowlanders are accustomed to larger quantities of plantains, and to boiled rather than processed cassava.

One item that does <u>not</u> vary greatly among indigenes and immigrants province-wide is cropping system. There has been heavy borrowing in both directions between the two groups wherever the immigrants have come, and although there are still differences, in each place people have tried the different ways, come to similar conclusions on which ones work in that place, and drifted toward the same basic rules about planting surfaces, densities etc. This does not mean, that there is not considerable individual variation in system within each village, just that it is not ethnically based.

Highlanders claim that they produce much more food than the original inhabitants of the land. That is born out by the production estimates: people

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native to their own place report an average annual 233,000fr in food crops[11], divisional migrants 270,000fr, and extra-provincials 310,000fr. However, the latter also have larger households to feed, 7.6 persons as vs 6.7 for divisional migrants and 6.4 for indigenes.

C. Household Organization:

Farm families average 7 persons sharing one kitchen and fields, with the largest households being found in urbanized areas (Lower and Upper Volcanic,Kumba Corridor) where secondary jobs are more common. Two persons are between10 and 19 years of age, 2.2 are under 10 years of age, and 2.8 adult, including a grown child, sibling or aged relative (Table 2). Polygamy is acceptable but only common in Manyu. It is rare to find two wives sharing the same kitchen, which was the definition used for a farming household in the surveys. Seven percent of households in the survey were polygamous under this definition (most in the Lower Volcanic). 73% were operated by a couple, 17% with no husband present, and 3% with no wife present.

Dependency ratios (percent of children) are high in the Highland Savanna but similar elsewhere, and across ethnic groups. The provincial farming population is evenly split between the sexes, but there are wide disparities in the Lower Volcanic (56% male) and Mamfe (47% male) zones, representing heavy im- and emigration.

Most families subdivide responsibilities by sex (Table 3). The men are in charge of the entire household, directly operate the tree fields, and usually control plantains and oil palms wherever they are planted. The women directly operate the food fields and assist with the rest.

For tree fields (mostly cocoa and coffee), husbands clear 74% of fields without the wife's help, while wives (or single women) clear only 4% alone[12]. The husbands plant 63% alone, and the wives 13%. But the women help more often in the weeding and harvesting, more regular activities than the other two: women help the husband in 42%, and help harvest in 74% of fields. (Men weed alone in 42% and harvest alone in 21%.)

For food fields the situation is opposite. Women clear 32% of food fields alone, and help with 43%, although this is regarded as man's work. (Women who are working with their husbands, however, usually are raking, burning, and mounding while their husbands cut the grass and trees.) Women plant63% of the food fields without their husbands, and usually without any other help; men plant 6% of these without their wives. The women both weed and harvest 66% "alone", usually doing the weeding with njanggi or children's assistance, and the husbands help with 30%. Men and women cooperate together most in the two heavily immigrant zones, Lower Volcanic and Kumba Corridor,although this is in neither highland nor lowland tradition. Probably the cause is the increasing

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[11] Total value if all had been sold at 1988-89 prices.

[12] Alone or with children, paid or exchange labor.

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emphasis on food sales and intensive land use.

D. Extension Services:

Although several provinces enjoy special parastatal extension services endowed with greater resources, South West Province has only the basic extension service of the Ministry of Agriculture (MINAGRI). In the more market-oriented half of the province, extension agents have benefitted from a Belgian project, CCSP, to provide motorbikes, inputs and training to establish cocoa and coffee demonstration plots and promote these crops generally. Project funds dwindled just when it was to expand to the rest of the province, and it hardly touched on food crops.

There is an extension agent posted to every third or fifth village throughout most of the province, although in the more remote areas most are untrained assistants. Recently, emphasis has also been given to group farming within the female-staffed Community Development (CD) service of MINAGRI. Are cent study in Meme found a ratio of one extension agent to 600 households, and one CD agent to 1600 (Arze et al. 1990). 54% of the agents in this zone had no formal agricultural training, and the Community Development staff are trained in a special program that focusses on organizational skills rather than agronomy. Our attempt to estimate the agents posted to direct extension work[13] produced a provincial average of 600 farm households per agent, from450 in the Sands (artificially increased by the presence of two sub-delegations in this small zone) to 800 in Kumba Corridor (Table 4).

Relations between the farmers and research and extension services have been fragmented and individual, although this has started to change since the surveys with the impact of the TLU and cassava-multiplication programs on foodcrops. During the surveys, we observed that about a third each of the agents were attempting to help food farmers, a third responded only to tree farmers, and a third were absent or non-responsive. Relative to extension services in other parts of the world, this is not a poor showing.

If the extension agent lives in a village, or visits it frequently, farmers of both sexes at first try to bring their field problems to him. Some agents respond only for cocoa and coffee, and lose the attention of the food farmers, mostly women. Others only respond to the requests of the wealthiest or most "modern"-looking farmers. Some visit and comment on the food-crop farms, and look for something to recommend. Only a few, trained in the old days in community development techniques, have formed groups to work with a large number of farmers together, although this has also changed recently with increased MINAGRI emphasis on groups. IRA research staff act as advisors to occasional individual farmers that come to them, and rarely to women's groups organized by the community development service of MINAGRI.

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[13] Agents meeting with farmers and visiting fields for advisory purposes, including extension-oriented sub-delegates, and including agents who are usually absent from post.

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In the surveys, only 20% of farmers claimed to know nothing about an extension agent for their village, although 62% had never had a farm visit and only 14% had been visited more than yearly. Half would not consider asking an agent for help. The 40% who had asked, had mostly wanted material help for cocoa and coffee: chemicals, polythene bags and seedlings. Most of these got such help, before the crisis. A third of households had sent someone to an agricultural meeting, usually on cash crops and cooperative affairs; these were considered useful. However, there had been, up to survey time, little use of the extention agents for agronomic advice and training. Even in the food crop area, and even for disease problems, farmers and agents stressed provision of inputs rather than learning.

IV. The Economy

A. Land Access:

Agricultural production in SWP is divided between two sectors, a parastatal sector of large commercial plantations and a private sector fragmented into 65,000 small holdings, 90% under 5ha (MINAGRI 1988). The plantations produce rubber, bananas, palm oil and some black pepper, all for export, and provide employment and social services for large numbers of workers. The smallholders (subject of our surveys) produce cocoa, some coffee, plantains,aroids, cassava, maize, melon seed, groundnuts, palm oil and fruits. All of these crops are also exported, but only the cocoa and coffee are officially recognized as export crops.

Half the farmer population suffers from increasing land scarcity due to proximity to plantations and to their own over planting of tree crops. The scarcity is recognizable in shortened fallows, fertility problems and temporary access to land, and occurs precisely where food-crop markets are strongest. Twenty-eight percent of Lower Volcanic land, 8% of Sands, and 4% of Kumba Corridor is in incorporated plantations; these figures exclude the individual large farmers in cocoa, rubber and palms, most of whom are based in Kumba Corridor, the Sands and Mamfe.

Despite this, 77% of farmers own all the land they farm, 15% own at least some of it, and only 8% must rent or beg all their fields (10% of all fields are rented, and 5% begged)(Table 5). Renting is usually by money payment of5,000fr to 10,000fr a year for a typical field, which we have found in a later study to be usually about half a hectare (Besong and Almy 1990). Most farmers rent for a prolonged period, returning after fallows, and the rent payment,made when the farmer plants, covers the fallow period as well. Fields closer to the village are likely to be more expensive for their quality, because they are also less often fallowed.

Before the crisis, older cocoa farmers were also renting out land in"two-party" or "pledge" arrangements. In two-party, the renter would pay in labor, maintaining the cocoa field, and only harvest his/her own food, leaving the cocoa to the owner. In pledging, the renter would advance a large sum of money to the owner, and receive full use of the field until the loan was repaid, after

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a specified period of years. Retired people could thus use land already in cocoa to provide income with little or no work on their part. Today, the economic crisis must have stopped these practices.

Land is begged from a relative, rich person in the village, or the chief. The land is often of inferior quality, and small. Also included in this category is "no man's land", public or fallowed plantation land for which permission has not been asked. Plantation workers, not included in the survey, often farm small plots of this land, under risk of crop destruction by the owner, although some, especially in the Lower Volcanic, farm substantial rented fields.

Fields are distant, averaging 50 minutes' trekking from the house. Most villages line the road sides, with the food and tree fields stretching out on all sides in between fallowed areas. The more mountainous zones and Mamfe have the longest travel time.

In the surveys, households owning no land reported a total food production value of 171,000fr/year, while those owning all their land reported239,000fr and those owning and renting/borrowing reported 320,000fr, probably because the latter are working hard to earn enough to expand their holdings. Caloric values of owners' and partial-owners' crops were much closer to one another, indicating that the latter are concentrating on more commercial foodcrops (eg, plantains rather than cassava).

Most farmers in the province are above subsistence level, having benefitited much from cocoa/coffee sales in the past. Some kind of food can be harvested throughout the year, and virtually all farmers participate in foodcrop markets. Only one out of nine of the farmers in a 1990 randomized adoption survey (TLU 1990) still had thatch roofs, and at the time of the surveys virtually all children 5-17 years of age were in school. Today, after the crisis, cash comes into the villages only through food crop sales and gifts from relatives in urban jobs, and flows out in taxes, school fees and purchases of medicine, clothing and non-local foodstuffs and beer. Many children have left school.

i. Capital Investment:

The relative prosperity of local farmers is built on the opportunities provided by year-round rains and, in most of the land-scarce areas, good soil. Capital investment in the food farms, whether human or material, is near zero,and the tree fields have little except the trees themselves. Almost no farmer has formal agricultural training, although male farmers average almost 4 years of school and women almost 3, allowing the use of simple extension bulletins if such became available. The only pieces of agricultural machinery more complicated than a hoe or basket are engine saws, for cutting forest trees,and knapsack sprayers, for the now-rare cocoa insecticides. Some farmers inmost villages have sprayers, and a few have engine saws. Even basic tools like hoes and matchets are hard to replace in many zones, and were commonly requested in lists of things the farmers would buy if commercial input stores were established in their sub-division.

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Seventy-eight percent of farmers surveyed have tree fields, although over a third in the Lower Volcanic and Sands do not. These are primarily cocoa, with some coffee inside, in Kumba Corridor, the Sands and Mamfe; coffee in the Highland Savanna; and either in the Lower Volcanic and Mountain Forest. Six percent have oil-palm fields, primarily in Mamfe and the Sands, and only Kumba Corridor and the Sands have rubber (1%). Sixty-two percent have cocoa fields, and 4% coffee; usually in the lowlands, the coffee trees in the field are less numerous and more poorly tended. Improved planting materials were, at the time of the surveys, only available from individual contacts with IRA[14]; 0.5% each had improved maize and cassava (all old varieties), and 1.1% had improved plantains. At survey time, fertilizer had been used by 7% on food crops and an additional 4% on trees near food; when the question was added in Manyu and Ndian, 9% and 3% respectively said they had ever put fertilizer on tree crops, although the figure would doubtless be much higher in the south. The later impact survey (ILU1990) indicates that more people in the south have since tried it on food, but most gave it up due to the crisis. Crop protection chemicals had been used on food by 10%, principally in the Manyu Highlands, where farmers had easy access to UCCAO supplies and credit, and in the Kumba Corridor, where toxic cocoa chemicals were often diverted to protect maize and plantains from borers. Many of the chemical supplies have also disappeared with the crisis.

Animals (Table 6) are used for food and cash reserve only, and usually maintain a precarious balance between the damage they do to crops and the benefits they bring, particularly where goats are concerned. Some villages enforce tethering laws, but most do not. Three quarters of households own an animal, 32% having goats, 18% pigs, 10% sheep and 66% chickens or ducks. Less than 10% have more than one sheep or pig, while only a fifth have more than one goat or 10 fowl. Only 12% of those with animals apply the manure to a crop, usually smearing goat or fowl dung on stems to use the smell to chase these predators away from young plantains or maize.

C. Labor:

Land preparation costs are very heavy, restricting the average farm holdings to 2.6ha, of which 1.5ha is in trees and 1.1ha in seasonal crops[15]. With the exception of the Kumba Corridor zone, where many farmers pointed to the time of cocoa harvest/second food planting, most farmers throughout the province indicated land preparation as the worst labor bottleneck. At the time of the surveys, before the crisis, farmers were spending an average 75,000frper year in paying labor, mostly for land preparation and to village youths and men without cocoa fields. Especially in Manyu, Highlanders and Nigerians also come in for the season to work. Njanggi (exchange) labor is more common in Manyu, and paid labor elsewhere; njanggi labor is rare in Ndian.

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[14] Each survey occurred shortly before distribution campaigns began in their division.

[15] Calculated from MINAGRI 1988.

