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GOURMANTCHE AGRICULTURE

Part II

Cultivated Plant Resources &
Field Management

Dr. Richard Alan Swanson
Development Anthropology Technical
Assistance Component
Integrated Rural Development Project
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NOTE

The following study, though complete in itself, is seen as a continuation of Gourmantché Agriculture, Part I, Land Tenure and Field Cultivation. The introduction to that study is the introduction to the present one as well, and is therefore included for those who may not have read the former.

All the documents of my research during the past two years have been linked together. One builds up the background and structure for the one that follows. Taxonomies and Figures are numbered consecutively throughout all these documents.

The documents which have been completed are as follows:

- Document #1: Innovation Analogies Among the Gurma; Development Effort Formulations as Expanded Through Culturally Perceived Channels
- Document #2: Time & Space
- Document #3: Destiny
- Document #4: Proverbs and Riddles
- Document #5: Gourmantché Taxonomies and Paradigms
- Document #6: Eastern ORD Village Names, Upper Volta
- Document #7: Gourmantché Agriculture, Part I, Land Tenure & Field Cultivation
- Document #8: Gourmantché Agriculture, Part II, Cultivated Plant Resources & Field Management

Best Available Document

GOURMANTCHE AGRICULTURE

Part II

Cultivated Plant Resources & Field Management

	<u>PAGE</u>
0.0	General Introduction..... a-k
2.0	Introduction..... -1-
3.0	The Land and its Soils..... -2-
3.1	Surface Feature Categories..... -3-
3.1.1	<u>Fuanu</u> /(Draining Center of Watershed)..... -5-
3.1.2	<u>Gbangbanli</u> /(Sloping, Higher Land)..... -5-
3.1.3	<u>Jaduoli</u> /(Plateau Top)..... -6-
3.1.4	<u>Jabala</u> /(Land Below Edge of Plateau Ridge)..... -6-
3.1.5	<u>Kpenbala</u> /(Land Bordering Edge of River)..... -6-
3.1.6	<u>Boanbala</u> /(Land Bordering Edge of Stream)..... -6-
3.1.7	<u>Beagu</u> /(Marsh, Flood Plain)..... -7-
3.1.8	<u>Ogbaanu</u> /(Flat Land)..... -7-
3.1.9	<u>Tinbuoli</u> /(Land Depression)..... -7-
3.1.10	Others..... -8-
3.1.11	Observations..... -8-
3.2	Major Soil Types..... -10-
4.0	Cultivated Plant Resources..... -13-
4.1	Taxonomy VII: Classes of Plant Life..... -14-
4.1.1	<u>Tiidi</u> /(Trees)..... -14-
4.1.2	<u>Muadi</u> /(Grasses)..... -14-
4.1.3	<u>Fontaalin-Kaala</u> /(Vines)..... -15-
4.1.4	<u>Kpaandi</u> /(Crops)..... -15-
4.1.5	<u>Dabiligu</u> /(All usually small plants with non-blade-like round or oval leaves)..... -17-
4.1.6	Others..... -17-
4.2	Distinguishing Characteristics of Crop Varieties..... -18-
4.3	Taxonomy IX: Cultivated Plants..... -21-
4.3.1	Semantic Confusion in Naming Systems..... -23-
4.3.2	Classification System for Cultivated Crops..... -25-

5.0	Crop & Field Management.....	-34-
5.1	Regional Crop Variations.....	-34-
5.2	Lost Equilibrium in Seed Varieties and the Search for New Varieties.....	-38-
5.3	Field Management Systems.....	-43-
5.4	Field Cultivation and Labor Requirements.....	-46-
5.4.1	Labor Requirements for a 'New' Field, First Year of Cultivation.....	-47-
5.4.2	Labor Requirements for a 'New' Field, Second Year of Cultivation and Later.....	-48-
5.4.3	Labor Requirements for an Ageing Field.....	-49-
5.4.4	Labor Requirements for Animal Traction on a New Field or Ageing Field - As Envisioned.....	-50-
5.4.5	Labor Requirements for Animal Traction on a New Field or Ageing Field - As Presently Practiced.....	-51-
5.4.6	Difficulties Encountered with Animal Traction.....	-52-
(1)	A Total Animal Traction Package is Required.....	-53-
(2)	Further Constraints.....	-56-
(3)	Animal Traction Suggests a Pattern of Community Organization.....	-57-
5.5	The Structure of the Gourmantché Household as it Relates Specifically to Field/Crop Ownership.....	-61-
5.5.1	Basic Supporting Data.....	-64-
5.5.2	Interpretation of Survey Data.....	-66-
5.6	Crop Distribution and Ownership.....	-79-
5.6.1	Field and Plot Type by Household Member Category.....	-82-
5.6.2	Field and Plot Type Priorities.....	-90-
5.6.3	Land Borrowing as a Factor of Field and Plot Type....	-92-
5.7	Crop Association.....	-95-
6.0	General Discussion of Plants Cultivated.....	-98-
6.1	<u>Niadi, Nyiadi</u> /(Early Season Pearl Millet).....	-101-
6.1.1	Important Varieties.....	-102-
6.1.2	Where Most Often Cultivated.....	-103-
6.1.3	Associations.....	-103-
6.1.4	Cultivation.....	-103-
6.1.5	Usage/Marketing.....	-106-
6.1.6	Ownership.....	-107-
6.1.7	Seed and/or Crop Storage.....	-107-
6.1.8	Crop Recommendations and Observations.....	-107-

6.2	<u>Diyue, Dipieni</u> /(Late Season Pearl Millet).....	-111-
6.3	<u>Kaanlo</u> /(Sweet Sorghum).....	-119-
6.4	<u>Riadi, Dimoani</u> /(Sorghum).....	-122-
6.5	<u>Muuli</u> /(Rice).....	-131-
6.6	<u>Tiin-namaga</u> /(Peanuts).....	-134-
6.7	<u>Tiin-moana</u> /(Earth Peas).....	-138-
6.8	<u>Isasini</u> /(Local legume variety resembling earth pea)..	-142-
6.9	<u>Kokoda</u> /(Maize).....	-142-
6.10	<u>Kunkundi</u> /(Cotton).....	-148-
6.11	<u>Imaani</u> /(Okra).....	-150-
6.12	<u>Ibaliqi</u> /(Kenaf).....	-153-
6.13	<u>Tigoandi</u> /(Roselle).....	-156-
6.14	<u>Ijuoni</u> /(Soybeans).....	-158-
6.15	<u>Ihen</u> /(Sesame).....	-161-
6.16	<u>Mibelima</u> /(Fish Poison Plant).....	-163-
6.17	<u>Misiema</u> /(Indigo Plant).....	-164-
6.18	<u>Tiqalifadi, fedu</u> /(Sauce Herb).....	-164-
6.19	<u>Tikpankpandi</u> /(Sauce Herb).....	-164-
6.20	<u>Anyinkpina</u> /(Sauce Herb).....	-164-
6.21	<u>Ikambi</u> /(Red Peppers).....	-165-
6.22	<u>Imuaabi</u> /(Fonio).....	-167-
6.23	<u>Otabo</u> /(Tobacco).....	-167-
6.24	<u>Akana</u> /(Eggplant).....	-169-
6.25	<u>Sualinasua</u> /(Onion).....	-172-
6.26	<u>Tomati</u> /(Tomato).....	-172-
6.27	<u>Salaati</u> /(Lettuce).....	-172-
6.28	<u>Karoti</u> /(Carrots).....	-172-
6.29	<u>Chu</u> /(Cabbage).....	-172-
6.30	<u>Amagi-saana, Papai</u> /(Papaya).....	-173-
6.31	<u>Guoyaagi</u> /(Guava).....	-173-
6.32	<u>Maabu</u> /(Mango Tree).....	-173-
6.33	<u>Nasaali-pugili, lombula</u> /(Lime Tree).....	-173-
6.34	<u>Bananc</u> /(Banana).....	-173-
6.35	<u>Kalakala, nasaali-kaanlo</u> /(Sugar Cane).....	-173-
6.36	<u>Tangunbo, pangunbo, pangummo</u> /(Manioc).....	-173-

6.37	<u>Atuuna</u> /(Cowpeas).....	-176-
6.38	<u>Otungu</u> /(Gourd, Calabash Vine).....	-180-
6.39	<u>Afela</u> /(Squash Vine).....	-181-
6.40	<u>Kuudiku</u> /(Sweet Potato).....	-182-
6.41	<u>Anuga</u> /(Yams).....	-185-
6.42	<u>Apaala</u> /(Bush Potato, potato).....	-189-
6.43	<u>Imankani, ibankani</u> /(Taro).....	-189-
6.44	<u>Iqkali</u> /(Bamboo).....	-189-
7.0	Conclusions.....	-190-

APPENDICES

Appendix IV:	Gourmantché Terms for Sorghum and Millet Plant Parts, Cultivation and Growth Phases.....	-191-
Appendix V :	Percentage of Land Under Cultivation per Crop by Owner Category in 8 Villages Among 21 Households.....	-195-
Appendix VI:	Distribution of Field and Plot Type by Household Member Category.....	-197-
Appendix VII:	Crop Association.....	-204-

FIGURES

Figure 8 :	Watershed and Field Placement.....	-4-
Figure 9 :	Sorghum and Millet Panicles.....	-19,20-
Figure 10:	Factors in Crop Variation.....	-35-
Figure 11:	A 5½ Month Ideal Season.....	-39-
Figure 12:	Sorghum, Millet, Maize vs. All Other Crops.....	-66-
Figure 13:	Sorghum, Millet, Maize and All Other Crops by Percentage of Ownership per Category of Family Member.....	-67-
Figure 14:	Household Consumption vs. Produce for Sale.....	-72-
Figure 15:	Total Land Cultivated per Household and Percent by Category of Family Member.....	-73-
Figure 16:	Regional Crop Variations and Ownership Patterns,,.	-80-
Figure 17:	Methods of Crop and Seed Storage.....	-99,100-
Figure 18:	Early Millet Spacing Options with Animal Traction When in Association with Late Millet or Sorghum...	-110-

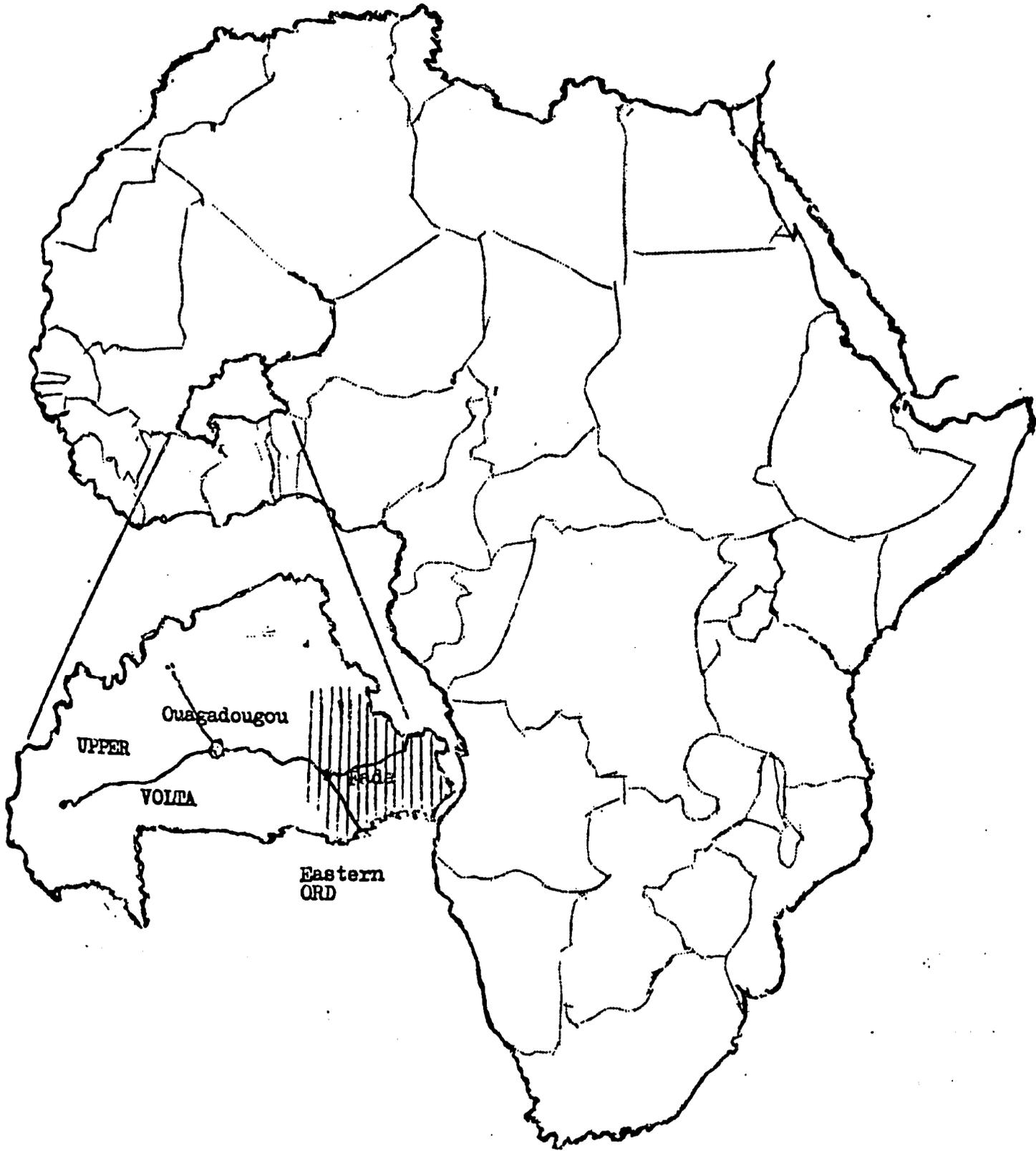
TABLES

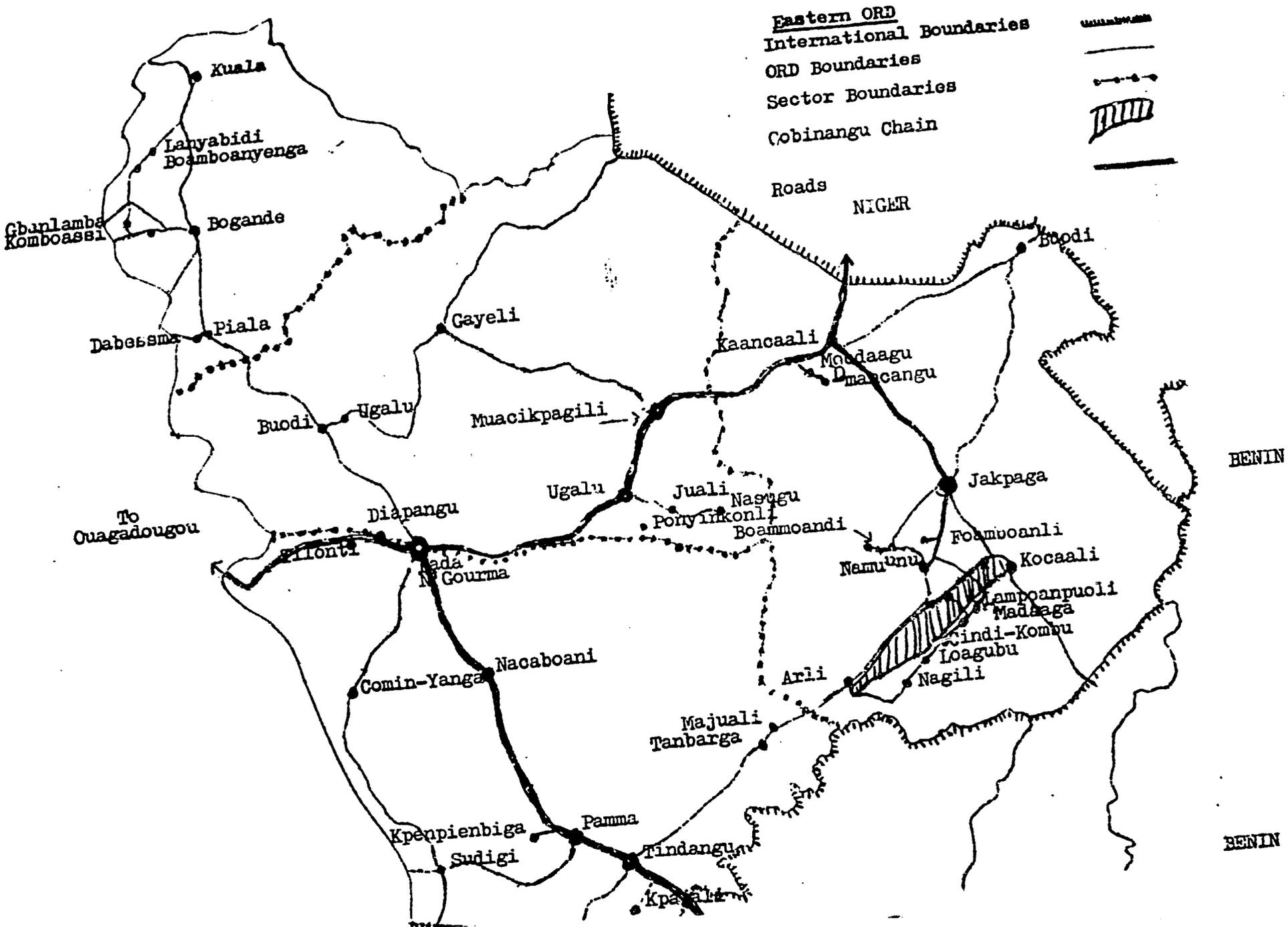
Table I :	Percentage of land under Cultivation per crop by Owner Category in 8 villages among 21 Households..	-65-
Table IIA:	Field and Plot Type by Household Member Category, BAEP-78 Survey/ 370 Gourmantché Households.....	-83-
Table IIB:	Field and Plot Type by Household Member Category, BAEP-77 Survey/ 23 Gourmantché Households.....	-84-
Table III:	Ranking of Fields and Plots by Numbers and Importance to Household Members.....	-88-
Table IV :	Comparing Field Type Priorities.....	-90-
Table V :	Land Borrowing Per Field and Plot Type.....	-92-
Table VI :	Crops in Association or as a Sole Crop.....	-96-

TAXONOMIES

Taxonomy V : Surface Feature Categories..... -3-
Taxonomy VI : Itin-buoli/(Soil Types)..... -10-
Taxonomy VII: Plant Life Classes..... -16-
Taxonomy VIII: Botanical Classification of Crops..... -22-
Taxonomy IX : Cultivated Plants..... -26 - 33-

AFRICA





GOURMANTCHE AGRICULTURE

0.0 General Introduction

Ideally, rural development is based on the participation of rural populations in the planning as well as execution of such development. A well-known obstacle to rural development is the difficulty in establishing meaningful communication between local/rural groups and representatives of national and international agencies. Understanding of local knowledge systems, often neglected in development programs in the past, is increasingly seen as essential if successful communication and innovation is to result.

Because life in general is so complex and human beings and their societies particularly so, every one of us tends to generalize. Such generalizing, particularly in the field of national and international development, can be at times disadvantageous to and misrepresentative of the human beings and societies about whom such generalization takes place. Economic surveys represent a popular form of generalization by modern societies. Such studies, often extremely expensive, rarely succeed in accounting for the dynamic human factors involved in development and change, despite claims to the contrary.

Carefully selected and 'representative' population groups are administered questionnaires following elaborate sampling techniques. Impressive outflows of data are generated in the form of tables, percentages, and statistics. The sheer weight

of this information tends to convince a reader of its reliability. Yet the validity of all this effort must begin in the formation of relevant questions posed to individuals in their own language. Answers given must be understood from the cultural context of those giving them - not those posing the questions.

Few 'socio-economic' or 'micro-economic' studies carried out in cross-cultural situations qualify very successfully in this first and basic step. The basic problem is one of communication and translation. Extension and research agents through whom such questionnaires are administered often have little knowledge of the specialized vocabulary of traditional agricultural and economic activity. It is easy to overestimate the ability of agents to communicate about specialized knowledge in a local language - even when it is their own language. The problem is compounded when those who prepare questionnaires have no knowledge of the local language and systems of knowledge found within it. The reader of socio-economic survey reports takes it as a matter of faith that extension or research agents are capable of translating the French or English questions on a questionnaire form into relevant ones in the local language. One further assumes answers given closely resemble answer codes provided in the questionnaire answer sheet. The fact that there are no exact correspondences between related words (not to speak of concepts) in different languages should produce caution when working in and reporting about crosscultural situations.

12

There are no absolute or universal solutions to problems encountered in different cultures or subcultures. This premise of anthropology suggests that a good or right course of action for the Mossi might not be good or right (done in exactly the same way) for the Gourmantché. The anthropologist attempts to make explicit for one group the implicit presuppositions and assumptions of another group. Rural development agents are often removed from their rural kinsmen by years of education and thinking in a foreign language. They frequently possess different values, social obligations, and perspectives as a result. At times they even represent a different ethnic group. These agents represent one kind of group which frequently can benefit by having explicitly defined for them some of the implicit, non-verbalized ways of organizing perception possessed by their non-educated rural kinsmen and village neighbors.

An illiterate farmer will not come and tell an agent that he perceives all cultivated land in two major classes (which the agent, because of his French orientation, may see as one class). The farmer certainly has never thought specifically of counting how many classes there are. It would be of no particular importance to him. It should be important to the extension agent. A rural development agent would not learn that there are six classes of land or that such classes are based on land tenure by simply listening to normal conversation or 'knowing the language'. There is no reason to assume that just because one might like to

differentiate red sorghum from white sorghum, that one can directly ask such a question in Gourmantché. One can not. Culturally precise questions based on an understanding of the categories of perception within the culture must be asked in order to elicit precise information of this kind.

This study may be seen as an elaborate means of demonstrating why development agents and organizations can not afford to exclude a social/cultural component or input at design, implementation, as well as evaluation and analysis stages of a program of development. What may often, to a development agent, appear on the surface to be a simple problem lending itself to straightforward solutions is rarely this at all. As long as the subjects or beneficiaries of some program are human beings, it must be realized that consideration of the human dimension is not only desirable, but essential.

Increasing farmer yields and incomes do not simply depend on adequate rainfall, increased field size and use of fertilizer, improvement of production practices (which might include animal traction), and improved seed varieties. These are possibly important material improvements. No one can predict or control where or when rain will or will not fall. There are cultural reasons why fields are a certain size and plots another, why one should plant a certain amount of sorghum and millet and not too much cash crop. High costs and risks of fertilizer use poses social problems not the least of which is security in what is

known and at least proven (ie. no fertilizer, no debt) to be adequate. How much is actually known about traditional production practices or how these systems compare to the supposed benefits of something like animal traction? How much is known about various crop varieties and their relationships to the environment? Increasing farmer yields assumes the farmer wants to go to the trouble to do this. What would the farmer consider as adequate compensation for his endeavor in this regard? What kind of crops, given yield increase, would most benefit the farmer? If a farmer is to accept innovation for increased food production, he must first be attracted to doing it. Produce price increases to farmers might be an incentive. If prices are unexpectedly reduced however, then farmers should not be expected to continue with the same enthusiasm the cultivation of that crop.*

An efficient extension system does not simply depend on good salaries, adequate mobility, intelligent and healthy agents. The human dimension is equally important. How do they relate to farmers? Are they interested in their work? What kind of people do they need to be and what do they need to know to effectively work and communicate with rural people?

* Soybeans were highly promoted in the Eastern region during the past few years, last year selling for 100 CFA/Kg., a price above the world market price. Farmers were very enthusiastic and many village group associations were formed around its cultivation. This year's (1977) crop was very large but the price was dropped considerably to 50 CFA/Kg. Though merchants have bought up some of the crop for about 70 CFA/Kg. for processing of soumbala, many farmers are having difficulty finding a buyer. This situation will result in a definite drop in production during the coming season and will make extension work of ORD agents much harder. Though it was inevitable that prices should drop, farmers were not forewarned of this.

A rational Western orientated approach to problems of agricultural development does not necessarily mean a valid or successful approach to such problems in non-Western rural societies. Consider a few differences in orientation as examples of the types of problems one can expect when cultural differences are ignored or overlooked.

(1) Fertilizers are generally placed on poor soils, usually for the cultivation of cash crops - this is done because of the technical advice of the extension agent. However, the Gourmantché reserve their best soils for the most important staple food crops. Upon the richest soils, located generally around the home compounds, is cultivated corn. Sorghum is cultivated on the next richest soils. When these soils begin to yield poor sorghum crops, millet production takes over. Cash crops often follow on former millet fields, though some are cultivated in rotation with millet. The point is that farmers do not 'waste' good soils on the production of less important crops.* Fertilizers should perhaps be placed upon those soils which would increase the production of those crops most valued by the people themselves. Since value is determined by the degree to which a crop provides

* Tobacco is often planted in the rich soils in front of some compounds. In such cases, however, it follows corn or an early sorghum on the same soil and therefore does not compete with these crops for farmer time or fertile soil.

basic food needs as well as its commercial value in the market place, sorghum and millet would be the crops on which to focus one's efforts.* If increased production of cereals could be achieved without increasing field size, farmers would benefit by the security of a solid food base and would have increased time and confidence for cultivation of other crops which might also increase their cash incomes.

(2) Collective fields represent the major activity of village groups at the present time. The formation of such groups has been a major activity of the Eastern ORD (Rural Development Organization) extension service. Agents concentrate their services to members of these groups. Members are the recipients of outside loans - provided they can prove themselves to be an effective group.

Almost all cultivated fields and plots, however, are individually owned by the Gourmantché. Ownership of land is differentiated from ownership of the standing crop on that land. The owner of the crops under cultivation is expected to compensate those who help him on the land, whether these are members of his own family or persons called in from outside the immediate family group. The nature of the compensation is different for these two groups. Cash is not a traditional form of compensation.

* The percent of sorghum and millet cultivated by the average household which is intended for the marketplace is about equal to the percent of all the rest of the other crops combined destined for sale. Prices are comparable as well.

The organization and responsibility of ORD groups working upon collective fields has been made to fit into this pattern. Since a field must have an individual owner, the extension agent (or the ORD as a whole) is often seen as the one in actual charge of these fields. The extension agent is clearly not in a position to meet the burden of obligations placed on him by members of the village group he has formed or is in charge of.* Yet, with proper and responsible management, the high expectations of these groups towards the ORD should be able to work for the benefit of the development of this village.

(3) The Eastern region has great resources of unclaimed, fertile soils. It is easy to draw the conclusion that no farmer should have problems therefore in obtaining enough good land upon which he may seriously attempt to invest time and money in land improvement and fertility maintenance. This is not true unfortunately. This is only true when a farmer has clear traditional access to land. On a practical basis, future and permanent access and cultivation rights to land is a real problem for numerous Gourmantché farmers. It is already becoming serious enough in populated areas without animal traction (eg. Gobinangu region).

* One sometimes has the feeling that members of a village group feel they are doing the extension agent a favor by being members of such a group and working on a collective field. The agent must reciprocate this favor when members have special problems (like getting them grain when stocks are depleted).

(4) Poor soil, lack of fertilizers, labor bottlenecks, lack of capital, poor rains and health problems are commonly considered reasons for lack of economic development. However, using even traditional means at their disposal, many Gourmantche farmers could produce more than they in fact do. They do not do so because of certain cultural and practical constraints. Among these is the concept of what is 'enough', the concept of social equality (not appearing too much more prosperous or successful than your neighbor or relative*), and the problem/obligation of giving 'freely' one's hard-earned produce and capital to needy kinsmen (for food, funeral obligations, weddings, initiation ceremonies, etc.). It might seem that the farmer would have to learn to be less generous with friends and relatives if he is to himself become a better producer and to more quickly gain a higher standard of living. Doing so, however, makes him more vulnerable when the bad times come. An alternative would be to exploit these so-called constraints.**

* Farmers often have considerably more cash reserves than outside loan agents realize. They are reluctant to 'reveal' their wealth as mentioned above, they also do not want to risk it. Acceptance of loan money can sometimes be seen as evidence of a farmer's lack of confidence in a new technology (such as animal traction). He will not use his own 'buried' money or sell his own livestock to attempt something new.

** Rather than seeing extended family obligations as a drain to individual initiative and advancement, this family group could perhaps be organized and collectively helped through aid to certain influential members of the group. One could expect the establishment of extended family enterprises. An organization such as Partners for Productivity could exploit this possibility.

(5) Innovations are adapted more rapidly for commercial crops than a farmer's subsistence good crops. The reason for this might not be what a development agent would at first expect. A less significant amount of a farmer's total labor and land resources are allotted to such crops (20%-25%). As a result, these are lower risk, lower priority crops. Innovation can be risked. For this same reason, most Eastern ORD group activities for village peoples have had to do with the cultivation of cash crops (peanuts, soybeans, cotton, rice). On the other hand, until field and labor productivity increases through new technology, 75%-80% of this same farmer's total field labor and land resources must be allocated for the production of subsistence crops (sorghum and millet). Such constraints pose serious problems in setting up field rotation schemes.

(6) Even as the Mossi of Upper Volta seem, in some respects, to be a more collectively minded people, the Gourmantché could be said to be more individualistically orientated. Organizations or groupings of these people need to take account of this proclivity. Collective goals and obligations should be well understood and agreed upon. Individual benefits and safeguards should be designed into those activities where collective participation is important.

One further, though related, objective of the following report is to describe agricultural knowledge, practices and related problems from, as much as possible, the perspective of the Gourmantché farmer himself. I have tried to be sensitive to differences within

the region.* There seem to be enough parallels and similarities between the Gourmantché and neighboring ethnic groups to make this study of relevance to persons interested in such groups.

* There is considerable variation in rainfall patterns and soils in the Eastern region. Rain fall varies from 500-600 mm. in the north-west to 900-1000 mm. in the south-east. I have noted as much as one month difference in the growing seasons of bush plants between these areas. Specific trees, grasses and sometimes crops bloom or mature a good month earlier in the south-east.

The dominant ethnic group of the Eastern region, the Gourmantché, possesses some variation in cultural practices. This is particularly true of the north-east (Bilanga/Piala/Bogandé). Farming communities of Mossi, Fulani (Peul), Bariba, and Zaoussé may also be found in this region.

The following code is used to distinguish various Gourmantché regions in the Eastern ORD: (F) for Fada/Ugalu; (M) for Macakoali/Kaancari; (J) for Jakapaga/the Gobinangu; (P) for Pemma/Sudigi; (B) for Bilanga/Piala/Bogandé.

Material for this study comes from observations and interviews over a period of a year with scores of farmers throughout the ORD. Contact was also made with the members of three household units in each of the following villages: Nasugu, Ugalu, Bulimoanga, Buajaga, Tindaangu, Nagili, Duayaana (near Mani), Kpentuangu, Kpenpienbiga. Some of the 393 Gourmantché households scattered throughout the ORD which are part of the Eastern ORD's village level survey were also contacted. Basic research methodology is that of ethnoscience, described briefly in Document #1: Innovation Analogies among the Gourmantché.

Eighteen years residence and versatility in the Gurma language give added depth to this study.

Note: Specific Gourmantché terms used in the text represent Fada or Jakpaga dialects (which vary slightly). I am aware that some regions often use other terms to express basically the same concept. This study is concerned with reaching some kind of general understanding of land tenure and field cultivation among the Gourmantché. Intensive research of one village would certainly give more specific data to which a resident would respond 'Yes, that is just the way it is here.' Gourmantché readers of this document will find much which they recognize, some which is done somewhat differently or entirely differently in the village or area they know best. Our 1978 B.A.E.P. village survey (see Eastern ORD, B.A.E.P. report 8) helps greatly in showing some kinds of specific variation.

CULTIVATED PLANT RESOURCES & FIELD MANAGEMENT*

2.0 Introduction

The purpose of the following presentation is not to give technical information about various aspects of plant cultivation. Such description can be found published elsewhere.** The description recorded here is what seems to Gourmantché farmers to be the more significant aspects of plant cultivation and field management, storage and use of produce. Greatest attention is given to those crops of greatest concern to farmers. Personal observations are included.

The poverty and technological unsophistication of these Voltaic farmers often tends to obscure for outsiders the wealth of reliable knowledge which exists concerning the cultivation of land and plant nutrition. Such knowledge represents many years of practical agronomic experience. Sound agronomic principles are often evident. It is in those subject matter areas which take place over long periods of time, great distances, and on scales not perceptible to individuals, that the formal measurements and organized operations of modern technology are clearly superior.

Agronomic experience of Gourmantché farmers is given in the hope that this knowledge will become a useful

* I wish to thank the following persons for having read and given helpful criticism on an earlier draft of sections of this document: Gregory Lassiter, Vincent Barrett, David Wilcock, Paul Christensen, Steve Reyna, Thomas Luché, and Stuart Gaudin.

** Kassam, A.H., Crops of the West African Semi-Arid Tropics, ICRISAT, 1976.
République Française, Ministère de la Coopération, Mémento de l'Agronome, 1974.
Gaudy, M., Manuel d'Agriculture Tropicale, La Maison Rustique, Paris, 1965.
Doggett, Sorghum, Tropical Agriculture Series, Longmans, 1970.

26

tool in the hands of extension agents in understanding something of what the farmer himself knows about his land, crops, agriculture systems, and field management under local environmental, economic, and social conditions. With this kind of knowledge, the extension agent would find that he can more adequately communicate and integrate himself with the needs and understandings of farmers. Farmers will appreciate that these agents not only wish to modify or change farming systems for the better, but know something about the system they hope to influence.

3.0 The Land and its Soils

Before discussing cultivated plant resources and farming systems, Gourmantché farmer perception of the physical aspects of land and soils must be considered. If farmers are to be helped in maintaining or improving their land resources, the topography of their land and how they use it will have to be considered carefully.

Farmers know that the surface features and soils of their land are important factors in determining their crop options and productivity during a given year. Practicing shifting cultivation, the number of years they will be able to cultivate specific fields is determined by the surface features and soil conditions of land. Such conditions will affect how fields weather once cleared of natural vegetation.