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People who pay some labor usually carry the same operations with njanggi labor as well, the choice depending on the urgency and how much needed to be done. Njanggi is considered to be more an alleviant of work, making things easier and more comfortable, than a good way to get a lot done. Average labor payments in the Manyu and Ndian surveys were 1.300-1.500fr/day for paid labor(usually working 6 hours, but including engine-saw and other heavy work; the median wage was 1.000fr) and 350-380fr/day/participant for the food and drink for njanggi labor (usually working 2-3 hours). Thus njanggi labor is little less expensive than hired labor, since njanggi groups seldom do the heavy and skilled tasks the higher wages are paid for. The crisis has cut back njanggi work as well as paid labor; people feel they cannot afford to provide food.

D. Credit and Markets:

Farmers say they need cash most at three times of year: September for school fees, December for Xmas celebrations, and immediately after, in January and February, to pay for land preparation help. At survey time, 55% of farmers reported having saved or borrowed an average 143,000fr during the year(Table 5), but this average covered wide disparities, from 305,000fr in then cocoa-rich Kumba Corridor (where two-thirds did not report any savings or loan) to 113,000fr in the commercialized Lower Volcanic down to 54-93,000fr in the other zones. The most popular "bank" is the family or ethnic meeting, in which a closely knit group meets regularly to contribute and save together,usually all paying out at the same time when cash is needed by all. Two-thirds used this means, the next most common being a commercial bank (13%),followed by individual loans from Licensed Buying Agents for cocoa (8%) or friends (7%), and the Cooperative (3%). Credit Unions have not reached past urban employees in the province. Two percent had had FONADER loans.

Only 47% of farm households have any type of secondary occupation, 30% in the informal sector and 27% requiring some capital or training (carpenter,herbalist, off-license owner, market trader, teacher) (Table 5). Thus only17% held jobs in the formal sector, from which money could flow into the village. Jobs were rarely listed as sources of cash at critical periods, perhaps because most bring in regular amounts that are spent or saved as they come,and then the savings source is credited. However, food crops are listed as the most important cash sources, followed by tree crops[16], despite also being funnelled through savings.

Markets are found in almost every village over 50 households, and only17% of farmers do not take any crops to market, more in the highland zones where travel is most difficult (Table 7). Most people walk to market, and go nearby when they have little to sell, but they travel an average 50 minutes to the farthest market they normally take produce to, only 29% using taxi or,rarely, canoe. Kumba Corridor farmers are the most fortunate, with numerous markets

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[16] This ranking may reflect the fact that more women than men were interviewed, though they were asked about the entire household.

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attracting Douala and Kumba truckers at hand; they travel an average of 15 minutes. Lower Volcanic farmers, despite numerous markets, prefer to go further to meet the bigger ones, and travel 44 minutes. Mamfe farmers seldom travel outside their village markets (which, outside of Mamfe West sub-zone, are very small), only going 28 minutes in a region of long distances between villages. Farmers of the other three zones must walk over an hour, some up to 5 hours, to sell their most profitable food crops.

Many farmers also sell plantains, yams, fresh maize and cocoyams from the roadside to passing cars, and to trucks that come to buy from everyone in the village. Some farmers also charter space in trucks to go to Douala to sell, when they harvest a large quantity.

Plantains, egusi and cassava (as garri and water fufu) are the most commercialized crops, 59%, 64% and 58% respectively of farmers reporting having sold more than half of their crop. Yams and groundnuts also pass 50% of farmers, the least attractive being taro, over half being sold by only 30% of farmers. Kumba Corridor and Sands farmers sell everything they produce in quantity; the Lower Volcanic concentrates more on plantains, maize and groundnuts; Mamfe on cassava, egusi and yams; Highland Savanna, selling less, on cassava, potatoes and plantains; and Mountain Forest, on plantains and yams.

E. A Multi-Staple Economy:

The agricultural economy of South West Province is equipped to weather the worst shocks of the economic crisis, because it is based on multiple commodities. When a drought hits the maize and egusi, the cocoyams and cassava are still there. If the mealy bug destroys the cassava, the other crops are there. Although farmers are stressed by the lack of cash coming from cocoa and coffee, they still have food to eat and sell. Although individual farmers and zones can be hurt worse by one epidemic or disaster than others, there is always a way for most to recuperate.

In energy terms, the predominant crop is cassava, providing 33% of all calories. However, much of this caloric supply is turned into cash in the marketplace in the three zones where its contribution passes 10% (the Sands, Mamfe, and Kumba Corridor) (Table 6). Eighteen percent of calories are provided by maize, 14% each by cocoyams and plantains, 9% by taro, 4% by yams, and 3% by bananas, which in some areas are eaten green in place of plantains due to production problems. Thus there are five significant consumption staples in the province.

In monetary terms, the food crop budget is even more equally distributed. In previous reports we had used the median of farmers' reports of prices during principal sales time to calculate total value. This had led us to report that plantains, followed by cocoyams, contributed 43% of the total value of food crops. However, this time, we used the actual mean prices from the 1988-89 survey of provincial markets (see Methodology section). Apparently farmers had inflated the prices they thought they were receiving for plantains (men sell most of the plantains, bananas and yams, and women the other crops). The new calculations place plantains third, with 17% of total cash value, after cocoyams

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(22%) and cassava (19%)[17]. Maize comes fourth with 13%, taro 9%,yams 8%, and irish potatoes (almost all from the rich upper highlands of Fontem) 5%.

Thus 6 staples contribute significantly to the economic welfare of foodcrop farmers. The zones most dependent on a few crops are the Mountain Forest, where 76% of value is in cocoyams and plantains; the Sands, where 50% is in cassava, and 73% in this plus yams and plantains: and the Highland Savanna,where 78% is in cocoyams, irish potatoes and maize, although the importance of potatoes is a distortion from one micro-zone (Table 8).

V. Field Systems in the Six Zones

In general, South West farmers have 2-3 food fields and one tree field(Table 9). The former are fairly small (.3-.6ha) and densely planted relative to station recommendations. Inside are a few oil palms, fruit and shade trees, saplings for yam/bean stakes, and/or large trees such as bomas which are too big to fell safely. Farmers clear by cutting the grass and shrubs,pruning or felling trees, letting the residues dry and then firing across the field before preparing by mounding or bedding. In the high rains, they pick small fields with grass only (from short fallows) and rake the residues off the field or plant through them. They plant most crops at the same time, or within a week of each other, weed a month or two after planting, and return to weed again at maize/groundnut/egusi harvest at 3-4 months. If they fear fire destruction in the dry season, or the weeds grow heavily in the later rains,they weed again in early dry season. The last crops come off the March fields in January-February (yams and cocoyams) or 1.5-3 years after planting (cassava).

Fallows are declining in most of the province, as represented by the divergence between the farmers' general statements about fallow length and their actual recent fallows. A key indicator of fallow is the R, the ratio of cultivation years over the full fallow-cultivation cycle (Ruthenberg 1976). 55, the actual R for the province, indicates that 55% of the cycle is spent under cultivation[18]. The expected R given by farmers is 50 (Table 10).

One of the key determinants distinguishing the zones is the manner in which their farmers design and manage their fields. Here we look at fallowing, land preparation, weeding and field design practices, as they occur in the separate zones.

A. Highland Savanna

The Highland Savanna zone consists of two sub-zones, the Manyu Highlands

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[17] The place of cassava is artificially somewhat inflated, since it is counted all as garri, when in fact not all of it is processed for use or sale.

[18] Even this figure may be too low, as farmers' expected length of cultivation between fallows was retained in the calculation.

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[19], or Fontem, more densely populated, with less degraded soil, and planting principally on mulched beds, and Bangem, planting more often on very large mounds. Both have old volcanic soils showing erosion gullies, and are almost entirely above 1000m. Many fields, most in Fontem, are severely sloping, and beds are usually planted down the vertical slopes to avoid being washed away. Nutritional/disease problems were observed in most fields and crops in Bangem, despite lower population densities.

There is a concentration on coffee, which is seldom intercropped except with some plantains and aroids. Food fields are separate, and densely cropped with maize, cocoyams or taro, interspersed with several secondary crops, including these and yams, sweet and irish potatoes, vegetables and legumes. Among the latter, groundnuts and Phaseolus beans share equal place. Plantains are scarce.

Fields are abandoned once production drops too low, and new fields picked by appearance and, in Fontem, the agreement of the fon. Users often do not know the previous history of the field. The expected R for food fields is 39and the actual, 46, indicating a system still not far from shifting cultivation, despite the intensive land use.

Trees and shrubs grow slowly, and clearing mostly involves cutting of grass, which is incorporated into the beds or mounds. Rainfall seems to continue sporadically early and late in the dry season, and farmers open fields in most months of the year, though primarily in March. Spaces left by dead or harvested crops are often filled with new minor crops such as beans or vegetables, even though the older crops shade and crowd them. Weeding may be done once, twice, or three times in the year according to the farmer's energy level and fertility of the field.

B. Kumba Corridor:

The heavy clay soils of Kumba Corridor zone, underlain by a level of gravel, make planting of deeper-rooted crops on beds and mounds imperative. The traditional system was mounds, which is still retained in fields with heavy root systems, but the Highlanders brought in beds and most inhabitants have found them more useful for the cropping system. It is difficult to classify the primary crop in most fields, the maize, cocoyams, cassava, taro, yams and groundnuts all being outstanding at a different time in the cycle. Densities are extremely high, but crops usually do well, despite the lack of phosphorus in the soil. Plantains are planted between beds, and throughout the cocoa/coffee fields, while many food crop fields and mini-plots are scattered throughout open spaces within the trees. Only half of all fields are free-

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[19] A sub-subzone in the highest part of Fontem, with extremely rich soil, is being intensively cropped with temperate crops (irish potatoes, leeks, garlic, cabbage) using chemicals. It is not considered here.

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standing food fields, one third being mixed tree-food[20].

The actual R for Kumba is 68, which puts it into the permanent-cultivation class of farming according to Ruthenberg. The expected is 58, indicating a growing crisis in land access and use that threatens the system. Most Kumba farmers do incorporate grass inside their beds, after burning or removing the most noxious weeds, but unfortunately the most noxious weeds include the nitrogen-fixing ones (Almy et al. 1989). Non-indigenous farmers, the majority, purchase their land or rent from other purchasers, usually returning to the same spot year after year, often with 1-6 months' fallow, and seldom more than one year. (Some regard the final 6-12 months with only cassava in the field as a fallow.)

Planting is done simultaneously with the first rains, sometimes with early egusi or late yams and/or cassava added. Weeding starts immediately after planting for many farmers, and a second weeding follows at maize harvest. Smaller secondary fields are opened for August planting of short-season crops and taro.

C. Lower Volcanic:

Lower Volcanic farmers plant fewer fields, often only one or two, and many do not have tree farms. Half of those that do monocrop them. Food-fields are also often monocropped, or one main crop, maize, cocoyams, plantains or second-season groundnuts, is planted and a few secondary ones added inside. Fully two thirds of fields were identified with only one major crop. In other fields, maize and an aroid share equal prominence. The principal crop is scattered in a regular pattern across the field, and then other crops planted between; sometimes cocoyam, country taro or cassava is added at first weeding.

The soil is usually very fertile, although nutrient depletion symptoms are common in the fields near roadside by the most populated town. It is extremely rocky, and for this reason in most places, cassava and yams do poorly, and groundnuts require considerable preparation of the planting surface and are planted only on small beds. The volcanic soil is so porous that a week or two of drought early in the season, or at tasselling time, is disastrous; in 1990, farmers in the drought-stricken sector had to replant 3-4 times in March-May.

Except for the groundnut and leafy vegetable beds, most planting is on the flat, or in tiny hillocks built for a single tuber plant. A few people plant larger mounds to taro. Fallows are very short, and expected to be so: customary and actual R are 69 and 71 respectively, indicating permanent cultivation. In first season, the grass is cut and burned; often there is not enough grass to burn without pulling it together in heaps. In August, the grass is cut and left on the surface, or gathered under small, marshy vegetable beds. Weeding starts immediately after planting finishes, and often starts again as soon as the first weeding is complete; but if the season has not been very rainy, the second weeding is often omitted. A third weeding after the root crops are well

[20] Tree fields with plantains or bananas inside are counted as pure tree fields.

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established is not considered necessary.

D. Mamfe:

Mamfe zone contains three subzones: Mamfe Forest, with small villages, more intact forest, little marketing, and generally heavy clay soils, water retentive but hard to work; Mamfe West, with large villages, the most active marketing in Manyu, and more sandy soils; and Eyumojock, largely forest, with small hunting and farming/administrative communities and a mix of both soils and cropping patterns. Mamfe Forest farmers concentrate on taro and maize, with cocoyams, plantains, bananas and yams, while Mamfe West farmers focus on cassava and egusi, with yams, cocoyams, taro and plantains. Both plant 4-8 crops together on large mounds; the Forest system intersperses the tubers and maize regularly around and across the mound, while the West one puts the principal tuber in the center, other crops around it, and the cassava pushed into the sides. Although much maize is grown in Mamfe Forest, it is still a harvest-time food there, the local variety being nearly unstoreable. Cocoa fields are usually monocropped or with coffee and plantains.

The rains come late in Mamfe, usually in mid-to-late April, and decline abruptly after October. Despite this, farmers insist that they plant in March. Although some egusi and yams are planted then, and even maize in marshy areas, serious planting begins with the rains. Mamfe farmers also responded in the survey that they harvest tubers in January-February, although since then farmers asked to harvest at that time have told us that the ground is then too hard to permit it, and they harvest all tubers by the end of December. All calendar information from Mamfe is thus suspect.

Fallows are still 3-5 years and more in Mamfe, and the customary and actual R are both 33, at the watershed between shifting cultivation and fallow systems. Households keep and return to the same fields after fallow. Some fields are losing fertility due to overuse because the people who should clear the older, heavily covered fields are absent or sick, or because women prefer to keep a field near the village where they can get food easily on busy or rainy days.

Another recent factor is the advent about ten years ago of Chromolaena odorata, or "acha casara", "outgrows cassava", now know across coastal Cameroon by its Bayang name. This weed becomes extremely woody with time, and has taken over all fallows; because of the woodiness, farmers have ceased their customary practice of incorporating clearing residues in mounds, and burn the whole field instead. The major exception to this practice is the building of "stick mounds" of Chromolaena in June-August, when the rains can help to rot it best. These are covered over with mud and used to plant tubers, then replanted the following year to regular crops. These are the only mounds replanted, the rest being returned to fallow after the final crop is removed. Fields made during the rains are much smaller, because working in heavy rain is dangerous to the health.

After mounding, usually a whole field is planted to one to three crops simultaneously, often maize, egusi and yams, and then the farmer returns to add

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other tubers, sometimes leaving the cassava until July or August. Because of this practice, and the building of stick mounds, farmers often have no time to weed until maize harvest. A second weeding is often done as dry season approaches, before yam and cocoyam harvest.

E. Mountain Forest:

The Mountain Forest is a composite zone of three widely separated mountains, Fako, Koupe and the Rumpis. The southern slopes of Mount Fako (Mount Cameroon) are formed of rocky recent volcanic lava flow, and the farmers on them have relatives commuting to government and other urban jobs in Buea, and access to the Buea markets. The western base of Mount Koupe is of pyroclastic material, deep, extremely loamy and rich soil, and most of its farmers have been cut off from easy market access by terrible roads (the road was improved since the survey). The Rumpis are covered with highly acidic granitic heavy clay soils, and its farmers are, at best, at the end of a very long and difficult road leading down to Kumba Corridor. Nevertheless, all these farmers practice the same basic system.

Most fields are left under heavy shade from tall trees, and planted to cocoyams and plantains, yams or country taro, with small subplots of other crops in more open or marshy areas. Fields are usually quite sloped, and this system protects against erosion. Shrubs, smaller trees and weeds are cut and left where they fall just before planting. Cocoa and coffee may be planted only with plantains, or mixed with the food crops. Plants are spaced at roughly regular, wide intervals throughout the field, but the design is broken by the presence of trees, stream beds, boulders and fallen trees. Weeding is usually a matter of pulling off vines or clearing the brush out of a new subplot to transplant suckers.

R values of 61 (customary) and 72 (actual) indicate a system of permanent cultivation that is running out of land. The large difference between the two may be due instead to the elimination from calculation of the newly opened virgin forest fields (7% of fields, with a fallow period of infinity). "Permanent cultivation" in this case consists of an agro-forestry system which takes very small output from the land, and provides maximum cover.

F. Sands:

The Sands zone is composed of sandy clay loam sedimentary soils from the river sheds of the Moungo, Ndian and Meme rivers. There are two sub-zones: the Ekondo Titi area, with fallows still at 3-4 years, rainfall at 3.000mm and above, and somewhat higher fertility; and Sands I, the Meme-Fako border area,ranging south to the coast at Mudeka, with low fallows, depleted soils and lower rainfall (1.800-2.400mm). Heavy clay pan underlies much of the Sands area south of Muyuka, forcing farmers to plant on mounds to avoid flooding.

R values are very different for the two subzones. Sands I is effectively under permanent cultivation: a customary R of 67 and actual of 71. Ekondo Titi is on the borderline of shifting cultivation and fallowing: customary R of 31

and actual, 34. Sands I farmers not only fallow only 1-2 years, but they often replant harvested fields a second time to cassava, lengthening the cultivation period. Ekondo Titi farmers plant a single time, and wait until saplings have regrown to 3-4m before clearing again.

Sands farmers are cassava farmers, with additional attention to egusi melon and sometimes groundnuts. Yams form a very important sub-system, but one mostly developed by Nigerian immigrants. For these and the Ekondo Titi farmers, men's food-crop farming is serious business, and the women usually collaborate rather than have their own fields. Fields are planted to egusi and maize, or groundnuts and maize, and cassava added some weeks later. The cassava remains suppressed by shading until the first crops are harvested and then takes over the field. Cocoa fields are usually separate, located in clayey areas more remote from the villages, where some plantains and cocoyams are also grown. Half the Sands farmers have no cocoa/coffee field, though an additional tenth have monocropped palms or rubber. Food fields with better organic matter than usual are planted with cocoyams, taro and plantains interspersed with the basic crops.

Sands farmers cut the grass and shrubs, leave it to dry, then burn across the field. Most then plant on the flat, some (in the north of Sands I) first tilling the soil, and others (in the claypan areas) making mounds. In flat-planting, the egusi or groundnuts are planted regularly across the field with a maize stand every 2m or so to avoid shading; then, once they are established and spreading, the cassava is placed in between, usually flat to avoid loss to drought. On the mounds, cassava is planted in the center, egusi or groundnuts around the sides, and a maize stand off the side. Yam fields are usually also planted with egusi. Egusi is the usual first-season crop, and if second-season crops are planted (mostly in Sands I), groundnuts are chosen. However, some farmers in Sands I prefer to plant groundnuts both seasons. Second-season crops are often stunted by late drought.

Egusi fields do not need to be weeded, except when late drought or insect attack causes the crop to be lost. Sometimes scattered weeds are picked out of the egusi before it covers completely in the first few weeks. Weeds start to sprout as the egusi dies in June-July, and a full weeding is done at harvest, after which some farmers do a second in November-December to reduce the chances of fire disaster during the dry season. This is a common problem in Sands I, where fields near roads are fired by careless tobacco smokers or neighboring farmers burning a cleared plot.

VI. Important Crops

In this section the most important smallholder crops are considered individually: maize, cassava, cocoyams and taro, plantains, yams, groundnuts, egusi, and briefly, cocoa and coffee.

A. Maize (Zea mays) (Table 11):

Maize is the most common crop in the province, although it is a staple

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food for a minority, owing to storage difficulties and its perception as a harvest food by indigenes. It provides 18% of the calories produced in the province, and 13% of monetary value, is found in 50% of all food fields and grown by 94% of farmers.

South West farmers plant two types of maize: an intermediate-late, hard medium-yellow variety, flinty and with good husk cover, which was brought in by highland immigrants and is constantly renewed by purchase of supplementary seed at planting from highland traders; and an early, white, soft, floury flinty variety traditional to the lowlands both here and in southeastern Nigeria, often called "Calabar" or "Ikom". The latter is very susceptible to weevils, and now grown primarily in Manyu and Ndian. There is no commercial sale of improved seed. At the time of the survey, 3 farmers were found to have some improved seed from IRA sources: one with Ekona White and Yellow(both released about ten years earlier), one with Ekona White, and one with seed from a highlands development project. Thirty-seven percent of farmers buy some or all of their seed from the market each year, due to storage losses; 65% supply from their own stock.

Planting occurs primarily in first season, 80% of all farmers planting maize then. But half also plant towards the end of the high rains, and 14%plant in swampy areas or rainy zones during dry season. Each zone has its own favored planting location for maize, on mounds in Mamfe, beds in the Highland Savanna and Kumba Corridor, and on the flat elsewhere (Table 11), but everywhere 2-3 seeds are put in each hole, and stands are spaced about 70-100cm apart. Cocoyam and taro, cassava and groundnuts are the most common inter-crops, and mono cropping is common only in the Lower Volcanic. Maize is seldom weeded a second time. Lowland harvest is at 3 months, often starting earlier for the green-maize market, and harvest in the highland zones at 3-4 months. Farmers reported losing 21% of their crop in first season, and somewhat less second season,complaining of stem borers, lodging, drought, stunting or streak virus, floods, wild and domestic animals, termites, crickets, and rarely, ear rot.

The most common forms of eating maize are green - roasted in the south and boiled in Manyu and Ndian - and as fufu (coarse flour porridge). Other forms include corn chaff (boiled grains mixed with beans in palm oil), koki (boiled mixture of corn flour, pepper and vegetable wrapped in plantain leaf),pap (finely ground, sweetened flour porridge), and beer.

Storage is common, 85% storing over 1 month, for an average of 4.7 months after July harvest, usually inside the husk, on smoky shelves or ropes over the kitchen fire. Farmers complain strongly of storage losses in maize, which they estimate at 37% at the end of storage, to both weevils and rats.

B. Cassava (Manihot esculenta) (Table 12):

Cassava is an important staple and commercial food in the province, especially in the Sands and sandier Mamfe zones. It contributed 33% of calories and 20% of monetary value of crops reported in the surveys. Eighty percent of the farmers grow it, and it is in 39% of all food fields.

Two principal varieties are found, a tall, bitter and toxic white-skinned type with red petiole, used for processing, and a non-toxic red-skinned type with white petiole, used as a quick meal after fieldwork. In some places there is also a short toxic white. All farmers appreciate the red-skinned type, but the white is preferred only in the areas which process to garri and water fufu for sale and home use. At the time of the surveys, only 2 farmers reported having improved cassava, and this was the red type, which has been discontinued by IRA for poor performance. Since the survey, the red-white perception has created some initial difficulty for IRA cassava distribution inmost areas, but demonstration of the non-toxicity of the IRA whites has quickly allayed most fears. Almost all planting material is brought from the farmer's or a neighbor's farm.

The most common intercrops are maize and cocoyam or taro. It is monocropped in 15% of fields, primarily in the Highland Savanna and Lower Volcanic, and usually after completing harvest of earlier crops[21]. Planting is almost always first season. Cassava is usually planted on beds or mounds, but in most of the Sands zone it is planted on the flat, and by many farmers also in the zones with less interest in the crop. Spacing is wide, averaging 140cm, due to the accustomed planting between, often later to, other crops. One or two sticks are either laid flat or pushed into the side of a mound or bed. Only half the cassava is weeded a second time. Harvest starts on average at one year, and continues to 19 months, but this varies greatly between zones, from the Lower Volcanic's final harvest at 15 months to Mamfe's at 26.

Field losses are reported to be low but variable, the highest due to rodents in Mamfe and other forested areas and tuber rot in the highlands. Mosaic, snails, and fire were also indicated, and extensive mealy bug damage was found in Akwaya. Contrary to what one might expect, it is not planted on older fields than other crops, although it usually is the last crop in the field.

Cassava is most often consumed as garri (a rough flour made by grating,pressing to dry, and roasting), boiled tubers, and water fufu (a wet mass made by soaking the tubers in water until they are soft enough to pulp by hand). Other methods are roasted tubers, pounded fufu (boiled tubers, pounded into mush), ekwan (grated tuber, wrapped in plantain leaf and boiled), myondo (fermented flour twisted into narrow ropes), koki (the same, but mixed with oil and vegetable), and as kumkum (a fine flour made by drying pounded, soaked tubers). Only two farmers reported storing cassava, as kumkum, a Littoral Province food.

C. Cocoyams (Xanthosoma sagittifolium) (Table 13):

Cocoyam used to be a common and cheap food in the province, but as the root rot complex has cut deeply into production, prices have risen and its social as well as economic value has soared. It represents 22% of monetary value and 14% of caloric value of the food reported in the surveys. Eighty-four

[21] Monocropping in this case does not include the cassava which is planted together with other crops and left sole after their harvest.

percent of farmers grow it, and it is in 47% of food fields. Farmers report an average loss of 39% of expected production, almost always describing symptoms of root rot; animals and soil pests also do damage.

Both red and white cocoyams are common in the province, but the white is preferred, despite its greater susceptibility to root rot. Only 2% plant the red type alone, and 46% only the white. In the Rumpi Hills, the slow-growing yellow tetraploid is common; this cocoyam is very tasty, and resistant, but has seldom been found to bear cormels outside this zone. But even there the white seems to be preferred. Cocoyams are consumed in many related fashions,as boiled tubers, pounded fufu, ekwan, "porrage" (boiled chunks), roasted tubers, kwa coco and bible (methods of wrapping the grated tuber in thin leaves before boiling).