The effective management of different kinds of watersheds with different kinds of soils in the Eastern region will require considerable future research. Different methods of farming and land and soil management systems (drainage, runoff, soil erosion, tillage, cropping systems, and water conservation practices) will have to be compared. Technology developed must be feasible for the small farmer. Strategies for maintenance of low, seasonally flooded lands will have to be substantially different from those for

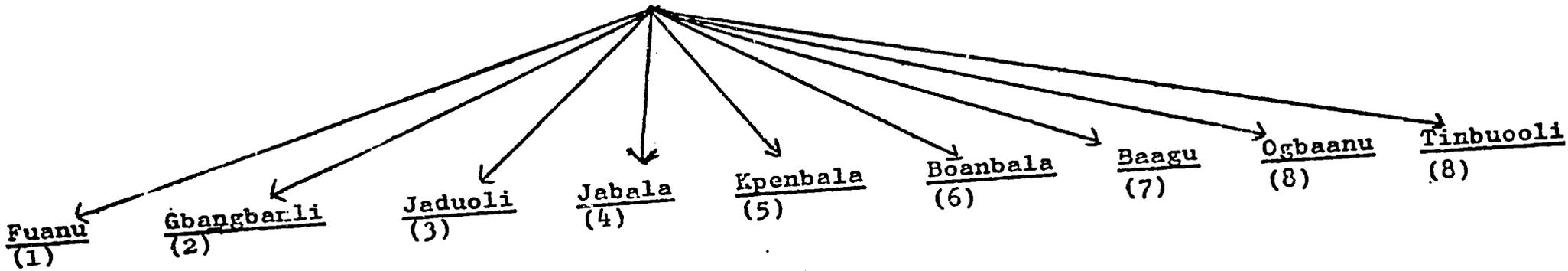
22

sloping lands, or flat, sandy-soiled lands.

3.1 Surface Feature Categories

Major surface features recognized by the Gourmantché, appropriate for cultivation, are given below.

TAXONOMY V
SURFACE FEATURE CATEGORIES
(cultivateable)
Itingban-buoli

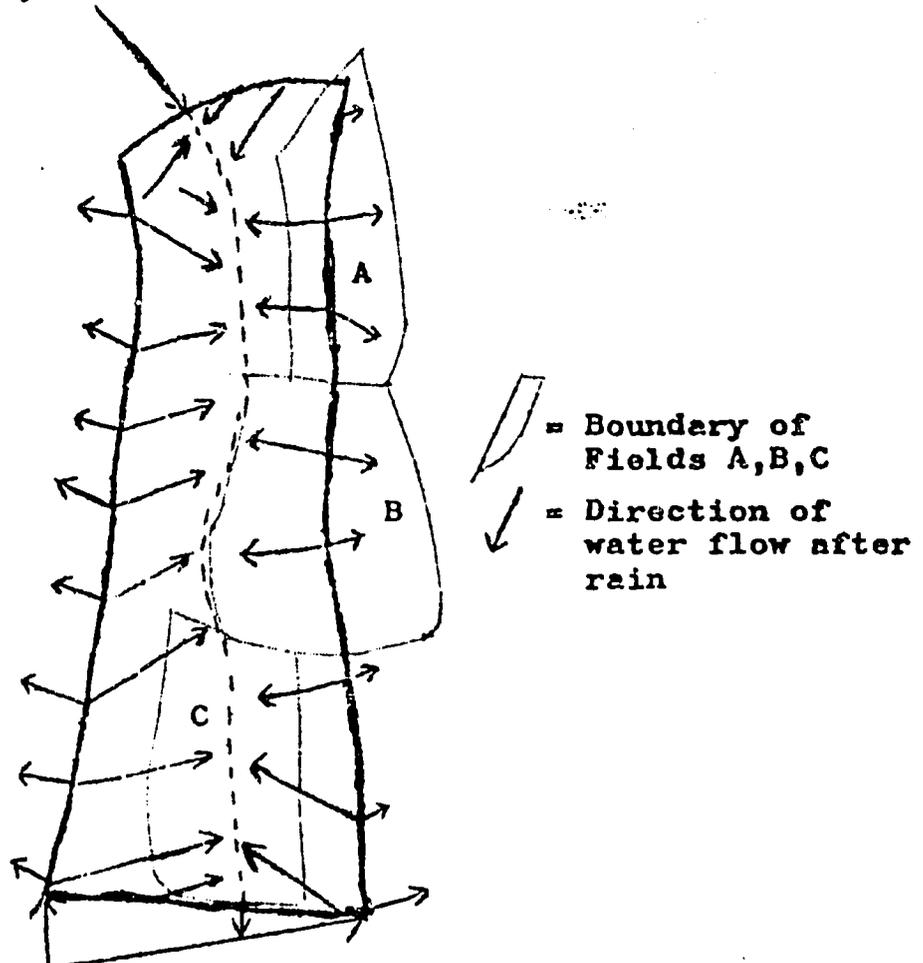


It should not be of any surprise that, in a semi-arid region such as that occupied by the Gourmantché, farmers are experienced with the use of various kinds of watersheds. The use and availability of both surface and ground water is important to them. The categories given above are basically named features of watersheds.

Figure 8 below gives part of a small watershed. The major fields of three households are placed upon this watershed to illustrate three land use systems used by farmers. Each system has its merits under specific rainfall conditions.

Figure 8: Watersheds and Field Placement

Drainway of Watershed



Ridge or strip of high land dividing the areas drained by two different stream/river systems

25

3.1.1 Fuanu/(Draining Center of Watershed)

A first category of land, perhaps presently the most sought after, is a fuanu/(draining center of watershed). These are the gentle depressions in land along which water flows after a rainstorm, leading eventually into a stream, then river. A fuanu can be very broad as well as long, encompassing many fields down its length. Gently undulating land or land in the lower reaches of a watershed would provide such land. On the other hand, a fuanu can be narrow, representing a several meter-wide path cutting across someone's field. Here land features are more distinct and water runoff faster. Whatever the size (breadth) of a fuanu/(draining center of a watershed), it is always characterized by the presence of more soil moisture during the rainy season.

There has been a definite, indeed urgent, movement down from higher (gbangbanli) or flatter (ogbaanu) lands to land of this kind. In some regions (Bogandé, Piala, Bilanga) farmers attempt to have a major portion of their fields on a fuanu, as in Field C above. Such fields will follow down both sides of a watershed's drainway. Certain sorghum varieties produce well and are not damaged by short periods of excessive flowing water. Unfortunately the availability and quantity of such land falls far short of demand.

3.1.2 Gbangbanli/(Sloping, Higher Land)

This includes the ridge or strip of high land dividing the areas drained by two different stream/river systems as well as the land sloping down to the watershed's drainway. Compounds and villages are located on this land.

Depending on the soils, such land can support most kinds of cultivation. Fields may be located exclusively on such land, as in Field A above. Because of fast drainage however, continual rains are necessary to prevent the drying up of crops.

3.1.3 Jaduoli/(Plateau Top)

This is the topographically diverse land found upon the plateau-like ridges located at the extreme eastern part of the country, best known as the Gobinangu-Majoari chain. It is quite fertile, permitting a diversity of crops, among which cowpeas are known to be especially successful.*

3.1.4 Jabala/(Land Below Edge of Plateau Ridge)

This land is located at the foot of the ridges of the plateau of the Gobinangu-Majoari chain. Again cowpeas grow well. Where streams descend from the plateau, fruit trees, rice, and garden produce are successfully cultivated.

3.1.5 Kpenbala/(Land Bordering Edge of River)

The large seasonal rivers of the Eastern region (Penjari, Kpenpienga, Singu) are located in the bush, usually far from human habitation. Little cultivation takes place upon the banks and flood plains bordering such rivers. These are the river valleys associated with onchocerciasis or Black River Blindness, which explains the underpopulation of these fertile valleys.

Where such land is presently cultivated, rice as well as tobacco grow well. Tobacco is transplanted along the Kpenpienga at the end of the rainy season (October) before harvests of crops have commenced.

3.1.6 Boambala/(Land Bordering Edge of Stream)

Such land is found in the lower reaches of a watershed, and, like the fuanu/(draining center of watershed), is highly valued land, and is limited. Most crops grow well, especially the preferred sorghums, manioc, sweet potatoes, and tobacco. Dry season gardens and orchards can sometimes be established along the banks.

* The known higher level of phosphate in these soils could be the explanation for cowpea productivity.

3.1.7 Baagu/(Marsh, Flood Plain, Bas Fonds)

These lands are found in the lower reaches of a watershed where low lands and basins are inundated by water during the rainy season. Normal bush vegetation does not grow on these generally dark and heavy soils (vertisols) located in spots along most large streams and rivers.

Soils in these natural bas fonds remain soft until the early part of the dry season and as such might be useful for some types of dry land farming. Both floating and plain rice would grow well, the latter being the most common present use by farmers of this land. Considerable uncultivated portions of such land remain in the Eastern region, indicating the fact that farmers are generally not familiar with cultivation methods for such land. Up to quite recently a baagu/(marsh, flood plain) was not considered cultivateable land.

3.1.8 Ogbaanu/(Flat Land)

This land, also fairly common in the Eastern region, is to the eye unusually flat. Runoff of rain water is slow. This land is not characterized by a fuanu/(draining center of a watershed) or gbangbanli/(sloping, higher land). Farmers note that water more often sinks quickly into the soil. Productivity of such land depends on the soil type and fertility.

3.1.9 Tinbuooli/(Land Depression)

Flat land (ogbaanu) often possesses depressions into which water moves after a rain and sinks in. A pond is not formed. A large cultivated field upon flat land may contain such a depression. Farmers are, in fact, attracted to cultivate land which includes a depression of this kind because the soils in them are more fertile and retain more moisture.

Maize and sorghum grow especially well.

3.1.10 Others

Other types of surface features are named but are of little or no importance to cultivation. An otialu, for instance, is a flat place, with scattered laterite rocks upon its surface, where grass never grows more than a few inches high. The leached sandy topsoil is only 1 or 2 inches thick. A penpeligu is bare (bald) land where even grass will not grow. The clay subsoil itself is exposed. Even after rain, it is hard and impenetrable. Farmers in the Bogandé/Piala region noted that a penpeligu is sometimes caused by overcultivation and erosion.

3.1.11 Observations

There are few unknowns which concern a farmer more than the quantity and timing of the rains during the farming months. The success or failure of his choice of crops can depend greatly on the surface features of his land fitting a particular year's rainfall pattern. In recent years farmers have been experiencing shorter seasons and less rain which has resulted in a pragmatic choice - when possible - for land where water retention is higher and/or crops whose maturation is more rapid.

Occasionally, a rainy season will be adequate to the expectations of farmers in specific areas of a region.* More often, however, a farmer will speak of a rainy season as having been a tanyin-binli or tayalu-binli. During the former, there was too much rain, during the latter, too little on the whole. Depending on where his fields were located, either could be good or bad years for a farmer.** The problem is prediction of the type of year it will be. Since

* For a region as large as the Eastern region of Upper Volta, it is hard to say that the region as a whole has had a 'good' or 'bad' year for rains. One must speak of sub-region.

** A rainy season that was considered 'good' by one farmer can be considered 'bad' by his neighbor - the difference resting entirely on the surface feature characteristics of their respective fields.

this is not possible, the only evident solution seems to be the development of soil/water technology appropriate to various terrains under varying rainfall conditions.

Farmers cultivating in a fuanu/(draining center of watershed)(Field type C in Figure 8) during a year of too little rain (in that area) will almost certainly have good crops. His neighbor, who may not have had access to this kind of land but who had to use a gbangbanli/(sloping higher land)(Field type B in Figure 8) may face the loss of his crops for lack of moisture at a critical period.

Farmers cultivating in a 'draining center of a watershed' during a year of too much rain may have poor crops because of excessive moisture or the erosive force of the flowing water. His neighbor on higher, better drained land may have done well. The fact that some farmers attempt to have some of both types of land under cultivation (Field type B in Figure 8) is therefore understandable.

Because it is possible to obtain rainfall data from many different areas of the Eastern region, it would seem that mapping out the surface feature types of land under actual cultivation for particular regions could give planners a fairly good idea of crop conditions and yields during a particular year. If it were known that 40% of the fields in the Bogandé/Piala region are located in what may be classified as 'watershed draining areas', and if it were known that the rains were especially poor in that region this year, one could estimate that at least 40% of the crops did well, with considerable loss expected for the remaining 60%.

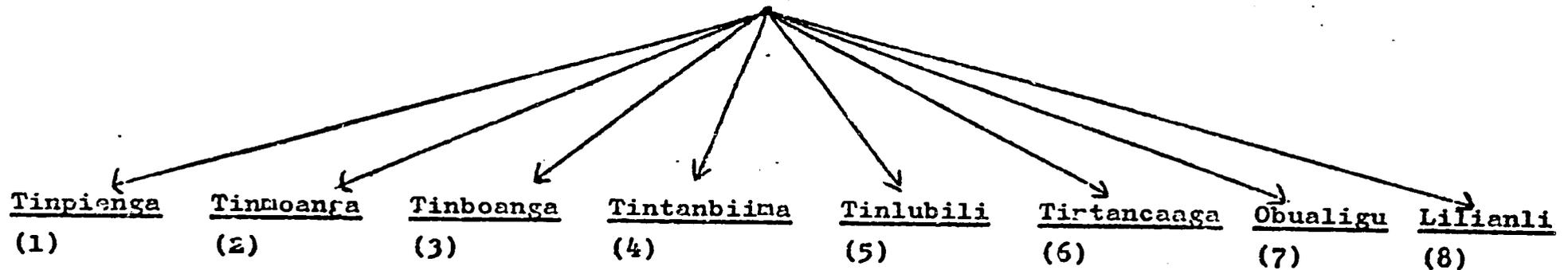
Given a favorable rainy season, traditional agriculture systems provide farmers with food surplus and increased expendable income at low production cost. The problem is that traditional technology does not provide the soil/water management techniques necessary to produce well when rains are excessive or lacking. Innovations are needed, and would be eagerly accepted if economically feasible, in improved soil and water management systems for small watersheds.

3.2 Major Soil Types

Major soil types and the preferred crops for each as recognized by many Gourmantché farmers are as follows.

TAXONOMY VI

Itin-buoli/(Soil Types)



Soil specialists view soils as being made up of a mixture of two basic components: the mineral constituents of gravel, sand, silt, and clay; and organic matter. Though the Gourmantché farmer will not describe his soils in quite this way, these properties are nevertheless important in his classification of soils. Tanbiili/(sand, gravel), tama/(clay, silt) and tibugidi/(organic material) are recognized as soil properties.*

* In the 1978-79 farm level socio-economic survey of 370 Gourmantché households in the Eastern region, 4,639 fields and plots were classified, using surface feature categories and soil type categories, by the farmers themselves.

3.2.1 Tinpienga/(Light-colored Soil)

Such soils are generally porous, light in texture, and light colored. Organic material is low. Preferred crops on these soils are late season pearl millet and peanuts, though early season pearl millet also grows well.

3.2.2 Tinmoanga/(Reddish-colored Soil)

These are the reddish laterite soils. They are fairly coarse (gravelly) with a high clay content. Organic content depends on location. One must wait long enough into the rainy season for such soils to become moist for planting. Then, late season pearl millet and sesame can be cultivated. Cowpeas do very well.

3.2.3 Tinboanga/(Dark-colored Soil)

Soil composition is loam-like, that is, with a greater proportion of sand to somewhat less but equal parts of clay and silt. As a result, moisture retention is better than other soils. Sorghum, kenaf, sweet potatoes grow well. Cowpeas, if rain is not excessive, also produce well. As the fertility of the soil declines, late season millet may be cultivated.

3.2.4 Tintanbiima/(Sandy Soil)

These porous, sandy soils are considered best for millet and tuber cultivation. Peanuts and earth peas grow well on such soils, sorghum poorly.

3.2.5 Tinlubili, ligbali, buali-tinpia/(Silty Soil)

These soils are very fertile and are said to retain their fertility the longest. The soil is usually dark, compact, and difficult to work when wet (very sticky). Sorghum and maize grow well, millet less well.

3.2.6 Obualigu, boalli/(Clay Soil)

These are the usually dark colored soils of the flood plains and marshes. Organic content is high. Soil is tightly packed and cracks when drying. They are good for rice cultivation and, if water is not far from the surface, for dry season gardening.

3.2.7 Tancaaga/(Laterite, Gravelly Soil)

These lateritic, gravelly soils are either reddish or dark in color. The reddish soils (tancagi-moangu) support millet, cowpeas, and sesame cultivation best. The dark ones (tancagi-boangu) support sorghum, maize, and okra cultivation. As such soils dry out quite rapidly, the rainy season must be well in progress before planting and good yields require a long rainy season.

3.2.8 Lilianli/(Salty Soil)

Such soil is not good for cultivation. Animals use it as a salt lick.

3.2.9 Observations

Farmers judge the fertility of various soils by the vegetation upon it. The presence of any of the grasses discussed below (4.1.2) are an indication that sorghum will produce well for a couple years at least.

4.0 Cultivated Plant Resources

All plant life belongs to that order of terrestrial existence classified by the Gourmantché as yaalin gi pia miali/(things which do not possess life). Plants are not abonfuoda/(living things)(See Taxonomy I, Document No. 5, p.6). Though it is true that plants can be said to fuo/(live) or kpe/(die), such life or death is not seen to be of the same nature as animal life or death. Plants are not animated. Nor do they possess a soul or destiny for their existence (Document No.3).

The term which most closely expresses the concept of 'plant life' in Gourmantché is bonpudi-kaala/(things which sprout, emerge). On the same taxonomic level with plants are other non-animate classes such as the soils, mountains, metals, stones, and all the mass nouns recognized in the Gurma language by the affixes "mi+..ma" (as in mi-nyi-ma/(water); this includes blood, sand, fire, and speech itself).

Taxonomies VII and IX below set out the nature of Gourmantché naming and classification of the plants they cultivate for various purposes. The extent to which certain varieties are cultivated along with their associated uses will be discussed further on.

4.1 Taxonomy VII: Classes of Plant Life

Numerous classes of bonpudi-kaala (sprouting, emerging things) (plant life) are recognized. Those of special concern to this study are illustrated in Taxonomy VII. Here, the context in which cultivated plants are to be understood is provided in relationship to the more general taxonomies of life discussed previously (Taxonomy I, Document No. 5).

4.1.1 Tiidi (Trees)

Most Gourmantché farmers can readily identify numerous varieties of trees as well as indicate a number of uses to which the leaves, bark, wood, or roots of certain trees can be put. During an earlier period of research*, 125 named varieties of trees were identified and, with the aid of CVRS ** botanists Mr. Simon Ouattard and Mr. Boonounou, botanically classified.

One may either buli (plant by seed) or Qu (transplant) trees.

4.1.2 Muadi (Grasses)

A number of major classes of grasses are important in the lives of these people. There are the mua-pimma, or mua-gbandi grasses with which most huts in the Eastern region are roofed. The heavier, longer goam-muani grasses are used in weaving fencing and roofing mats. The latter, in those regions where they are scarce, are often left to grow in clumps in kuani (sorghum and/or millet fields), or around the borders of such fields.

Farmers throughout the Eastern region would benefit greatly by being encouraged to leave (or transplant) alternating bands of this grass across the slopes of their

* Doctoral dissertation research among the Gourmantché, September 1973 - August 1975.

** Centre Voltaïque de la Recherche Scientifique

fields to prevent erosion of the soils. Farmers generally do not see the need to 'protect' their soils, though they sometimes do make an effort to slow down the water flowing down the drain of a watershed after a rain.

Farmers seek out several varieties of grasses for their livestock. Animals can either be staked out in such grass, or such grass is cut and brought in, sometimes chopped up, and fed to the animals. Farmers will also cut, dry out, and store these grasses for dry season use in a circular crib-like structure. Preferred varieties: odigben-mualado (a luxuriant growing grass found only on rich soils); ocalimu (serrate-edged leaves, abundant in fertile soils of marshes, bas fonds); ticiandi (grasses found on fairly fertile soils, leaves distinctive with their covering of fine whitish 'hairs'); goam-muani (mat grass). These grasses are cut before plants produce flowering stalks.

In the northern parts of the Eastern region, fonio is cultivated. Seeds are sown.

4.1.3 Bontalin-kaala/(Vines)

Some cultivated plants are vines. One uncultivated bush vine, tam-muaja-yaama, is rolled up while yet green, like cowpeas, and given to livestock or stored as feed.

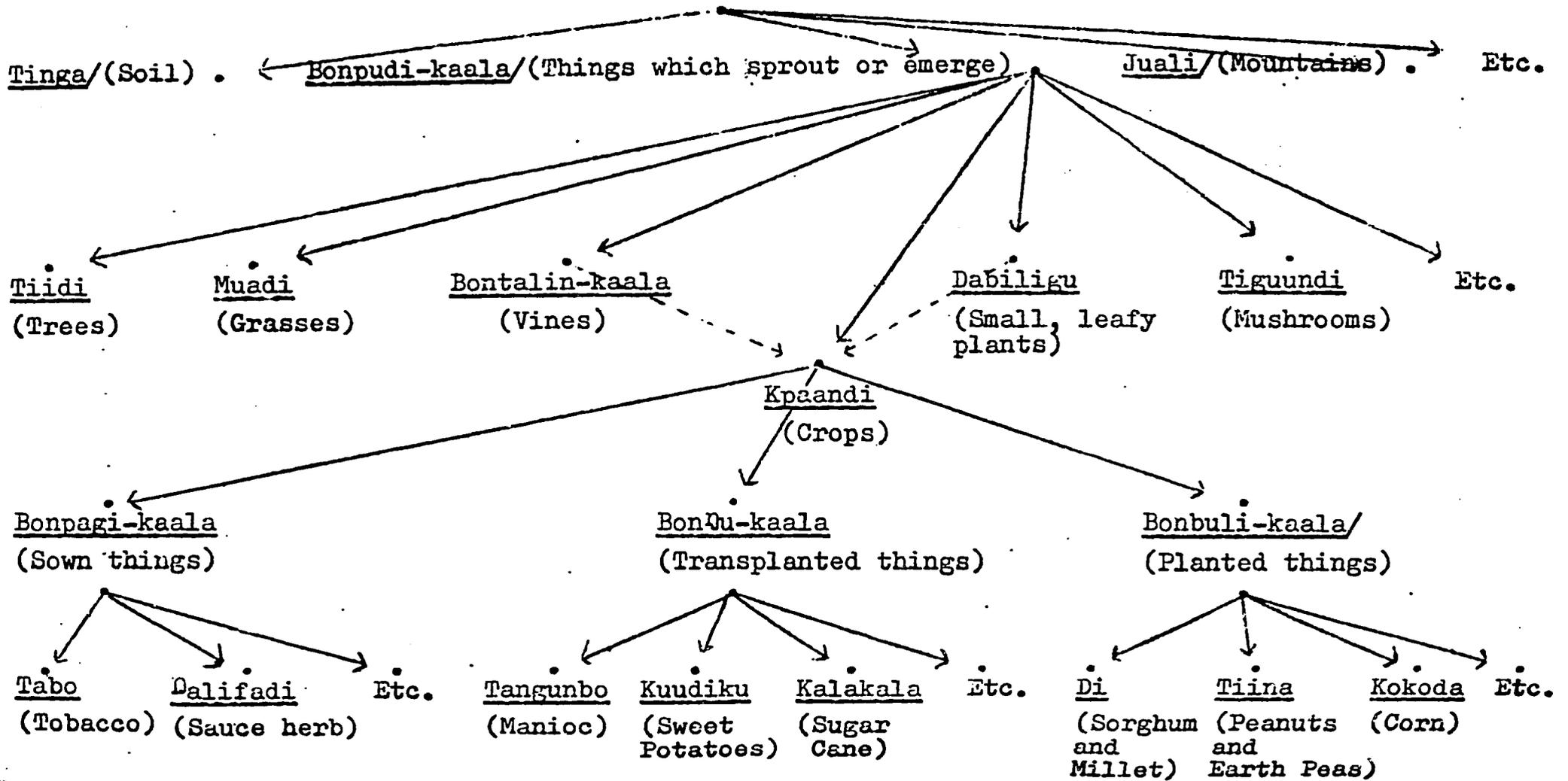
4.1.4 Kpaandi/(Crops)

The hoe labor associated with cultivation is called bu-kpaa-bu. The noun stem -kpaa- is used to refer to the crops cultivated by this means (ti-kpaa-di). All cultivated plants can be differentiated as to the manner in which they are commonly * planted. These categories are not exclusive in all cases.

* Rice and onions can be 'sown' and 'transplanted', but these options are not associated with traditional agriculture. Some farmers are beginning to learn the conditions under which sowing and transplanting of rice, for example, can lead to greater productivity and use of land before left uncultivated.

TAXONOMY VII: PLANT LIFE CLASSES

Yaalin gi pia Miali/(Non-Life)



(a) Bonpagi-kaala/(things which are sown)

Most, but not all, 'sown things' are transplanted later (e.g. tobacco, tomato, eggplant, papaya).

(b) Bonju-kaala/(things which are 'transplanted')

One may ju ('transplant') a seedling or young plant with roots (e.g. tomato, rice, mango tree). To ju also has the meaning of 'propagation from cuttings or slips', as would be the case with a cut branch (e.g. manioc) or plant segment with joints (e.g. sweet potato vine segment, sugar cane).

(c) Bonbuli-kaala/(things which are 'planted')
Boncoagi-kaala

'Planting' here has the meaning of placing one or more seeds into prepared pockets across a field or plot. Most cultivated plants fit into this category. This includes segments or whole tubers (such as a seed yam) which are buli or cuagi/(planted) underground. New plants develop from the eyes of these segments or whole tubers.

4.1.5 Dabiligu/(All usually small plants with non-blade-like round or oval leaves)

The people of the Bogandé/Piala region employ this term. Many of the cultivated plants are included. They also employ the term kpaandi/(crops)*that other Gourmantché use. These other Gourmantché however do not know the term dabiligu, and simply lump all uncultivated plants which are not trees or bushes as muadi/(grasses). A plant classified as a dabiligu is an annual.

4.1.6 Others

In addition to these plant groupings are numerous named varieties of fungi, mosses, liverworts, ferns, agaves, cactuses, sisal, various water and parasitic plants, and yet others.

* Actual term in their dialect is kpaanti (pl.), kpaangu (sing.).

4.2 Distinguishing Characteristics of Crop Varieties

Farmers are quick to point out those traits which distinguish one crop variety from another. The names of such varieties often provide a clue to some major characteristic. Colors are of major importance.

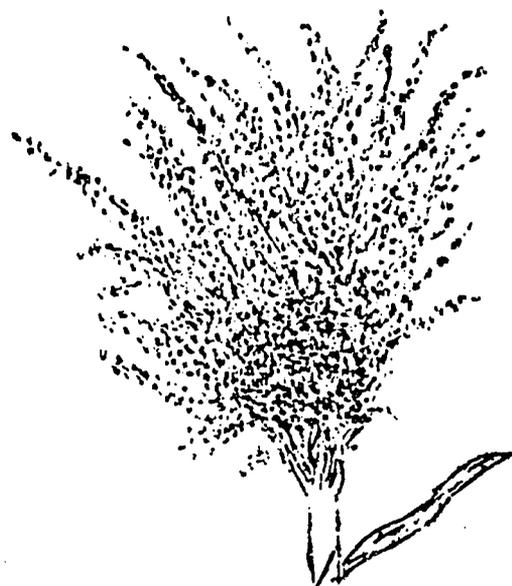
The 'red sweet-potato' speaks of that variety with red color outside and white within. Cowpeas are distinguished both by the shape of the vine, color of pods at various stages of development, and color of seeds (black or white). One cowpea variety is called 'can't steal at night'. It is cultivated by Bogondé/Piala farmers who have a special problem of thieves entering their fields at night and removing maturing cowpeas. These pods are dark and black spotted (normally pods are yellow-brown in color) and are difficult to spot in dark.

Sorghum varieties are distinguished by color and shape of panicle (loose, compact, erect, drooping), the color of leaves and seed. In the descriptive section of crops in the last half of this document, only the descriptive characteristics most commonly recognized by farmers is given. Figure 9 below illustrates some of the major differing characteristics of sorghum and millet panicles.

Should the need arise, a good farmer can describe the various species of plants he cultivates. He can name the parts of a particular plant as well as stages of its life cycle. In order to illustrate the kind of naming resources available, the terminology associated with sorghum and millet is given for plant parts, stages of cultivation, and growth in Appendix IV. Information of this kind for each cultivated crop could be important to extension agents who are not themselves Gourmantché, but who work among these people.



A. Compact, with neck bent .



B. Erect & Loose



C. Erect & Loose



One-Sided
D. Loose, Drooping,



Compact & Erect



F. Erect & Slightly Compact

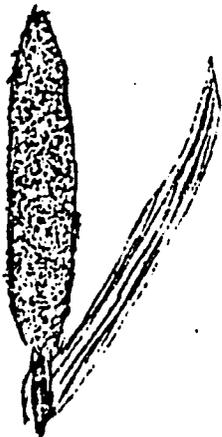
G. Erect, Extremely Compact



H. Loose, Drooping at Top



I. No Bristle, Thick



J. Thin, no Bristle



07

K. Bristles Present

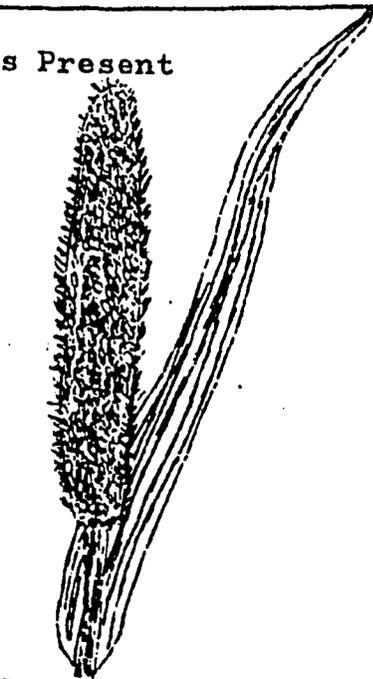


Figure 9: Sorghum & Millet Panicles

41

4.3 Taxonomy IX: Cultivated Plants

Taxonomy IX provides a detailed Gourmantché classification of cultivated plant resources. Ethnobotanical research has demonstrated that folk classification systems are comparable in complexity to the Western botanical (scientific) classification system. This system, which was itself originally developed from a Western folk system, has developed into a system attempting to describe the supposed evolutionary origin of plants. Ethnobotanical taxonomies, such as that presented below, have more practical objectives.

The scientific taxonomic tree for major crop domains is given in Taxonomy VIII in order that comparison might be made, if desired, with the taxonomic tree of Gourmantché classification. Specific terms for plants often compare to genus and species and sub-species (variety) level classification in the scientific system. In fact, folk systems are occasionally, at some points, more precise and descriptive in classifying local flora and fauna - reflecting locally significant botanical, agronomic, economic, or social distinctions.

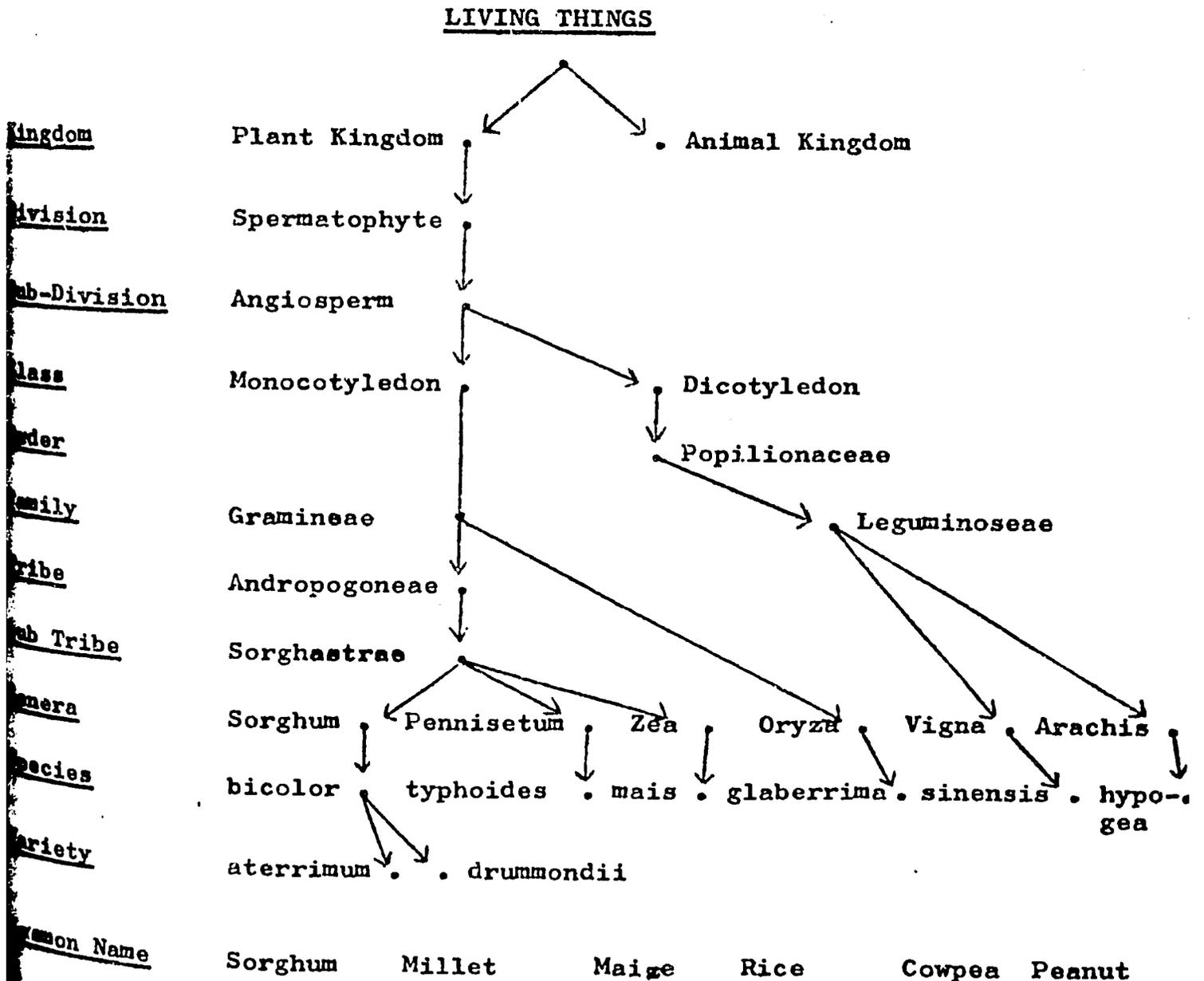
Sorghum varieties undoubtedly exist which have adapted to local environmental conditions and which are unknown elsewhere. It is known among farmers that the 'common millet' variety of one area different from their own will often not produce well in their own area. They recognize that different rainfall patterns, soils, and the plant's inherent characteristics are the chief factors in determining yields.

Locally adapted sorghum and millet varieties (as well as other plant varieties) naturally selected over the years by farmers, represent important resources with which the further development of the nutritional and income needs of this region can be realized. Farmer familiarity with

the requirements of such plants, their integration into the labor schedules of family groups, and their dietary acceptability give them considerable value. A catalogue, which includes the farmer's understanding of growth requirements and the characteristics of such cultivated plant resources needs to be made.

Taxonomy VIII: Botanical Classification of Crops

(Levels)



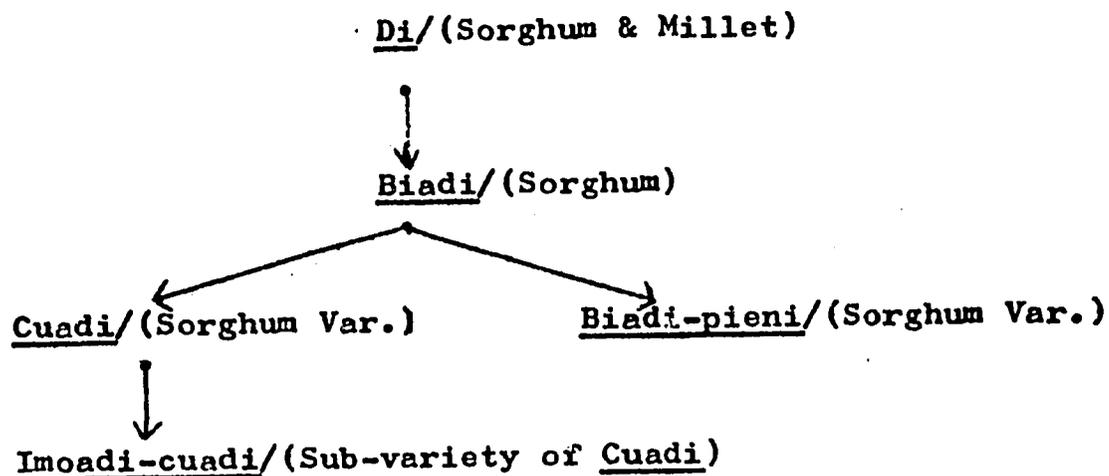
4.3.1 Semantic Confusion in Naming Systems

It is because words in a language are in some way related to other words that communication is possible. A taxonomy represents one kind of structural organization of meaning. If one is not aware of the organization of such word systems, confusion in communication is possible.

Many domains (word systems) of cultural knowledge are specialized in nature. Not all farmers (and very few non-farmers) are familiar with all the terms employed for various cultivated varieties of plants. Some farmers are more interested in the subject than others, some are more perceptive in noting the traits which differentiate varieties from one another, some have traveled more extensively and thus have more knowledge.

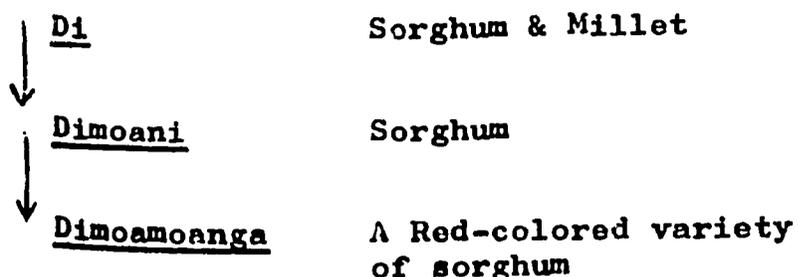
If one were to meet with four farmers on their respective fields and ask about the grain crops they planted this year, it is possible that one farmer might say that he planted di in his field. Another might say he planted biadi. A third might say that he had imoadi-cuadi. A fourth could say he cultivated ibiadi-pieni. Are these four different kinds of grain? Are they sorghums or millets? Are all these perhaps the same grain variety with different names? Closer inspection reveals that these terms come from different levels in the classification hierarchy. Di can mean any type of sorghum or millet (does not include maize). Biadi proves to be a term referring to any kind of sorghum. Biadi-pieni represents a specific variety of sorghum. Imoadi-cuadi represents a sub-variety of cuadi, another variety of sorghum.* Taxonomically, we have:

*Many Fada based farmers are most familiar with the many sub-varieties of cuadi. Some of them even think of cuadi as almost synonymous with the general concept of sorghum (biadi). The only biaui some of them have ever heard of is biadi-pieni which is a variety of sorghum, like cuadi. Even they, however, know that biadi-pieni is not a kind of cuadi. The problem is that they are not familiar with the naming resources of the Eastern region as a whole.

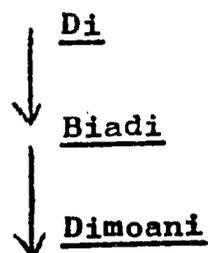


Farmers occasionally have difficulty in communicating about this domain (cultivated plants) because knowledge shared is not always similar. The Piala/Bogandé/Bilanga region employs the term dimoani in the same manner in which biadi is used in the taxonomy above. Literally, dimoani/(sorghum) means 'red grain', but for these people the term includes both red and white sorghums. What other regions of the Eastern region call dimoani/(a red-colored variety of sorghum), the Piala/Bogandé people call dimoamoanga/(a red colored variety of sorghum). Taxonomically we have:

Bilanga/Piala/Bogandé



Fada, Jakpaga, Pamma



One may expect even greater semantic confusion when translation into other languages is necessary. There is no one term in Gurma which includes all red sorghum as opposed to all white sorghum.* There are numerous named

* Such distinction does exist for the Mossi however (Kaziaga/(red sorghum), Bananga/(white sorghum)).

varieties of both cultivated. Some varieties have red and also white sub-varieties. The one literally translated term for 'red sorghum' (for Piala/Bilanga/Bogandé peoples) even includes the white sorghums. Nor is there one term in Gurma which includes both late and early season pearl millet as contrasted from sorghum. Taxonomy IX is given as a first attempt to clarify the semantic domain of cultivated plants.

4.3.2 Classification System for Cultivated Plants

The classification system presented in Taxonomy IX below has been carefully worked out with the help of a wide cross-section of good farmers throughout the Eastern region and represents their accumulated knowledge of this domain. No one farmer could possibly know this entire system without himself visiting other regions of the ORD and comparing his own knowledge against that of other farmers. The taxonomy is not exhaustive, though all important varieties are listed.*

* Samples of most of the sorghum and millet varieties have been collected and preserved. Samples are being given to ICRISAT, Upper Volta for their own program of research into local varieties. Slides and color prints were taken of most important varieties of crops in the Eastern region. Capital letters following varieties of sorghum indicate regions in which they are most frequently encountered (see key in General Introduction). Specific varieties were always cross-checked with a number of farmers within each region to make sure conformity in naming existed. Samples were also shown to farmers in regions outside where they were known (by name given) to learn if farmers had similar varieties but named them differently. Future research on these naming systems might experiment with making a key for different levels in the taxonomy from descriptions given by farmers.

onomy IX : Cultivated Plants

Les Plantes Cultivées

Bonbuli-kaala/(Planted Things)(Les Choses Cultivées)

Di

(Sorghum & Millet)(Sorgho et Petit Mil)

1, Nyiadi (1)

ly Season Pearl Millet,
ay Millets)(Petits Mils
fs, Mils à Chandelles,
Pénicillaires, Millets)

Niadi-fani

- (a) ania(di)naliga
-1- nianali-pienga
-2- nianali-moanga
(b) ania(di)koba
-1- niakobi-pienga
-2- niakobi-moanga

Jaboanli

Ikpentuani

Buodi ya niadi

Diyue, Dipieni (2)

(Late Season Pearl Millet)
(Petits Mils Tardifs, Mils
à Chandelles, Mils Pénicillaires,
Millets)

- (1) Diyue-fani, dikuabi,
diyue-boani
(2) Diyue-moani
(3) Nakoali
(4) Abidjan, Bijan, Pabila
(5) Kpaan-yinin-tanli
(6) Kpagiligu
(7) Buasaani, Difoagidi,
Boan-buoli
(8) Buodi ya Diyue
(9) Ikpayaani
(10) Sabino
(11) ɲandi-cili

Kaanlo, Kaano (3)

(Sweet Sorghum, Sorgho)
(Sorgho Doux, Sucré)

- (1) Kaanlo-kpabida
(1) Kaanlo-yu-moana
(2) Kaanlo-yu-piena, Kaanlo-
cuadi, kaada-yu-cuada
(3) Ikaali-buadi

Di ↓ (Sorghum & Millet)(Sorgho et Petit Mil)

Biadi, Dimoani . (Sorghum)(Sorgho)

- (1) Suoodi (J;F)
 - (a) suoodi-nabam, suoodi-moani, biadi-moani
 - (b) suoodi-pieni
 - 1- suoodi-pienga (fen-pienga)
 - 2- suoodi-moanga (fen-moanga)
- (2) Dimoani, Dimoanmoanga (J,F,P)
- (3) Conlooli, Belko (J, F, B, P, M)
- (4) Dagbani, Digbeni, Osansan-calo (J,P)
 - (a) digban-calo (fen-boanga)
 - (b) digbeni (fen-pienga)
- (5) Cuadi
 - (a) moadi-cuadi, cuadi-moani (J,M,F)
 - (b) cuadi-jananga, cuadi-pieni (J,F,P)
 - (c) cuadi-poyinga, manin-muuli (F)
 - (d) cuadi-je, cuadi-jeje (B)
 - (e) denbo (M, J, F)(caan-buagili?)(P)
 - (f) cuadi-luomo, luon-buado, cuadi-niigu (F,B,P)
 - (g) tanga, titanga (B,F)
 - (h) cuadi-moani (B)
- (6) Osoango (F,J,P,M)
 - (a) gisoajaga
 - (b) osoaniigu
- (7) Dimangu, Dimanga
 - (a) dimankaliyaada, kaliyada (J, M)
 - (b) tankaja, tankanyaala, kantanyaalo, kankanyaalo (F,P,B)
 - (c) diman-piengu (J)
 - (d) lijali-kan-bia-famma, adisoga, cindi-juoli, jua-fid-oyua (J,F,P,M,B)
 - (e) dimanga (B)
 - (f) dimanpo-boanga, kudiman-fen-boanga (J)

- (8) Biadi-pieni, Papienli, Pabila, Papabi (J, M, F,P, B) Dimoan-pieni
- (9) Biadi-boanga (J,M)
- (10) Litandi-jali, ligudili, ligoangoanli (J,F,M,B,P)
- (11) Diedaan-kan-fiagi, Muabidi (F,P,B)
- (12) Ojuan-nun-fan-daan, Juamo, Piado-quuba (F,P,B,M)
- (13) Wubili (B)
- (14) Tankuobi-juoga, Tankobi-kuo-jena (B)
- (15) Ogaaja (B,K)
- (16) Idiyo (B)
 - (a) dije-pieni, baalamanu
 - (b) dije-moani
 - (c) pia
- (17) Nungbeo lebidi nunbim' lie-lie, nungban yengu nunbimi-lie (F,P)
- (18) Oancaa-wabo, Ocancanbiwago (F,M,J)
- (19) Nanaoama, Nanwaama (F,M)
- (20) Dimmagili, Dmagili, Atan-nmiida (J,F,M,P)
- (21) Anmiidi-moana
- (21) Titanga, Tanka, Tanga (J,P,F)
- (22) Tanjuodi, Tuonjuali (F)(B)
- (23) Inanyuoni (F)
- (24) Ikpadi-bi-nuani (J,M,F)
- (25) Anlipabi-piena (F)
- (26) Konjuali (F), Kondeligu, Kondeli (J)
- (27) Mbandigu, Likacamoan-di, Imoandi-di (B,I)
- (28) Jagundi-tukuda (M)
- (29) Linmankpabili (M)
- (30) Luobo (F)

Bonbuli-kaala/(Planted Things)(Les Choses Cultivées)

Di ← (Sorghum & Millet)(Sorgho et Petit Mil)

Biadi → . (Sorghum)(Sorgho)(4)

- (31) Gijanjan-pienga (F)
- (32) Gbeeja (F)
- (33) Idini (B)
- (34) Nakpabi-jan-juodi (B)
- (35) Gaan-noaga (P)
- (36) Kogibu-den-ditonu (P)
- (37) Suam-mui (B)

Muuli → . (Rice)(Riz) (5)

- (1) Igulin-muuli, amuli-moana, nanyaado, anyuabi-juona
- (2) Jakuni, Jakoabiga, Kunkuni
 - (a) jakoabi-pieni
 - (b) jakoabi-moani
- (3) Japiengu, Aguana
- (4) Ataboboe
- (5) Bernard (ORD)
- (6) De Gaule (ORD)
- (7) Chinois, Indo-Chine (ORD)
- (8) Daada, Dorado (ORD)
- (9) Falifadi
- (10) Amulsalimadi
- (11) Nyim-muuli
- (12) Yaanyuligu, Jabana
- (13) Janbenli

Bonbuli-kaala/(Planted Things)(Les Choses Cultivées)

Tiina/(Peanuts & Earth Peas)
(Arachides & Pois de
Terre)

A. Tiin-nalaga, tiinkpama,
tiin-kpankpana/(Peanuts)
(Arachides) (6)

Arachis hypogoea

- (1) Jabicuodi, cuodopo
{ jacuoda, ajakpigi-tiina
- (2) Tiintugida,
tiintandika
- (3) Ayaantiina,
tiinjaguona
- (4) Kunbunga
- (5) Ouaga, (ORD)
tiin-nyia-gobila
- (6) Nasaali-tiina (ORD)

B. Tiin-moana, tiin-piena,
tiin-kpenga/(Earth Pea,
Bambara Grouadnut)(Pois
de Terre, Pois Bambara)(7)

Voandzeia subterranea

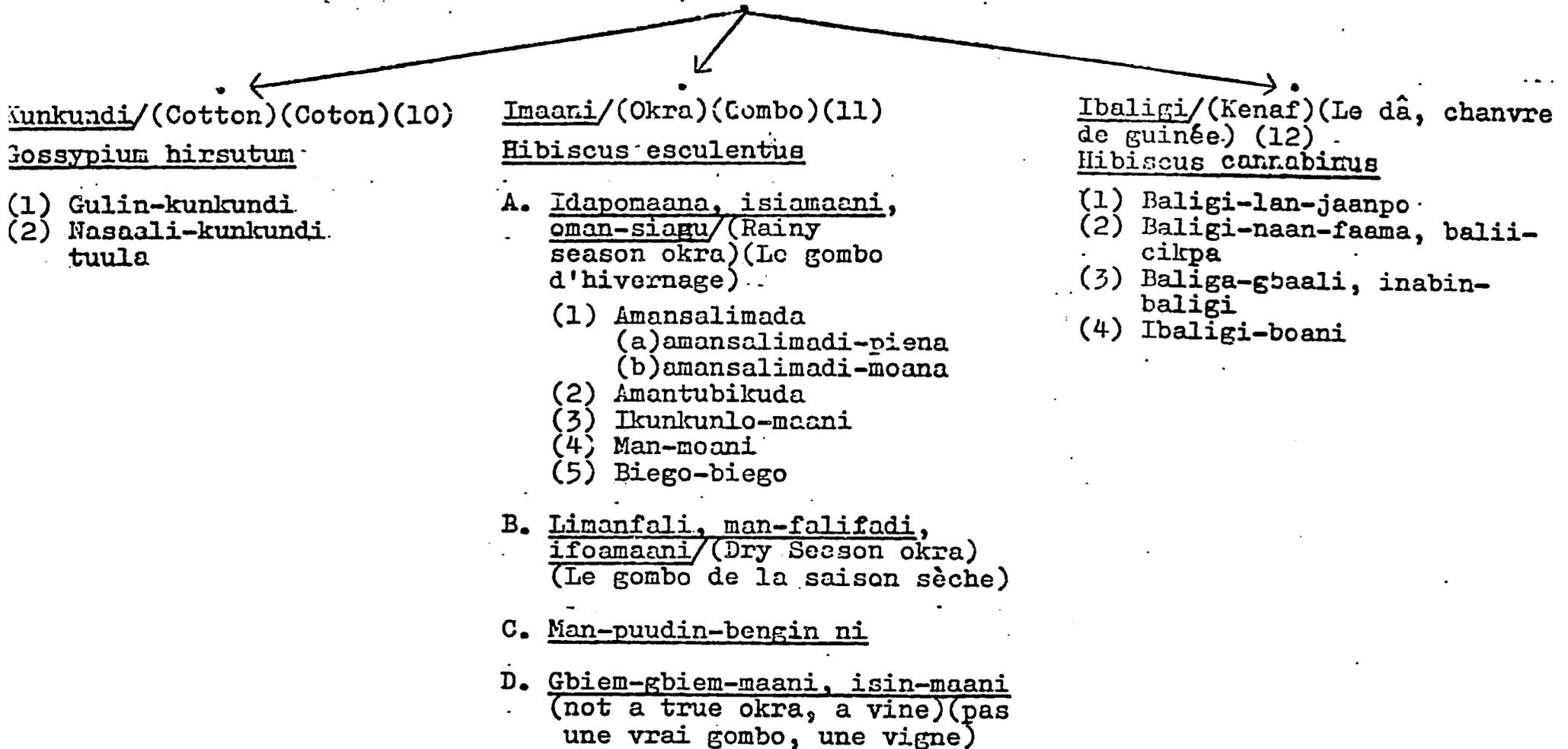
- (1) Tiinmoan-boana, tiin-
boana, dagbena, Ouaga
- (2) Tiinmoan-piena, tiin-
piena
- (3) Pualipugidi
- (4) Tiinmoana, gobinangu

Isasini/(Local legume
variety resembling
earth pea)(légume
indigène qui ressemble
le Voandzou) (8)

Kokoda, akpabida/(Maize)(Mais)(9)

Zea mays

- (1) Japiengu
- (2) Kondeliga
- (3) Foli-kokoda
- (4) Kokodi-baalo
kokodikan-Umadini
- (5) Kokodi-lamudi
- (6) Kokodi-ajima
- (7) Bonpien-kokoda
- (8) Kokodi-fana
- (9) Cincinga
- (10) Kokodi-niidi

Bonbuli-kāala/Planted Things)(Les Choses Cultivées)

- (1) Goan-yan-piena, goan-yan-bansanbi-tuona.....
- (2) Goan-yan-moana.....
- (3) Goan-yan-tankpina.....
- (4) Goan-yan-nyua-cuda.....
- (5) Bonpien-goan-yana, goan-yan-siro.....

Tigoandi / (Roselle) (13) ...
(Oseille)
Hibiscus sabdariffa

Ijuoni, nasaali-juoni, imatuli-juoni, nasaali-tuuna / (Soybeans) (14) ...
(Le Soja)
Glycine max

Then, Inye, Onyiagu
(Sesame) (Sésame) (15)

- (1) Beli-boamma.....
 - (2) Beli-piemma.....
- Mibelima / (Fish Poison Plant) (Plante utilisée pour empoisonner des poissons) (16)

Misiema / (Indigo) ...
(Indigotier) (17)

- (1) TiValifa-niidi.....
 - (2) IValifaje.....
 - (3) TiValifa-kpama.....
 - (4) Tidagbaa-Valifadi.....
 - (5) TijaaVali-fadi.....
 - (6) Kpinbobi-tuagi, kpinbobi.....
- TiValifadi, fedu
(Sauce Herb)
(Herbe pour la sauce)
(18)

- (1) Kpankpan-fana.....
 - (2) Titanbuo-kpankpandi.....
- Tikpankpan / (Sauce Herb) (Herbe pour la Sauce) (19)

- (1) Inyinkpinje.....
 - (2) Tinyinkpin-niidi.....
- Anyinkpina / (Sauce Herb) (Herbe pour la Sauce) (20)

- (1) Kambi-pe-yula.....
 - (2) Kambi-jugi.....
 - (3) Kambi-gbenga.....
 - (4) Bompian-kambi.....
 - (5) Tampian-juaga.....
- Kambi / (Red Peppers)
(Piment) (21)

Imuaabi / (Fonio) (22)

Bonbuli-kaala / (Planted Things)
(Les Choses Cultivées)

Bonpieri-kaala / (Sown Things)
(Semis à la volée)

Bonpari-kaala / (Sown Things)
(Semis à la volée)

Kambi / (Red Peppers)
(Piment) (21).....

Otabo / (Tobacco)
(Tabac) (23).....

Akana / (Eggplant)
(L'aubergine) (24).....

Sualimasua / (Onions)
(Oignon) (25).....

Tomati / (Tomato)
(Tomate) (26).....

Salaati / (Lettuce)
(La Salade) (27).....

Karoti / (Carrots)
(Carotte) (28).....

Chu, Su / (Cabbage)
(Chou) (29).....

Amagi-saana, papai / (Papaya)
(Papayer) (30).....

Guoyaagi, guoyaak / (Guava Tree)
(Goyavier) (31).....

Maabu / (Mango Tree)
(Manguier) (32).....

Nasaali-pugili, lombula
(Lime Tree) (Citronnier) (33).....

Banane / (Banana Plant)
(Bananne) (34).....

Nasaali-kaanlo, kalakala
(Sugar Cane) (Canne à sucre) (35).....

Tangum-boano.
Tangum-pieno.
Tangum-moano.

→ Tangumbo, Pangumbo, Pangummo
(Manioc, cassava) (Manioc) (36).....

Borru-kaala / (Transplanted Things)
(Les Choses Repiquées)

- (1) Abali-tuuna.....
- (2) Agulin-tuuna,
atufana, atumoana,....
atupiena
- (3) Pia oyaana.....
- (4) Ituje.....
- (5) Igogoli.....
(a) agogoli-piena
(b) agogoli-boana
- (6) Asoatuuna, dunguuli,
adunguli-tuuna.....
- (7) Kanta-nyua.....
- (8) BuliDaba, ocuado-
buliDaba.....

Atuuna/Cowpea
(Nièbé,
Haricots indigènes)
(37).....

- (1) Akulibugida.....
- (2) Ayela.....
(a) liyeniinli
(b) anyinkobi-yela
(c) ipobitomu
- (3) abaga.....
(a) abagi-tuguuna
(b) ayalibaga
(c) adabaga,
ibagitujali
- (4) mupulimu.....
(a) asapula
(b) ojoagidu, ijagidi
- (5) atuatunda, tuntumma...
- (6) anoala, noaligu.....

Otungu/(Gourd, Cala-
bash)(Calebasse)(38)

- (1) afepiena.....
lifeDmanli
- (2) afemoana.....
- (3) agbanjabida.....
- (4) iluonkondi.....
- (5) kanpatoa.....
- (6) feboanga.....
- (7) najafuli.....
- (8) jabido-fela.....
- (9) nasaali-fela.....

Afela/(Squash Vines)
(Courge)(39)

IUmali/(Bamboo)(40)

- (1) kuudiku-moano,
tikpen-fedi.....
- (2) kuudiku-pieno,
Balimo.....
- (3) kuudiku-jaga.....
- (4) aDuntuba, tiDuntubidi.....
- (5) kuudiku-komboangu.....
- (6) nasaali-kuudiku.....

Kuudiku, kuudiko/
(Sweet Potatoes)
(Patate douce)(41)

- (1) anugi-piena.....
- (2) anugi-moana.....
- (3) aluonduna.....
- (4) liUmabili, iUmabidi.....
- (5) cankpe.....
- (6) ojoanuga, afoanuga,
afaboanga.....

Anuga/(Yams)
(Ignames)(42)

Imankani, ibankani
(Taro)(43)

- (1) afoa-paala.....
- (2) aden-paala.....
- (3) nasaali-paala.....

Apaala/(Potatoe)
(Patate)(44)

Bonbuli-kaala/
{Planted Things}
(Les Choses Cultivées)

Bontalin-kaala/(Vine)
(Vigne)

Bonny-kaala/
{Transplanted Things}
(Les Choses Repliquées)

5.0 Crop and Field Management

In the following section, some of the agronomic, economic, and social dynamics of Gourmantché farming systems are discussed. A review of some of the factors influencing farmer decision making concerning crop cultivation is followed by a comparison of the labor requirements of traditional hoe labor and animal traction. The extent to which various crops are cultivated in different parts of the Eastern region is then related to household structure and ownership patterns.

5.1 Regional Crop Variations

A broad array of human and physical factors influence the choice of crops for cultivation. Socio-economic factors would include population pressure, traditional technology, food/taste preferences, and the access to markets where farmers may get rid of unneeded surpluses and may purchase those things in which their own production has been deficient. Physical factors would include soil physical properties, soil nutrient availability and moisture availability, and the surface feature /structure of the farm land. There is a great range of variability in each of these factors for different parts of the Eastern region of Upper Volta.

The extent in crop variation within this region can be illustrated by a look at the two extremes. Data comes from this year's BAEP farm level survey,* which included villages in the Bogandé region (Gbanlamba & Kombuasi) and Gobinangu region (Loagibu, Lampoanpuoli, Cindi-kombu), is used. Physical data comes from the Atlas de la Haute-Volta, Jeune Afrique, 1975.

* Bureau of Economic Analysis and Planning of the Eastern Regional Development Organization (EORD). Survey is part of USAID financed Integrated Rural Development Project.

Figure 10
Factors in Crop Variation

<u>Factors</u>	<u>Bogandé Region</u>	<u>Gobinangu Region</u>
Population Pressure	Low	High
Technology	Traditional	Traditional
Food/Taste Preference	Similar	Similar
Access to Markets	Fair	Poor
Elevation	400 meters	300 meters
Soils	Light, gravelly, low in organic material	brown, generally more fertile, higher moisture content
Rainfall/Year	600-700 mm	900 - 1000 mm
Ethnic Group	Gourmantché	Gourmantché
Average Number of Different Kinds of Fields and Plots Cultivated*	10	24

In a region like the Gobinangu, farmers grow a greater diversity of crops. For them, labor resources per household and availability of land for specific types of crops (e.g. sweet potatoes, rice, sugar cane) become limiting factors. In a region like Bogandé, the rainfall and generally poorer fertility of soils poses the greatest limiting factor for a household, resulting in less crop diversity.**

* Compound plots, personal sorghum &/or millet field, household head sorghum &/or millet field, maize plot rice plot, peanut plot, soybean plot, etc.

** In low rainfall areas, farmers have less maneuverability in when, where, and what they must plant. The time period in which one can plant what one needs and still have enough time for it to reach maturity is very short. Farmers must concentrate on the essentials. Though crop diversity is limited in the Bogandé region, it is here that livestock resources are greatest. No other region of the Eastern ORD can compare to this one in total number of goats, sheep, and cattle. Farmers claim this dryer region is healthier for domestic animals.

The amount of time and land a farmer will give to a specific crop seems to be directly related to the extent to which the farmer believes this crop 'will be able to support/uphold a person' (ba fidi ga nilo). For this reason, everywhere, sorghum and millet are the crucial crops. A farmer is careful not to spend more time than he should on other crops, referred to depreciatingly as tikpan-yuodi/(crop 'odds-and-ends'). He will state a kuanu ya bia, a nam ba je be/(if you lose your sorghum &/or millet field, what would you eat?). This heavy preoccupation with grain cultivation can, in part, be seen by the scarcity of suitable markets in the Eastern region.

Where soil fertility and land availability permit, sorghum will always represent the major crop. No other crop category comes even near to possessing the number (56+) of locally named distinct varieties and sub-varieties as sorghum. It is the specific variety of sorghum and millet, as well as its combination with other varieties on the same or nearby fields that varies greatly from one region to another. It is not uncommon for one farmer to have between four and six varieties of sorghum and two varieties of late season millet. Though Eastern ORD farmers recognize many different varieties of other crop categories (see Taxonomy IX), a particular farmer is not likely to possess more than one, or at the most two, of these varieties (ie. maize, rice, peanuts, etc.).

The very existence of so many sorghum varieties testifies to the importance of this crop to farmer existence. Access to these varieties is the farmer's insurance against the unpredictable nature of rainy seasons in the Sahel. By choosing among the varieties he has available (personally or within the village), the farmer gains some flexibility

in response to seasonal variation.* Farmers do not possess such flexibility within the other crops they cultivate (though the slightly longer rainy season and more moisture in a region like the Gobinangu - as discussed above - does give the farmer more time to respond in, which in turn makes it possible to have greater crop diversity).

Stuart Gaudin documents ** that the optimal time to plant peanuts was mid to end June and for soybeans the end of June. Either before or after these times gives decreasing yields. His data for sorghum pointed out that there was not an optimal planting time for the region as a whole before or after which time yields were inferior (between end of April and end of June). Sorghum variety flexibility provides a possible explanation.***

* Dr. Paul Christensen (SAFGRAD) suggests that one might postulate that a reason why sorghum is more popular than millet or maize is that it is a self-pollinated crop. Without self-pollination, it would not be possible to maintain this diversity of varieties for special applications.

** Stuart Gaudin, FAO farm management expert, conducted an intensive study of 28 farming households in the Eastern ORD during the 1977 - 1978 farming season. The data referred to here comes from his January 1978 report, page 1 & 2 of appendix.

*** If, due to poor rains or drought, a farmer does not finish planting his sorghum or millet fields until the end of June (in which case he will have switched seed to a quicker maturing variety), he will be late in planting his peanuts and soybeans. Since he does not have quicker maturing varieties of these, he will be faced with poor yields.

5.2 Lost Equilibrium in Seed Varieties & the Search for New Varieties

In even normal years, farmers have always cultivated several varieties of sorghums and millets to help insure adequate harvests should rains be excessive or inadequate. Taking a region as a whole, there was usually someplace or someone who had had a sufficient harvest surplus from whom some grain could be obtained freely (ie. some relative), bought (usually not in marketplace), or borrowed against the next year - when the situation might be reversed.*

The value to the farmer of sorghum and/or millet for his daily food needs ** has never been the only factor governing his choice of seed varieties. Also important is the need to cultivate certain varieties of "red" sorghum for beer making, or the need for some quantity of late millet for special-purpose foods and drinks. Some local medicines, the feeding of livestock (principally horses), and the artistic creation of colored basketry require the presence of other varieties. Furthermore, the generally long sturdy stalks of sorghum varieties are important for fencing and burning materials. Certain varieties are kept from year to year simply for preservation as a different variety. Changing soil and season conditions may one day once again bring these to the forefront.

Older farmers throughout the Eastern region claim that the rainy seasons of recent years are definitely shorter than in previous years (about 30 - 40 years ago). This is not an idealization of the past. If a calander could be made which would correspond to what farmers in most parts

* This situation has become more complex as merchants, responding to a national demand for sorghum and millet, have purchased up large quantities of grain and moved these to regional centers (or out of the region entirely). These farmers will have to look much further than normal to obtain food in bad years. Their neighbors and relatives have sold their surplus to 'outsiders'. The promotion of village group grain storage banks should help reverse this trend.
 ** Representing as much as 85 - 90% of the food consumed in one year.

59

of the ORD would like to see, one would have something like this:

FIGURE 1 : A 5½ Month Ideal Season

Mid-May to June 1:	Several heavy rains with planting at end of May
June	: About one rain a week
July	: Several rain storms (a little less than June), crops grow quickly
August	: Much rain, perhaps 10 days of constant showers, crops growing tall
September	: Several very heavy rains (line squalls), heading of sorghum and late millet
October	: Little or no rain, sorghum and millet panicles forming seed and maturing
November	: Early part of month is harvest time

Recent years have not followed this schedule at all. Planting often isn't successfully started until late June. August rains are not sufficient. This year (1978), September was the month of continual rains (like August should be), with August being quite dry (Fada, Bogandé regions). Crops were poor.

One effect of serious drought periods of past years is still evident. The droughts seem to have been the outcome of unusually short and irregular rains in an already region-wide shorter permanent rain cycle.

One objective effect of an overall shorter rainy season has been the loss of equilibrium and some of the flexibility in seed varieties among farmers. Where one region might have had seed varieties which insured against 4-4½-5 month seasonal variations*, they presently need

* That is to say, farmers expect seasonal variation of one month. They could count on at least 4 but not more than 5 months of adequate rains.

varieties of the 3½-4-4½ month range in maturing time. Because some years have fallen in the 4 month range, people would have thought this was but a poor year - not realizing that this is now the average cultivation season they can expect for the near future at least. When a 'bad year' in the new cycle fell upon them (ie. 3½ months), they were unprepared. Seed varieties they possessed were not flexible enough in maturation ranges to reach full productivity in such a short period of time. People would then seek low areas (see 3.1.1) where added moisture retention would permit adequate harvests of perhaps their 4½-5 month seed varieties. The problem is that there are not enough low areas for everyone to have enough land space for adequate production of their year's grain needs. What they need, and what they must search for, are 3½ month to 4 month seed varieties. This much simplified scenario is typical of many parts of the Eastern region.

It takes many years for a new variety to find acceptance and wide-spread stability in a new region. It is not the occasional farmer who seeks to obtain and experiment with new seed varieties; most farmers are presently doing so on a regular basis. They are searching for shorter maturing varieties of sorghum and millet to meet the various seed needs they have. Farmers would readily be willing to experiment with any variety that crop research organizations might give them (e.g. ICRISAT). That such varieties might happen to yield more than their local varieties under ideal conditions would just be an added bonus.

Many villages of the Eastern region were visited in which the most commonly cultivated local sorghum with greatest maturing time are no longer producing well - they are taking too long to mature.* Farmers in such areas have often

* An example: Ugalu is a village located 70 kilometers from Fada towards Niamey. Fifteen to twenty years ago the common sorghum variety cultivated on bush fields was caan-buagili (maturity about 5 months). Today ogaaaja is the major sorghum of these fields (4½ months) and conlooli and kankan-yaalo the sorghum varieties of village fields (3½ months). The

requested information about varieties of other regions and have asked for some of the samples I have had with me from such regions.