Fourteen percent of farmers buy their planting material in the marketplace, a quarter of Lower Volcanic and Highland Savanna farmers but no one from the Mountain Forest. Planting is mostly in first season, on the flat only in the Mountain Forest and those parts of the Sands that have access to loamier soil, but the "mounds" used in the Lower Volcanic are usually merely small mulchings of soil. Spacing varies from 60 to 90cm. Except in the Mountain Forest, it is almost never monocropped, taro, maize and plantains being most commonly associated. Only half weed a second time.

Harvests begin at 9 months average, but a third now start before 8 months, as farmers harvest tubers when they see the leaves begin to die from the disease. The average harvest ends by 13 months after planting, but in Mamfe only continues to 11, and in the Mountain Forest, averages 20. Mountain Forest farmers report high losses, but less attack has been observed in their fields, and the conditions they plant under (shade, higher altitude, slope,little import of plants from other places) are considered to be the best for reducing the impact of root rot.

Cocoyams are stored on the house floor, in cool, dry areas, and covered with wood ash to deter rot, or in holes in the ground in the field, lined with leaves and covered over with soil, or on the ground under a shed in the field. The average storage period is 5 months, and 25% rot by this time.

D. Taro (<u>Colocasia esculenta</u>) (Table 14):

Taro is apparently the oldest staple tuber in the province, and comes in many varieties, most of which, the traditional ones, are late-maturing (8-10 months) and prefer shade. These are classed together as "country coco". "Ibo coco", which does not come from the Ibo, is a recent arrival, possibly from an area near Littoral, or possibly from Hausa areas, which matures in 5-7 months and does well in full sun. Its spread has been remarkable in the last few years during and since the survey, in zones reached, field area covered, market price relative to "country", and culinary adaptation. Until recently,many non-highlanders remarked disparagingly that it could only be used in "achu coco", a Bamenda dish of pounded taro, palm oil and windash. Only 7%surveyed planted pure "country" taro, and 60% planted only "Ibo".

Both types of taro command 30-40% lower market prices than cocoyam. Taro

accounts for 9% of both the monetary and caloric value of food crops, and is found in 40% of fields, planted by 76% of farmers. It is planted in ways very similar to cocoyam, at somewhat closer spacing, 60-70cm. Because it is harvested earlier, only a third weed it a second time. Harvest starts at 6.1 months, and continues to 8.4. Field losses are only 13%, the highest, 27%,being in Mamfe and attributed to a tuber rot. Root rot was occasionally implicated, but not proven to be the same as the cocoyam's, and wild animals(bush fowl, porcupine, cutting grass and squirrels) also did damage.

Besides "achu coco", taro is made into pounded fufu, boiled tubers, porrage, ekwan, and roasted tubers. Its storage also mimics that of cocoyam.

E. Plantains (Musa spp.) (Table 15):

Plantains represent 17% of monetary value of all food crops, and 14% of caloric value; with bananas added in, these figures are 19% and 17%. Bananas are almost always grown in the same fields as plantains, for snack food and occasional sales; their market price is only 49% of that of plantains (Ulmy,Besong and Bakia 1990). Plantains are found in 39% of food crop fields, and in 62% of cocoa fields and 52% of coffee fields. Four-fifths of all farmers grow them. Mono cropping is used in only 6% of fields, and in four-fifths of plantain fields, cocoyams and/or taro are present. Maize is also a frequent intercrop, in almost half of fields.

There are many types of plantains and bananas in the province, and most have been given local names that are not identifiable outside the village or zone, and as "Woman's" or "Three-Finger". The most common local types of plantain are the Ebanga and Small Finger, both horn and French types respectively. Five farmers had IRA plantains, French Sombre, French Clair, and Dwarf Njikorn. One fifth of farmers had bought suckers in the market to plant. Plantains are planted primarily in first season, but a seventh of growers plant in the high rains, and the same in dry season. Planting is always on the flat, at wide spacing, 320-400cm. Inside food fields, men plant them in between the women's crops, and women plant around established plantains the way they do around the palms and other trees. Women then care for the plantains with the rest of the crop until the men harvest to raise cash or bring home. Inside cocoa and coffee, they are planted throughout the field in most zones, but in the Highland Savanna and sometimes elsewhere, primarily on field borders.

There is no rotation, which would reduce nematode and borer attack, and suckers are usually pruned only when spaces are available in the same or a new field for replanting. Field losses are perceived to be high, 22%, and in all zones, and attributable from symptoms mostly to borer weevils and nematodes. Since the surveys, black sigatoka has appeared throughout the province, most drastically in Mamfe, and added to losses. Farmers claim that the plantain losses, which many blame inaccurately on "panama disease", have been increasing. If so, the lack of rotation in a situation of decreasing fallows may be blamed.

Farmers reported only 10% losses for bananas, which may be due to lesser interest in them; but farmers along the Manyu-Meme border claimed that they could plant bananas into holes where young plantains had died of disease, and

harvest successfully. Lodging, flood and wild animals are also blamed for damage.

Less than half the plantains are weeded a second time in the year; weeding is done when the woman takes care of the rest of her field, or when the underbrush under the cocoa is cut down. Harvests start at an average 11.7 months after planting, less in Mamfe and more in the Lower Volcanic, and the field continues viable until 23.4 months. The severity of disease problems may be gauged by the variations in end of harvest: at the time of the survey, plantains lasted until 33 months in Mamfe and 28 in the Highland Savanna, but only 16 in Kumba Corridor and 20 in the Sands and Mountain Forest.

Plantains are eaten boiled, as porrage, roasted, fried as dodo, as ekwan, in koki balls and pounded. Boiled plantains are most common. Storage is not attempted: farmers harvest at need. Theft is a problem, and in the more commercial areas many farmers mark their developing bunches with paint.

F. Yams (Dioscorea spp.) (Table 16):

Yams are grown by only half the farmers, and in only a quarter of the food crop fields. However, for a minority of male farmers, especially in the Sands zone, they are a major commercial crop. Women often grow them as a primary or secondary tuber in intercrop with maize, cassava, cocoyams and/or taro, especially in Mamfe, Kumba Corridor and the Highland Savanna. Men usually grow them in monocrop, or together with egusi as a ground cover. Yams gave 8% of the total monetary value and 4% of the caloric value of food crops.

There are three principal types of yams grown in the province. The most valued is white, or Calabar yam, Dioscorea rotundata, used by 57% of growers. Dioscorea dumetorum, or sweet yam, is grown by 61%: it needs less care, but hardens quickly once harvested, limiting its usefulness. Water yam, Dioscorea alata, is grown by 30%, and is popular primarily in Mamfe (63%) and the Sands (44%). A few farmers in most zones also have some red yam. Dioscorea cayenisis. Only one farmer has material from IRA, but fully 42% buy their material to plant.

Yams are planted early in the first season, or during the dry season to await the first rains. Three-fifths plant them on mounds, but a few, especially in the Mountain Forest and Mamfe zones, plant on the flat. Sweet yams are given the shallowest mounds. Spacing varies enormously from zone to zone, from 80cm in the Highland Savanna to 160cm in the Mountain Forest, both mostly with sweet yams. One to 1.2 meters seem to be the norm for white yams. Weeding is only done a second time in two-fifths of fields. Harvesting starts fairly uniformly at 7.7 months and continues to 9.8 months. Reported losses were 14%, almost double this in Mamfe, where wild animals are a serious problem. Soil borers, ants, tuber rot and poor soil are also blamed for damage.

Yams are eaten boiled and in porrage, and sometimes pounded, roasted, in ekwan and chips. Yams are stored in diverse fashions to try to avoid the high(20%) losses to tuber rot: in a bag in the house, on the floor with wood ash, in yam cribs in the field, on ropes, and even pinned to the fronds of a

palm.

G. Groundnuts (Arachis hypogaea) (Table 17):

Groundnuts are a secondary crop in the province, representing only 2% of both caloric and monetary value. They are grown on 22% of food crop fields,by half the farmers. They and egusi serve as ground cover to discourage weeds, as sources of early cash and as sauces for food. The most common variety name is "Yaounde", although the plants are multi-branching, unlike Yaounde's; other names given are Bafia, Bamenda, Garoua and Ngaoundere. Half plant a mixture of red and white types, and the rest are split between the two colors. Almost three quarters of seed is purchased in the marketplace.

Groundnuts are only monocropped in the Lower Volcanic, where the effort to prepare a small bed for them is great. They are generally planted in younger fields. Maize is found in 90% of fields with groundnuts, and cassava and cocoyam or taro are also frequent. Planting is in both seasons, most farmers planting first season and two-fifths again in the late rains. In some areas farmers plant egusi the first season and replace it with groundnuts in the second. Most are planted on beds, but mounds are used in Mamfe and part of the Sands, and Sands farmers also plant on the flat. Spacing is usually 20-25cm, 1 to a hole. Losses are reported to be an average 13%, due to probably rosette, animal and insect damage, and some drought and pod rot and malformation.

Groundnuts are eaten ground in soup and boiled, and sometimes fried, raw and in pudding. Storage is in bags, baskets and closed containers, and can continue up to 18 months, with few losses. Weevils and rats are however said to attack them.

H. Egusi melon (Citrullus lanatus) (Table 18):

Egusi melons contribute only 1% of caloric value, and 2% of monetary value, in the province, but are considerably more important in Mamfe and Sands zones, and as a weed suppressant. They are grown only in the first season,although sometimes planted before the rains start. Two-fifths of farmers plant them, on 70% of all food crop fields. Maize is the most common intercrop, followed by cocoyams or taro and cassava.

The egusi of South West Province is not that of Yaounde. A few farmers plant a little Yaounde egusi, but 95% of growers use the "Ibo" type, Citrullus lanatus, which grows along the ground, providing ample shade against weeds. 46% of the seed is bought in the market at planting time. Except for the mounds in Mamfe and part of the Sands, it is planted on the flat. Usually it is put into the field first, and then other crops are added after it has emerged, as it needs strong sun. The earlier it goes in, the greater chance of adequate establishment, but the greater the damage by the egusi beetle, which is wiped out by the rains. The egusi thus often has to be replanted several times before other crops can be added, and in some years with poor early rain,almost nothing is harvested.

Spacing is usually 150-200cm, but at only 50cm in Mamfe, where several are placed on each mound to grow down into the alleys. Weeding occurs as quick

hand-picking just before the flowers start to set at 3 weeks, and then not done until the plants die, in order to avoid disturbing production. Field losses are reported at 17%, due to the egusi beetle (a Chrysomelidae) and crickets, but are seen to be much higher in some years.

The crop is eaten in soups and puddings. Most of it is sold, either in quantity uncracked, or in small amounts, cracked, as needed during the year. Storage is in bags and covered containers, for 6-8 months, and losses are minor.

I. Tree Crop (Tables 19 and 20):

Tree crops grown by smallholders are cocoa (62% of farmers), coffee (49%), oil palms (6%, as dedicated fields), and 1% (rubber). The rubber fields are part of the CDC smallholders' scheme. Virtually all farmers have a few oil palms in their fields, which are eventually tapped and replaced with seedlings by the men. Some farmers, especially in Mamfe near the Nchang Palm Cooperative and near Pamol and CDC palms centers, grow palms in monocrop as a commercial oil venture.

Cocoa and coffee are the principal tree crops, and cocoa is predominant everywhere except in the highlands zones. Arabica coffee is only grown in F item. The coffee in a lowland field is often neglected. Only 21% of cocoa and 26% of coffee fields are monocropped, and 69% of all tree fields have food crops inside them. Half of tree fields have food crops other than plantains or bananas inside. Plantain or banana is found inside 62% of cocoa fields and 52% of coffee fields, and cocoyam or taro (primarily the former) inside 44%and 32% respectively. Maize, cassava and yams are each in over 10% of both types of fields, primarily in the Kumba Corridor and Mountain Forest zones,where they appear as sub-fields in spaces between trees. Coffee is in 29% of cocoa fields, and cocoa in 43% of coffee fields. Fallows for the food crops grown inside trees are very short or non-existent, and the fields average 15-17 years of age.

VII. Appendices

A: Tables

Table 1: Distribution of Soil Types, Altitude Zones and Agro-eco-zones by Farming Population Density and Land Area in South West Province, 1986[22].