How do farmers experiment with a new variety? A farmer, during the dry season months may, in his travels from his village, hear of some variety he is unfamiliar with. He may seek out a farmer with this variety and ask for two or three panicles. Farmers also sometimes, when traveling during the grain maturing season, notice the sorghum or millet of somebody's field is going to produce a good crop. If he does not have this variety, he may either ask the owner for two or three panicles to take home with him, or he will simply enter the field and help himself to several heads of grain. Sometimes new varieties are encountered in the marketplace. Wherever it is that he obtains his seed (and no matter what crop variety it might be), he will take his seed home and store carefully until the next farming season.

When the new season arrives, the farmer will pound the seed from his two or three panicles and plant this in some corner of his regular field. If this variety does well that year (and tastes good, stores adequately), the farmer may plant next year's field with a greater amount. Neighbors seeing his success will obtain several panicles and try the seed out on their fields next year. In this way the new variety spreads naturally through proven success. If a variety does poorly, on the other hand, next year it will not be used.

latter are very recent introductions because of quick maturation. These 'introductions' represent natural diffusion of varieties among farmers. Good farmers of any village can give information about the various varieties currently present on bush and village fields. Some will be 'old, traditional' varieties, others will be new ones coming from out of the east (puoli) or west (nintuali). With enough research, charts showing the diffusion of these varieties could be constructed.

63

Farmers do not speak of the number of days to maturity of a crop; but of the approximate number of months (from seed planting until it could be harvested). Sorghum and millets; for instance; can be 3, 3½, 4, 4½, 5, 5½ months: These all exist within the ORD.* As in the scenario described above, regions with previous expectations of a 4½, -5-5½ month rainy season are now experiencing one of 4-4½-5 months. The Gobinangu and Pamma regions seem to have shifted from a 4½-5-5½ month season to about a 4-4½-5 month one. The ORD could have an immediate impact on grain production in the region if even well-known local varieties of sorghum, for instance, could be taken to the regions in which they would now be most appropriate.

In the Gobinangu region, suoodi is the preferred local variety of sorghum. It is excellent for eating, beer making. It is also, however, a variety which needs between 5-5½ months in which to mature. Today, one finds it mainly in the low regions, in bas fonds. A common (previously mid-term) 4 month sorghum has become the present long term variety of many fields (papienli, biadi-pieni). The early sorghum variety of about 3½ months has assumed the importance of the mid-term variety (digbeni). A problem with digbeni however is that it does not store well. As a crop of village fields, it normally is the first sorghum to be eaten. Farmers want a new mid-term variety which yields highly; preserves well under their methods of storage, and tastes good. They have heard of an important variety called conlooli, found in other parts of the ORD (as close as Jakpaga), which matures in 3½ months, and which they think, would meet their requirements.

The ORD might be able to help such farmers in experimenting with appropriate, high yielding local varieties from other regions. They have but to be given a panicle or

* This indicates that the ORD has a possible season variation of up to 2½ months from its north-western corner to its south-eastern corner. Personal observations of flowering peaks of bush trees supports this variation figure.

two for seed grain and be told when it should be planted and on what kind of soil. The farmer will do the rest. He will judge for himself whether or not this is something he would like to try on a more extensive basis.

The introduction of new improved varieties of sorghum or millet by research stations must be seen as the long term solution to the problems discussed above. The introduction of superior local varieties from other regions can provide the present and short term solution.

5.3 Field Management Systems

Village fields and plots contain crops generally quite different from the household's bush kuani (sorghum and/or millet fields) and the plots around such fields.* Rainy season okra, gourds and calabashes, some kenaf and roselle are found in the compound plots along with the important first crop: maize. Tobacco or some quick maturing variety of sorghum continues on these plots after the maize has been harvested. ** Early millet is principally cultivated on village fields. Because village livestock need the forage area provided by the early harvest of the village fields, late maturing sorghum and millet will be placed on the bush fields.

* For discussion of types of fields and plots recognized by the Gourmantché, see Document No. 7, Land Tenure and Field Cultivation, pp. 19-29.

** For some reason, farmers starting from around Fada and going north and north-east (Bilanga/Piala/Bogandé) do not seem to make as good use of their compound plots and village fields as do people of other regions ((to west, south, south-west). This is at least the opinion of some farmers of these regions. The many plots of maize in the north are rarely associated with another crop (with the exception of several rows of early sorghum planted around such plots or sometimes some cotton planted down between rows of maize). If, as in other regions, maize had been associated with a quick maturing variety of sorghum or millet, they would have another

In the Bilanga/Piala/Bogandé region, the principal field for the head of a household contains sorghum or millet associated with cowpeas and interspersed with rows of sesame. In other regions, the sesame is lacking. The Bilanga farmer may plant an important variety of sorghum such as Wubili until soil fertility begins to decline - at which time his wives will cultivate large plots of peanuts there. The following year, sorghum will return. This rotation continues for about 5 years when the field will be abandoned or placed under millet or cotton cultivation.*

Wulibi--Wulibi--Wubili--Peanuts--Wulibi--Peanuts--Wulibi--Peanuts--Leave
 1 2 3 4 5

This same farmer, the year he clears new land, will put cowpeas or cotton upon it - to be followed by several years of sorghum production...

In the Jakpaga/Madaaga region, peanuts and cowpeas are put on newly cleared land for the first year of cultivation. Sorghum follows.. When he leaves the field, the farmer may put it in manioc or cotton. *

Within a grain field, sorghum varieties which can be expected to mature within two or three weeks of each other are planted together. At harvest the panicles of one variety may be very dry while others may require separation and five or six days of drying. If maturing periods are greater, the farmer will place the crops in different parts of his field, the longest maturing variety planted first. Harvest will still then fall at about the same time.

important source of food during a period when it is scarce.

If the fertility of their soils is to explain this difference between regions, then these people would benefit more than most by having fertilizer use promoted for their village fields and plots.

* Cotton cultivation at the end of the rotation cycle is seen by the farmer as far from ideal - he would prefer it to be the first crop of the cycle. However, the farmer often does not have the time to clear special land just for cotton - which is low on a crop priority basis (see Table III below). If time permits creation of a cotton plot some year, a recently (0-3 or 4 years) left to fallow field can be used. Field preparation is minimal and even if the plot should be isolated in the bush (not near a community or group of active farms), it is not serious (domestic or wild animals are not likely to eat up this crop). Minimal management is given a cotton plot.

Why, it was asked a farmer near Jakpaga, do you plant the three major sorghum varieties you do (suoodi, papienli, imoadi-cuadi) (he had several other less extensively cultivated varieties mixed in the field)? Why not just plant your latest maturing sorghum variety (suoodi-moani-a red sorghum) which did so well the past year. "If I get too much rain", he answered, "after i mali gbeni/ (the plants are forming panicles but before seed formation has taken place), this variety will be spoiled; it will send up secondary shoots from its roots and produce poorly. On the other hand, if the season is too short, I would not get anything."

Why then, I asked him, not just cultivate papienli, a mid-term (4 month) variety of sorghum (a white sorghum). "Well", he answered, "I do need my suoodi for its beer at least." But why then should he have both papienli and imoadi-cuadi, both of which are mid-term varieties of white sorghum, and both of which produce well and are good to eat. "Well," he continued, "imoadi-cuadi is just as good as papienli, and the former does store better than the latter, but imoadi-cuadi is more easily and quickly damaged by the appearance of sorghum Striga plant parasites as soil fertility declines." He noted that his suoodi also helped to impede this parasite, permitting a less resistant sorghum variety upon this soil next year. Farmers give these and other responses throughout the ORD to explain their crop choices during a specific year.

66

5.4. Field Cultivation and Labor Requirements

The routine that farmers follow in the maintenance of their fields and crops is influenced by a number of important constraints, one of the most important being the declining fertility of the soils. The amount of labor required on a field is directly related to its fertility, (i.e.: infestation by weeds). Amount of labor is also dependent on proper timing of labor inputs.

An attempt is made below to sort out the significant labor inputs Gourmantché farmers recognize for a kuanu (sorghum and/or millet field). Specifically, this is the principal family field yielding the major portion of a household's yearly food grain requirements. The family head possesses the large field upon which members of his household will labor. (see Gourmantché Agriculture, Part I, pp. 10-12). Animal traction as it might be practiced, animal traction as it is presently practiced and traditional farming practices are compared in order to highlight important areas for concern and possible innovation. Five systems are discussed and illustrated.*

1. Labor Requirements for a 'New' Field; First Year of Cultivation
2. Labor Requirements for a 'New' Field; Second Year of Cultivation and Later
3. Labor Requirements for an 'Aging' Field
4. Labor Requirements for Animal Traction on a New or Aging Field -- As Envisioned **
5. Labor Requirements for Animal Traction on a New or Aging Field -As presently practiced

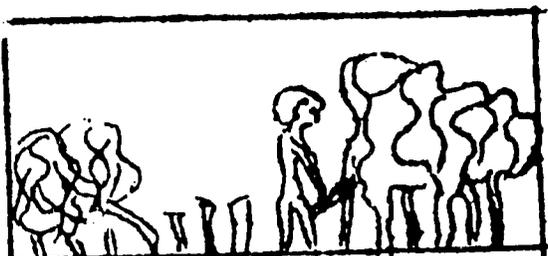
Household members are responsible for the labor requirements of the respective fields and plots. Community groups (of friends) are sometimes formed on a reciprocal basis during weeding and harvest activities.

*The rather simple pictures are given to aid the reader in visualizing the stage the crop has reached when the activity discussed takes place.

** The disparity between envisioned and actual animal traction practices is a result principally of lack of experience and support services of ORD extension efforts. Expense to farmers of the total package of equipment has served as a brake (approximately 150,000 CFA for total animal traction package (oxen, plow, weeder, cart)).

Labor Requirements for a 'New' Field,
First Year of Cultivation

1) When a farmer's present field no longer provides good yields, he will either expand his field by cutting more trees and brush, or he will relocate. Until his new field is big enough for his needs, he will not abandon his old field. About seven days hard work by male members of a family unit are required to level trees for a new field, * usually a dry season activity, (December-May) .



2) The farmer must now pile the brush and small trees around larger trees yet standing. He will have to hoe up all the grass clumps in the field. This latter task is the hardest work of the year. About six weeks hard work by male members of family unit required. (Usually a dry season activity.)



3) Dried clumps of grass are gathered into piles and burnt along with brush piles collected in activity No. 2 above. About seven days hard work by male members of family unit required for cleaning field and burning. (Done during the month before planting (April-May))



4) Planting



5) First Hoeing/Weeding



6) Second Hoeing/Weeding

7) Third Hoeing/Weeding, Plants are ridged. ** This latter step is especially important in that should rains end too abruptly, enough



moisture will have been conserved to see plant through to maturity.

Size is determined by available labor force
**Ridging is a traditional activity of good farmers.

8 Harvest
9 Gathering/Storage

Principal Activities: 9

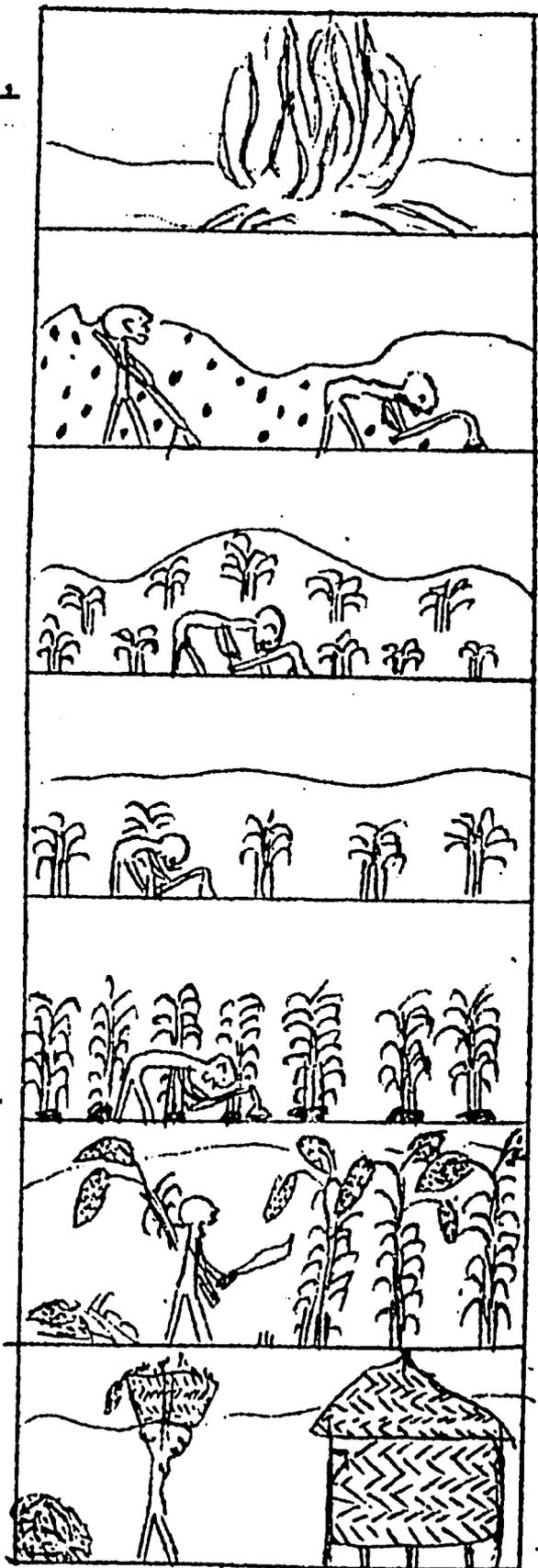
5.4.2 Labor Requirements for a "New" Field, Second Year of Cultivation and Later *

Steps

1. Last year's grain stalks are gathered up and burnt; piled in the morning, burnt in the afternoon. More than seven days work required by male members of family unit.
2. Planting
3. First Hoeing/Weeding
4. Second Hoeing/Weeding
5. Third Hoeing/Weeding, Plants are ridged with soil. Some farmers are either lazy or slow in their cultivation and never get to this stage. They risk their crops drying out too fast if rains end too early. Since weeds are thus permitted to reach maturity and seed, they will 'pay the price' of their neglect or failure by having to hoe before planting next year - even if the field is a 'new' one. Should the field be old, his hoeing problems next year are even more serious.
6. Harvest
7. Gathering/Storage

Principal Activities: 7

For definition of difference between 'new' and 'aging' field, see Gourmantché Agriculture, Part 1, pp. 13-18.



D.7.

61

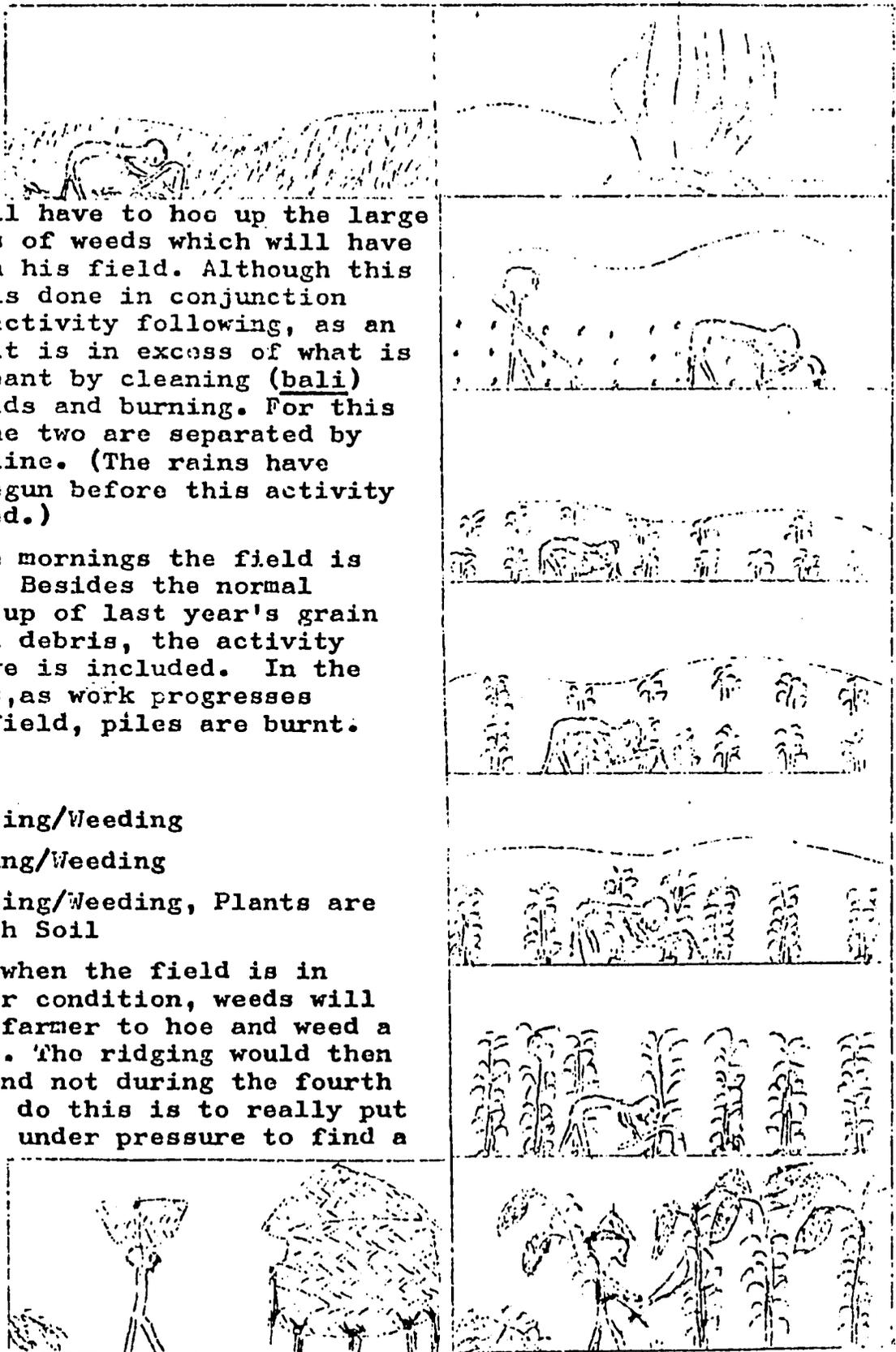
Steps

1. Farmer will have to hoe up the large quantities of weeds which will have come up in his field. Although this activity is done in conjunction with the activity following, as an activity it is in excess of what is usually meant by cleaning (bali) one's fields and burning. For this reason, the two are separated by a dotted line. (The rains have usually begun before this activity is finished.)
2. During the mornings the field is 'cleaned'. Besides the normal gathering up of last year's grain stalks and debris, the activity No. 1 above is included. In the afternoons, as work progresses down the field, piles are burnt.
3. Planting
4. Second Hoeing/Weeding
5. Third Hoeing/Weeding
6. Fourth Hoeing/Weeding, Plants are ridged with Soil

Sometimes when the field is in really poor condition, weeds will force the farmer to hoe and weed a fifth time. The ridging would then come now and not during the fourth hoeing. To do this is to really put the farmer under pressure to find a new field.

7. Harvest

8. Gathering Storage



Principal Activities: 8, possibly 9

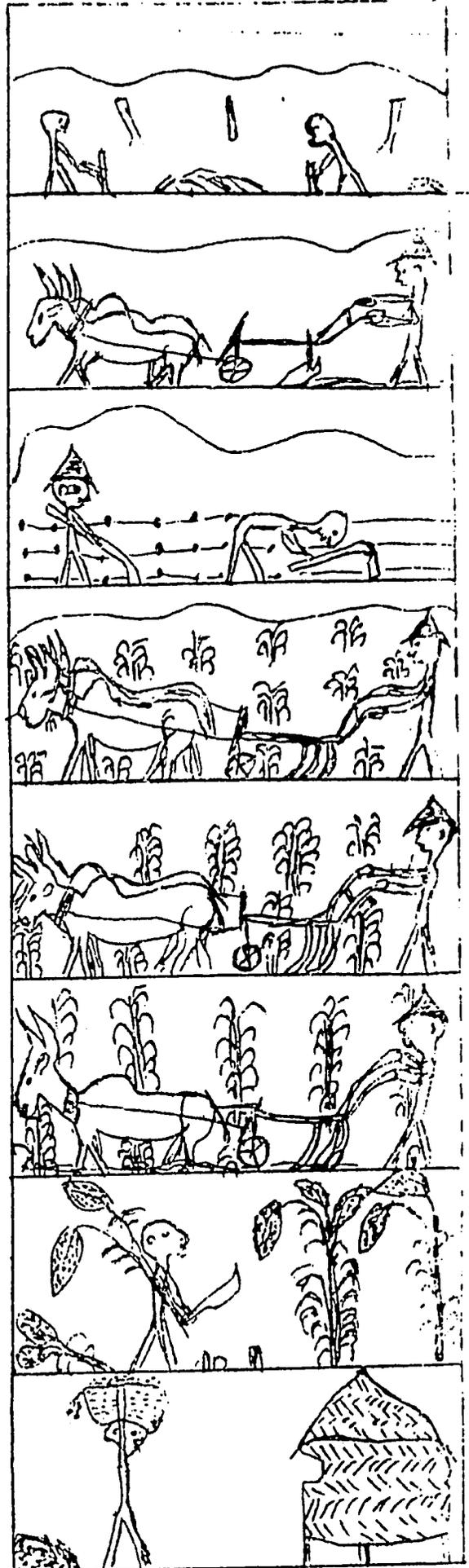
L.F.

5.4.4. Labor Reuirements for Animal Traction on a New Field or Aging Field -- As Envisioned *

1. If it is the first year for animal traction on this field, much labor will first have to go into removing stumps and roots. Otherwise, organic matter left over from last year's crops will be plowed under. Because of de-rooting, labor time spent here is probably greater than that spent clearing land for a new field.
2. Field is Plowed using Animal Traction
3. Planting
4. First Weeding using Animal Traction, Hoeing between Lines
5. Second Weeding using Animal Traction, Hoeing between Lines
6. Ridging of Plants
7. Harvest
8. Gathering/Storage

Principal Activities: 7, possibly 8
for a new field.
8, for an old field*

* One additional weeding



1.5. Labor Requirements for Animal Traction On New Field or Aging One-as Presently Practiced

Steps

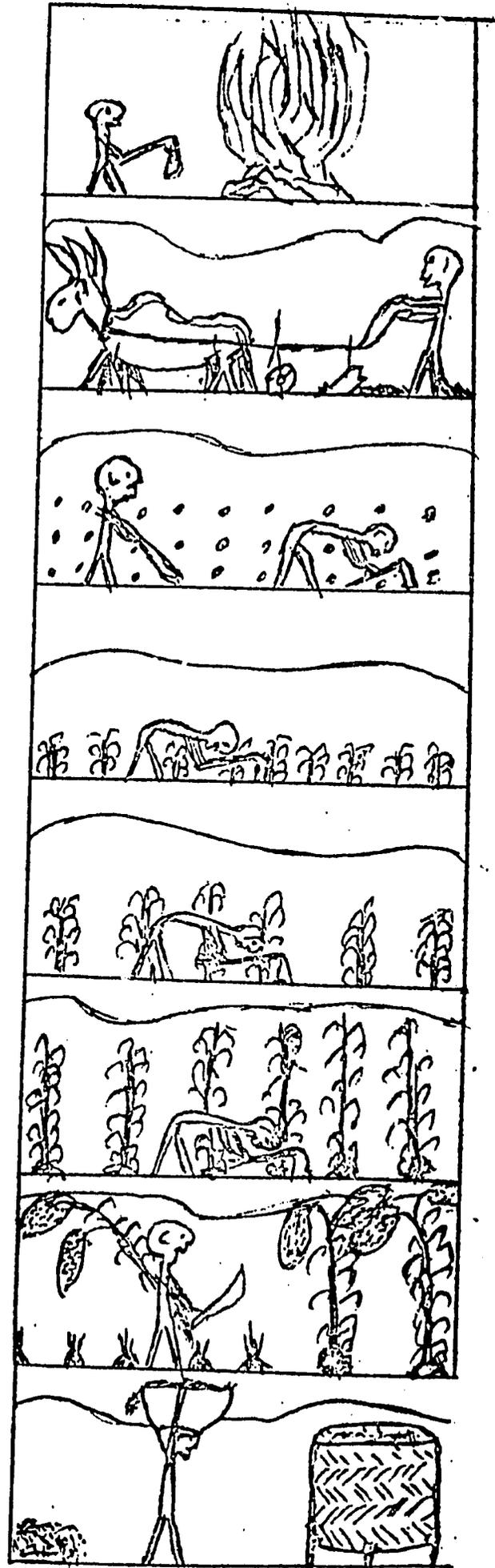
1. Field is 'cleaned' and debris burnt
2. Field is Plowed using Animal Traction
3. Planting (by hand)
4. First Hoeing/Weeding
5. Second Hoeing/Weeding
6. Third Hoeing/Weeding, Plants are Ridged
7. Harvest
8. Gathering/Storage

Principal Activities:

8, if field is new

9, if field is old *

* One additional weeding



5.4.6 Difficulties Encountered with Animal Traction

Animal traction is still a fairly new technology in the Eastern Region. Problems relating to improper training of farmers in animal and equipment use and care, inadequate supporting services on the part of the ORD, and incomplete sets of equipment have yet to be resolved if greater productivity of the farmers and the region as a whole is to be realized.

In a recent survey of medium term animal traction credit borrowers in the Eastern ORD, it was learned that "867 sets of animal traction (528 sets of oxen and 339 sets of donkey traction) have been distributed under the credit program from its inception in 1974 through October 31, 1978" (MSU Six Month Report, Feb. 1979 ,p.8). Furthermore, "of the 700 sets of animal traction distributed before 1978, 21% still have animals that are not trained to plow and 31% have incomplete sets of the animal traction package, that is, at least one vital piece of the package is missing making the entire package unusable" (p.8). The farmers who own the above mentioned equipment represent the major share of farmers with animal traction equipment in the ORD.

The few farmers who do possess some animal traction equipment only have the minimal plow and pair of oxen (or donkey) which is used, if at all, for only initial plowing. As illustrated above (5.4.5), all activity following this first plowing is the same as what traditional farmers have always done.

The animal traction farmer of the region presently plows more land than he can manage to weed using local hoe technology.* It is not uncommon to see such farmers behind in their weeding -- whether this is a field of sorghum or millet, or peanuts. He ends up weeding about the same size field as he did before he had the new technological inputs. The constraint of weeding here determines the size he and his family can control. The difference between this farmer

* Preliminary results of Eastern ORD farm level survey. Intentionally choosing the best practitioners of animal traction in the region for our sample, we learned that of

and his more traditional neighbors is that the former has has some equipment and animals plus a sizable debt with little * or no extra surplus from his fields with which to pay his debts. The traditional farmer has about the same crop (and surplus) yields and no debts. The reality of poor management and backup services of animal traction technology to rural farmers can be harsh.

(1) A Total Animal Traction Package is Required.

The weeder for the animal traction package, in many cases, has not been available to farmers. Yet this is one of the major lacks in equipment by those farmers who do have animal traction and are trying to succeed with it. To permit a farmer access to some of the animal traction package but not all of it not only guarantees that the farmer will experience frustration and lack of noticeable increase of yields, but he will begin to believe the entire system will not be worth the expense involved. He may return what he has.

It is sometimes because of the expense involved that only part of the equipment is bought (or given) on loan in the first place - a situation which is self-defeating. The farmer may rationalize that he will get his oxen (or donkey) and plow paid for first before he gets the rest of the package (weeder, ox or donkey cart). Yet, unless he has another source of income, he probably will not be able to meet the payments required. As the matter stands now, these farmers seem to be working harder, longer than a traditional farmer without substantial increase in income and yields. (See Principal Activity calculations at bottom of last five pages). The introduction and use of weeders seems to be an important next step for serious extension work.

Using animal traction equipment for weeding will make it difficult if not impossible for farmers to intercrop

these only 83% even plowed, and only 16% weeded and 6% ridged their traction equipment (See MSU Six Month Report, Feb. 1979, p.2)

* a small yield increase from plowing is possible

74

cowpeas with sorghum or millet. When vining becomes extensive, cowpeas will be damaged by the second or third weeding or ridging process. Such farmers should be encouraged to have a tuu-bagili / (plot of cowpeas); that is, a homogenous crop on a plot set aside for this purpose. Since agronomically, intercropping a legume crop with sorghum or millet is more sound ecologically than a homogenous crop of grain, some other non-vining type of legume might be able to take the place of the cowpeas. An upright variety of cowpea might be accepted (as farmers prefer to intercrop cowpeas with sorghum and millet). Intercropping of early millet with late millet or sorghum must also be somewhat different from traditional methods (see section on early millet below) if animal traction is used.

In comparing the field labor activities illustrated earlier for different farming systems, it becomes evident when the most serious bottlenecks for labor will occur. The difference between an envisioned animal traction system and local 'traditional' technology farming systems presented is most clearly apparent in the use of animal traction for plowing and weeding.

Assuming that the constraint of weeding can be overcome, the farmer may have a great problem harvesting a large field on time. Either some mechanical harvesting device will have to be introduced, or he will need to acquire additional labor through an 'invitation'. This would only work so long as not too many of his neighbors were in a similar position. Neighbor participation in an 'invitation' of this nature requires the aided farmer to reciprocate in like manner. In no way is the "payment of beer or food" during and after such an 'invitation' seen as total payment. Final and real payment comes when labor reciprocation takes place. If this is true, it is clear that the system of labor 'invitations' must either change to accommodate a new farming system or must die out. One could conceive a landlord-tenant system developing; that is, a progressive, innovative, and prosperous group of farmers drawing their labor needs from a working class.

75

Part of the harvest bottleneck problem can be alleviated by promotion of animal drawn carts with the animal traction package. Not only do such carts facilitate the performance of a multitude of tasks during rainy and dry season *, but they keep traction animals in shape for the farming season. This keeps the animals nearer home where they can also be given better health care and food as well as benefit from their manure. Animal drawn carts are becoming the commercialization/work vehicles of farmers in other ORDs of Upper Volta. I was recently impressed by a village in the Black Volta ORD where the ORD has not succeeded in encouraging more than 2 households to take up animal traction (through a credit program). Yet in this same village over 100 households have purchased (without credit) donkey and ox carts to facilitate their farm labor.

A further, though perhaps less serious bottleneck, is the planting of a large field. Farmers do not presently 'hire' or 'invite' neighbors to help plant. Everyone has their own planting to do. If a mechanical planting device could be introduced which was economical and could be used for the right kind of crops, it would be an important improvement. Such a device would help in that it would reduce planting time even if the amount of land cultivated were not increased. If more land was put under cultivation because of the ability to plant more in the required period (and assuming animal traction was used in plowing and weeding), one would realize an even greater increase in the potential harvest problem already referred to. Because sorghum and millet are the principal crops cultivated, a mechanical planting device would first of all have to be adequate to plant both of these. Maize, peanuts, cowpeas, and other crops represent a very small part of the total land under cultivation by a household. Planters for such crops would therefore be of secondary importance as a time saver.

* Some uses: hauling wood for sale and domestic use; hauling bricks from distant bas fonds (where presence of water made brick making possible); hauling harvested crops from distant farms to storage in village graineries and silos and to the marketplace; hauling water from distant wells or ponds or waterholes; renting out of carts to other village people for above purposes.

In summary therefore, and relating back to the illustrations presented, greater productivity would be immediately realized by farmers if a total package of equipment were in their hands from the very beginning (this includes, a weeder, cart and mechanical planter). Productivity would be much greater than that of farmers using local technology using the same manpower resources, and labor time spent would not be greater. That is to say, greater productivity as well as larger fields under cultivation is possible with animal traction without significant increase in total labor time in comparison to labor expended by non-animal traction farmer. The problem of the harvest bottleneck will seem increasingly important as weeders become more available for traction farmers - especially if planting should in some way become more efficient over present methods.

(2) Further Constraints

The labor requirements for a 'new' field, second year of cultivation and later was shown to comprise 7 principal activities. Sorghum is the major crop cultivated on such a field. Using animal traction equipment as it should be used, 7 principal activities would also be required, possibly 8. Farmers are quick to point out that it is the farmer with the 'new' field (relatively fertile sorghum soils) and only 7 principal activities who, during the rainy season, has the time to cultivate significant amounts of other, cash orientated, crops. The farmer with an aging field who is laboring under 8 even 9 principal activities just to obtain adequate sorghum and millet has little time to adequately exploit other crops. Even if he should have some cash crops, the chances are that he has had to plant such crops too late in the season resulting in lower yields.

Note: The animal traction farmer of most of the ORD presently uses up to 8 or 9 principal activities, suggesting that he also may be having problems cultivating other desired crops in the quantity and variety he might otherwise want.

Since animal traction farmers must plow their land before planting, they must wait until a good rain for the soil to be soft enough for seedbed preparation. Having done this, they must wait until the next big rain to plant. Rains of this kind are generally two to three weeks apart at the beginning of the season (May). The farmer using local technology will have finished most of his major field planting by the time the animal traction farmer starts. Farmers almost always state that it is better to plant too early than too late in the season, since it is impossible to know how the rains will begin each year much less if they will last long enough at the end of the season. The animal traction farmer, by planting two to three weeks late, is very vulnerable to a year of poor rains - his fields may not get a good start early enough. The animal traction farmer in such cases gets poorer yields from his land than his non-AT neighbors. An additional problem is that all those crops which follow his major fields in planting will also be delayed, resulting in declining yields for these as well (they may have passed their optimum time for planting).

Animal traction farmers should perhaps, like their more traditional neighbors upon the good sorghum lands, plant first and do a light plowing and first weeding soon after as the young plants appear. This would assume that a good weeding had been performed at the end of the preceding season before plant weeds in the field could flower and seed. Another possible solution to this problem would be to plow as recommended and then, taking into account the shorter season remaining, plant a more rapid maturing variety of sorghum or millet.

(3) Animal Traction Suggests a Pattern of Community Organization

A compound may consist of one or more family/household units each one of which will have one or more principal fields of sorghum, perhaps several personal fields of sorghum or millet, and a selection of other plots

individually owned by various family members.* These plots may sometimes be adjacent to or near the principal grain fields but more often than not they are scattered. It becomes difficult, if not impossible, for one team of oxen (or even two) to perform all the labor required for all the plots of members of one family group - not to speak of the other family groups within the compound. One of the important constraints is the distance involved between the various fields and plots - some in the village, some down near the marsh, some several kilometers out in different directions in the bush. Animal traction use requires that this system change to a certain degree so that better use of equipment is made without unnecessary loss of time in moving equipment around from one place to another (if it can be done at all during the rainy season).

Farmers might be encouraged to organize themselves so that the fields of members of one family or even a compound are adjacent or at least near enough so that fields may be plowed and weeded efficiently. Farmers in bush settlements during the rainy season will have to organize themselves so that there is some equipment available both in the home village (for village fields and plots) as well as in the farm community.

What could be expected to happen if farmers were successful with the animal traction program? A model farmer located in Jakpangu is now cultivating 14 hectares, ten of this in sorghum and millet. There are 7 persons active in this household. The head of this household, when he obtained his first set of oxen and plow and equipment, purposely relocated his field to an area of unclaimed, formerly uncultivated land some seven kilometers from the village. The land for his previous farm had been nearer the village, but it was on borrowed land. This new land, now under cultivation for the first time. Because of its location,

* Eastern Region farm level survey data results indicate an average of 12.5 fields and plots per household of which 1.6 are principal fields, 1.6 are personally owned sorghum/millet fields, of members of the household other than household head.

a secondary bush residence has been established. There, his two grown sons and their wives stay with their children to work the large field. The household head, an older man, and his wife, remain in the village taking care of their peanut and maize plots, and one small field of sorghum.

This model farmer follows the advice of a good extension agent and seems to do everything he should do. Last year, he claimed that his yield per unit land was larger than in previous years when he did not have the use of animal traction. He also insists that he can cultivate a much larger area in the same time it would have taken him to do a smaller field with 'traditional' technology. His confidence in the new system was proven this year when he purchased a second pair of oxen with equipment. Next year, he said, he intends to increase field size even more. In a few years, he noted, he would leave to long term fallow the area under present cultivation and keep expanding into the 'virgin' bush. This farmer is following the system outlined in 5.4.4 above and his success perhaps justifies animal traction and proves what can be done with effort, a willingness to follow a good extension agent's advice, and money.

It seems reasonable to wonder, however, what will happen if every family group in a village were to follow such a model. It is clear that there would not be enough land near a village to support such expansion indefinitely. Rainy season bush residence would be further encouraged, would actually be necessary. *

The Eastern ORD should anticipate formalizing some system of extension service which centers upon services to farmers, not in village centers (where most village groups are presently formed), but in the Kuajaana (farm communities) where, even now, a major segment of the population resides during the rainy season. Extension service should perhaps

* The 1978 season ended poorly for this model farmer. His crops did not mature as a result of lack of moisture during the grain filling stage. A neighbor without animal traction on comparable land had an excellent harvest. He had planted several weeks earlier !

be based on improving the total farming systems of such farm communities (where land is abundant and available). Members of such groups - if they are to collectively organize for activities of an agricultural nature - should belong to the same farm community. * Some formal organization of a farm community, with members allotted tracts of land of a large enough size (15 - 20 hectares) to permit proper rotation and fallow even under shifting cultivation, would encourage efficient and careful use of land resources. When distance and land availability begin to pose a problem for further increase in size of a farm community, another such community might be established at some distance from the first. A farm community would be seen as the hub of a wheel with fields located around it - thus paralleling the traditional development of a farm community. It would be interesting to apply some form of this model as an experiment connected with resettling some of the oncho-cleared areas of the Eastern region.

* As it is, village groups established by extension agents can have members whose farms are located in different farm communities making group participation in some activities difficult if not impossible because of distance involved. More serious perhaps is the fact that many farmers who might otherwise be members of a village group are not able to do so because of the focus on the village itself as the site for organization of farm activity.

5.5 The Structure of the Gourmantché Household as it Relates Specifically to Field/Crop Ownership

Three farm level surveys have been completed recently which, when placed within the perspective of Gourmantché conceptual categories, provide insights into some of the dynamics underlying the farming systems of these people.*

(1) The first, completed two years ago by Josef Angehern, a Swiss volunteer, took as a sample 15 households in each of five villages of the Fada N'Gourma region.

(2) A second, more intensive study was conducted by FAO farm management expert Stuart Gaudin (1977, BAEP) among 23 Gourmantché households in 11 villages located in most of the major ecological regions of the Eastern region. His sample was necessarily limited by personnel constraints. Unlike the BAEP sample (below) however, which was randomly selected, his households represent (in the opinion of village leaders he asked) the very best farmers of the 9 villages worked in. Of these, 46.7% of the households possessed some form of animal traction equipment. His study is therefore interesting to compare with the BAEP survey results. In many instances data results are very similar, in others they differ. These differences can often be explained by the fact that his farmers are superior farmers whereas (with the exception of the animal traction sub-sample) the BAEP households represent the average farmer.

(3) The third survey is the 1978-1979 farm survey conducted by the Applied Research Section of the Eastern Region's Bureau of Economic Analysis and Planning (BAEP). The base line data provided in this study is to be used in

* Other surveys have been conducted in the region by various Ouagadougou based organizations (SAED and CVRS).

All three surveys mentioned here were part of the research efforts of the Eastern ORD's research office (B.A.E.P.). The FAO financed Gaudin study will from this point on be referred to as the B.A.E.P.-77 Survey while the USAID financed Integrated Rural Development Project's farm level survey will be referred to as the B.A.E.P.-78 Survey.

87

designing a regional development plan for the Eastern Rural Development Organization (EORD). The BAEP employs the services of thirty-eight persons including five AID contractors, including myself. The survey included 370 Gourmantché farming households.

The following discussion attempts to bring together some of the significant findings of these surveys. Field size data is not yet available for the 78-79 study. Gaudin's field data is considered of such high quality so as to serve as reasonably accurate statistical indicators of the relative importance of specific crops to a household.

I have re-analyzed Mr. Gaudin's data in an attempt to aggregate it in what would seem to be more culturally appropriate categories. * Some of the dynamics involved in land use by various members of a household become more evident. Which members are more likely to cultivate specific crops becomes more apparent.

Appendix V presents the results of this further analysis of Annexe I (15 pp) of Gaudin's study. This data has been aggregated to give the outlines of the Average Household in Table I below. Percentage figures are given of the total land cultivated per crop and per category of family member. I reorganized the family data into their relevant socio-economic groupings, which are:

- (1) the household head
- (2) all the female members of the household (daughters, wives, mothers, sisters)
- (3) all the other male members of the household (sons, 'retired father', possible brothers - usually unmarried, live-in laborers)

* He gives, for instance, hectares per crop cultivated for each of the households sampled. By re-analyzing his data it was possible to determine the percentage of land cultivated per crop per owner category - thus making the data available for comparison with BAEP data presently available. His contrast of "cash crops" versus "basic food crops" is difficult to interpret in relevant cultural terms. More appropriate is the contrast sorghum/millet/maize versus all other crops. This different interpretation accounts for the slightly varying figures given below (eg. what Gaudin gives as 5.6 ha. for 'basic food crops' when reanalyzed in appropriate cultural categories gives 5.3 ha. for sorghum/millet/maize. The .3 ha. difference belongs in the "other

82

In re-analyzing Gaudin's data, I have excluded information from 2 non-Gourmantché villages (Sudigi and Tangaye) (consisting of 4 households) and Nagili. While the latter is an important Gourmantché village and included 3 households, subsequent study by Gaudin and myself demonstrated that information was incomplete and unreliable.* This left 21 households from which good research results justify further analysis.

To enhance our ability to compare Gaudin's data with '78-79 BAEP survey results, several of the basic BAEP farm survey questionnaires were used with Gaudin's (BAEP-77) sample. During this exercise, we determined that there had been an under-enumeration of most household plots (okra, peppers, tobacco, manioc, sweet potatoes) so that percentages here should be higher (about 3% underestimated for 'cash crops' and 1% for sorghum/millet). One must not underestimate the importance of crops which appear only in association with other crops and so do not figure in to field plot size calculations (ie. sesame, cowpeas, early season okra, roselle, kenaf).

* Gaudin's figures were readjusted for the 21 households reanalyzed. Instead of the average area per household being 7.0 ha., it is 7.09 hectares.

5.5.1 Basic Supporting Data

Average Number Persons per Household	: Gaudin notes 6 'working units'*
	: 10.4 persons in Animal Traction Household **
	: 7.7 persons in random sample**
Average Area Cultivated Land per Household	: 7.0 hectares(ha.)*
Of This: 79% constitutes basic food crops, or	: 5.6 ha.*
21% constitutes cash crops, or	: 1.5 ha. *
Average Number of Fields and Plots per Household	: 19.9 fields/plots*
	: 12.5 fields/plots**
An Adult Farmer Cultivates, on the Average an Area of	: 1.18 ha.
Average Age of Gourmantché Household Head	: 45 years*
	: 44 years**
Average Age of Household Head when he Obtained his First Principal Field (Major Sorghum/Millet Field)	: 22 years *
	: 25 years **
Average Number of Principal Fields Cultivated per Household (since the First Principal Field)	: 3.8 Fields **
Average Number of Years These Principal Fields are Cultivated	: 5.4 years **

* From Stuart Gaudin's data, Programme Experimental de Gestion Des Exploitations Agricoles, BPA, juin 1978, (ORD de l'Est, Fada).

The 47% animal traction farmers which make up this sample represent farmers, most of whom have only just begun to possess such equipment. The animal traction program in the ORD is not old enough or successful enough to date to reasonably expect major differences between AT farmers and non-AT farmers - though data does show some potentially important differences and trends to keep an eye on. I do not expect to find substantial differences in field size data between Gaudin's data and BAEP data (though the latter data will be appended to this document when it becomes available.). BAEP averages should be somewhat lower than Gaudin's averages, representing, in my judgment, the basic difference between superior and average farmers.

** BAEP farm level survey data researched by Dr. Swanson. For details on this data, see Gourmantché Agriculture, Part I, April 15, 1979. There data are disaggregated by villages in Appendices II and III

25

TABLE I: Percentage of land under cultivation per crop by Owner
Category in 8 villages among 21 households *.

Average Number of Hectares per Household 7.09	Sorgho	Petit Mil	Sorgho & Petit Mil	Mais	% TOTAL	Soja	Arachides	Coton	Pois de Terre	Riz	Ignames	Indigo	Sesame	Potatoe Luce	Piment	Combo	Manioc	Jardin	Sous- Total %	% TOTAL
<u>Average Household</u> Household Head	28.1	16.9	9.5	2	56.50%	4.2	2.1	1.7	.2	1.3	.4	.5	-	.1	-	-	.2	.1	10.8%	67.30%
Wives, Daughters	2.7	4.7	1.2	.15	8.75%	2	5.3	.1	.2	.1	-	-	-	-	-	.3	-	-	8.0%	16.75%
Sons, Other Men	1.7	7.2	-	.05	8.95%	3	.9	-	-	2.6	-	-	-	-	-	-	-	-	6.5%	15.45%
Total	32.5	28.8	10.7	2.2	74.20%	9.2	8.3	1.8	.4	4.0	.4	.5	-	.1	-	.3	.2	.1	25.3%	99.50%
Est. % Destined For Sale	-	-	-	-	23.35%	8%	6.5%	1%	.1	3%	.2	.3	-	-	-	-	.1	-	19.2%	42.55%

* This Table (an aggregation of data from Appendix V) reflects the 1977 season. One should expect the ratio between peanuts and soybeans to have changed this year (1978) as a reflection of a large price drop of the latter this year (1500 CFA/tin to 800-1000 CFA/tin). The rice percentage should be higher this year than last, reflecting steadily increasing cultivation of this crop in low areas.

A certain under-enumeration was found in these figures as well, especially in what usually are considered less important crops (okra, peppers, sweet potatoes, manioc). Associated crops do not show up on these percentages. Had some of these been cultivated as homogenous plots they would constitute a higher percentage of total land cultivated than some of the crops presently listed. The absence of sesame, cowpeas, roselle, and kenaf are particularly important in this regard.

5.5.2 Interpretation of Survey Data

A number of basic observations may be made from Table I.

(1) On the average:

- 74.2% of all cultivated land per household is used for sorghum, millet, maize
- 25.3% of all cultivated land per household is used for all the other crops combined.

FIGURE 12

Sorghum/Millet/Maize vs. All Other Crops as Percentage of Total Cultivated Land Per Average Household

74.2% *	25.3%
Sorghum Millet Maize (2.2%)	All Other Crops
Hectares: 5.3	1.8 ha.

In the study of Josef Angehrn,** the average household used:

- 78.1% of all cultivated land for sorghum, millet, maize
- 21.95% of all cultivated land for the other crops combined.

(2) Table I also informs us that, on the average:

(a) Of all land cultivated per household for sorghum, millet, maize,

76.1% is possessed by the head of the household (of which maize is 2%)

11.8% is possessed by female members of the household (of which maize is .15%)

12.1% is possessed by male members of the household (of which maize is .05%).

* Possible associated crops such as cowpeas, kenaf, roselle, rainy season okra, sesame, would not account for much more than 2% of the total area.

** Josef Angehrn, Enquete Agricole dans les cinq villages de Developpement Communautaire, Kikideni, Konnaadigu,

(b) Of all land cultivated per household for all the other crops combined,

- 42.7% is possessed by the haad of the household
- 32.6% is possessed by the female members of the household
- 25.7% is possessed by the other male members of the household.

Figure 13: Sorghum/Millet/Maize and All Other Crops by Percentage of Ownership per Category of Family Member

Sorghum/Millet/Maize		All Other Crops
76.1% Family Head (maize 2%)	8% 42 ha.	42.7% Family Head .77 ha.
	4 ha.	31.6% Family Women .57 ha.
11.8% Fam: women .63ha.	12.1% Other Fam: Men .64ha.	25.7% Other Men .46ha.

(3) Sorghum and millet cultivated by persons other than the head of the household are found upon the suali-kuani/ (personal sorghum and/or millet fields) (see Document No.7, p.20) of these people. * The produce from such fields is intended for the market place. With the money from such sales, family

* One may find households of more than one nuclear family. In such cases the heads of each family (ie. the husbands) may have their own kuani/ (sorghum and/or millet fields), the produce of which is reserved for the household's consumption. These men do not spend time cultivating the field of the head of the household as a consequence. If this were the case, their own fields would then be categorized as a special kind of kuanu. The wives or sons of these men may have their own personal grain fields as well.

members can buy the few personal things they need. Women may buy a cloth or some kitchen items, or perhaps a goat or sheep; younger men may buy clothing, small work implements, pay their own taxes, buy some small animals.*

Maize is rarely seen as a cash crop and the 2.2% represented in Figure 12 is in most cases entirely consumed by the household.

From Figure 13 above, one may state that for any normal year, the average Gourmantché household may be expected to sell at least 31.5% of its total sorghum/millet production (11.8% + 12.1% + about 8% - which is 10% of the household head's grain field production). This represents production from approximately 1.7 hectares.

Most of the sorghum and millet sold during and immediately** after harvest time (November and December) comes from the personal fields of the women of a household. The other men of the household (not counting the household head) tend to speculate with the production from their grain fields (the 12.1% in Figure 13) - not selling until during the first three months of the new year.

The head of a household faces a different set of problems entirely which effect his motivation to sell or not sell. It is his obligation to see that members of his household have enough food reserves for the year and that taxes are paid. He will be very cautious about selling any of the produce from his large field(s) (the 76.1% of Figure 13), upon which the other members of the household have worked in varying

* As small animals accumulate, they can be exchanged for larger ones (cattle, donkey). Eventually when major purchases or expenses arise (taking a wife, buying bicycle, roofing pan, etc.) they can be converted to cash. Household herds do not exist primarily as a source of food when needed but as a means of storing wealth.

**
It is rarely sold at one time however. A women may sell only a large calabash full once or twice a week at some marketplace. Men are more apt to sell larger quantities at a time.

degrees. * In an average year, however, he should produce an excess of about 10% of subsistence needs, representing about 8% of the grain fields he controls.

Because the interests of the household are involved should the family head sell sorghum or millet from his major fields, he will often, without informing anyone else, remove a tin or two from time to time to meet unexpected expenses for which he can not raise the money elsewhere.** Because over-selling and running out of stocks will result in much insult and loss of face with friends and family alike, the farmer is cautious.

During a year when harvests are poor, the head of the household's 8% will clearly not be sold. If he procrastinates too long in obtaining the needed additional reserves, he can expect to find that the other family members

* If sons or wives give all or most of their cultivating time to these fields and as a consequence do not have much or any time left over to have some personal fields or plots, the head of the household will be obligated to pay their taxes for them, and, if he is a good husband and father, give them some spending money. If a son or wife, in addition to helping the household head on his field, also have their own personal fields or plots, the family head will attempt to have them pay at least part of their own taxes. If one son should spend all his time tending the livestock of the household, his recompense will be a young animal from the flock for his own.

** Farmers generally do not like outsiders prying into what they consider their secret (Qasiili) affairs. One reason the BAEP village survey experienced considerable under-enumeration of fields and plots was because of this. Farmers feared we intended to somehow take part of their produce. In the same manner, but to an even greater extent, farmers very clearly do not want to tell an outsider anything about their cash and stock reserves, their purchases and sales. It is certain that they would not inform anyone fully of the kind of transaction mentioned above. Information gleaned from questionnaires designed to obtain this kind of data must therefore be looked upon with great caution. These factors must be taken into account when it is later suggested that the produce from 42.55% of all cultivated land is used for the purpose of produce sale! It is possible given an average year. Some farmers sell above 50% of their produce. This method of determining potential household incomes and sales seems to me to be far more reliable than the direct questionnaire approach.

19

have already sold their produce. * Such family members generally prefer to sell early in the post-harvest season. To do so, they are assured of cash for the needed supplies. Should the family head want their sorghum or millet to add to the household's reserves, he will have to purchase it from them.

An example will illustrate. A wife may agree to sell her husband most or all of her grain at a much reduced price - if he asks in time. It is understood that the husband (family head) wants this grain for household consumption purposes. He would not get it for any other reason. Should they agree on a price of 600 CFA/tin, the husband will probably pay only 500 CFA, promising the rest later. He does not pay later, nor does the wife say anything about it since she is, after all, helping to eat it!

Following this course of action, the wife does not get a good price for her sorghum or millet, nor does she get the amount agreed upon. This is why she, and other members of the household like her, prefer to sell early on the open market - even though prices are lower at this time than they will be later. They want and need their money quickly and do not usually feel responsible to see that grain reserves are sufficient for the household's needs during the coming year. Once sold, the household head will find it almost

* With the exception of the major sorghum and/or millet fields controlled by the household head, all other fields and plots are individually owned by the various members of the household. Even the 42.7% of 'other crops' held by the family head (see Figure 13) are peanut, soybean, tobacco, cotton, etc. plots he himself cultivates without the help of others. If others do help, they must be paid in one form or other (cash, beer, food, reciprocal hoeing). No one else in a household needs to know (and probably does not know) what money individuals get for the sale of their crops.

impossible to get any of this money out of family members. They will say they don't have any, or it is already spent.*

A husband should not, therefore, procrastinate in obtaining needed reserves should the major field(s) produce poorly. Should he sell off too much of the produce of such fields for his own ends, it will be his problem to come up with money or food when the going becomes difficult. He will either have to use the money obtained from his own cash crops or borrow money or grain against next year's crop. Some farmers live off the good will of relatives.

(4)

Because the head of a household is limited in his ability to raise money from his sorghum and/or millet fields, it might be expected that he would own a major share of the 'other crops' cultivated by that household. This, in fact, is the case.

In the 'other crops' category of Figure 13 approximately 76% on the average, of the total produce of a household is intended for sale during any given year. ** Household consumption requires about 24%. Interestingly enough, given a bad year, it is only out of the 42.7% owned by the family head that one finds money going to purchase additional grain stocks. Money earned from the 'other crops' category by other members of the household is rarely if ever, used for this purpose.

* This seemingly hard-headed and selfish orientation by family members towards each other should be seen in terms of Gourmantché generosity. These same persons will give both cash and produce to certain categories of people in need (at times of marriage, funerals, initiation camps, guests, non-household extended family members in need). One should note that there is a built-in mechanism for resource sharing by family members. The consequences of not following this must be paid by the household head.

** See estimation calculations for average households on Table I. This estimation was worked out in conversation with various sample farmers.

- (a) On the average, given a normal year *, of all cultivated land used per household for sorghum/millet/maize,

the produce of 68.5% of the land is used for household consumption
 the produce of 31.5% of the land is intended for sale

- (b) On the average, given a normal year, of all cultivated land used per household for all other crops,

the produce of 24.1% of the land is for household consumption
 the produce of 75.9% of the land is intended for sale.

Figure 14: Household Consumption VS Produce for Sale

Sorghum/Millet/Maize	Other Crops
68.5% Household Consumption	24.1% Consumption
	75.9% Sale
31.5% Sale	

This informs us further that:

- 57.45% of all cultivated land for the average household is intended for consumption (approx. 3 ha.)
- 42.55% of all cultivated land for the average household is intended for sale (given a normal year) (approx. 2.3 ha.)

These percentages refer to the production of the superior farmers in the village^s sampled. One would expect a slightly higher percentage of land used for basic consumption purposes in the more 'average' Gourmantché household.

* A farmer can count on some years not being too good and his overproduction of about 8% on his own sorghum and/or millet field might perhaps be seen as the buffer for such variation. A normal year would be a year of some excess when this 8% would not be needed for consumption purposes. A farmer would consider the 'loss to consumption' of his 8% as a 'poor' year. A 'bad' year will require seeking out further stocks from other family members. To go outside the household is worst of all.

(5) One last observation may be made from Table I:
 Figure 15 below indicates that of the total land under cultivation for the average household:

- 67.3% is under the control and possession of the head of that household (4.8 hectares out of 7.09)
- 16.75% is under the control and possession of the women of the household (1.2 hectares out of 7.09)
- 15.45% is under the control and possession of the other men of that household (1.1 hectares out of 7.09)

FIGURE 15

Total Land Cultivated Per Household and Percent by Category of Family Member

67.3 % Head of Household 4.8 ha.	Household Women 16.75 % 1.2 ha.
	Other Household Men 15.45 % 1.1 ha.

(6) Summary

The preceding data are drawn from a statistically small sample for an area as large as the Eastern Region of Upper Volta. Its principal value is that these households represent the better farmers of the region - whether or not they use animal traction.* In addition to Gaudin's own study (B.A.E.P.-77), some of the farm level survey questionnaires which were used with the B.A.E.P.'s 370 randomly selected households (B.A.E.P.-78) were also used in 1978 with his sample of Gourmantché households. Some comparison between these two groups is therefore possible.

* I have suggested that, for the present at least, there is little or no difference in the amount of land cultivated between animal traction and non-animal traction farmers.

BAEP-77 data include good field size data, whereas similar data is not yet available for the BAEP-78 study.

Good farmers whether or not they have animal traction, tend to attract to their households more members (often from the extended family). Increased size of household linked with good and constant labor practices seem to lead to more efficient use of time and somewhat greater productivity. The average number of fields and plots per household for the BAEP-77 sample (19.9) is considerably higher than the BAEP-78's sample of 'average' farmers (12.5). Though some of this difference is due to the larger households of Gaudin's sample, there is also some increase in land cultivated per person.

It will be these kinds of farmers who could benefit most by the extension services of the ORD. These are the farmers, who, already being above-average farmers, could greatly increase their productivity - if they can be encouraged to use animal traction technology and other extension services properly and if the government supporting services and price structures are such as to make this economically feasible.

One problem that can already be identified, is that the village (pre-cooperative) groups formed by extension agents in most areas have little impact on just these kinds of farmers - especially to the extent that group membership requires participation in working a collective field. The average age of the Gourmantché household head is about 44 years (BAEP and Gaudin data), yet the average age of village group members is much lower than this. * This suggests that ORD village groups are not being formed on the basis of the society's basic farming unit: the household. Some other 'group' must be forming. The nature of this new 'grouping' will be discussed below. By not organizing and supporting village household leaders, rural development

*I would estimate that the average age of village group members would be between 30-35 years, possibly lower.

workers lose not only the cooperation of some of the village leadership, but also the labor and financial reserves that these people can call upon.

A rough calculation of household consumption vs. produce sale for Gaudin's sample of above average farmers suggests that about 44% (about 3.1 ha. of the 7.09 ha. for the average household) of the land presently under cultivation could give yields resulting in disposable income for the family members. Breaking this down into household member categories, we learn that:

- 14% is under control of the household head
- 16% is under control of the family women
- 14% is under control of the family men *

We have noted that this could only be true of a 'normal' year. A poor year could wipe out most or all of the household head's 14% of 'excess' land (the produce from this land would be needed for consumption or purchase of food for consumption). Other household needs like farm implements would need to be purchased. The 16% and 14% for the other family members would probably result in less than 8% and 7% per person.** There is therefore, in fact, very little disposable income given even a normal year and the basic needs of individuals within the household.

All this is to indicate that an increase in the animal traction farmer's ability to manage his equipment and land resources properly would result in a substantial increase in the amount of land that he (and members of his family) could use for produce sale (assuming that household consumption per person would not increase significantly). One

* Example of calculations: Household Head: 4 ha. (8% of 4 ha. - see Fig.13) plus .58 ha. (75.9% of .77 ha. - see Fig.14) equals .98 ha. divided by 7.09 ha. equals 14%.

** Gaudin's average household had 6 "working units", meaning 1 household head and at least five other family members (male or female). In his calculations, two children between 8 and 13 might produce the labor equaling 1 'working unit' - the expected daily labor of one adult.

would expect higher percentages of land resources to be used for produce sale. One would also expect that the 'average' Gourmantché household would not have quite as large a margin of safety (the percentage of land intended for producing an excess) as the farmers of Gaudin's sample. Survey data (78-79) later to be reviewed, substantiates this observation.

The degree of economic rationality is clearly linked to marginality as defined by the state of food stocks at the conclusion of an agricultural season. What a particular farmer decides to plant and what he actually does plant depends most on when rains come permitting planting (and hopefully no replanting), if his land is fertile, if weed growth is not excessive, and if physical well-being is anticipated. If time permits, if the season has not progressed too far and seed is on hand, if cleared land is available, it is certain that a farmer will maximize his production by cultivating a diversity of crops (the produce of which he thinks he can sell).

If the farmer is to maximize his production, one might expect him to pick the single most profitable crop - for instance sorghum. Yet, he does not, indeed can not, for a number of reasons.

(1) Diversity in crops is a form of insurance in itself. To concentrate on what one might consider the 'single most profitable crop' is to risk disaster if the season ends poorly for that crop, giving poor yields, or the market price for this crop should suddenly drop. Even though maize might be a good cash crop, to have concentrated on it in the Fada-Bilanga-Piala and Bogandé regions last year would have meant total loss.* Many village groups were harmed last year by concentrating on soybeans. People eager to make quick profits cultivated twice the amount of land as the year before. With the halving of the market price by the harvest season, twice as much land only gave these

* The maize that is cultivated is almost totally consumed by the household during a time of year when food reserves may be low. To lose this crop was therefore very serious.

farmers the same income as they had last year - with half as much land and labor. Diversity could have helped them,

(2) Planning for a new agricultural season takes place long before the start of the first major rains of the new season. The land must be cleared, the seed grain obtained, and proper farming implements repaired. By the time the farmer and his household have planted the planned crops for the year plus any normal surpluses, the season is already well in progress. By the time the farmer realizes that this year is going to be a really good year, he is already limited in the manner in which he can take advantage of the information. He is limited in what crops he can consider and what kind and how much land he can put into extra production. He may not have enough suitable cleared land for sorghum - and not enough time left to clear and plant. An abandoned (fallow) field on the other hand might be suitable for peanuts or soybeans - or he may decide to put in some cotton. The time it would take to clear off the few small bushes and clumps of grass would be easier than clearing new land. On the other hand, he might take time to clear a small plot from the bush land for cowpeas or cotton. Or he might have time this year to make the necessary mounds for sweet potatoes -if he can get some vines for planting. *

(3) Maximizing income through crop diversity is also an economic response to short-term cash restrictions. If one can not be assured of the market ability of some crop in order to buy the list of goods needed, then a farmer is wise to have at least enough manioc, sweet potatoes, okra, gourds, kenaf, etc. for the needs of his own household. Then he does not need to purchase the twine he knows

* A good extension service can aid the farmer in at least providing him with the seed grain the farmer might not otherwise be able to get during the opportune time.

he will need for mat weaving and house repairs, for calabashes for domestic use, various herbs for supplements to daily meals. Purchasing some of these products when they are available may also mean selling some of his own surplus at a time when prices are at their lowest.

The number of people which make up a household can differ greatly in the Eastern region. Yet the actual amount of land a working member of this household can cultivate appears to be about the same. Farmers seem to have reached the upper limit of land they are able to cultivate within the restrictions of present (local hand labor) technology and physical capabilities. For the best farmers, this limit seems to be about 1.18 ha./person. Efficient use of animal traction technology can be expected to raise this substantially.

5.6

Crop Distribution and Owership

The crops and crop varieties farmers cultivate in different parts of the Eastern region vary considerably from areas of low rainfall to those of higher rainfall. Soils of some areas are better suited to certain types of cultivation than others. Besides these and other similar physical/climatic causes for variation, considerable inter-cultural variation exists as well. Crops which women in one area consider their domain, for example, will be found to be dominated by men in another.

For these reasons there is always some danger in aggregating information for a region as a whole. Important sub-region and village-level differences can be overlooked - leading to misrepresentation. Aggregated data presented in the body of this study are therefore always given in its disaggregated form at the village level for those whose particular interests require such data.

Aggregation of properly researched and verified data can have the useful purpose of giving a broad understanding of farm systems which can serve as a base for planning at the regional level. The Eastern O.R.D.'s B.A.E.P. farm level survey was designed with regional planning purposes as a priority.

Before presenting a region-wide description of crop and ownership patterns, an attempt has been made to separate somewhat these characteristics for the major sub-regions of the O.R.D. This is given in Figure 16 below.

FIGURE 16

Regional Crop Variations and Ownership Patterns

Jakpa/Madaaga

Early Millet (M)
Sorghum (1,4,7,5a,8,10,18,)(M,F)*

Pama/Sudigi

Early Millet (M)
Sorghum (2, 3, 4, 6, 36)(M,F)

Pada/Jakpangu/Ugalu

Sorghum (3,5,6,8,10,22)(M,F)

Iancaali/Macakoali

Sorghum (3,6,9,5e)(M,F)

Piala/Bilanga/Bogandi

Sorghum (3,5,6,8,10,22)(M)

All Four Above Regions

Late Millet (M,F)
Sweet Sorghum (M,F)
Rice (M,F)
Peanuts (M)(F too now)
Earth Peas (F)(M too now)
Maize (M,F)
Cotton (M)(some old women)
Okra (F)
Kenaf (M)
Roselle (F)
Soybeans (M,F)
Sauce Herb Plants (F)
Red Peppers (M)
Eggplant (M)(some old women)
Tobacco (M)
Cowpeas (M,F)
Calabash (M)
Squash (F)
Sweet Potatoes (M)
Manioc (M)

Late Millet (F)(also M)
Peanuts (F)(M too now)
Earth Peas (M)(F too now)
Maize (M)
Okra (F)
Kenaf (M)
Roselle (F)

Tobacco (M)
Cowpeas (M,F)
Calabash (M)
Squash (F)

Sesame (M,F)

Some farmers may also have:

Banana (M)
Sugar Cane (M)
Yams (M)

Gobinangu Region

Garden produce may be found
in large towns of each of
these regions.

Some farmers may also have:

Cotton (M)
Soybeans (M,F)
Manioc (M)
Red Peppers (F)
Sweet Sorghum (M)

A farmer living near a
marsh area may also have:

Sweet Potatoes (M)
Rice (M)

* Numbers refer to varieties of Sorghum
M = men cultivate this crop
F = women cultivate this crop
M/F = both men and women cultivate the crop

People of different societies divide up the reality they perceive around them in often very different ways. For instance it is impossible to find one word in English or French which corresponds to what the Gourmantché mean by di (sorghum and millet). Based on ethno-linguistic research, an attempt was made to define the manner in which Gourmantché farmers perceived the land they cultivated (eg. What kind of fields and plots do they name?) Results of this research were provided in Gourmantché Agriculture, Part I, Land Tenure and Field Cultivation, B.A.E.P. Document No. 7, April 15, 1979.

Farmers, of the 370 Gourmantché households of the E.O.R.D.'s B.A.E.P.* socio-economic farm level study for the 1978-1979 farming season, were asked to identify from a questionnaire coded list all the fields and plots they cultivated the previous year. Since these questions were administered in early May 1978, we asked what the farmer expected to cultivate that year. The specific crops (including varieties of sorghum and millet) were obtained. This was verified, for what amounted to 4,639 fields and plots, some four months later. Crop association, soil type, topography, ownership, labor time, as well as crop rotation data (over a period of six years) was noted for all these fields and plots. Some of these data are aggregated in Tables II and IV below, and given in disaggregated form in Appendix VI and VII.

* Eastern Rural Development Organization's Bureau of Economic Analysis and Planning (under the Ministry of Rural Development).

5.6.1 Field and Plot Type by Household Member Category

Table II A below presents information gained from the B.A.E.P.-78 survey's random sample of 370 Gourmantché households. These households should be considered to represent the 'average' farmer. Table II B, on the other hand, gives similar type information for the B.A.E.P.-77 survey's select group of 23 (above average) Gourmantché households.* These tables provide answers to the following questions.

- (1) Which fields and plots are significant to various household members?
- (2) What is the ranking per field and plot for the 4,639 fields and plots identified in the survey (BAEP-78)?
- (3) What kind of crops are most important to various household members?
- (4) What kinds of fields and plots are most apt to be found on land not belonging to the households cultivating them?
- (5) Which household members control the most or the least number of fields and plots?
- (6) Finally, what differences are significant between the B.A.E.P.-78 Survey's average farmer and the B.A.E.P.-77 Survey's good farmers with relation to field and plot ownership?