Zoning	% of farming households	% of habitable land	farming households per sq. kilometer
Altitude:			
Lowland (<800m)	79.3	85.9	2.5
Highland	20.7	14.1	4.0
Soils:			
Recent volcanic	24.0	10.3	7.2
Old volcanic	33.6	18.6	4.9
Sedimentary	11.2	6.1	5.7
Granitic	31.2	64.5	1.3
Agro-eco-zones:			
Super-zones:			
Lower Volcanic	11.8	4.1	12.3
Kumba Corridor	22.2	12.4	4.8
Sands	11.3	6.1	5.7
Mamfe	14.9	16.6	2.5
Mountain Forest	10.1	6.3	4.3
Highland Savanna	15.5	7.9	4.4
Micro-zones:			
Lower Volcanic	11.8	4.1	12.3
Upper Volcanic	3.1	1.5	2.1
West Coast	1.1	0.9	3.9
Sands (I)	5.2	3.2	5.1
Kumba Corridor	19.2	7.8	6.6
Koupe	4.2	2.3	5.0
Bangem	5.6	5.0	1.9
Supe	3.0	4.6	1.8
Nguti	1.1	5.8	0.5
Korup	3.2	18.7	0.4
Rumpi	2.8	2.5	3.8
Mundemba	1.6	4.0	1.1
Ekondo Titi	6.1	2.9	6.4
Mamfe Forest	5.7	9.7	1.5
Mamfe West	7.2	3.2	5.9
Eyumojock	2.0	3.7	1.4
Manyu Highlands	9.9	2.9	8.8
Akwaya Centre	1.3	1.9	2.0
Other Akwaya zones	5.8	16.8	1.1

[22] For methodology see end of table. Habitable land estimates include plantations (CDC, Pamol, Del Monte). Farming population and farming population density exclude plantations.

Methodology

Population figures were estimated using a combination of tax records, the Ministry of Agriculture 1986 Census, and zoning done in the 1986-88 Farming Systems (FS) Surveys of the four divisions (Almy & Besong). In Fako Division,tax lists for the villages studied were compared with lists of all farming families, compiled by the village council or chief, and taxable persons in all villages in each zone were added together and corrected by the average difference between tax list and chief's list for that zone. The substantial difference between the TLU final total for Fako and that of the MINAGRI Census is attributed to the MINAGRI definition of farmers as including micro-farmers(those owning a few chickens or a goat and farming a town garden), of whom there are many in Fako, and our exclusion of all estate camp residents. Outside Fako, we compiled taxable persons by zone and corrected for approximate %of non-farmers (obtained from the FS survey sampling), obtaining the percentage of divisional farmers in each zone. Inspection of the size classes of farms in the four divisions showed us that outside Fako, approximately 10% of farmers were micro-farmers. We thus subtracted 10% from the MINAGRI Census total for each division, and then attributed proportional populations to each zone.

Area was estimated by reducing the Centre Geographique National survey national survey maps to a scale of 1:285.000, tracing the zonal boundaries on them as delineated during the FS surveys, applying a grid of 0.5cm and counting the number of squares (down to .25 square) in each zone, then adding them up to obtain % area of each division. Swampy areas, ocean and river area, and the uninhabited tops of mountains were omitted. National survey figures on area per division were then used to obtain sq.km. per zone and population densities. Soil classification was an estimate based on FS observations, classification done by CNS surveyor staff of samples brought for analysis from the FS villages, and the available CNS data. Each zone was classified as all one soil type, or half or one-third one soil type and the rest another, on a very tentative basis. A full soil survey is needed to improve on these estimates.

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Table 4: Extension Contacts, by Province and Zone

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Estimated farm households per extension agent	700	800	500	500	500	450	600
% with knowledge of agent:							
knows nothing	17	17	11	23	16	15	18
knows name & site	76	64	59	56	69	72	64
% visited by agent:							
never	53	57	55	77	70	45	62
once	17	15	16	14	13	27	16
yearly/less	10	9	13	3	5	15	8
more often	21	19	16	6	12	13	14
% who have asked help from extension:							
never, won't	40	38	45	53	44	44	44
never, but could	11	18	4	4	14	5	11
would ask non-agent	0	1	13	9	10	5	6
have asked agent	49	43	39	33	32	46	40
% who have been to an agric meeting:	33	37	36	21	27	40	32

Table 5: Access to Land and Capital, by Province and Zone

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Access to land used:							
Fields:							
% owned	88	77	78	98	88	88	85
% rented	9	18	9	2	4	12	10
% given/public land	3	5	13	0	8	0	5
Farmers:							
% own all fields	80	61	71	98	83	81	77
% own some fields	15	27	16	2	12	11	15
% own no field	6	12	13	0	5	8	8
Total food crop cash value ('000 frs)	290	187	291	301	203	257	248
% with tree fields:	85	87	66	86	73	61	78
% saving/borrowing	99	36	58	63	37	65	55
'000fr sav/bor'wd	54	305	113	68	93	74	143
% outside earnings:							
none	78	51	47	60	59	32	53
low, informal sec.	3	5	20	21	13	29	15
low, formal sector	3	4	10	3	2	12	5
med-high, inf.s.	3	31	7	9	11	16	15
med-high, form.s.	13	10	15	6	15	12	12

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Table 6: Livestock Ownership per Household, by Province and Zone

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Animal owners (%)	97	80	76	63	76	61	75
Total animals[23]:	26.0	4.4	3.6	2.0	3.0	1.6	6.5
Goats:							
mean owned	9.7	1.2	2.1	0.8	1.2	0.7	2.5
% owning	52	30	34	19	43	23	32
Sheep:							
mean owned	14.6	1.1	0.3	0.7	0.4	6.6	2.7
% owning	27	5	5	13	12	4	10
Fowl:							
mean owned	6.9	13.7	8.4	4.9	4.3	0.1	8.1
% owning	87	69	66	56	65	52	66
Pigs:							
mean owned	1.0	0.7	0.4	0.0	0.9	0.1	0.5
% owning	58	20	9	3	9	4	18

Table 7: Market Usage, Distances, Transport and Crops Sold by Province and Zone

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Do not sell food in any market (%)	25	14	3	15	36	16	17
Time to market (mins)	93	15	44	28	62	81	50
Transport mode (%):							
foot	85	77	78	91	84	73	81
taxi	15	31	48	9	36	31	28
canoe	0	0	2	0	0	3	1
Growers (%) selling over half of their:							
maize	20	55	49	44	31	50	43
cassava	42	52	50	69	47	74	58
cocoyams	21	59	33	38	37	42	38
taro	13	43	33	36	21	24	30
plantains	44	63	65	46	62	70	59
bananas	39	68	60	49	66	75	50
yams	34	59	39	58	84	39	51
groundnuts	38	61	60	47	67	60	53
egusi	-	50	50	64	0	84	64

[23] 10 fowl equal 1 other animal. "Animals owned" below refers to means among owners, not across the general population.

Table 8: Caloric and Monetary Value of Crops per Household, by Province and Zone[24].

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Caloric:							
Maize	1075	1002	1308	931	407	599	908
Cassava	471	1273	354	2630	353	4750	1652
Cocoyams	1152	288	1043	471	1411	369	689
Taro	480	252	1000	664	253	170	460
Plantains	169	662	126	672	1195	487	700
Bananas	93	19	123	349	41	142	134
Yams	62	257	74	241	83	288	177
Groundnuts	103	160	111	50	45	109	110
Egusi	0	46	11	148	1	198	68
Beans	286	16	50	23	27	1	62
Potatoes	376	0	27	1	0	5	61
Total	4267	3975	5317	6180	3816	6965	4995
Monetary:							
Maize	45.1	37.3	32.7	40.5	14.3	17.2	32.1
Cassava	14.7	38.3	11.3	86.3	10.2	129.4	49.1
Cocoyams	102.9	18.4	94.9	42.2	89.0	22.1	54.7
Taro	24.6	12.0	46.9	34.9	11.2	7.5	22.4
Plantains	10.8	41.4	82.2	44.0	65.2	26.4	43.3
Bananas	3.6	0.7	4.8	13.3	0.9	2.7	4.6
Yams	7.0	28.6	9.6	27.1	9.8	32.2	20.1
Groundnuts	4.5	6.6	5.2	2.2	1.9	5.2	4.9
Egusi	0	3.4	1.0	10.2	0.1	19.2	5.6
Potatoes	76.3	0	2.0	0.1	0	0.3	11.8
Total	289.5	186.7	290.7	300.8	202.7	257.2	247.9

[24] Caloric value in 000's of kilocalories, and monetary in 000's of francs, calculated at market price. If all crops were actually sold, prices would decline substantially.

Table 9: General Characteristics of South West Fields by Province and Zone

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Mean no. of fields[23]	3.7	3.1	2.6	3.2	3.0	2.8	3.0
Mean age (yrs for present user)	9.8	15.0	11.5	12.6	11.7	9.9	12.1
Mean distance (min.s from home)	62	50	59	65	71	50	57
Field type:							
% food only	70	49	73	63	44	70	62
% trees[24] and food	12	34	9	11	42	5	19
% trees only	18	17	18	26	14	26	19
Mean No. of crops in food fields	3.7	4.1	2.8	5.6	3.5	3.6	3.9
% monocropped tree fields	22	12	59	42	17	38	31

Table 10: Fallowing, Clearing and Weeding Practices for Food Fields, by Province and Zone

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Fallow cycle:							
Customary, reported:							
Cultivation yrs.	2.4	2.8	4.4	1.7	5.4	2.5	2.9
Fallow yrs.	3.8	2.0	2.0	3.5	3.4	3.1	2.9
Actual, fields>3yrs:							
Fallow yrs.	2.8	1.30	1.8	3.4	2.1	2.7	2.4
R-Index:							
customary	39	58	69	33	61	45	50
actual	46	68	71	33	72	48	55
Clearing months3yrs:							
Jan-Feb.	42	66	74	56	67	71	62
March-April	4	9	11	3	4	5	6
Sept-October	27	1	0	5	3	2	6
November-December	17	21	6	36	19	19	21
No. of weedings/year							
None	1	3	1	3	7	6	3
One	38	23	56	33	30	34	35
Tow	38	49	30	57	52	45	45
Three/more	24	26	14	6	10	15	17

[23] Permanent or planted in year preceding survey.

[24] Cocoa, coffee, rubber and palms.

Table 11: Maize Cropping System by Province and Zone (fields with maize a majority crop)

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Age of fields[27]	8.1	11.0	11.0	10.3	10.8	9.5	10.0
Length of last fallow (years)	1.8	1.0	1.5	2.6	1.6	2.1	1.8
Total no. of crops in field	4.2	4.8	2.9	6.5	3.8	4.2	4.6
Intercrops:							
non	0	3	31	0	12	3	7
cassava	33	53	26	58	24	70	49
cocoyam/taro	56	69	31	84	72	30	60
plantain/banana	22	47	21	33	52	20	31
yams	31	39	2	67	8	35	31
groundnuts	33	56	36	71	16	48	46
egusi melon	2	17	17	76	12	45	32
cocoa	0	25	10	0	8	5	6
coffee	4	6	5	0	12	0	3
Planting season[28] (%):							
first rains	64	72	91	99	69	87	80
high rains	53	57	86	39	43	29	50
dry season	28	24	3	3	11	4	14
Planting locus:							
beds	83	66	0	9	17	10	35
mounds	14	2	1	78	3	8	19
flat	4	32	99	14	83	82	47
Spacing (cm)	73	69	88	70	73	105	79
Seeds per hole	2.4	2.8	3.3	2.4	2.7	3.3	2.8
Field losses[29]	17	19	16	25	26	25	21
% of all food fields:							
w/ maize major	38	26	26	34	20	26	28
w/ maize minor	12	20	15	31	23	32	22

[27] Since first opened by present user, including any fallow time.

[28] First rains are March to end May, high rains June to Mid-October, dry season late October to February.

[29] Percentage of expected harvest, as perceived by farmers. Losses to long-established endemic disease are not noticed.