* This information is drawn from the 1978 B.A.E.P. Survey questionnaires which were administered to Gaudin's (B.A.E.P.-77) Gourmantché sample.

TABLE IIA

Field & Plot Type by Household Member Category
B.A.E.P.-1978 Survey/370 Gourmantché Households

Field & Plot Type	Household Head		Household Women		Household Men		Percent Borrowed		Total % of Total	
	%	No.	%	No.	%	No.	%	No.	No.	%
Personal Sorghum/ Millet Field	6%	38	65%	389	29%	173	19%	114	600	13.0%
Principal Household Sorghum/Millet Field	91%	520	5%	29	4%	25	26%	150	574	12.4%
Compound Plot	26%	149	66%	369	8%	45	29%	165	563	12.0%
Peanut Plot	28%	150	59%	332	13%	69	26%	139	541	11.7%
Okra Plot	2%	9	97%	403	1%	5	28%	116	417	9.0%
Rice Plot	45%	113	28%	70	27%	66	20%	51	249	5.4%
Maize Plot	89%	212	3%	7	8%	20	22%	52	239	5.2%
Earth Pea Plot	35%	79	56%	125	9%	21	25%	56	225	4.8%
Village Sorghum/ Millet Field	72%	146	19%	39	8%	17	29%	58	202	4.4%
Front-Compound Plot	97%	173	-	-	3%	6	35%	62	179	3.8%
Soybean Plot	45%	69	43%	66	12%	18	40%	61	153	3.3%
Manioc Plot	81%	113	5%	7	14%	20	39%	54	140	3.0%
Cotton Plot	76%	72	2%	2	22%	21	24%	23	95	2.0%
Local Variety Sauce Herb Plot	1%	1	99%	86	-	-	46%	23	87	1.9%
Sweet Potato Plot	63%	54	3%	3	34%	29	35%	30	86	1.8%
Roselle Plot	8%	4	90%	45	2%	1	42%	21	50	1.1%
Dry Season Garden	91%	40	-	-	9%	4	20%	9	44	1.0%
Tobacco Plot	79%	34	2%	1	19%	8	23%	10	43	.9%
Yam Plot	69%	27	-	-	31%	12	23%	9	39	.8%
Red Pepper Plot	86%	30	8%	3	6%	2	31%	11	35	.8%
All Other Plots Combines: Eggplant, Cowpea, Indigo, Kenaf Sauce herbs, etc. *	56%	55	28%	16	6%	7	31%	17	78	1.7%
Average/ Total	45%	2088	43%	1982	11%	569	27%	1268	4.639	100%

* The fact that few plots of these crops exist doesn't mean that they are unimportant. For example, Cowpeas, sesame and kenaf, in terms of domestic consumption and commercialization, are very important, yet they usually appear only in association with many of the fields and plots listed above.

TABLE IIB

Field and Plot Type by Household Member Category
 B.A.E.P.-1977 Survey / 23 Gourmantché Households

Field & Plot Type	Household Head		Household Women		Household Men		Percent Borrowed		% of Total	
	%	No.	%	No.	%	No.	%	No.	No.	%
Personal Sorghum/ Millet Field	2%	1	64%	36	34%	19	-	-	56	12.0%
Principal Household Sorghum/Millet Field	85%	44	13%	7	2%	1	-	7	52	11.0%
Compound Plot	18%	9	71%	35	10%	5	10%	5	49	11.0%
Peanut Plot	19%	12	62%	39	19%	12	13%	8	63	14.0%
Okra Plot	2%	1	98%	43	-	-	16%	7	44	10.0%
Rice Plot	53%	19	14%	5	33%	12	17%	6	36	7.8%
Maize Plot	93%	14	7%	1	-	-	20%	3	15	3.3%
Earth Pea Plot	29%	10	68%	23	3%	1	24%	8	34	7.4%
Village Sorghum/ Millet Field	80%	12	13%	2	7%	1	20%	3	15	3.3%
Front-Compound Plot	93%	13	-	-	7%	1	7%	1	14	3.1%
Soybean Plot	34%	12	52%	18	14%	5	14%	5	35	7.6%
Manioc Plot	91%	10	-	-	9%	1	27%	3	11	2.4%
Cotton Plot	100%	7	-	-	-	-	43%	3	7	1.5%
Local Sauce Herbs	-	-	-	-	-	-	-	-	-	-
Sweet Potato Plot	100%	6	-	-	-	-	67%	4	6	1.3%
Roselle Plot	-	-	100%	1	-	-	-	-	1	.2%
Dry Season Gardens	100%	9	-	-	-	-	56%	5	9	2.0%
Tobacco Plot	-	-	-	-	-	-	-	-	-	-
Yam Plot	100%	1	-	-	-	-	100%	1	1	.2%
Red Pepper Plot	67%	2	33%	1	-	-	-	-	3	.6%
All Other Plots Combined: Eggplant, Cowpea, Indigo, Kenaf, sauce herbs, others *	100%	7	-	-	-	-	14%	1	7	1.3%
Average/Total	41%	190	46%	210	13%	58	15%	70	458	100.0%

* The fact that few plots of these crops exist does not mean that they are unimportant. For example, cowpeas, sesame and kenaf, in terms of domestic consumption and commercialization are very important, yet they usually appear only in association with many of the fields and plots listed above.

(1) Of the 4,639 fields and plots possessed by the 370 Gourmantché households (B.A.E.P.-78 survey),

- 45% were possessed by the head of the household
- 43% were possessed by the women of the household
- 12% were possessed by the other men of the household

For the B.A.E.P.-77 survey, the figures were 41%-46%-13% respectively.

The B.A.E.P.-78 data do not refer to field size for these categories of people. This is available for the B.A.E.P.-77 data however (see Figure 15 above). Therefore, of the average household's total area under cultivation (7.09 ha.):

- 57% (4.8 ha.) is controlled by the head of the household. These 4.8 ha. represent 41% of the total number of the household's fields and plots.
- 17% (1.2 ha.) is controlled by the women of household. These 1.2 ha. represent 46% of the total number of the household's fields and plots.
- 16% (1.1 ha.) is controlled by the other men of the household. These 1.1 ha. represent 13% of the total number of the household's fields and plots.

The two sets of data above are very similar and show basically the same ratios of difference and similarity.* The B.A.E.P. data suggests that among the households of superior farmers (using local technology) and animal traction farmers (as they are presently using equipment), women may have realized a favorable ratio increase in the land they control. Based on these results one might hypothesize that efficient use of animal traction would not only bring larger amounts of land under cultivation

* Though the ratio between household member categories is basically the same, it is almost certain that the amount of land cultivated is not. The B.A.E.P.-77 survey's good farmers probably do cultivate a larger area of land (though ownership distribution of this land is about the same.)

per household per adult, but that women will be gaining an increasing percent of the total production.

It is interesting to note that the 'other household men' (mainly the younger brothers and sons of the household head) with only 13% of the total number of household fields and plots still control about as much area as the household women with 46% of the fields and plots. The reason for this is simple, Women have more but smaller plots (eg, all the small okra plot) while these men have fewer but larger ones. Since the household head controls the large family sorghum/millet field (s), it is clear that he will possess the greatest share of the household's land. The financial and social obligation of the household head make it necessary for him to also possess as many plots as physically possible.

(2) In Tables IIA and B, the following fields and plots have as their principal or sole crop either sorghum, millet, or maize.

1. Principal household sorghum/millet field (kuanu)
very large *
2. Personal sorghum/millet field (suali-kuanu)
medium size
3. Maize plot (kokodi-loli)
medium size
4. Village sorghum/millet field (lifeloli)
medium size
5. Front of Compound plot; maize (cancanli, tapagili)
small size
6. Back of Compound plot; maize (dapuo-loli)
very small

These six types of fields and plots account for about 75% of the average household's cultivated land (B.A.E.P.-77 survey). ** Table II B informs us that 201 or 41% of all fields and plots among these households had as their principal or sole crop sorghum, millet or

* Size differentiation is recorded here only to give the reader a general idea of the relative size of these fields and plots. The principal crop of these fields is also indicated.

** 5.3 ha. out of 7.09 ha. for the average household.

Maize. All the other fields and plots (25%) accounted for 56% of the total number. Therefore:

44% of the B.A.E.P.-77 survey's average household's fields and plots accounted for 75% of their land given over to sorghum, millet, and maize cultivation.

In contrast,

51%* of the B.A.E.P.-78 survey's average household's fields and plots had as their principal or sale crop sorghum, millet, or maize.

This suggests that the B.A.E.P.-78 farmer (the 'average' farmer) has a greater percentage of his total land area cultivated on the six types of fields and plots listed above - perhaps as much as 80%. **

(3) A quick review of Table II A. reveals that certain types of fields and plots belong almost exclusively to certain categories of people.

91% of all principal fields are controlled by the head of the household. Special circumstances for the other 9%.

97% of all okra plots are in the hands of women.

97% of all 'front of the compound plots' belong to the head of the household - who in this case, will also be the head of the compound.***

91% of all dry season gardens belonged to the heads of households.

Women rarely possess tobacco plots (2%), manioc plots (5%), cotton plots (2%), sweet potato plots (3%), and do not possess cowpeas, kenaf, yam, or garden plots .****

* 2,357 fields and plots out of a total of 4,639.

** When field size data is complete and analyzed, we will know for certain.

***This plot is reserved for the head of a compound.

**** Control of small market gardens by women is a recent development around large market towns and cities (there were no such towns in the B.A.E.P.-78 sample).

108

(4) The importance of various types of fields and plots to various household members can be demonstrated by ranking the top ten for each member category.

TABLE III

Ranking of Fields and Plots by Numbers and Importance to Household Members

Household Head				Household Women				Household Men			
Rank	Type of Field/Plot	No.	D/S*	Rank	Type of Field/Plot	No.	D/S*	Rank	Type of Field/Plot	No.	D/S*
1	Personal Sorghum/ millet Field	520	D	1	Okra Plot	403	D	1	Personal Sorghum/ Millet Field	173	S
2	Maize Plot	212	D	2	Personal Sorghum/ Millet Field	389	S	2	Peanut Plot	69	S
3	Front-Compound Plot	173	D	3	Compound Plot	369	D	3	Rice Plot	66	S
4	Peanut Plot	150	S	4	Peanut Plot	322	S	4	Compound Plot	45	D
5	Compound Plot	149	D	5	Earth Pea Plot	125	D/S	5	Sweet Potato Plot	29	D/S
6	Village Sorghum/ Millet Field	146	D	6	Local Sauce Herb Plot	86	D	6	Principal Sorghum/ Millet Field	25	D
7	Rice Plot	113	S	7	Rice Plot	70	S	7	EarthPea Plot	21	D/S
8	Manioc	113	D/S	8	Soybean Plot	66	S	8	Cotton Plot	21	S
9	Earth Pea Plot	79	D/S	9	Roselle Plot	45	D	9	Maize Plot	20	D
10	Soybean Plot	69	S	10	Village Sorghum/ Millet Field	39	S	10	Manioc Plot	20	D/S

* D = intended for domestic consumption, S = intended for sale. D/S = either domestic consumption or for sale.

For the household head, the top 10 fields and plots (out of a possible 31 types of fields and plots) account for 83% of all the plots owned by household heads in the B.A.E.P.-78 survey (80% for the B.A.E.P.-77 sample).

For the household women, the top 5 fields and plots account for 81% of all the plots owned by household women, (84% for B.A.E.P.-77 data), while the top 10 account for 97%.

For the other household men, the top 10 fields and plots account for 87% of all the plots owned by these household men. Among B.A.E.P.-77 households however, the top 5 fields and plots account for 91% of all the plots owned by the household men - which shows a considerable loss in crop diversity (in comparison to the 'average' farmer) and greater attention to just a few cash orientated crops.

For the average household head, the most important cash crop, in order of importance, would be:

1. Sorghum or millet (if there is excess on his plots -see Fig.13)
2. Peanuts
3. Rice
4. Manioc/Earth Peas
5. Soybeans

For the average household women, the most important cash crop, in order of importance, would be:

1. Sorghum or millet (in some regions women cultivate only millet)
2. Peanuts
3. Earth Peas
4. Rice
5. Soybeans

For the average 'other household men' the most important cash crop, in order of importance, would be:

1. Sorghum or Millet
2. Peanuts
3. Rice
4. Earth Peas/Sweet Potatoes
5. Cotton
6. Manioc

In terms of total number of plots, the 'other male members of a household' do not dominate in any one kind of crop - though sorghum and millet rank almost three times more important than the next most important crop-peanuts.

It is important to note that sorghum and millet are considered by farmers to be the most important cash crops of the Eastern O.R.D. Peanuts, in all cases, rank second. In terms of actual number of plots, peanuts are far more important to women than to men as cash crops. Rice ranks third, with earth peas and soybeans following. Manioc follows closely after soybeans. The poor showing of soybeans reflects last year's big drop in price for this commodity.

5.6.2 Field and Plot Type Priorities

The data for the B.A.E.P.-77 sample (Table IIB) and the B.A.E.P.-78 sample (Table IIA) both reflect the 1978-1979 agricultural season.* These two different groups of farmers (the 'average' farmer vs. the very good farmer) placed their land and labor resources on different types of fields and plots.

TABLE IV

Comparing Field Type Priorities

Fields/Plots (F/P)	BAEP-78 Survey	BAEP-77 Survey
Sorghum/Millet/Maize	51% of all F/P	44% of all F/P
Peanuts	11.7% of all F/P	14% of all F/P
Rice	5.4 % of all F/P	7.8% of all F/P
Earth Peas	4.8 % of all F/P	7.4% of all F/P
Soybeans	3.3 % of all F/P	7.5% of all F/P
Manioc	3 % of all F/P	2.4% of all F/P
Cotton	2 % of all F/P	1.5% of all F/P
Dry Season Gardens	1 % of all F/P	2 % of all F/P

* Gaudin continued research among the B.A.E.P.-77 sample farmers into 1978 - at which time some B.A.E.P.-78 questionnaires were employed. ///

The 'good farmers' sampled in B.A.E.P.-77 survey seem to have increased the extent of their cultivation of cash crops other than sorghum or millet. This does not mean that these farmers necessarily cultivate less sorghum or millet than the B.A.E.P.-78 average farmer. What it does suggest is that, in increasing their total cultivated area, these farmers have put the increased land into production of cash crops other than sorghum or millet.

Based on the field type priorities discussed earlier, the Eastern C.R.D. might find it beneficial to place a ~~much~~ greater emphasis on the cultivation of sorghum and millet upon village (pre-cooperative) group fields. As long as price structures remain favorable, the C.R.D. can continue to expect rising production of peanuts and rice (as more 'average' farmers become 'above average' farmers - through perhaps the input of an appropriate animal traction package). One could predict, with some certainty, a great increase in production of such crops as earth peas, cowpeas, sesame, tubers, etc. if good commercial outlets could be established. Almost any locally cultivated crop, no matter how seemingly unimportant, could, with proper encouragement, enjoy greater commercial importance.*

* Red peppers, for instance, are fairly easy to cultivate and the plants live with little care for a number of years. A small local industry could be established based on the commercialization of dried red pepper powder.

5.6.3 Land Borrowing as a Factor of Field and Plot Type

Table IIA informs us that among 4,639 fields and plots of 370 Gourmantché households, 27% were upon borrowed land.* For an average, borrowing even 20% of all fields and plots should be considered a fairly high figure. Though some borrowing no doubt takes place for reasons of convenience only - and not necessity - yet farmers generally do not borrow land unnecessarily. Table V below gives a ranking of the kind of fields and plots using borrowed land.

TABLE V

Land Borrowing Per Field and Plot Type

B.A.E.P.-78 Survey of 370 Gourmantché Households &
B.A.E.P.-77 Survey of 23 Gourmantché Households

Field or Plot Type	% of Fields/ Plots of Each Category on Borrowed Land	
	B.A.E.P.-78	B.A.E.P.-77
1. Local Variety of Sauce Herb Plot (<u>Kpankpan</u>)	46%	-
2. Roselle Plot	** 42%	-
3. Soybean Plot	40%	14%
4. Manioc Plot	39%	27%
5. Front of Compound Plot	35%	7%
6. Sweet Potato Plot	35%	67%
7. Red Pepper Plot	31%	-
8. Compound Plot	29%	10%
9. Village Sorghum /Millet Plot	29%	20%
10. Okra Plot	28%	16%
11. Principal Household Sorghum/Millet Field	26%	13%
12. Peanut Plot	26%	13%
13. Earth Pea Plot	25%	24%
14. Cotton Plot	24%	43%
Rice Plot	20%	17%

* Disaggregation of this average at the village level is given in Appendix VI. See also Gourmantché Agriculture, Part 1, Land Tenure and Field Cultivation for a thorough discussion of rural land tenure issues.

** One would read this table in the following fashion: 42% of all the roselle plots (see Table IIA - there were 50 plots in all) were on land borrowed from a non-kinsman for this purpose.

Farmers who wish to cultivate roselle, soybeans, sauce herbs, manioc, sweet potatoes, red peppers, and okra seem to borrow an excessively high percentage of the land for these plots. These explanations may be advanced:

- (a) These plots are generally found within or immediately around a village. A major percentage of all non-inhabited land, within any sizeable village, belongs to a minority within that village.* Therefore the rest would have to borrow such land.
- (b) Unlike major sorghum/millet fields which remain localized in one general area year after year (until land is left to fallow), most of the plots of special crops do not remain in the same spot year after year. This year a farmer finds a plot for his soybeans in one place, next year he may look for a different location. This system encourages land loaning/borrowing because the person who lends the land can do so one year at a time.

Peanuts, earth peas, and cotton are often part of the crop rotation system of the major sorghum/millet fields. One would expect the land upon which these plots are found to show about the same percentage of borrowing as the large fields. This is the case. **

* By 'inhabited land' I refer to the land upon which an actual compound rests. 'Non-inhabited' land would be the land extending from outside the compound walls out into the surrounding bush. Many of our household heads indicated that they 'owned' the compound plots and village fields around their compounds. They probably do. Yet further research would demonstrate that many of these households were in fact 'loaned' this land when the actual ancestors of these compound heads settled in this village. Long term use has established their claims.

** These plots also 'move' in location from year to year, but they are still upon some segment of the total sorghum/millet field site.

The fact that B.A.E.P.-77 Survey households have a total average of land borrowing of almost half (15%) of the B.A.E.P.'s sample (27%) can be best explained by the non-random sample of the B.A.E.P.-77 survey used. Not only were these farmers good farmers, but they almost always consisted of the leading households of these villages (the household of the village chief was often included in the B.A.E.P.-77 sample of three households per village). The fact that only 7% of the 'front of compound plots' and 10% of the compound plots were borrowed clearly illustrates this. This means that about 90% of these farmers owned the land around their compound. This in turn means these farmers have long term tenure in their village and probably own considerable amounts of fallow and field land around (outside) the village as well. This explains why they need borrow so little land.*

Using the same type of procedure outlined above,** we note that (for the B.A.E.P.-78 sample) compound plot, front compound plot, and village sorghum/millet field borrowing are within the same range of borrowing: 35%-29%-29%. One would expect this to be so. If 29% of all compound plots had to be borrowed,*** it stands to reason that these same people would have to borrow at least that percentage of village fields. An average of these three types of plot borrowing would be 31%.

* We might, in fact, consider their 15% borrowing of land a 'normal land borrowing gauge'. People borrowing more than 15% of their fields and plots do not possess the same solid political and social footing within the village that the minority, who own a major part of the land surrounding the village, possess--(see Gourmantché Agriculture, Part 1, under 'Establishment of a New Community' p. 28 for further details).

** Observations based on a knowledge of the social organization of Gourmantché society.

*** One must not forget that these figures are aggregated and an average at that. But this only means however that in some villages the percent of land borrowing is a great deal higher - as in the Gobanangu region or in any large village.

With this 31% figure, one may hypothesize that, on the average, 1/3 of the households of this sample do not possess land in the village or immediately surrounding that village*. Many of this group of farmers would have to borrow the land for their large grain fields outside the village as well.

5.6.4 Crop Association

In Table VI below, crops are ranked in order of the number of fields and plots which contained a specific configuration of crops. I start with the most general category 'grain' which includes fields of sorghum and/or millet. The first one on the list 'Grain and Cowpeas' should be read to mean that cowpeas were found associated with 'grain' on 701 fields and plots. This does not mean however that any one of these fields might not have included a third or even fourth crop. When only one crop appears on the list below, this refers to a sole crop. For these, I have given the percentage of the total number of fields/plots of this crop, which appear as a sole crop. That is, for example, 62% of the 541 peanut plots (see Table IIA) cultivated among the 370 Gourmantché households were devoted solely to peanuts.

For a less aggregated set of data, see Appendix VII. Approximately 87% of the total 4,639 fields and plots derived from the B.A.E.P.-78 survey of 370 sample Gourmantché households are accounted for in Table VI below.**

* These households would probably represent the late comers into this community. The earlier inhabitants have possession of the land within the village and the best crop lands around the village. The earlier inhabitants own most of the fallow lands which new comers will have to borrow for their own fields.

** The same fields and plots may be counted two or three times depending on how crop association were aggregated. Rank No. 4 (Sorghum and Cowpeas) was included in the count of Rank No. 1 (Grain and Cowpeas).

TABLE VI

Crops in Association or as a Sole Crop
 B.A.E.P.-78 Survey of 370 Gourmantché Households

Rank	Crop (s)	No. Fields, Plots	Rank	Crop (s)	No. Fields, Plots
1	'Grain', Cowpeas	701	29	Rainy and Dry Season Okra	43
2	Sorghum	333	30	Maize, Calabashes, Squash	40
3	Peanuts (62%)	333	31	Peanuts, Sesame, Roselle	37
4	Sorghum, Cowpeas	277	32	Dry Season Okra, Roselle	34
5	Sorghum, Millet	233	33	Maize, Dry Season Okra	33
6	Rice (89%)	222	34	Maize, Cotton	31
7	Earth Peas (84%)	189	35	Maize, Tobacco	29
8	Dry Season Okra	182	36	Peanuts, Cowpeas	23
9	Maize, Dry Season Okra	175	37	Maize, Cotton, Okra	21
10	'Grain' and Maize	165	38	Maize, Okra, Calabashes	20
11	Millet	148	39	Maize, Okra, Sorghum, Calabashes	20
12	Millet, Cowpeas, Sesame	125	40	Maize, Sauce Herbs	20
13	Soybeans (73%)	109	41	'Grain', Roselle	19
14	'Grain', Sesame	106	42	'Grain', Kenaf	18
15	'Grain', Cowpeas, Sesame	100	43	Millet, Sesame	18
16	Manioc (71%)	97	44	Sorghum, Millet, Sesame, cowpeas	18
17	Millet, Cowpeas	79	45	Okra, Squash, Calabashes	17
18	Maize (33%)	74	46	'Grain', Maize, Okra	16
19	Sweet Potatoes (86%)	72	47	Maize, Rainy and Dry Season Okra	16
20	Sorghum, Cowpeas, Sesame	68	48	Sorghum, Cowpeas, and Roselle	15
21	Peanuts, Sesame	67	49	Red Peppers (43%)	15
22	Sorghum, Early Millet	64	50	Tobacco (35%)	15
23	Sauce Herb (Kpankpanɔ)	55	51	Okra and Calabashes	13
24	Cotton (58%)	55	52	Sauce Herb (ɔalifadi)	11
25	Sorghum, Maize	46			
26	Roselle (92%)	45			
27	Maize, Squash, Okra	44			
28	Rainy Season Okra				

Special attention may be drawn to some specific data of Table VI.

- Cowpeas are the crop most extensively associated with sorghum and millet - reflecting their importance to household subsistence.
- More sorghum is cultivated as a sole crop than millet (333 fields compared to 148 fields).
- Sorghum and millet are intercropped in 233 fields representing 17% of all sorghum/millet fields.
- The following crops are most often cultivated as a sole crop:

Roselle	92%	of all plots
Rice	89%	"
Sweet Potatoes	86%	"
Earth Peas	84%	"
Soybeans	73%	"
Manioc	71%	"
Peanuts	62%	"
Cotton	58%	"

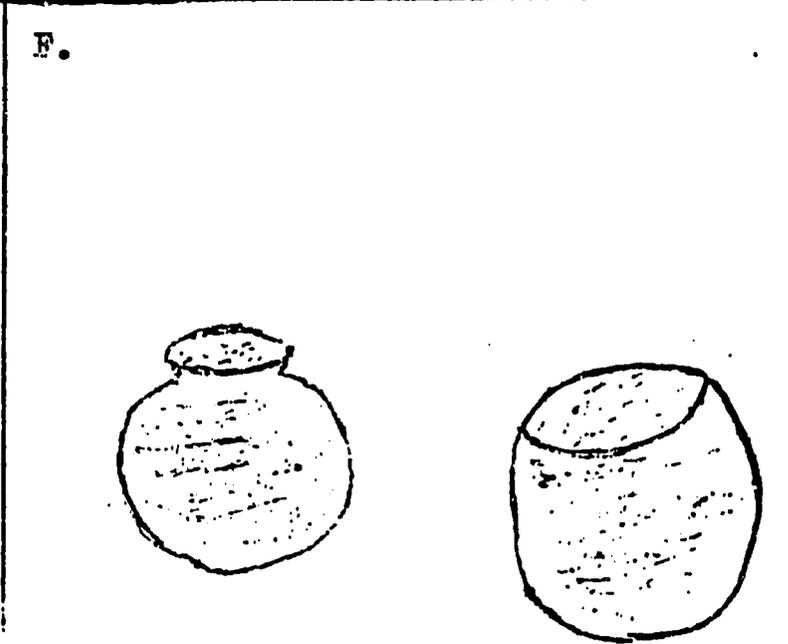
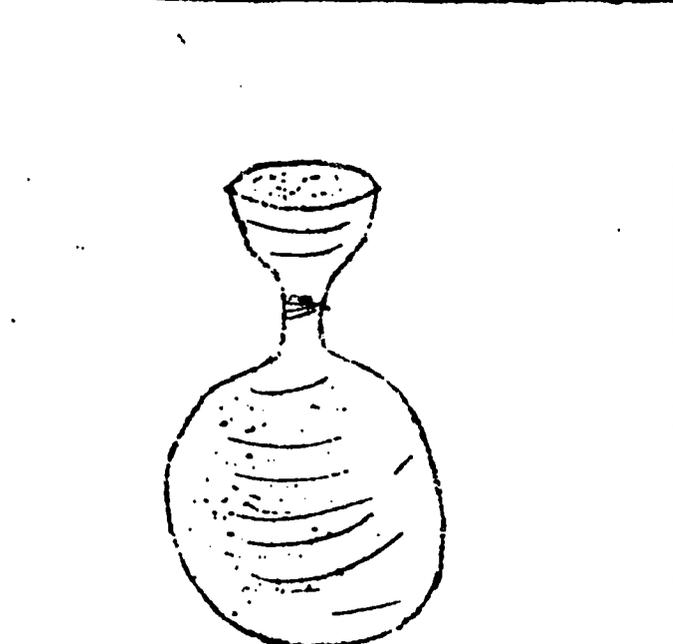
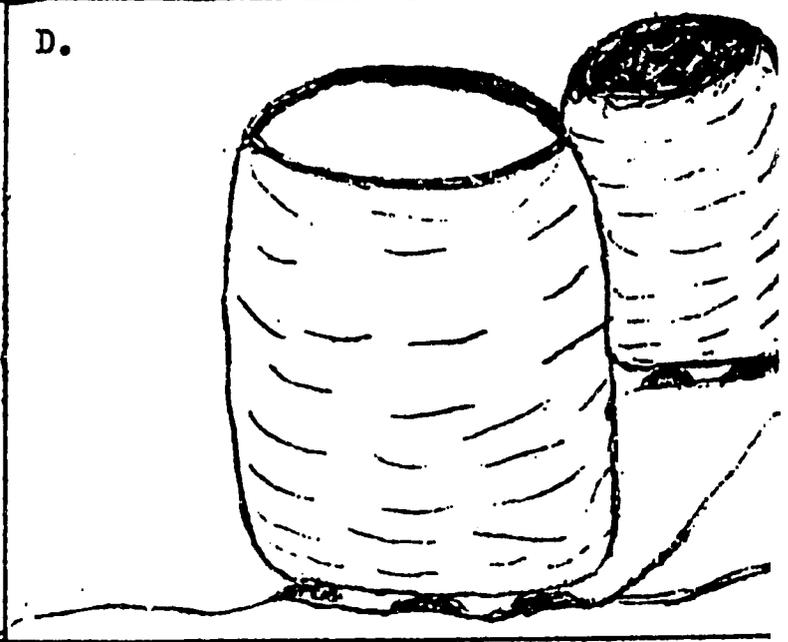
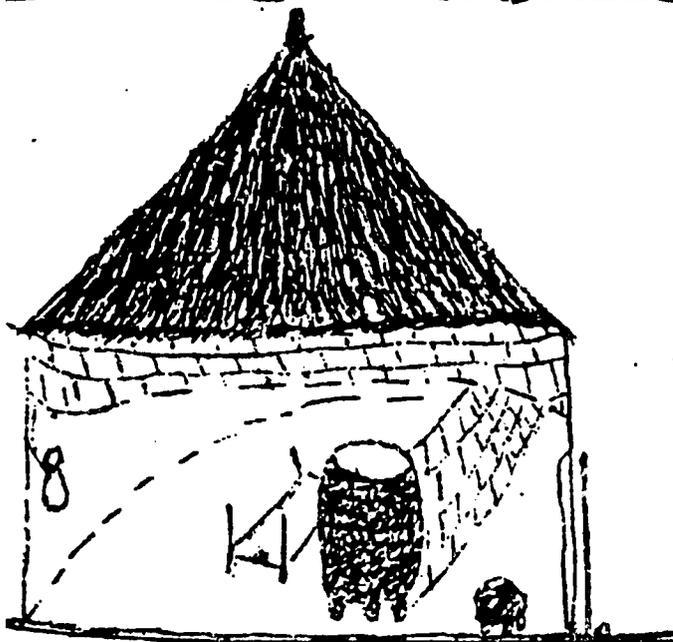
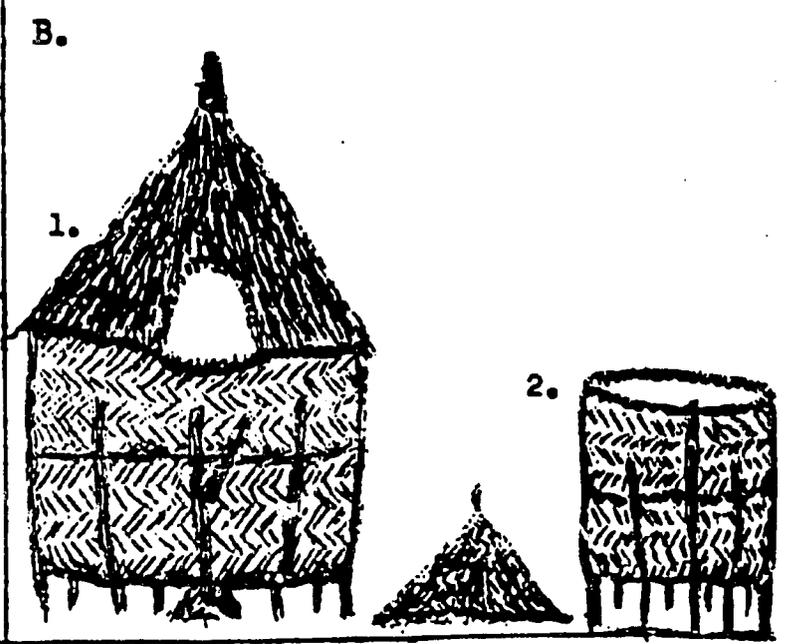
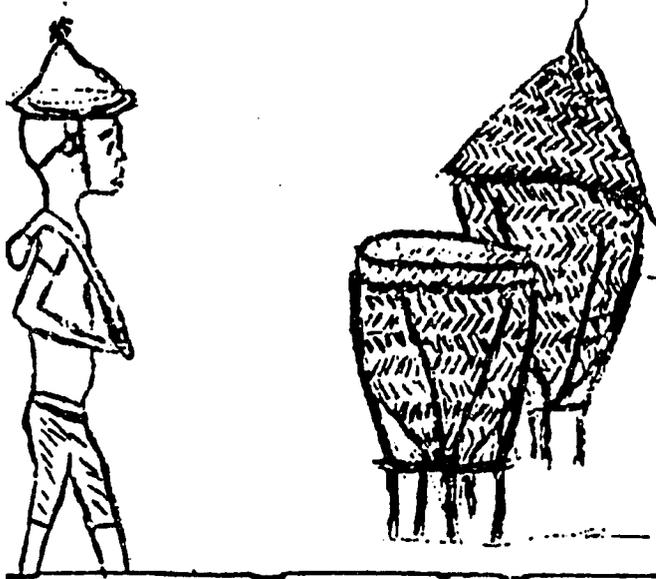
- The greatest combination of crop associations appears on the usually fertile soils located around the compounds of Gourmantché households. These soils are constantly being enriched by human, animal, and household wastes.
- Note the importance of okra.
- The principal crops on 64% of all fields and plots (4,639) were cultivated in association with one or more other crops. Only 36% of all fields and plots were exclusively devoted to one crop.

6.0 General Discussion of Plants Cultivated

The last section of this study is devoted to a description of the various crops cultivated by Gourmantché farmers. To repeat what was said in the introduction to this study, the descriptions recorded here are the Gourmantché farmers' perception of the more significant aspects of plant cultivation and field management, storage, and use of produce. Greatest attention is given to those crops of greatest concern to farmers. Personal observations are included.

For those crops of greatest concern to farmers, the following outline will be followed:

1. Important Varieties
2. Where Most Often Cultivated (Type of Field or Plot)
3. Associations
4. Cultivation
5. Usage/Marketing
6. Ownership
7. Seed and/or Crop Storage (See Figure 17 below)
8. Crop Recommendations and Observations



[Handwritten signature]
120.

H.