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Table 12: Cassava Cropping System by Province and Zone (fields with cassava a major crop)

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Age of fields	8.1	13.9	11.3	11.1	9.4	9.3	10.5
Length of last fallow (years)	1.6	1.1	1.4	3.1	.8	1.7	1.7
Total no. of crops in field	3.9	4.9	3.5	6.1	4.3	3.8	4.5
Intercrops:							
non	22	10	24	18	13	17	15
maize	57	60	39	72	60	72	64
cocoyam/taro	65	74	55	68	87	37	62
plantain/banana	30	48	36	32	60	22	34
yams	22	36	6	58	7	24	28
groundnuts	6	38	36	48	7	30	32
egusi melon	0	14	27	64	20	42	34
cocoa	0	31	6	0	13	1	6
coffee	13	7	0	0	7	1	3
Planting season (%):							
first rains	32	70	44	88	41	94	64
high rains	16	1	26	7	7	0	9
dry season	8	16	0	0	10	1	8
Plantain locus:							
beds	58	65	32	4	15	9	33
mounds	37	18	37	91	25	32	40
flat	5	16	31	10	60	62	28
Spacing (cm)	115	179	136	95	190	102	137
Field losses (%)	20	8	5	18	10	11	13
Harvest (months after planting):							
begin	12.6	11.9	12.1	11.5	12.4	12.7	12.1
ends	19.2	15.1	18.4	26.1	16.8	18.0	19.1
% of all food fields:							
w/ cassava major	19	30	21	38	12	52	27
w/ cassava minor	7	17	11	12	9	3	10

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Table 13: Cocoyam Cropping System by Province and Zone (fields with cocoyam a major crop)

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Age of fields	7.4	10.5	10.6	11.5	12.4	9.4	10.8
Length of last fallow (years)	1.7	1.1	1.7	2.4	1.9	1.7	1.8
Total no. of crops in field	4.4	5.4	3.9	6.6	3.8	4.5	4.9
Intercrops:							
non	0	0	4	0	10	2	3
maize	54	48	44	70	51	52	59
cassava	24	71	33	48	22	39	42
taro	74	55	48	78	49	59	44
plantain/banana	44	65	54	61	54	59	56
yams	28	29	9	57	12	27	29
groundnuts	11	29	17	51	3	9	23
egusi melon	4	16	20	55	9	43	28
cocoa	0	36	11	12	14	9	11
coffee	15	10	11	4	7	2	7
Planting season (%):							
first rains	43	59	65	88	58	70	64
high rains	13	2	2	0	13	0	4
dry season	35	25	9	2	22	1	19
Planting locus:							
beds	83	53	7	4	4	4	30
mounds	17	59	75	96	23	44	49
flat	0	13	20	0	72	52	21
Spacing (cm)	68	87	76	59	71	90	74
Field losses (%)	45	35	28	48	42	35	39
Harvest (months after planting):							
begin	9.6	8.4	10.0	8.1	11.0	9.1	9.2
ends	14.1	11.7	14.7	10.8	20.0	13.3	13.0
% of all food fields:							
w/ cocoyam major	38	22	29	52	46	29	35
w/ cocoyam minor	8	19	11	11	9	12	12

able 14: Taro Cropping System by Province and Zone (fields with taro a major crop)

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Age of fields	8.5	17.5	13.4	11.6	5.9	6.9	10.0
Length of last fallow (years)	1.9	.8	2.2	2.3	.9	1.6	1.6
Total no. of crops in field	4.4	5.3	3.7	6.6	3.8	4.8	5.1
Intercrops:							
none	0	0	0	0	8	0	1
maize	51	56	48	77	44	59	7
cassava	33	67	24	47	33	41	47
cocoyam	82	37	43	80	67	47	69
plantain/banana	33	56	67	55	58	59	50
yams	36	56	24	59	14	37	40
groundnuts	8	30	14	52	3	4	25
egusi melon	0	11	10	61	11	41	29
cocoa	3	37	10	11	8	11	11
coffee	10	7	0	3	3	0	5
Planting season (%):							
first rains	49	56	65	99	57	46	62
mid rains	6	0	2	0	5	2	2
dry season	30	17	1	2	16	1	12
Planting locus:							
beds	72	41	8	6	4	21	28
mounds	25	36	90	93	30	39	54
flat	3	23	5	2	66	40	18
Spacing (cm)	62	70	62	57	68	87	66
Field losses (%)	12	6	7	27	13	11	13
Harvest (months after planting):							
begin	7.4	6.1	6.0	5.3	6.7	5.6	6.1
ends	9.7	7.7	8.9	8.3	8.0	8.3	8.4
% of all food fields:							
w/ taro major	33	19	13	48	28	18	26
w/ taro minor	11	19	16	17	10	12	14

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Table 15: Plantain Cropping System by Province and Zone (fields with plantain a major crop)

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Age of fields	10.3	17.7	10.9	11.4	11.9	10.6	11.8
Length of last fallow (years)	1.5	0.7	1.3	1.9	1.1	1.7	1.4
Total no. of crops in field	4.7	5.6	3.9	5.8	4.5	4.4	4.8
Intercrops:							
non	0	3	8	2	11	11	6
maize	46	55	39	39	57	46	46
cassava	33	59	37	30	27	[illegible]	35
cocoyam/taro	77	79	73	91	80	76	81
yams	32	31	12	46	14	32	27
groundnuts	9	31	16	24	5	8	17
egusi melon	0	10	14	35	11	30	19
cocoa	5	52	12	28	27	14	22
coffee	32	10	8	6	11	5	10
Planting season (%):							
first rains	35	48	72	91	53	7[illegible]	60
high rains	18	15	7	0	19	[illegible]	10
dry season	24	9	10	3	17	[illegible]	11
Spacing (cm)	408	350	319	328	340	316	340
Field losses (%)	19	33	19	25	24	18	22
Harvest (months after planting):							
begin	12.6	11.8	12.4	10.9	11.5	11.4	11.7
ends	27.9	16.4	27.1	32.6	20.1	19.7	23.4
% of all food fields:							
w/ plantain major	18	21	32	41	34	24	28
w/ plantain minor	9	21	10	6	12	10	11

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Table 16: Yam Cropping System by Province and Zone (fields with yam a major crop)

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Age of fields	11.8	13.9	9.7	12.4	10.0	8.5	11.5
Length of last fallow (years)	2.4	1.1	1.3	2.7	2.7	2.1	2.1
Total no. of crops in field	4.5	4.6	2.2	6.9	2.8	4.3	5.0
Intercrops:							
non	6	5	56	0	36	10	10
maize	53	63	22	85	36	77	66
cassava	29	42	11	63	0	50	45
cocoyam	59	68	22	85	46	33	62
plantain/banana	41	32	11	45	27	23	32
groundnuts	24	26	22	60	0	20	35
egusi melon	0	16	11	78	9	53	40
cocoa	0	26	0	3	0	7	6
coffee	24	16	0	0	0	0	5
Planting season (%):							
first rains	18	40	17	87	16	48	39
high rains	0	0	0	0	3	1	0
dry season	35	18	4	0	7	4	12
Planting locus:							
beds	70	9	0	6	0	6	17
mounds	20	68	82	65	64	76	61
flat	10	23	18	30	36	17	22
Spacing (cm)	78	122	112	91	159	113	107
Field losses (%)	5	10	18	24	8	14	14
Harvest (months after planting):							
begin	8.0	7.4	7.7	7.7	7.7	7.7	7.7
ends	10.2	9.8	8.6	9.8	9.9	9.5	9.8
% of all food fields:							
w/ yam major	14	14	6	30	9	20	15
w/ yam minor	13	16	7	17	4	7	10

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Table 17: Groundnut Cropping System by Province and Zone (fields with groundnuts a major crop)

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Age of fields	8.2	7.3	10.2	7.8	10.8	7.1	7.8
Length of last fallow (years)	2.1	1.5	1.6	2.4	1.6	1.6	1.8
Total no. of crops in field	4.5	5.1	2.5	5.7	4.0	4.0	4.6
Intercrops:							
none	0	0	33	0	0	0	5
maize	100	93	53	100	100	100	90
cassava	27	60	20	56	40	73	53
cocoyam	33	60	20	67	60	13	49
plantain/banana	13	40	7	22	40	13	21
yams	27	33	0	44	0	20	26
egusi melon	7	20	7	67	0	40	32
okra	0	7	13	0	0	0	3
coffee	0	0	0	0	0	0	0
Planting season (%):							
first rains	49	37	28	73	12	26	40
high rains	12	30	36	10	12	17	20
dry season	3	11	1	4	0	0	4
Planting locus:							
ridges	100	91	95	27	20	60	75
mounds	0	0	0	73	0	9	16
flat	0	9	5	0	80	34	10
Spacing (cm)	21	28	19	33	22	24	23
Seeds per hole	1.0	1.1	1.1	1.2	1.0	1.0	1.1
Field losses (%)	18	14	2	17	0	10	13
% of all food fields:							
w/ groundnut major	13	11	9	14	4	10	10
w/ groundnut minor	5	11	13	29	1	11	12

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Table 18: Egusi Melon Cropping System by Province and Zone (fields with melon a major crop)

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Age of fields	na	14.0	11.2	8.0	6.0	9.7	8.8
Length of last fallow (years)	na	1.5	2.0	2.6	0	2.3	2.0
Total no. of crops in field	na	5.0	2.0	6.3	7.0	4.8	5.3
Intercrops:							
non	na	0	67	0	0	0	7
maize	na	60	33	95	100	83	80
cassava	na	60	33	45	100	63	61
cocoyam	na	40	0	85	100	46	63
plantain/banana	na	60	0	45	100	25	39
yams	na	40	0	70	0	54	46
groundnuts	na	60	33	65	0	29	44
cocoa	na	0	0	0	0	4	1
coffee	na	0	0	0	0	0	0
Planting season (%):							
first rains	3	16	20	90	6	56	32
high rains	2	0	2	0	0	0	1
dry season	3	9	7	2	3	8	6
Planting locus:							
beds	na	0	0	4	0	5	4
mounds	na	0	0	88	0	20	39
flat	na	100	100	8	100	75	56
Spacing (cm)	na	202	120	48	40	157	118
Seeds per hole	na	2.5	4.3	2.3	2.0	4.7	3.3
Field losses (%)	na	5	10	20	0	27	17
% of all food fields:							
w/ egusi major	1	4	4	15	2	16	7
w/ egusi minor	2	4	11	39	4	20	13

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Table 19: Cocoa Cropping System by Province and Zone (fields with cocoa)

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Age of fields	12.4	22.5	10.4	15.5	13.3	13.1	15.6
Length of last fallow (years)	.3	.1	.2	.3	.3	.6	.3
Total no. of crops in field	2.8	4.8	2.9	3.1	4.5	2.6	3.7
Intercrops:							
non	13	11	36	30	16	20	21
maize	0	40	11	2	40	3	19
cassava	0	51	7	0	32	0	19
cocoyam	25	58	29	35	72	23	44
plantain/banana	63	65	32	65	76	63	62
yams	13	28	0	7	4	3	11
groundnuts	0	11	7	0	0	3	5
egusi	0	4	0	2	8	6	4
coffee	13	40	36	14	24	23	29
% of all food fields:							
w/ cocoa major	2	33	6	12	14	7	12
w/ cocoa minor	0	4	3	1	1	1	2

Table 20: Coffee Cropping System by Province and Zone (fields with Coffee)

	Highland Savanna	Kumba Corridor	Lower Volcanic	Mamfe	Mountain Forest	Sands	South-West Province
Age of fields	17.2	18.3	11.3	22.1	15.2	25.9	17.4
Length of last fallow (years)	.2	.1	0	.3	.3	0	.3
Total no. of crops in field	3.5	5.8	2.2	2.7	2.8	2.5	3.5
Intercrops:							
non	35	4	40	38	28	9	26
maize	13	44	0	0	20	0	14
cassava	3	68	0	5	12	0	17
cocoyam	26	60	16	19	32	18	32
plantain/banana	55	72	20	43	60	36	52
yams	13	28	0	5	4	0	10
groundnuts	7	12	0	0	0	0	3
egusi	0	0	0	0	0	0	0
Cocoa	3	96	48	29	24	73	43
% of all food fields:							
w/ coffee major	12	14	3	3	8	2	7
w/ coffee minor	2	0	4	0	0	0	1

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B: Sub-zonal Descriptions

1. LOWER VOLCANIC (Fako)

Location: from 600-700m (fog belt) on Mt. Cameroon's southern slopes around to Munyenge on the northeast slopes, down to Meanja Estate, Tiko Town, Limbe and Bonjongo

Importance: 21.3% of food crop production by economic value, 14.7% by caloric value; 30.2% of food crop sales; 11.8% of farmers; 4.1% of area (about half in plantations)

Ecology: altitude, 0-600m; rainfall, 3.000-4.500mm, from March to November; soils: recent volcanic, extremely rocky but rich in N, P, K (analyses from 9 farm field samples: N mean .36; P mean 23; K mean .68; organic carbon mean 4.87%; pH (H_2O) mean 5.8)

Tree crops: coffee and cocoa (64% of farmers, in minority of planted area)

Food crops: by economic value, plantains, cocoyams, taro; by caloric value, maize, plantains, cocoyams, taro

Cultivation cycle: fallow one to two years after four or more years of cultivation

Land preparation: burn over field in March, plant through cut grass in September

Planting dates: maize, second half of March and first half of September; cassava, second half of March and August

Principal food cropping systems: mixed cropping of maize, cassava and cocoyams or taro; monocropped maize; cocoyams and plantains; all on flat on sloped fields; low wide groundnut beds

Marketing: large internal urban markets plus major exports to Douala and beyond

Internal variations: highest rainfall at Limbe; forest still available at Bonjongo and on eastern slopes; largest maize, plantain and cocoa farms on eastern slopes; most intensive intercropping and broadest range of crops in Mile 14 to Muea belt (including sugar cane, sweet potato)

2. Upper Volcanic (Fako and Meme)

Location: upwards from 600-700m altitude (fog belt) on southern slopes of Mt. Cameroon, from Mapanja and Bokwango through Ekona Lelu; possibly also the isolated villages of the northwestern slopes (Bomana Bakweri to Mundongo)

Importance: 2.3% of food crop production by economic value, 1.2% by caloric value; 2.4% of food crop sales; 3.1% of farmers; 1.5% of area

Ecology: altitude, 700-1100m; colder than interior altitudes due to ocean winds and fog; steep slopes; tall forest; rainfall, mm, from March to October; soils: very rocky, rich recent volcanic (higher slopes have little topsoil) (analysis from 1 farm field sample: N .74; P 20; K .97; organic carbon 8.9%; pH (H_2O) 5.8)

Tree crops: coffee (43% of farmers, in minority of planted area)

Food crops: by economic and caloric value, cocoyams and yams

Cultivation cycle: fallow 4-6 years after 2-3 of cultivation or never fallow (forest fields)

Land preparation: cut bushes, small trees and vines and leave as surface mulch, burn around large trees to discourage foliage

Planting dates: maize, late March and September

Principal food cropping systems: cocoyams and/or plantains under forest shade; monocropped yams on flat; plantains in coffee

Marketing: small local markets with large urban market at Buea and regional one at Muea nearby

Internal variations: Bokwae area specializes in off-season yams; northwestern slope not surveyed

3. West Coast (Fako)

Location: from Mokundango to Sanje on western coast of Mt. Cameroon

Importance: 0.3% of food crop production by economic value, 0.5% by caloric value; 0.3% of food crop sales; 1.1% of farmers; 0.9% of area (most covered by CDC)

Ecology: altitude, 0-100m; rainfall, 5.500-9.800mm, all year round; soils: recent volcanic, very rocky, thin topsoil (slopes above have almost none), not acidic but low in P and K (analyses from 4 farm field samples: N mean .40; P mean 7; K mean .12; organic carbon mean 5.7%; pH (H_2O) mean 6.0)

Tree crops: some cocoa and oil palm (27% of farmers, in minority of planted area)

Food crops: by economic value cassava, cocoyams and maize; by caloric value cassava and maize

Cultivation cycle: fallow 2-3 years after 2-3 years of cultivation

Land preparation: cut grass, bushes, all but a few large trees and burn across field

Planting dates: maize, November to January in north, early March near Limbe; cassava, November to March

Principal food cropping systems: on flat; mixed cropping of cocoyams, maize and cassava, sometimes with plantains; monocrop cassava

Marketing: small internal markets and some sales to traders from Limbe

Internal variations: largest population is at lower-rainfall end near Limbe, where there is more off-farm employment and arable land

4. Sands (Fako and Meme)

Location: from just east of Tiko Town to the swamps in the south, Littoral border on the east, base of Mt. Cameroon on the west, to Ediki in the north

Importance: 4.7% of food crop production by economic value, 8.7% by caloric value; 4.9% of food crop sales; 5.2% of farmers; 3.2% of area

Ecology: altitude, 0-300m; rainfall, 1.800-3.000mm, from late March to October (November near coast); soils: sedimentary, sandy clay loam, low in water retention, N, P, K (analyses from 11 farm field samples: N mean .10; P mean 6; K mean .11; organic carbon mean 1.48%; pH (H_2O) mean 5.6)

Tree crops: cocoa and some coffee, oil palm and rubber (50% of farmers, possibly in half of their planted area)

Food crops: by economic value cassava (plantains); by caloric value cassava (maize, yams)

Cultivation cycle: fallow one to two years after four or more years of cultivation

Land preparation: burn over field, usually mound

Planting dates: maize, late March and second half of August (September near the coast); cassava, late March and some August

Principal cropping systems: mounds planted to one/two cassava or yam, surrounded by groundnuts (cassava only) or egusi, with a stand of maize at the base of the mound; or on the flat, mixed cropping of cassava, taro and maize

Marketing: medium and large internal rural markets plus exports to Kumba urban market and through Fako to Douala and beyond

Internal variations: land far from the villages still has some forest cover and is more fertile when first cleared; longer fallows are available to some indigenes and improve fertility: rainfall is higher in Tiko area where hardpans add flooding to drought risks

5. KUMBA CORRIDOR (Meme)

Location: from Ebonji in the east through Barombi Kang and Barombi Koto on south to Nganjo on west, Big Ngwando and Ikiliwindi in north

Importance: 16.0% of food crop production by economic value, 15.2% by caloric value;

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16.5% of food crop sales; 19.2% of farmers; 7.8% of area

Ecology: altitude, 100-400m; rainfall, 2.200-2.500mm, from March to October; soils: weathered volcanic, with areas of recent volcanic, moderate in N, P, K (analyses from 9 farm field samples: N mean .21; P mean 11; K mean .23; organic carbon mean 2.48%; pH (H_2O) mean 5.3)

Tree crops: cocoa and some coffee (85% of farmers, in majority of planted area)

Food crops: by economic value, plantains, maize and cocoyams; by caloric value, cassava, maize and plantains

Cultivation cycle: fallow one season or year after one season or year of cultivation, or permanent cultivation

Land preparation: burn over field and bed, or incorporate weeds in beds, in March, remove weeds from field or plant through them in September, again on beds

Planting dates: maize, second half of March (late February in the east) and second half of August; cassava, second half of March

Principal food cropping systems: high-density mixed cropping on beds of maize, groundnuts, cocoyams, taro, and sometimes cassava or yams, hemmed in by cocoa; plantains and cocoyams scattered inside cocoa

Marketing: large internal rural markets feeding into Kumba urban market, and major exports through Fako and Loum to Douala and beyond

Internal variations: much of the area south and west of Kumba has very heavy clay soil, difficult to till and with waterlogging problems; some sedimentary soils at Kumba Town; Ebonji (although following Kumba farming practices) has Koupe soils and rainfall (rich loam, nearly year-round rainfall)

6. Supe (Meme)

Location: from south of Baduma Balong to Babenssi along the Kumba-Mamfe road

Importance: 3.0% of food crop production by economic value, 2.8% by caloric value; 1.0% of food crop sales; 3.0% of farmers; 4.6% of area

Ecology: altitude, 300-500m; tall forest; rainfall, 2.500mm, from March to October; soils: areas of volcanic upcroppings inside granitic area, most soils acid and low in P, some low in K and N (analyses from 5 farm field samples: N mean .21; P mean 8; K mean .19; organic carbon mean 2.53%; pH (H_2O) mean 4.9)

Tree crops: cocoa and some coffee (100% of farmers, in minority of planted area)

Food crops: by economic value plantains, cocoyams and taro; by caloric value cassava, taro, plantains and cocoyams

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Cultivation cycle: fallow 2-3 years after 2-3 years of cultivation, or fallow a year after a year of cultivation

Land preparation: cut the smaller trees, bushes and vines and leave as surface mulch (forest fields), or incorporate grass and leaves in beds, removing rest from field

Planting dates: maize, February to March, August and November (alluvial); cassava, February to March

Principal food cropping systems: mixed cropping of maize, cassava, cocoyams, taro, beans on beds inside cocoa fields, or of cocoa seedlings with cocoyams, taro and plantains and bananas on flat under forest shade; bananas and plantains inside cocoa; dry-season alluvial maize, groundnut and cowpea fields

Marketing: moderately sized local markets; sales to truckers from Nguti and Kumba Towns

Internal variations: Konye-Kokobuma area seems to have more of the volcanic soil, has more food crop and cocoa production and is closer to the Kumba Corridor pattern

Special note: animal destruction of crops often serious

7. Koupe (Meme)

Location: from Tombel Town to Ngomboka along lower slopes of Mt. Koupe (most of Tombel Sub-Division)

Importance: 4.3% of food crop production by economic value, 3.2% by caloric value; 4.7% of food crop sales; 4.2% of farmers; 2.3% of area

Ecology: altitude, 400-800m; mostly sloped; tall forest; rainfall, 3660mm at Tombel, from February to November; soils: pyroclastic volcanic loam, very tillable and fertile, borderline P (analyses from 4 farm field samples: N mean .73; P mean 12; K mean 1.68; organic carbon mean 7.98%; pH (H_2O) mean 5.5)

Tree crops: cocoa and coffee (75% of farmers, in minority of planted area)

Food crops: by economic value plantains and cocoyams; by caloric value plantains, cocoyams, cassava and maize

Cultivation cycle: fallow 2-4 years after 3-5 years of cultivation, or never fallow (forest fields)

Land preparation: cut down bushes, small trees and vines and leave as surface mulch under tall trees, or incorporate grass and leaves in beds, removing rest or burning

Planting dates: maize, March and August to September; cassava, April to May

Principal food cropping systems: cocoyams alone or intercropped with plantains under forest shade; mixed cropping of maize, cassava, vegetables and legumes on flat in small

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fields

Marketing: small internal markets plus large Tombel Town market; truck produce to Tombel over bad road (recently improved) or trek over mountain to Manjo in Littoral; town traders come to buy at Tombel

Internal variations: Tombel Town area has land shortages, pest and disease problems and short fallows due to population concentration; rest of area has low marketing access

8. Bangem (Meme)

Location: most of Bangem Sub-Division, excluding a few low-lying villages, and probably including Upper Mbo (highland area between Bangem and Fontem in Nguti Sub-Division)

Importance: 2.9% of food crop production by economic value, 3.5% by caloric value; 2.1% of food crop sales; 5.6% of farmers; 5.0% of area

Ecology: altitude, 800-1700m; usually sloped; most of forest gone; rainfall unknown, from March to November; soils: old volcanic clay loam, somewhat acid with serious P deficiency (analyses from 4 farm field samples: N mean .27; P mean 3; K mean .54; organic carbon mean 3.72%; pH (H_2O) mean 5.1)

Tree crops: coffee (100% of farmers, in minority of planted area)

Food crops: by economic value cassava, taro, plantains and maize; by caloric value cassava, maize and taro

Cultivation cycle: fallow 2-4 years after 2-3 years of cultivation

Land preparation: cut any remaining trees, bush and grass, remove wood and incorporate rest in wide high mounds

Planting dates: maize, January to May and August to November; cassava, May, June and October

Principal food cropping systems: mixed cropping of maize and/or cassava with taro, cocoyams and some beans, yams or sweet potatoes; plantains and bananas border coffee fields or are scattered between mounds of food fields

Marketing: small internal markets; some sales to Melong in Littoral Province

Internal variations: higher altitudes are more denuded, suffer worse erosion and perhaps disease problems; Upper Mbo region is two days' trek from a road and was not surveyed

Special note: cassava tuber and stem rot serious, also cocoyam root rot despite high altitude

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9. Nguti (Meme)

Location: from Ekita on the Mamfe Road to Nguti Town, and east to the base of the foothills of Upper Mbo and Bangem

Importance: 0.8% of food crop production by economic value, 0.7% by caloric value; 0.7% of food crop sales; 1.1% of farmers; 5.8% of area

Ecology: altitude, 200-400m; rainfall, 3.000mm, from March to October; soils: weathered volcanic areas within a granitic region, generally acidic, very low in K and borderline in P (analyses from 3 farm field samples: N mean .24; P mean 12; K mean .10; organic carbon mean 2.85%; pH (H_2O) mean 4.6)

Tree crops: cocoa and coffee (80% of farmers, possibly in majority of planted area, for retirees and urban farmers)

Food crops: by economic value plantains and bananas, cassava and taro; by caloric value bananas, cassava, plantains and taro

Cultivation cycle: fallow 1-3 years after 1-2 years of cultivation followed by cassava harvest

Field preparation: burn over field and make mounds or beds; use weeds and sticks as surface mulch to discourage rodents

Planting dates: maize,late February to early April and August; cassava, second half of March and April

Principal food cropping systems: extremely dense mixed cropping of cassava, cocoyams and taro; cassava, maize and groundnuts; or plantains and bananas, cocoyams and taro; plantains and bananas inside tree farms (bananas often replace plantains in system)

Marketing: food deficit area due to heavy urban, non-farming population and infirmity and hunting priority of farmers; supplied from Kumba, Supe and Mamfe Forest zones

Internal variations: transition zone: granitic-soil areas resemble Mamfe Forest system while volcanic ones are closer to Supe frontier system

Special note: animal destruction of crops often serious

10. Mamfe Forest (Manyu)

Location: from Nfeitok, Fainchang, Bakebe and Eyang Atemako on west to Numba, Ekpor and Ebensuk on east

Importance: 6.5% of food crop production by economic value, 6.7% by caloric value; 5.2% of food crop sales; 5.7% of farmers; 9.7% of area

Ecology: altitude, 100-300m; heavy forest; rainfall, about 3.300mm, from April to