J.

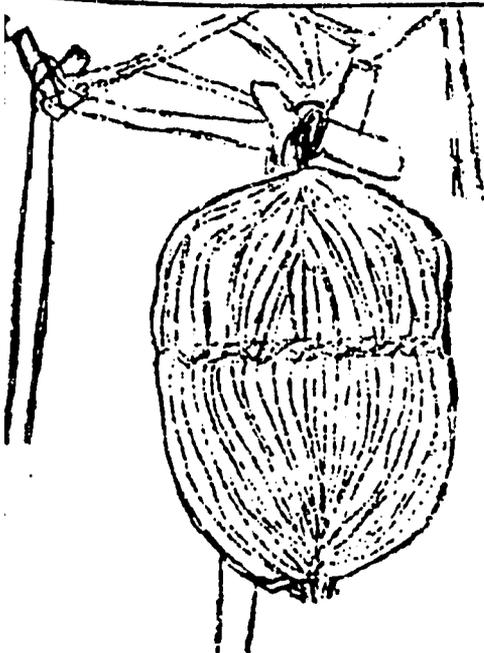
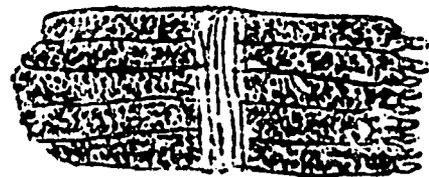
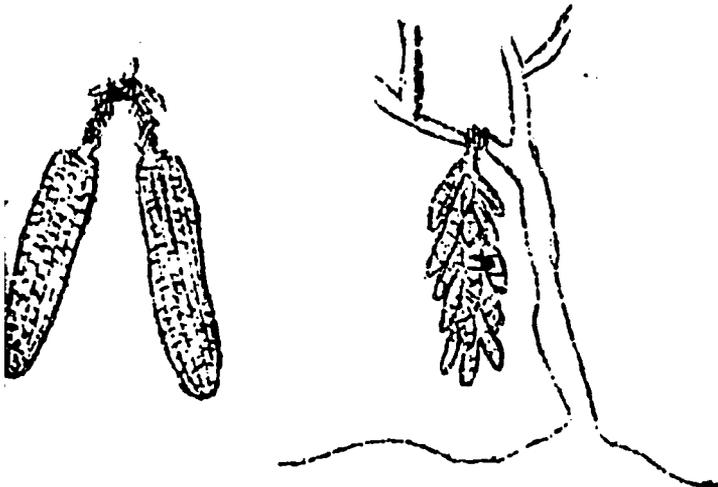


Figure 17: Methods of Crop & Seed Storage

- A. Small, temporary grass granary (cowpeas, peanuts, earth peas)
Sorghum/Millet if in small amounts (sembi-tuondiga)
- B. Large, grass granary (sorghum, millet)
(sembi-dieli, sembi-pienga)
- C. Small mud silo in hut (buabuali)
- D. Large mud silo outside hut (buabuali)
- E. Gourd (water, beer, grain storage)
- F. Ceramic pots (quali, bobili)
- G. Sorghum panicles (di-bobili)
- H. Early Millet panicles (niadi-bancoanli)
- I. Maize (kokodi-joanli)
- J. Late Millet panicles (diyue-bobili)
- K. Sorghum leaf container (tobacco, herb leaves, okra) (osogiligu)

6.1 Niadi, Nyiadi, Nyiadi-di (Early Season Fearl Millet)

Pennisetum typhoides

Agronomists speak of different varieties of short season millet (mil hâtifs) and long season millet (mil tardifs). This distinction is found in two of the four classes of di, (sorghum & millet) farmers recognize (see Taxonomy IX).

Four principal varieties of the short season millet have been identified, with sub-varieties based on color or the presence of bristle-like hairs in the panicle. Farmers sometimes claimed that the seed of these sub-varieties would generate the same sub-variety.

Stalks are more slender and much shorter than the long season millets cultivated in the Eastern O.R.D. Maturation is in about 70 to 90 days. Light grey to grey, slate-blue to purple panicles vary in thickness (3-5 cm.) and length (20-40 cm.). Panicles may or may not have reddish brown to black bristles interspersed between the seed folicles, a characteristic which farmers everywhere claim hinders small bird damage.

The Gobinangu and Pamma regions particularly cultivate a great deal of early millet, with harvests beginning in late July and early August. This millet is especially important during the months just before the major grain harvests when food supplies are often running out. Birds can be very destructive to this millet. Many farmers in the Eastern O.R.D. would like to cultivate early millet if they had the seed and/or if enough of their neighbors could be persuaded to cultivate it too. One or two fields would be completely destroyed by birds if there were not enough persons available (usually young children) throughout the ripening season to chase birds. However, if the crop is widely planted in a region, as in Loagibu and Pamma, the risk of bird damage to individual fields is less because

they are not numerous enough to consume large areas during the short harvest period.

The O.R.D. could be of much service to farmers if its agents could introduce greater use of this important famine crop in the region. Judging from the experiments of farmers in this O.R.D., there seems to be evidence that it could be cultivated successfully on a wider scale than it is. In the Fada and Bogandé sectors for instance, people who do not customarily intercrop maize with any other crop (except along the border) might do so with early millet. Their recurring food shortages could in this way be partially alleviated.

The information which follows reflects the experience of Gobinangu and Famma farmers with this crop.

6.1.1. Important Varieties

- (1) Niadi-fani: The common variety of the region. Panicle slightly thinner (4cm.) and longer (approx. 25 cm.) than jaboanli. Bristle and bristle-less varieties exist in both pearl grey and purple colored panicles. Maturation: Approx. 3 months.
- (2) Jaboanli: Has the shortest panicle. (Approx. 21 cm.) can be up to 5 cm. in diameter. Panicle does not taper at end like other varieties but ends abruptly. It possesses no bristles and seeds are the smallest of all varieties. Maturation: Approx. 3 months.
- (3) Ikpentuanli: Has the thinnest panicle of all varieties (2.5 cm.) and is generally quite long (Approx. 31cm.). Black bristle and bristle-less varieties exist. Maturation: Approx. 3 months.
- (4) Buodi ya niadi: Cultivated north of Jakpaga and into Niger. Possesses the longest panicle (40-100+ cm.). Observed panicles all possess bristles. Maturation: Approx. 3 months.

6.1.2 Where Most Often Cultivated

Lifeloli/(Village Field)

Lidapuo-loli/ Compound Flot)

Kuanu yun kpeligi/ (Ageing sorghum &/or millet field)

6.1.3 Associations

- : Never cultivated as sole crop
- : Early millet planted first, in lines, sometimes, if in the village parcels, on top of ridges.
- : Peanuts may follow several days later, between the lines, (in which case ridges are not used), or
- : Sorghum may follow about a week later between lines, or
- : Late millet may follow about two weeks later between lines.
- : Cowpeas can be planted throughout the field.
- : When located on a village field or compound plot, early millet may also be associated with okra and and gourd/squash vines.

6.1.4 Cultivation

The Gourmantché farmer does not space one variety of millet differently from another variety. Nor does he space one variety of sorghum differently from another. He is conscious however of an important spacing difference between sorghum and millet. This difference relates to soil fertility as well as plant space requirements.

Early millet is the first crop planted at the beginning of the rains. It is traditionally planted in ijasani or iniani/(rows).* As he strides across his field thrusting his planting stick into the ground, the farmer does not necessarily form the straight and even rows he might otherwise have if he used a row marker. This does mean that he does not follow some general procedures.

* There seems to be a correspondence between regions which by custom plant sorghum and millet in rows and the cultivation in those same regions of early millet. Here also is found the planting stick. Elsewhere grain is planted haphazardly using a hoe in one hand and a calabash of seed in the other; early millet is rare or unknown.

Farmers who plant early millet always do so in association with some other crop. They therefore leave room for the important sorghum or late millet crop which will follow. If it is late millet which is to be associated with the early millet, one knows that the soil in question is not too fertile, that this is probably an ageing field. A good farmer also knows that the late millet must be planted so that icuagi niani pia/ (the width between planted rows of late millet is wide). This is because of the way millet spreads out with numerous stalks from one pocket. This is also why late millet is planted some two weeks later than the early millet - giving the latter a chance to get a good head start on the former. In this same field, ijatuli koabi/ (the spacing down the planted rows - of late millet - is narrow). Farmers will say that those who leave too much space within these rows simply waste space.*

Where sorghum is cultivated in association with early millet, one will know that this soil is more fertile, that this is probably a young field, or a village field, or compound plot, where household and animal wastes increase or maintain fertility. A good farmer also knows that sorghum must be planted so that icuagi niani ba muagi/ (the width between the planted rows of sorghum will be narrow). Ideally also, ijatuli ba koabi/ (the spacing down the planted rows is narrow). Farmers who leave more space, waste space. Local sorghum varieties do not spread out like late millet, and because of higher fertility, can be thus closely spaced.

The density of plant pockets of sorghum in an early millet field will be greater than pockets of late millet in the same space on another early millet field. If one were to count actual number of stalks however, late millet stalks would exceed sorghum stalks. The spacing between and down rows of early millet will also be somewhat closer when sorghum is associated with it than in a field where late

* Space between rows is frequently an important reserve of moisture if plants are well rooted (Paul Christensen, personal communication).

millet is associated.

If small ridges are made in a field for early millet, sorghum or late millet will be placed in the furrow.

Farmers explain that the quantity of seed planted in one pocket is critical. Too many plants produce thin, weak stalks and low producing panicles. Some seedlings have to be pulled out, leaving not more than 6 or 7 plants or secondary shoots.* Early millet is not transplanted -- probably because such plants would mature at a later date than the rest of the field and be destroyed by birds. Unlike late season millet or sorghum, it is not photo - sensitive.**

Two or three hoeings are common, depending on the field's fertility and age. The first hoeing (if ridges were not used) will take place when grain is several inches high. The second hoeing takes place when it is passing knee height, and before heading takes place. The third hoeing in this field occurs after the early millet has been harvested. During the grain filling phase, small birds (sparrows, finches) will attempt to peck out the soft, milky, forming seeds. Larger birds (parrots, weaver birds), monkeys, and baboons attack the more mature heads. A field of early millet, without the presence of several noise making children, can be destroyed.

Harvest occurs during the period of heaviest rains (August). Cut grain is spread out upon the threshing ground

* The E.O.R.D. recommends 3 to 4 plants or secondary shoots as being the maximum for best results.

** Late season millet and sorghum are transplanted, and being photosensitive, will produce panicles at the same time (small, younger plants yielding small panicles, larger, older plants yielding larger ones). Early millet would simply produce its panicles when it reached full maturity. This would mean that transplanted or re-planted early millet would produce panicles sometime after the planted crop. Bird damage on these would be even greater than on a whole field maturing at once.

to dry and must be constantly protected from rain showers by protective matting. Every night, the unthreshed grain is gathered into a pile and covered. Four or five sunny days are sufficient for drying.

Unless the quantities are very small, early millet, late millet, and sorghum are not mixed in the same granary. Dry early millet panicles are put into an empty granary (Fig. 17,B1). If one isn't available, a senbi-pi ngu (temporary, smaller granary) can be constructed (Fig.17,B2). Even if sorghum remains from last year's crop, the new early millet is eaten before the remaining sorghum. Early millet will be more quickly destroyed than any other kind of grain. It is susceptible to asidabila (larvae) and mukudimu (weavils). Termites and dampness can also destroy one's stock in the silo if it is not properly maintained.

If a farmer has a great deal of early millet, then it is necessary to gather people together for threshing. After winnowing, wood ashes or insecticide will be mixed in with the seed. It will then be stored in a buabuali (mud silo) (Fig.17,D), and sealed with mud.

6.1.5 Usage/Marketing

Early millet when newly ripe is often roasted over coals, husked and eaten. When there is hunger, much of a harvest can be consumed at this time in this way. It is also threshed, winnowed, and ground into flour for saabu (the Gourmantché staple 'porridge' meal), though its taste is inferior to other grains. Only a little is sold as the principal reason for its cultivation is consumption during a general period of low food stocks (maize harvest is still some weeks away).

Early millet flour is also a preferred ingredient in making nyim-piemma (flour mixed with water and drunk) and yencagini (coarsely ground millet mixed with water and sugar, tamarind, or monkey bread fruit). Early millet is used for beer making.

6.1.6 Ownership

Early millet is, for the most part, the responsibility and domain of men. Women will help in its cultivation and harvest.

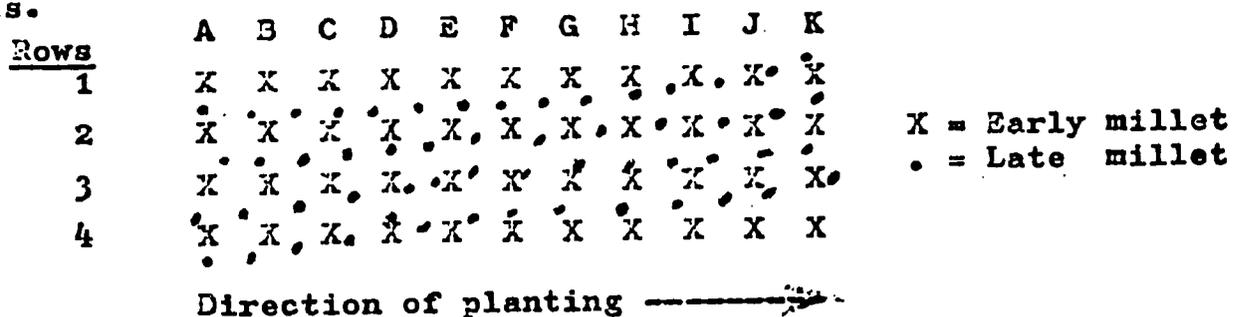
6.1.7 Seed and/or Crop Storage

Panicles are selected that are well filled out with large seeds. The still damp stalk portion of the cut millet is woven with other heads to form a cluster of heads (liniadi-bancanli) which is hung up with other clusters for next year's seed grain needs (Fig.17,H).

6.1.8 Crop Recommendations and Observations

Traditional spacing arrangements of crops associated with early millet will have to be modified if animal drawn weeding and ridging equipment is to be used. Space must be left open between rows. Certain innovative farmers already follow some procedures which might be useful elsewhere.

A common traditional pattern encountered when early and late millet (or sorghum)* are associated might look like this.



* Whenever late millet or sorghum planting is mentioned, please recall that sorghum spacing is generally different from late millet spacing as already described.

Spacing between A-B-C etc. is often wider than space between 1 and 2 for early millet - though this does not need to be so. Space is often determined by the stride of the man making the packets with his planting stick. The seed will be planted (often by the women and children) coming along behind. Looking down rows 1-4, more or less parallel rows are visible with space between them. Viewed from the right angle perspective A,B,C, etc., parallel rows are not formed.*

The farmer plants his late millet down between the rows of the already two to three inch high early millet. The same method is used when sorghum is associated except that spacing is generally closer. In either case, the farmer does not particularly try to plant down the middle of existing early millet rows. Though the associated late millet or sorghum is planted in the same general direction as rows of early millet, it does not seem to fall in any predictable pattern along or among the pre-existing rows of early millet. It almost appears like the farmer ignores the early millet seedlings while planting the next associated crop -- perhaps reflecting that it is the late millet or sorghum crop which is seen as the principal crop of this field (the early millet is seen as an insurance crop in case of food lack just before the new year's harvest). If stocks are not too depleted, the significance of the early millet becomes less).

Using a row marker with properly spaced teeth (80 cm.), to trace out straight lines along which to plant, a farmer will nevertheless space down these rows as he is normally accustomed to doing. At this point, the only change from traditional methods is that spacing between rows is even and pre-set.

This traditional method is important because it permits farmers to readily accept the idea of fixed spacing equipment which accompanies animal traction equipment.

107

The O.R.D. recommends that farmers using animal traction should plant in rows leaving 40 cm. between pockets and 80 cm. between rows. The latter spacing is required because of the standardization of the yoke used by oxen. Plows or ridging equipment can be adjusted for some variation in rows of crops. In measuring numerous fields of either late millet or sorghum, it was noted that farmers, by custom, seem to leave between 40-60 cm. between and down rows of sorghum and 60-80 cm. between and down row of late millet. Early millet, in association with either of these, requires a different approach.

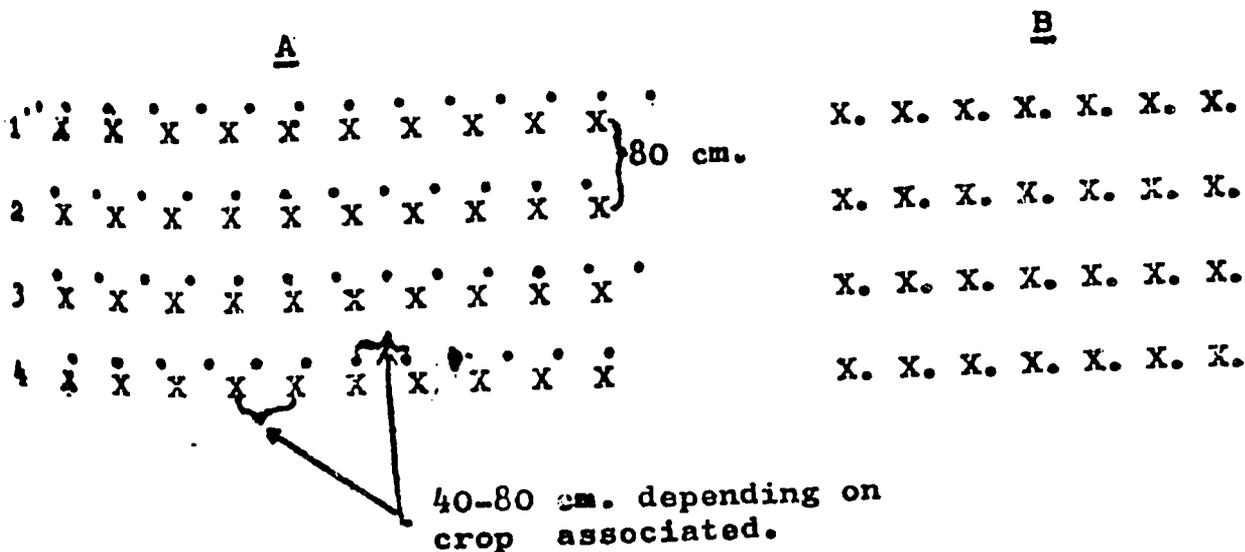
Three options for such a different approach present themselves for the farmer who, using animal traction equipment, decides to cultivate early millet.

- (1) He could cultivate early millet as a sole crop, not associated with either late millet or sorghum. Farmers will not accept this option because they always associate early millet with another major grain crop, and because a great deal of additional field space, time, and labor would be required. Early millet is important, but not that important.
- (2) He may plant late millet (or sorghum) parallel to the rows of early millet. These rows will be located to the right of center (and not down the center of the rows), which will leave enough space (approx. 50.) for oxen to pass. This requires extra weeding by hand between the closely spaced rows of early millet and the associated sorghum or late millet. Once the early millet has been harvested, the full 80 cm. spacing is once again available. This permits at the third weeding or ridging a turning over of the remaining stubble at the base of the remaining (and principal) crop (see Fig 17, A, below).
- (3) He may plant late millet (or sorghum) within the same rows as the early millet, planting between pockets of early millet (see Figure 17, B, below).

Both systems 2 and 3 are currently used by some animal traction farmers in the Gobinangu region. A farmer will get more late millet using system 2 which is closer to his own methods than system 3. This is especially true of sorghum where system 3 would waste a lot of space (from the farmer's point of view). Furthermore, because early millet does not grow very high, the second (and last weeding for the early millet) still finds the early millet low enough to pass beneath the yoke without damaging stalks.

FIGURE 17

Early Millet Spacing Options
with Animal Traction when in
Association with Late Millet
or Sorghum



X = Early Millet
 • = Late Millet or Sorghum

12/1

6.2 Diyu, Dipieni/ (Late Season Pearl Millet, Candle Millet)
Pennisetum typhoides

Late season pearl millet represents a second basic division in farmer classification of di/ (sorghum and millet). Like early season millet, late season millet possesses candle-shaped panicles (Figure 9, J). Ten principal varieties have been identified. Depending on the variety and region, maturation ranges from about 100-150 days. Panicles vary greatly in diameter ($1\frac{3}{4}$ - $3\frac{1}{2}$ cm.) and length (25 - 115+ cm.).

Late season millet is generally cultivated on fields of low fertility - following sorghum of previous years. It is photoperiodic and more drought resistant than sorghum. It does poorly in heavy soils, particularly in low-lying areas where moisture is apt to be retained.

As noted earlier, 75% - 80% of a farmer's total labor and land resources must be allocated for the production of sorghum and/or millet when traditional cultivation methods are used. A farmer's decision as to the relative ratio of sorghum to millet is based on a number of factors. The farmer's field may be such that he can not plant sorghum - the soil is poor, moisture retention is poor. A farmer may have planted sorghum but the early rains were inadequate and great loss resulted to young plants. If the season is not too far advanced, the farmer may plant late millet into the field. A farmer will always cultivate more sorghum than millet if his land will permit and if risk of crop failure is not too great.

6.2.1 Important Varieties

- (1) Diyue-fani: The common late millet variety of the region. It includes a number of sub-varieties according to region. Panicles are generally short (approx. 25 cm.) and narrow in diameter (approx. $2\frac{1}{2}$ cm.), though the common millet of the Jakpaga region can be 50 cm. long by 4 cm. in diameter (perhaps due to higher fertility of soils). Some sub-varieties possess bristles in the panicle. This millet is very susceptible to insect damage. Maturation: Approx. $3-3\frac{1}{2}$ months.
- (2) Diyue-moani: The seeds are yellowish-orange in color, with panicles about 25-27 cm. long and 3 cm. in diameter. Common in Pamma/Sudigi region. Possesses fine 'hairs' on stalks and leaves. Maturation: Approx. $4\frac{1}{2}$ months.
- (3) Nakwali: Panicles are approx. 31-32 cm. long and $2\frac{3}{4} - 3\frac{1}{2}$ cm. in diameter. Common in Gobinangu region. Entire plant covered with fine 'hairs'. Maturation: Approx. 4 months (when rains are still in progress).
- (4) Abidjan: Panicles are approx. 36-40 cm. long and $2\frac{1}{2}$ cm. in diameter. Seeds are slate-grey in color. Common around Fada and on through to Bogandé. Maturation: Approx. $3\frac{1}{2}$ months.
- (5) Kpaan-yinin-tanli: Panicles are approx. 32-33 cm. long and $2\frac{1}{2}$ cm. in diameter. Seeds are reddish-brown. Found in small quantities everywhere in E.O.R.D. Maturation: Approx. 4 months.
- (6) Kpagiligu: Panicles are approx. 27 cm. long and 2 cm. in diameter. Seeds are very small and yellowish-white in color. Produces better than many local varieties and is more resistant to insect damage. Maturation: Approx. $3\frac{1}{2} - 4$ months.

102

- (7) Buasaani: Panicles are approx. 42-56 cm. long and 2-3 in diameter. Seeds are white in color. Common in Fiala/Bogandé region. No 'hairs' on plant.
- (8) Buodi ya diyue: Panicles approx. 115 cm. long and 2½-3 cm. in diameter. Seeds white. Common north of Jakpaga in Buodi region.
- (9) Ikpayaani: This is not strictly a variety of millet. It refers rather to any variety of late millet which comes up voluntarily and which does not produce useable seed. Panicles are about 30 cm. long and 2½ cm. in diameter. Seeds are not visible within glumes. Seeds will germinate. This 'wild' millet is believed to have originated through the germination of a normal seed within its glume.

6.2.2 Where Most Often Cultivated

Kuanu yun kpeligi/(Ageing Field)

Feloli/(Village Field) In some regions even normally fertile fields are low in fertility and can only support millet cultivation.

6.2.3 Associations *

- : Often cultivated as a sole crop
- : Early millet planted first, followed about two weeks later by late millet between rows
- : Sorghum and late millet seed mixed and planted together in same pocket.**
- : Late season millet planted, followed not more than four days later with cowpeas. *** Sesame is sometimes planted before the millet).

* See Appendix VII

** This is done because the sorghum Striga parasites are becoming a problem in this field. The presence of late millet is said to impede the growth of Striga, thus permitting the growth of sorghum. Both are harvested together.

*** If cowpeas were planted more than four days later, the late millet would have grown enough to inhibit proper development of cowpeas.

: Late season millet, planted in several rows across a peanut plot, marking divisions of this plot.

Note: Cowpeas will almost certainly be associated with the first two associations listed above as a third crop. The fact that some farmers say they do not have cowpeas in a particular field is more likely to mean that cowpeas were planted but they failed.

Late millet is not associated with maize. To plant maize indicates fertile soil, in which case the farmer would plant sorghum (if he does not intend to make the maize plot into a tobacco patch when maize is harvested).

6.2.4 Cultivation

Farmers do not space one variety of late millet differently from another. Late millet is planted with more space between rows than sorghum, mainly because of the way the plants spread out and because the soil is less fertile. Three or four young plants are left in each pocket. Those in excess of this will be removed and possibly transplanted elsewhere. This thinning takes place during the first weeding when plants are still young and have not yet begun to form true stalks. Transplanting is very common and is used to fill out those spots in a field where young plants may have died or been washed out by water. Farmers can obtain transplants freely from neighbors if necessary. Newly arriving people in a village can even obtain enough transplants to fill a small field if the planting season has already passed.

Late millet cultivation is not as demanding as that of sorghum cultivation since the latter needs more intensive care. What is important is that planting be on land where earlier hoeing has removed weeds. Otherwise, weeds will choke out the young plants. But once planted and growing, weeds will not be able to harm the millet, as they can not compete with its rapid growth.

Two or three hoeings are necessary for a field of millet. Unlike early millet, most late season millet varieties possess fine 'hairs' on their stalks, leaves, and panicles which render later weeding and harvest activities extremely irritating to the skin. Protective clothing is necessary if available. Leaves are also razor sharp and can easily cut exposed skin.

Unless late season millet and sorghum are to be mixed in planting, the two will be placed on separate parts of a field. In this case, the sorghum will be planted before the late millet. In either case, both will be harvested during the same week. Where late season millet is the principal crop cultivated, fields will be sown at the earliest possible moment.

Crops must be protected from domestic and wild animals. For maturing panicles, birds are less of a problem than with early millet.* Panicles can be damaged by small larvae, which in addition to consuming the young seed, attract the black magpies. While eating the larvae, these birds manage to knock off a considerable amount of seed to the ground. Monkeys, baboons, and warthogs pose serious problems in some regions (J,P). Late season millet has its own special variety of Striga parasite to which it is sensitive. This variety (oyuan-Qmaagu) is not the same as two others which pose a similar threat to sorghum (and of which late millet is supposed to impede the growth).

Harvests usually occur when the rainy season has terminated (late October and November). If the panicles are already quite dried out before the harvest begins, harvesting will only take place in the early mornings - often before daybreak. Stalks cut down in the heat of the day will lose too many seeds from the panicles. Panicles are either cut

* Fields are maturing everywhere so birds are well scattered. Bush grass seed is also available at this time of year.

immediately from stalks and spread out to dry or are left a day or two on the stalks and later cut and stored directly. If sorghum has been mixed in with late millet, their cut panicles will be separated and stored separately. An unexpected rain during November can cause serious damage from mold and rot.

Depending on their immediate need and the distance of their field from their dry season residence, farmers may either leave their millet in head within a granary or thresh and store it in their village compound mud silos. Stored panicles are not treated against beetle larvae and weavils. Stored seed is often treated however by mixing in wood ashes or insecticide if available. Some farmers believe the fine chaff dust of threshed late millet is sufficient to prevent serious parasite loss in silos.

6.2.5 Usage/Marketing

There are at least nine food uses for which the flour of late season millet is the preferred, and in some cases, the only ingredient to be used (saabu, moaabu, kanbiali, yencagini, nyimpiemma, yoncaali, yonkona, kantemoagidi, gbidili). Despite this, farmers, if they have the choice, prefer that sorghum make up the bulk of the crop of their fields. From the women's point of view, late millet is much easier to work with.*

* Late season millet is often the sole or major crop of the personal fields of women. This millet, owned by specific women, can either be sold or prepared as a special food and sold.

Farmers will give the following reasons for their preference to sorghum.

- (1) Late season millet is too quickly used up for various food purposes. If it represented one's major food reserve, its rapid use could cause serious shortage later. Farmers who are obliged to have millet fields are careful not to thresh too much at one time; this will oblige their wives to use the sorghum they have managed to grow or buy.
- (2) Late season millet is not used for beer making (it is said to cause diarrhea).
- (3) Except in large centers where market women have created a demand for late season millet to prepare the assorted foods they make for their 'road-side food stalls', sorghum commands a higher price than millet. One tin * of sorghum might cost 750 CFA at harvest time, whereas if it were millet, it would sell for 550-600 CFA/tin. Someone looking for grain to buy in Fada, for instance, will not pay 1000 CFA for a tin of millet if he can find a tin of sorghum for the same price. He will buy the sorghum.
- (4) Though equal amounts of sorghum and late season millet make about equal amounts of saabu (the staple 'porridge'), farmers claim the sorghum, being less tasty, will last longer.

6.2.6 Ownership

Late season millet is cultivated by both men and women on their personal fields. In the Bilanga/Piala/Bogandé region however, women, for cultural reasons, are expected to cultivate only late millet (and not sorghum). In the Kancaari region, farmers stated that women are not capable of cultivating the low areas (baagu) where soils are heavier and sorghum is grown. Women therefore grow millet, for the most part, on their own personal fields.

* one tin = one double decaliter or approx. 15 Kgs. of sorghum.

6.2.7 Seed and/or Storage

Panicles are selected that are well filled out with large seeds. These are tied together into several bundles, resembling small piles of cord wood, and are called di-bobili or di-babili (Figure 17,F). These are placed on top of the rest of the grain in the granary. It is fairly simple to obtain an idea of the amount of seed grain various households expect to use in the coming year by weighing the various bundles of millet (or sorghum) they have set aside for this purpose. Every year a natural selection of best yielding panicles of each variety are put aside for seed purposes.*

6.2.8 Crop Recommendations and Observations

A potentially useful activity worthy of further study is that of millet transplantation. It is widely practiced. Farmers might be encouraged, after having planted their fields, to seek a low spot and plant a seed nursery of sorghum and/or millet. Pockets within the grain field which do not germinate, or which wild fowl have picked clean, or whose seedlings have simply died out from lack of moisture will be replanted if the season for planting has not passed. If it has, the farmer will have to make the best of the situation by thinning and transplanting. In a poor year, such a farmer often does not have enough seedlings to recover his loss.

The O.R.D. has successfully introduced the method of establishing seed beds for rice which is transplanted when water has covered the rice plots (bas fonds) and the seedlings are large enough to survive. The same system would be valuable as a back-up system for sorghum and millet fields. Seedlings could be transplanted from seed beds at a time when the rains have been well established,

* This is not to say all farmers set aside seed in this manner, though most seem to do so. Some simply take whatever grain is available at the beginning of the rains.

filling in all those areas where seed planting has failed.* Such seedlings would also be far ahead of any plants the farmer might have as a result of replanting. Transplanted millet is hardy. One rain following its transplantation will permit it to take better root and be more drought resistant than seed having been replanted at the same time. The seed could again die or be consumed by pests, whereas transplanted seedlings would survive. Such a seedling 'nursery' could greatly reduce the set-backs experienced in years when the rainy season is later than normal.

6.3.0 Kaanlo/(Sweet Sorghum)

The third division within the domain of di/(sorghum and millet) consists of the sweet sorghums. Three varieties have been recorded.* Sweet sorghum is cut green, before panicles have completely matured.

Early and late season millet is easily differentiated from the sorghums by the color of leaves, form of growing plants within a pocket, as well as shape of panicle.

* The rich growth of seedlings which comes up around a threshing ground could in a sense be seen as a kind of nursery. Farmers sometimes do use these seedlings. Some farmers, however, believe such seedlings will develop into 'wild millet' (see variety No. 9).

** Although sugar cane is called nasaali-kaanlo ('white man's sugar sorghum') it does not belong to this class. Sugar cane is not a kind of di/(sorghum and millet).

6.3.1 Important Varieties

- (1) Kaanlo-yu-moana: Panicles are short, thick, and extremely compact (approx. 13 cm. long, 7 cm. in diameter). Well-exposed seeds and small hulls are red. (Figure 9,G).
- (2) Kaanlo-kpabida
- (2) Kaanlo-yu-piena: Panicles are approx. 30 cm. long and 5 cm. in diameter. Long, seed holding branchings of the panicle are loose and drooping. Seeds are entirely hidden by pale white glumes. Stalk juice is sweeter than variety 1 above. (Figure 9,H).
- (3) Kaanlo-cuadi
- (3) Ikaali-buadi: Panicles about same size as variety 2 above. Panicles are erect, not drooping, and are slightly compact. This is the sweetest variety of sorghum.

6.3.2 Where Most Often Cultivated

One or other of the above varieties of sweet sorghum can be cultivated anywhere that one might find regular cereal sorghum production. For the sweetest cane, farmers note that soils should not be too fertile nor hold too much moisture.

Licananli/ (Front of Compound Plot)

Dapuoli/ (Small Plot Behind Compound huts)

Feloli/ (Village Field)

Kuanu/ (Fields - with sorghum).

6.3.3 Associations

- : Never cultivated as a sole crop
- : A few rows of sweet sorghum may be associated with some other variety of sorghum ; cowpeas also possibly present.
- : A few rows of sweet sorghum may enclose a maize plot or peanut plot.

6.3.4 Cultivation

Sweet sorghum is cultivated for the juice of its stalks. This crop is neither widespread in the E.O.R.D. nor cultivated by many persons even where it is best known (Jakpaga/Gobinangu region). Except as a sweet snack, it is of little importance to farmers.

Because it matures quickly, planting time is not too critical. Weeding takes place when the principal crops of the fields or plots in which it is found are weeded. Where wild animals can pose a problem, sweet sorghum will be planted in the center of a field - not along borders. Once such animals (warthogs, monkeys) have tasted one or two stalks, they will indiscriminately tear down large sections of the field looking for more.