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October; soils: probably granitic, with some volcanic outcroppings and sedimentary material, much of it extremely hard to till, clayey, mostly acid and low in N, P, K (analyses from 6 farm field samples: N mean .10; P mean 9; K mean .16; organic carbon mean 1.6%; pH (H_2O) mean 4.8)

Tree crops: cocoa and some coffee and oil palm (84% of farmers, in minority of planted area)

Food crops: by economic value, maize, plantains and taro; by caloric value, maize, taro and cassava

Cultivation cycle: fallow two to three years after two to three plantings

Land preparation: incorporate woody material or only leaves and grass, depending on tillability, into mounds

Planting dates: maize, late March to April and August; cassava, April

Principal cropping system: mounds densely planted with taro plus maize, groundnuts and egusi

Marketing: very localized, small internal markets, with some supply to small Mamfe urban market; seasonal deficits

Internal variations: most of the southern half and parts of the north are extremely hard to till; some volcanic outcroppings with higher village populations are in the centre

Special note: animal destruction of crops often serious

11. Mamfe West (Manyu)

Location: from Bachuo Akagbe through Mamfe Town to Ayukaba, Ajayukndip and Talangaye

Importance: 6.4% of food crop production by economic value, 9.7% by caloric value; 6.1% of food crop sales; 7.2% of farmers; 3.2% of area

Ecology: altitude, 0-200m; rainfall, about 3.100mm, from April or May to October; soils: probably granitic, sandy to clayey, acidic and low in N, P, K (analyses from 4 farm field samples: N mean .13; P mean 9; K mean .15; organic carbon mean 2.4%; pH (H_2O) mean 4.7)

Tree crops: cocoa and some coffee and oil palm (95% of farmers, in minority of planted area)

Food crops: by economic value cassava, plantains, taro; by caloric value cassava (maize, taro, cocoyams)

Cultivation cycle: fallow three to five years after one to two plantings

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Land preparation: burn over field and mound, sometimes incorporate weeds in mounds instead beds; burn around internal trees to cut back foliar shade

Planting dates: maize, late March through April; cassava, April to May

Principal cropping system: mounds planted to a yam or cocoyam, surrounded by maize and groundnut or egusi, with cassava planted into the side; plantains scattered on flat between some mounds, or monocropped; cassava monocrop on old fields

Marketing: small internal markets feeding into small Mamfe urban market, with seasonal scarcities

Internal variations: the southwestern border villages have more access to forest, more internal trees inside fields and more rapid reversion to heavy vegetation in fallow

12. Eyumojock (Manyu)

Location: from the edge of the Cross River feeder streams and Nigerian border to Inokum court area in the south and Mbakem in the east

Importance: 1.6% of food crop production by economic value, 1.9% by caloric value; 1.1% of food crop sales; 2.0% of farmers; 3.7% of area

Ecology: altitude, 0-100m; rainfall, 3.000mm, from April or May to October; soils: granitic, sandy, very acidic, critically low in N and P (analyses from 2 farm field samples: N mean .10; P mean 3; K mean .23; organic carbon mean 1.8%; pH (H_2O) mean 4.7)

Tree crops: cocoa and some oil palm (60% of farmers, in minority of planted area)

Food crops: by economic value plantains, cocoyams, cassava, taro, maize and yams; by caloric value cassava, cocoyams, plantains, maize, taro and yams

Cultivation cycle: fallow 3-5 years after one planting season

Land preparation: burn across field and make mounds; burn around internal trees to kill foliage temporarily

Planting dates: maize, late March and April; cassava, April or May

Principal food cropping systems: mounds centered on yam or cocoyam and surrounded by alternating maize, groundnuts, egusi; mixed cropping of taro, maize, cocoyams, groundnuts and egusi; plantains scattered among mounds or separate with trees and/or cocoyams and taro

Marketing: few internal markets; local supply to Eyumojock Town and some cross-border seasonal trade; seasonal lack of some staples

Internal variations: the southern area, far from roads, merges into Korup and should be much more oriented to hunting

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Special note: animal destruction of crops often serious

13. Manyu Highlands (Manyu)

Location: Fontem Sub-Division, plus border villages of Bechati

Importance: 10.3% of food crop production by economic value, 9.1% by caloric value; 6.8% of food crop sales; 9.9% of farmers; 2.9% of area

Ecology: altitude, 400-2500m; steep slopes; short, palm forest; rainfall, approximately Dschang pattern (2000mm), from February to October; soils: somewhat acid, rich volcanic loam at highest altitudes, older volcanic with P deficiency below (analyses from 4 farm field samples below 2000m: N mean .23; P mean 7; K mean .60; organic carbon mean 3.9%; pH (H_2O) mean 5.5; from 2 farm field samples above 2000m: N mean .78; P mean 41; K mean 1.13; organic carbon mean 9.5%; pH (H_2O) mean 4.9)

Tree crops: coffee and cocoa (80% of farmers, in minority of planted area)

Food crops: by economic value cocoyams, irish potatoes (mostly in highest area), maize, taro; by caloric value cocoyams, maize, irish potatoes, beans and taro

Cultivation cycle: fallow 3-5 years after 1 year or 2 seasons of cultivation

Land preperation: cut bushes and grass and incorporate grass in beds; burn around trees (if any) in field to discourage foliage

Planting dates: maize, February and March, July and August, November; cassava, March to April

Principal food cropping systems: dense mixed cropping of cocoyams, maize, taro, beans on beds

Marketing: moderately sized internal markets in villages and Menji; sell to traders from Dschang or take produce there or to Mfaka on Mamfe Central border

Internal variations: highest area (about one fifth of population) is commercially-oriented, temperate-zone vegetable and potato area, rotates monocrops or from monocrop to pasture; lowest (same population) below 800m includes cassava in cropping system

14. Korup (Ndian/Manyu/Meme) (surveyed by Korup Project)

15. Mundemba (Ndian)

Location: from Loe in the south to the swamps on the west, Rumpi foothills on the east to just north of Mundemba Town

Importance: 1.0% of food crop production by economic value, 1.0% by caloric value; 1.2% of food crop sales; 1.6% of farmers; 4.0% of area

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Ecology: altitude, 0m; rainfall, 5.200mm, from early March to December; soils: granitic, highly acidic, sandy (except for alluvial loam fields), very low in N and low in P and K (analyses from 4 farm field samples: N mean .13; P mean 12; K mean .16; organic carbon mean 2.39%; pH (H_2O) mean 4.7)

Tree crops: very little cocoa and coffee (40% of farmers)

Food crops: by economic value plantains (maize, egusi, cocoyam, taro, cassava, groundnuts); by caloric value plantains, cassava, maize, taro

Cultivation cycle: fallow 1-3 years after 2-3 years cultivation, the final year in cassava; or, abandon after poor harvest and seek "new" land fallowed 5-10 years or more by others

Land preparation: burn grass in heaps, or burn across field, or heap grass in isolated sections; plant on flat or make mounds for root crops

Planting dates: maize, late February to early March, and October to December (alluvial); cassava, January to April

Principal food cropping systems: mixed cropping of cassava, taro, maize and/or egusi; cocoyams, taro, maize and groundnuts; cocoyams, taro, plantains and bananas under trees; plantains and bananas scattered in or lining food fields

Marketing: many local markets serving Mundemba Town and fisherfolk of western Ndian; food imported to urban area from Kumba and Ekondo Titi; some dry-season maize and okro exported

Internal variations: size and tree cover of fields varies between villages, and clear-cutting large fields causes severe erosion where it is practiced; acidity varies from moderate to extreme, possibly inversely to loam content of soil

Special note: animal destruction of crops often serious

16. Rempi Hills (Ndian)

Location: from the Meme border on the Ekombe Three Corners-Dikome Balue road, past Mt. Ratu, through the region over 800m altitude to Dikome Ngolo and Ikoi

Importance: 3.1% of food crop production by economic value, 2.4% by caloric value; 1.7% of food crop sales; 2.8% of farmers; 2.5% of area

Ecology: altitude, 800-1500m; steep slopes; tall forest; rainfall unknown, probably heavy and most of year; soils: clayey granitic, very acid and somewhat deficient in P (analyses from 4 farm field samples: N mean .38; P mean 14; K mean .39; organic carbon mean 5.52%; pH (H_2O) mean 4.5)

Tree crops: cocoa and some coffee (80% of farmers, in minority of planted area)

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Food crops: by economic and caloric value, cocoyams and plantains

Cultivation cycle: fallow 4 years after 8 of cultivation, or never fallow (field under forest shade and mulch)

Land preparation: cut down bushes, small trees and vines in forest, sometimes burn around tall trees to reduce foliage, usually leave residues as surface mulch

Planting dates: maize, early March and August to September; cassava, January to March

Principal food cropping systems: monocropped sections of yellow and white cocoyams, sometimes intercropped with plantains; mixed cropping of cocoa, yams, cassava, cocoyams, taro, maize and plantains

Marketing: one tiny internal market; some truck produce down to Ekombe Bonji (Meme)

Internal variations: northern section beyond end of road not surveyed; highest villages maintain cocoa farms in Kumba Corridor to which family moves for several months during June-September

Special note: domestic animal destruction of crops often serious

17. Ekondo Titi (Nklian and Meme)

Location: from the northwestern coast of Mt. Cameroon to Loe north of Ekondo Titi Town, from the swamps on the west to the foothills of Mt. Cameroon and Mbonge on the east

Importance: 4.9% of food crop production by economic value, 6.7% by caloric value; 5.4% of food crop sales; 6.1% of farmers; 2.9% of area

Ecology: altitude, 0-100m; low forest and bush cover; rainfall, 3.500-5.500mm, from late April to October (rain shadow); soils: sedimentary, sandy clay loam, acidic, low in water retention, N, P, K (analyses from 5 farm field samples: N mean .12; P mean 6; K mean .19; organic carbon mean 1.96%; pH (H_2O) mean 5.1)

Tree crops: cocoa and some coffee and oil palm (75% of farmers, in minority of planted area)

Food crops: by economic value cocoyams, plantains, cassava and egusi; by caloric value cassava, cocoyams, plantains and yams

Cultivation cycle: fallow four to five years after one to two plantings (second planting, cassava only)

Land preparation: burn over field, dig depressions for yams and cassava

Planting dates: maize, late March and some late August; cassava, late March through May

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Principal cropping system: egusi in mixed cropping with cocoyam and taro or with maize and yams; cassava often monocropped the following year; mostly on flat or in shallow depressions to ensure germination

Marketing: two large and one small internal markets with egusi and cassava exports to Kumba and beyond; deficits in other tubers, which are imported

Internal variations: southern half has poorer market access and smaller population, highest rainfall, but trade to fishermen

18. Akwaya Centre (Manyu)

Location: Akwaya Town and neighboring lowland villages north of Tinta highlands, extending north and west to Nigeria frontier

Importance: 1.3% of food crop production by economic value, 1.6% by caloric value; 0.9% of food crop sales; 1.3% of farmers; 1.9% of area

Ecology: altitude, 300-500m; savanna; land usually sloped; rainfall unknown, from April to October; soils: possibly granitic, sandy, low in P and N but not acid (analyses from 3 farm field samples: N mean .13; P mean 6; K mean .19; organic carbon mean 3.6%; pH (H_2O) mean 5.4)

Tree crops: a little recent cocoa (a few farmers)

Food crops: by economic value maize, yams, cassava and cocoyams; by caloric value cassava (maize, cocoyams, groundnuts)

Cultivation cycle: fallow 5-6 years after 1 or 2 plantings and cassava harvest; do not return to same land but to any with adequate fallow

Land preparation: cut down all remaining trees, cut bush and grass, burn across field and sometimes make shallow mounds for yams

Planting dates: maize and cassava, late March to April

Principal food cropping systems: rice or groundnuts usually primary in mixed cropping with cocoyams, cassava, maize, water yams

Marketing: internal market very small; trek down to Amana Market in Nigeria to sell rice, groundnuts, egusi to traders

19. Mossaga Lowlands: hilly lowland coffee-producing region on northeastern border of Akwaya with North West Province, marketing to Wum; not surveyed

20. Mbulu Highlands: hilly highland coffee-producing region on southeastern border of Akwaya with North West Province, marketing to Momo; not surveyed

21. Assumbo Highlands: highland belt extending from Mbulu north and west of Akwaya Cen-

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tre, to the Nigerian border, sparsely populated and with exceedingly difficult terrain, probably subsistence; not surveyed

22. **Akwaya Interior:** vast lowland region, sparsely populated, to the southwest of Akwaya Centre, too distant from any population centre for marketing; not surveyed

23. **Cross River:** feeder-stream region surrounding Cross River as it turns from the Nigerian border to Mamfe Town, sparsely populated, canoe transport, some food and cocoa marketing to Mamfe Town; not surveyed