6.3.5 Usage/Marketing

Children and women of a household are the principal consumers of the stalk juice. It is not generally sold.

6.3.6 Ownership

Children and women plant a household's sweet sorghum.

6.3.7 Seed and/or Crop Storage

Several stalks will be permitted to reach maturity from which panicles are cut and hung up in a granary or hut to prevent rodent damage. Others will place seed panicles in a small mud silo or ceramic pot.

6.3.8 Crop Recommendations

Because the crop matures rapidly and seems to grow well for those who do cultivate it, it might be possible to expand commercial use of the crop if the cane could be processed in some manner. It might also be considered as a forage crop.

6.4.0 Biadi, Dimoandi/ (Sorghum)

Sorghum bicolor

Biadi represents the fourth major class of di/ (sorghum and millet). With the exception of the sweet sorghums, all varieties of sorghum are included. In terms of household consumption as well as sale, this is the most important crop cultivated by the Gourmantché. Numerous named varieties exist, some of which are limited to certain regions, others which are fairly widespread. Sorghum is self-fertilizing. This characteristic lends credence to the statement that named varieties are in fact botanically different. Farmers recognize sub-varieties among many of the major varieties based on color of the glumes.*

The following are superior local varieties. Though the E.O.R.D. conducts experimentation of new seed varieties, these have not as yet become available to farmers.

6.4.1 Important Varieties

- (1) Suoodi: Panicles are approx 35-40 cm. in length and are heavy yielding, with erect but fairly loose primary branchings (Figure 9, F.). Seeds are large and half-exposed in the glume. Maturation: Approx. 5 ½ months.

A white-seeded sub-variety possesses either red or white glumes. A reddish seeded sub-variety can possess either red or black glumes. The latter sub-variety is preferred for beer making. Stalks are thick and very tall. Leaves are broad, thick, and heavy. Needs very fertile and moist soils. The red-seeded sub-variety impede the growth of one variety of sorghum Striga.** Stalks are blood-red at base. Seeds are extremely hard and store well. Even threshed, and kept dry, it is said to withstand parasites for two years or more without any kind of treatment.

* Botanists recognize that black in glume color is dominant over red, and that white is in a genetic category by itself, unaffected by either red or black traits.

** Roots have a thick membrane which resists the penetration and growth of Striga parasites. Two out of three named varieties of Striga infect most sorghum varieties. (1) yuan-nyuaga is a short plant (25-35 cm.) with bluish flowers,

- (2) Dimoani, Dimoammoanga, Dimoanga, Panicles are erect and compact, with dark reddish-brown seeds (Figure 9,E). Seeds are rather small. Glumes dark red to black. Stalks can be thick and long.
Maturation: Approx. 3 months.
Does well on most sorghum soils and is cultivated mainly for its excellent beer. Seeds store poorly.
- (3) Conlooli, Belko: Panicles are long and heavy yielding with loose, slightly drooping secondary branches (Figure 9,D). Seeds are dirty-white in color. Glumes usually black. Stalks are tall and sturdy with especially dark green, broad, non-serrated leaves.
Maturation: Approx. 3 ½ months.
Harvests in late September, and early October. Too much rain in grain filling stage results in poor yields. Even without treatment, seeds store well.* Is very sensitive to Striga. In recent years this variety has become one of the most widespread and valuable sorghums in the Eastern region. It is most often found upon village fields (as opposed to bush fields). In the Fiala region it is mixed with late millet and harvested together. In Pamma, it is rotated with dimoani (2 above) upon sections of a field. Near Jakpaga, farmers did not have it for fear of destruction by birds (it matures early and not enough people were cultivating it). In Madaaga, people are asking for its seed. Because it matures rapidly, it is greatly appreciated as the crop which relieves the 'hunger-months' of the rainy season when stocks are low.

(cont.) (2) yuan-bijaga grows higher (60+cm.) and has pink flowers. This Striga variety appears above the soil before the preceding variety.+ The third variety is parasite + specific to millet. Striga seems to appear under conditions of reduced or low fertility. (+ Striga hermonthica)
* 1976 E.O.R.D. seed variety tests included some local varieties. Production statistics available for these tests only come the Bilanga region. There, Belko gave 812 Kgs./ha.

- (4) Dagbani, Digbeni, Osansan-calo: Panicles are erect and loose and yield heavily (Figure 9,C). A white-seeded sub-variety exists with white glumes. Stalks are rather short (3 cm.) and panicles are short. Best for eating. A red-seeded sub-variety exists possessing long stalks (4 m.) and long panicles. It is cultivated principally for beer. The two sub-varieties are not generally mixed for planting.
Maturation: Approx. 3 ½ months.
Seed stores poorly. Widely cultivated on village fields of the Gobinangu and Pama regions.

- (5) Cuadi: Panicles of most sub-varieties are heavy, loose and slightly-drooping to drooping. It is a red and white sorghum which does better on higher, well-drained soils. Best known around Fada N'Gourma.

Sub-Varieties

- (a) Imoadi-cuadi: white seeds are large with tiny black spots. Stores well without treatment for two or more years. Possess black glumes. Soil fertility must be high.
- (b) Cuadi-jaɔɔanga: Seeds pure white and very small. Panicles are rather short. Possesses red glumes. Maturation: Approx. 5 months.
- (c) Cuadi-poyinga: Seeds reddish and very small. Maturation: Approx. 5 months.
- (d) Cuadi-jeje: White seeds which are extremely small and hard. Cultivated in limited quantities in fertile village fields and can produce several good panicles from one stalk. Panicles are cut individually from stalk while still moist and are pounded and eaten. A remedy for stomach ache.
- (e) Dembo: Seeds dirty-white in color with red or black glumes; long 'hairs' project from each glume. Maturation: Approx. 4 ½ months. Heavy, loose panicle.

- (f) Cuadi-luomo: Heavy, loose panicle, tiny white seeds, light red and white glumes. Panicle is cut while seeds are still soft. It is pounded individually and grain eaten raw.
Maturation: Approx. 4½ months.
- (g) Tanga: Panicles are erect and thick. White seeds within red glumes.
- (h) Cuadi-moani: Panicles are erect and thick. Red seeds with black glumes.
- (6) Osoango: Panicles are rather short, loose, and drooping (Figure 9,H). Seeds when maturing are white but turn a dark reddish-brown when dry. Glumes are reddish-black. Stalks are rather thin and medium size (8-9 feet). Seeds are slightly bitter, store poorly, but produce an excellent beer. This variety often provides food during a critical period. Generally, those who cultivate early millet will not cultivate much or any of this kind of sorghum and vice versa. As a drink, its flour will clear up some cases of diarrhea quickly. It is mainly cultivated upon the village fields. It is a special horse feed in some areas (J.). One sub-variety matures in about 90 days, and must be planted with first rains. The other (soajaga) matures in about four months.
- (7) Dimangu: Panicles of some varieties are extremely short, bulky, and compact (Figure 9,G), or compact and erect (Figure 9 E), or erect with loose branchings stemming from one center point (Figure 9,B).* Seeds are often yellowish-green in color with black or white glumes. Stalks are thick and quite long. Planted in rows around compound maize and tobacco plots. Planted by women in Jakpaga region. Single panicles can be cut to permit development of new ones.
Maturation: Approx. 3½ months.
Most of the sub-varieties of this sorghum are eaten raw before panicles have dried out.

* One sub-variety, kankan-yaala, gave yields of 2875 Kg./ha. (E.O.R.D.), 1976 variety tests - Dilanga).

- (8) Papienli, Biadi-pieni: Loose, erect panicles, with large very white seeds partly covered by strikingly black glumes. Stalks are tall and thick. Leaves are light green, and easily cut the person weeding. Has more red color at base of stalk than most varieties. * Is highly sought for its food value. With treatment, it can store reasonably well. Maturation: Approx. 5 months. (Figure 9,C).
- (9) Biadi-boanga: Short, compact panicles, with large white seeds (Figure 9,E). Stalks are very tall (up to 5 meters) and thick. Does best in dark, heavy, moist soils - even where water may stand several inches deep for short periods. Makes a dark colored porridge. Maturation: Approx. 4 ½ months.
- (10) Litandi-jali: Panicles are rather long, compact, and erect (Figure 9,E). Seeds are white in reddish-black or white glumes. Seeds in either head or threshed form do not keep very well (3-4 months as seed, a little longer with panicle). It is often given to horses and livestock, though people eat it themselves if better grain should be lacking. Maturation: Approx. 4 months. A sub-variety is characterized by a recurved peduncle (Figure 9,A).
- (11) Diedaan-kan-fiagi, Muabidi: Panicles long, loose, and drooping; (Figure 9,D). It is a white sorghum with small red spots on seeds. Ripens with maize in about 3 ½ months. The farmer can cut off without cutting stalk down and expect another good panicle to form. Most often planted in village fields and plots, often in two or three rows around maize plots. Literally, this sorghum is called: "the compound head who plants this will not be sorry".
- (12) Ojuan-nun-fan-daan: Panicles are loose, rather short, and slightly drooping. Seeds are hidden within the white or green colored glumes. This grain is eaten roasted; the glumes are burnt off causing the seeds to roast and burst. It is associated with late millet, though it is never cultivated in large amounts. Maturation: Approx. 4 months.

Farmers recognize that these rust-red markings are caused by presence of moisture or water, but they know that certain varieties react differently to such moisture with more or less red at bases of plants.

- (13) Wubili: Panicles are rather short, loose, and slightly drooping (Figure 9,H). Seeds are slate-grey. Thrives in well-drained, not too fertile soil.
Maturation: Approx. 4 months.
- (14) Tankuobi-juoga: Panicles rather short and loose. A rapid maturing, 3½ month., white sorghum.
- (15) Cgaaja: Panicles medium size, loose, and slightly drooping. The principal white sorghum of Ugalu/Macakoali region.
Maturation: Approx. 4½ months (Figure 9,H).

Many other sorghum varieties are important in yields and for food purposes but are less wide-spread. While most of the remaining varieties are white sorghum, a number of red sorghums also are represented. One variety is cultivated solely for the fibers of the stalks, used in baskets and mat weaving (No.27). One variety is distinctive in having two seeds per glume (No.17). *

6.4.2 Where Most Often Cultivated

- Kuanu/(Sorghum and Millet Field)
- Feloli/(Village Field)
- Cancanli/(Front of Compound Plot)
- Dapuo-loli/(Compound Plots - behind huts)

6.4.3 Associations **

- : Often cultivated as sole crop, or associated only with cowpeas
- : Sorghum follows the planting of early millet between rows in Gobinangu and Pamma regions.
- : Sorghum mixed with late season millet plus possibly, cowpeas
- : Several rows of an early maturing sorghum variety often provide the boundary lines between plots of maize or are placed across plots of peanuts or earth peas.

* Variety 20, Dimagili showed yields of 1416 Kg./ha. in Bilanga (1976) seed trial. Variety 37 gave yields of 541 Kg./ha. that same year.

** See Appendix VII

148

6.4.4 Cultivation

Most of the important issues regarding sorghum cultivation have been discussed - if not in 6.4.1 above under specific varieties, then earlier in this study (cf. 5.0 to 5.7). This information will not be repeated.

Sorghum is given the best soils the farmer possesses - with the exception of the small plots around most compounds intended primarily for maize. In planting, pockets are spaced about, 60-80 cm. between rows and somewhat closer down rows. During the second weeding, pockets are thinned of excess seedlings - leaving 4-6 seedlings to develop in each pocket. Three weedings are common, the last being a ridging activity as well among good farmers.

As the earliest planted sorghum varieties begin to mature in the village fields and compound plots, it is not uncommon for women to select out and cut maturing panicles from the standing stalks. They will do this for the next couple of weeks to supplement household food stock. Little piles of drying sorghum are frequently encountered inside compounds during this time of year (September-October).

Harvest activities are divided into a number of tasks, split fairly equally among men and women (see Appendix IV). The grain is cut by men and often stacked in parallel rows down a field.* This facilitates the work of the women who come along behind and cut off (yendi) the panicles. When a section of the field has been cut, the men will help the women remove the panicles which remain. Panicles are carried to a threshing floor and permitted to dry further for several days.

* This also facilitates the burning off of the leaves from the stalks some days later. The stalks will be too green to burn. Having been 'cleaned' in this way, stalks are easily gathered and carried to the home compound where they may provide the material for fencing.

Jakpaga and Pamma peoples usually put most of their grain directly into their granaries at this point (Figure 17B). These granaries are usually located at their fields and grain is removed and threshed as needed through-out the year. Fada and Piala/Bogandé farmers more frequently thresh out all their grain when time permits following harvest.

Birds are less of a problem for sorghum than for early millet - mainly because there is so much of it maturing at one time all over the countryside. Yet birds do cause damage to more isolated fields. Monkeys and baboons can also be destructive.

Planting schedules vary from year to year - depending on when the rains start and how they continue. Village fields are planted first with the more early maturing varieties. When these have been successfully started, the principal bush fields and personal fields will be planted with the mid to long term maturing varieties.

Examples of some planting schedules are given below for a number of areas. Numbers refer to order in which sorghum varieties are planted.

Buammoandi
 1. Conlooli (Var.3) and/or Kondeligu (Var. 26)
 2. Cuadi (Var.5) and/or Biadi (Var.8) & Diyue
 3. Dagban-calo (Var.4) and/or Suoodi (Var. 1) (late millet)

Pamma
 1. Iniadi (Early Millet) and Maize
 2. Osuango (Var.6)
 3. Sansan-calo (Var.4)
 4. Conlooli (Var.3) and/or Tankanja (Var.7) & Diyue (Late millet)

Kaancaali
 1. Conlooli (Var.) and Maize
 2. Cuadi (Var.5) and Diyue (Late Millet)

Bogandé/Piala
 1. Muabidi (Var.11) and Maize
 2. Dije (Var.16) and/or Cuadi Niigu (Var.5f)
 3. Belko (Var. 3) and Dipieni (Late Millet)
 4. Cuadi (Var. 5) and/or Wubili (Var. 13) &/or
 pmagili (Var.20)

Fada N'Gourma
 1. Maize and Osuango (Var.6)
 2. Conlooli (Var.3) and Dipieni (Late Millet)
 3. Cuadi (Var.5)

6.4.5 Usage/Marketing

Sorghum is the most common staple in the diet of Gourmantché farmers and is eaten as often as twice a day. A significant percent of a farmer's production is used to make daama/(beer). Brown/reddish seed varieties are preferred for beer. These are less preferred for food.

Grain prices fluctuate a great deal through the year. Following harvests, a tin of sorghum may cost about 700 CFA * a tin (a double decaliter or 15-17 Kgs.) in rural areas. By May and June the price will have risen to at least 900 - 1000 CFA. In more urban areas the price will reach 1500 - 2000 CFA/tin.

6.4.6 Ownership

Both men and women cultivate and sell sorghum.

6.4.7 Seed and/or Crop Storage

A farmer will select a number of panicles for next year's seed needs. These are tied together (see Figure 17 G) and stored in a granary. Farmers prefer to keep their sorghum in the panicle as insect damage is considerably reduced. If grain is threshed out, then it will be mixed with wood ashes and insecticides and stored in sacks or mud silos until consumed or sold.

6.4.8 Crop Recommendations and Observations

More experimentation should be done in farmer's fields with local varieties. Superior local varieties might be introduced into areas where they are presently unknown. Regional distribution systems for insecticides could be greatly improved and would be much appreciated by farmers. Farmers are prepared to purchase these if they are available.

* 215 CFA = \$1.00 U.S.A. (1979)

151

Seed multiplication of new sorghum varieties could be achieved if farmers were simply given several panicles to place on a section of their field - with a promise to purchase the yields at a reasonable price.

Major grain purchasing organizations (ie. OPNACER) should attempt to promote the purchase of only those local varieties which are known to store well. As it is, much of the grain bought up in local markets is indiscriminately mixed. Purchasers at the local level could be selective.

Farmers possess a wide range of grain varieties with which they can better adapt to the special circumstances of their environment. Rural development agents seeking to improve farming systems must also think in terms of a wide range of crop varieties - not just one crop or one improved variety.

6.5.0 Muuli/(Rice)

Oryza sp.

Rice cultivation is a fairly recent innovation in most parts of the Eastern Region due largely to increasing interest in low land (bas fonds) development. It remains under-exploited. A major reason is that rice is considered a cash crop and not basic to food subsistence like sorghum, millet, maize. Farmers who cultivate substantial amounts of rice do so in order to sell it. They will then repurchase sorghum or millet. Table I (p.65) indicates that about four per cent of the total land under cultivation by above average farmers (B.A.E.P.-77) would be used for rice. The 'average' farmer would cultivate less.

This orientation towards rice is not likely to change very rapidly - as long as adequate production of sorghum and millet can be maintained. A Gourmantché farmer who could not exchange his rice for sorghum or millet would, the following year, most likely leave rice cultivation to cultivate sorghum or millet.

One can expect rice cultivation to increase as rice becomes more important in the diet of these people. Irrigated rice is still a rarity in the Eastern Region, though important steps are being taken to increase such production. B.A.E.F.-78 survey data indicate that only 50% of the 'average' households sampled own or have access to rice lands - 73% of the non-random sample of animal traction farmers have access to such land.

6.5.1 Important Varieties

Thirteen varieties have been recorded, four of which have recently been successfully introduced by the O.R.D.. Several varieties are said to have originated in northern Togo and Ghana, brought here by persons returning from these regions. The traditional small grained red rice of the Gourmantché (igulin-muuli) has been cultivated for as long as people can remember in the Gobinangu region. It matures very quickly (approx. in 95 days) and was mainly considered a 'hunger crop' in times past. People prefer the taste of the new varieties.

6.5.2 Where Most Often Cultivated

Obaagu/(Marsh, Flood Plain)

Until recently rice cultivation involved the planting of seed in low areas where water passed but did not settle too deeply, or along the edges of ponds or marshes. Recent extension services have encouraged farmers to establish nurseries from which seedlings are transplanted into the standing water of ponds, marshes, and behind small earthen dams.

6.5.3 Association*

- : Most often cultivated as a sole crop
- : Rice associated with maize in low areas where land is quickly covered by water. Maize is harvested before heavy rains of August cause flooding damage.
- : Rice is often the principal rainy season crop planted in the dry season garden, where it stands near mango, guava, and lime trees, sugar cane and bananas.

6.5.4 Cultivation

Individual, personal plots are small, with three to five sacks of unhulled rice considered a good crop. Rice is sometimes planted in rows (traditionally), though this is usually not the case. When planted early, harvest can be expected to take place in early to mid-October, before the major grain harvests. When seed is planted directly into a plot, thinning and transplanting is necessary.

Three weedings are considered necessary for a rice plot. Mice, rats, pigs, and cattle are the principal threats. Birds attack local varieties more than the introduced varieties. At harvest, the owner enters his field and cuts off the mature heads and carries them to a threshing floor where they are dried further and threshed. Threshed rice, still within the glumes, is taken home and stored in mud silos either outside the compound or within the courtyard or some hut. Rice is sold by the farmer in the hull.

Within silos (Figure 17^b) weavils and mice can cause considerable damage. Because rice does not make good saabu (the staple meal), it is used for a mid-day meal with occasional meat and sauce.

With increasing use of water covered lands, more farmers are learning to use seed nurseries and to transplant the seedlings. Planting seed directly in these particular kinds of locations would not succeed. Seedlings would be covered and killed by water when rains became more frequent.

* See Appendix VII

6.5.5 Usage/Marketing

Some is eaten but most is sold.

6.5.6 Ownership

In the Eastern O.R.D. men control approx. 72% of all rice plots. Women, especially in the Gobinangu region, however, also have their personal plots (see Appendix VI).

6.5.7 Seed and/or Crop Storage

Some seed is set aside within a gourd or ceramic pot for the new season.

6.5.8 Crop Observations and Recommendations

Rice can become a more important crop in the region if it is promoted as a crop to insure against the potential hunger months of the rainy season. As a cash crop, it will continue to be important for a growing number of young farmers, especially as the many unexploited bas fonds come under cultivation for the first time and as new dams and small earthen dikes are constructed to retain water in low areas.

6.6.0 Tiina/(Peanuts and Earth Peas)

Gourmantché plant classification recognizes peanuts and earth peas as belonging to the same category: tiina. Because peanuts represent a major cash crop for many farmers, chances are good that when a farmer speaks of his tiina, he is referring to peanuts. But this is by no means always the case. So the distinction must be made:

A: Tiin-namaga: peanuts

B: Tiin-moara: earth peas (see 6.7.0).

135

Λ. Tiin-namaga, tiinkpama (Peanuts, Groundnuts)

Arachis hypogea

Peanut plots are individually owned and are generally small, representing only one of a number of cash crops available to the family. The exception is the Piale/Bogandé region where peanut plots of a household can represent as much as 25% of the land under cultivation. The household average for the Eastern region is closer to 8.3% of total land under cultivation (Table 1) (as compared to 4% for earth peas and 9.2% for soybeans).*

6.6.1 Important Varieties

Seven varieties have been recorded, three of which are known to have been introduced ^{by} the O.R.D.. Major characteristics distinguishing varieties are degree of oil content, size and number of kernels per pod. Some varieties tend to spread out a great deal, others develop in an upright position.

6.6.2 Where Most Often Cultivated

- : Plots within the village upon a portion of a village field
- : On newly cleared land, first year of cultivation**
- : On old sorghum field or where millet has been cultivated

6.6.3 Associations***

- : Most often cultivated as a sole crop
- : Peanuts with interspersed rows (every three or more meters) of sesame or kenaf, or roselle, or cowpeas, or earth peas.
- : Peanuts between rows of early or late millet and sorghum

*B.A.Z.P -77 data. The percent of peanuts should be a little higher for 1978, the percent for soybeans considerably lower.

** Farmers, after planting their cereal fields, usually have time to plant their cash crops. To do this, they often clear a new (not large) section of bush along an edge of their major field upon which peanuts, cowpeas, earth peas, or cotton are placed for a year (kagii pugi okuanu).

*** See Appendix VII

156

6.6.4 Cultivation

Peanuts should be planted some 10 to 15 days after all sorghum and millet fields have been planted. Planting peanuts at the same time as the grain fields would not only slow down the planting of the vital grain fields, but peanuts would mature when rains are still present and rot in the ground. Maturation should coincide with the termination of the rains, so that harvested peanuts can dry out properly.

Peanuts should not be placed in the same plot for two years in a row as yields will fall off greatly. Farmers note that peanuts will be smaller, or seeds may not even be present within the pod. For this reason, peanuts are often put on newly cleared plots adjacent to grain fields. Or, different parts of a grain field are selected for such plots from year to year. Such plots may continue on a field upon which grain production no longer takes place.

Planting is usually in rows which must be closely spaced if production is to be good. A proverb, referring to family solidarity, states that unless peanut plants are close to each other, they can not produce proper seed. Planting always follows the first of two or three expected weedings. The number of weedings depends on whether it is a new or an old field.

The second weeding takes place when seedlings have been well established. As weeds and peanuts will have come up together, considerable care is required not to hoe up the young plants. The third weeding takes place as plants begin to spread out on the ground. Each plant will be banked. Hoeing after this time will destroy many forming pods.

As they mature, squirrels (and monkeys and pigs in some areas) can cause considerable damage. A farmer knows his peanuts are mature when the leaves are turning yellow and leaves near the roots are dried out. A plot is usually

harvested in one day and left to dry for a few sunny days. A great pile is then made under some nearby tree where women and children (sometimes men) will sit and remove the pods. Unless the left-over plant material is quickly used for livestock, it loses its leaves, turns black, and becomes, according to farmers, worthless.

6.6.5 Usage/Marketing

One of the reasons farmers prefer peanuts over earth peas is that they can be eaten directly, without preparation. Many women also go through the ~~time-consuming~~ process of extracting the oil for their cooking needs. Peanuts are an appropriate gift to give visitors and make a tasty sauce to be eaten with rice.

Approximately three fourths of a household's production is sold. Peanuts which are not to be sold will be stored in mud silos or temporarily in small grass granaries (Figure 14,A). They are not shelled before sale. A tin brings about 500-600 CFA.

6.6.6 Ownership

Because of its value as a cash crop, both men and women cultivate it. For the Easter O.R.D. as a whole, household women control 59% of all peanut plots (B.A.E.P-78 data, Table IIA). Women in the north control an even greater share of the total produce (peanuts were traditionally cultivated there only by women).

6.6.7 Seed and/or Crop Storage

Farmers must be especially careful to remember to set aside enough seed for the next year and not eat it all. This is often placed in a ceramic pot or small mud silo within the owner's hut. Most of the household's unshelled peanuts are placed in a temporary granary until they can be sold.

6.6.8 Crop Observations and Recommendations

The O.R.D. has promoted high oil producing varieties of peanuts, and people generally prefer the taste of these. When peanuts^{are} needed during a period of low food stocks, however, it is peanuts with low oil content that people prefer. These can be eaten as a substitute for their staple porridge. The former, if eaten in this way, is said to cause dizziness. Farmers will want to cultivate both kinds.

6.7.0 Tiin-moana, Tiin-piena, Tiinkpanga/(Earth Peas)
Voandzeia subterranea

Plots are generally smaller than those of peanuts and not nearly so widespread. Table I (B.A.E.P.-77 data) indicates an average of four per cent of total land under cultivation by a household is used for earth pea cultivation - the average for the Eastern region is probably somewhat lower. Earth peas are seen principally as a 'hunger food', in that it matures during a period when food resources could be running out (September, early October). As a source of food, it could be much more important than it is.

6.7.1 Important Varieties

Four local varieties have been identified whose major differences are their colors: black, red, white, or spotted. A couple varieties may be found in the same plot, as new varieties are purposely sought and experimented with. A woman, seeing in the market a variety she does not have, will obtain a handful to try out in her plot the coming season.

6.7.2 Where Most Often Cultivated

- : Most often planted on newly cleared land, first year of cultivation
- : Plots within a village upon a portion of village field.
- : Occasionally on old grain field (no longer used for sorghum/millet)

6.7.3 Associations *

- : Most often cultivated as a sole crop
- : Sometimes a row or two of sesame, ^{keni} roselle, okra, cowpeas may be included within or around an earth pea plot.

6.7.4 Cultivation

Planting, during what appears to be starting out as a good year, should take place a full month following the termination of grain planting (end June). If it looks like the year is starting out poorly, or if last year's crops are expected to be insufficient until new grain harvests, planting should start immediately.

As the plot is prepared and weeded, ridges should be made into which the seed will be planted. Later harvest is made easier this way. Plants should be even closer spaced than peanuts (10-15 cm.) (as they do not spread out). Sprouting takes 5-6 days.

Two hoeings are usually sufficient. Because of narrow spacing of rows, a smaller than normal hoe should be used (giyapuliga, gikupuliga). Grass coming up after the second hoeing can do little to damage the crop.

As leaves yellow, one can begin to dig out the still moist earth pea pods for boiling and eating. They will not be eaten raw. Otherwise the pods are left to dry out in the soil and then harvested. After they have been dug out, pods are left to dry further for several days. If planting was in itampaani (ridges) the harvest is not too difficult. If, however earth peas were planted on the flat ground (tinteeli), it will be very difficult to get everything out of the now dry soil.

* See Appendix VII

For storage and sale, dried pods must be pounded in a mortar to remove the tough shells. Dried seeds are extremely hard to crack at this point so do not get broken up in the process. After winnowing out hulls and dust, earth peas will be sold or stored for later consumption.

Storage must be made in a mud silo located inside a hut or in the shade of a tree. The heat of the sun will spoil them. Into this silo will first go some sand after which about two tins of earth peas are dumped in. Onto this will go another layer of sand. This process is continued until the silo is almost filled. The rest of the space will be covered with a liberal amount of sand. Seeds are thus preserved for as long as three or four years if necessary.

While yet in the ground the greatest pests are rodents. Once into the silo, weavils can cause some damage. Heat from the sun can cause extensive damage.

6.7.5 Usage/Marketing

Many farmers save their earth peas until their grain stocks are about finished and eat them by grinding them into a powder. This is made into a kind of porridge mixed with tikpankpandi (sauce herb plant) (see 6.19). It is also boiled as it is and eaten. Much of an earth pea plot may be consumed before it has fully matured in the ground. Peas will be dug up and boiled. Sale of a tin of earth peas will bring about 1000 CFA. This is without pods.

6.7.6 Ownership

With the exception of the Piala/Bogandé region, women do most of the cultivation of this crop. 56% of the earth pea plots cultivated in the Eastern region (B.A.E.P.-78) were owned by women. Women from a non-random sample of superior farming households, including animal tractor farmers, own 68% of all earth pea plots (B.A.E.P.-77) (Tables II A and B). This suggests that greater

commercialisation possibilities for this crop might be most advantageous to women.

It used to be the old women who cultivated this crop in the Gobinangu region, where earth peas were considered a special treat for young boys during their initiation camp experience. Some people still believe in the old custom that states: 'as peanut vines creep across the ground and spread out, so (symbolically) the household of those who cultivate them will increase'. But since earth pea plants do not spread out, (remember that this is considered a kind of 'peanut' to the Gourmantché) no one without a big family should cultivate them. Their cultivation would inhibit the increase of a small household. This may explain why it is often the older women with older children who do most earth pea cultivation in the Eastern region.

6.7.7 Seed Storage

A small calabash of seed will be set aside in a silo, or larger ceramic pot inside the owner's hut for the new year.

6.7.8 Crop Recommendations and Observations

Earth peas are one of the most under-exploited crops in the Eastern region. Yields are generally good and production could be greatly increased if a market were developed for them. Their value as a food has been much overlooked.

Many villages throughout the Eastern region are completely devoid of earth pea plots. Some households have never cultivated the crop. Farmers often determine their need for earth peas when they sense that a rainy season might be poor. At the point, thousands of farmers are tied into the agricultural season and no longer have the ability to look for the seed which they need but do not have.

162

The O.R.D. would be of great service to farmers if, in each sub-sector, they had available to farmers a stock of seed in case of such an emergency. Farmers could be informed of the availability of these stocks over the radio. The potential hunger that would follow some ten to 12 months later from a poor season could be prepared for.

As a crop, earth peas must be compared with peanuts for the Gourmantché. While the former produces more versatile food, and preserves better, the latter is easier to prepare and eat and has a greater market. Both play an important role as household food resources.

6.8.0 Isasini/(Local legume variety resembling earth peas)

Behind the Gobinangu chain of ridges is to be found a legume which, one would think, should be called a kind of tiina (peanut or earth pea) but isn't. It is in a category by itself. Though still much liked by some people (in Nagili), it has been slowly disappearing in this region as well. It is cultivated only by women and is used principally in the sauce of the daily meal in place of other ingredients such as soybean or néré seeds. Plants produce, like earth peas, a number of pale white pods underground, each of which contains one white seed. Seeds are round and about the size of a dry pea.

6.9.0 Akokoda, Akpabida/(Maize)

Zea mays

All households will cultivate at least some maize. This is one of the first and most important crops to be harvested during the period of food shortage each year (late-August through September). Its importance during this time is obscured by the fact that only about 2.2% (table I) of the total cultivated land of the average household is used for its cultivation. Maize is cultivated specifically for this period and is quickly consumed.

6.9.1 Important Varieties

Ten varieties have been recorded, several of which are recent introductions. Ears vary greatly in length and color of kernels for different varieties. Maturation periods are different. Variety 8 for instance matures in under 90 days, has short stalks, and produces one good ear. Variety 10 is very tall, matures in about 100 days and produces two good ears.

6.9.2 Where Most Often Cultivated:

Cancanli/(plot of land directly in front of compound, owned by head of compound)

Dapuo-loli/(plot situated behind individual huts of compound)

Obaagu-balima/(the slightly rising higher ground around a marsh) Planting may also take place in the marsh itself if too much water does not habitually settle there.

Kuanu/(sorghum and/or millet field) Here, one occasionally may have an especially fertile spot, such as a depression (buo-buanli) which will permit maize cultivation.

6.9.3 Associations*

- : Maize is rarely cultivated as a sole crop, (it is often followed by tobacco on the same plot)
- : Maize is associated with rice in marshy areas
- : Maize is associated with an early maturing variety of sorghum if planted in compound plots and with more long term sorghums if planted in a portion of a major field.
- : Cotton between rows
- : Okra, roselle, kenaf, squash, and calabash may also be found around or within a maize plot.

* See Appendix VII

167

6.9.4 Cultivation

The method of cultivation of any specific plot depends on where it is located. Kernels are removed from the cobs just before planting and inspected for weevil, mold, or rot damage. Following a first weeding and seed bed preparation, planting will often be done in rows, with three kernels per pocket.

(a) Maize cultivation in marshy area

Planting, following the first weeding, will take place when the marsh soil has been well moistened by rain but before enough rain has come to cause water to flow over or settle on the surface. Planted late, seeds will either rot or plants will grow poorly. Planting is done in well-spaced rows to permit the planting of rice some weeks later down between the rows. Farmers recommend three hoeings and four if possible. Such activity, which always includes the tanking of roots with soil, not only removes weeds but is said to increase the soils ability to retain moisture at the roots.

The second hoeing should take place well before the ears start to form. To wait until this time will produce poorly filled ears (a ba tua nyinfoa). A third hoeing should take place about the time the ears are appearing.

The first maize will be eaten when the silk has completely dried on an ear. Most of the maize of a field will be harvested only after stalks have completely dried out (turned brown). In a marsh area, harvested stalks of maize will be completely removed to permit growing rice the needed room for expansion. Farmers will say this will give the rice "space, air" (gi ba mifaawaama). (The ears are removed from the stalks after the stalks have all been cut down. The latter is sometimes given as a forage material to animals.)

Family members at this time gather around the big pile of corn and begin to husk (pugidi) the outer husks from the ear. The inside white husk covering is used to then tie large and well formed ears into pairs which are in turn tied into bundles of 50. Two such bundles joined together by a piece of twine form a kokodi-juanli (100 ears). A farmer can indicate how much maize he harvests by telling how many of these "units of 100 ears" (Lijoanli) he obtained. Small ears are not included in his accounting and are immediately eaten or given as gifts to friends and neighbors. The bundles of 50 or 100 will then be hung from a tree or other appropriate object to dry. Much of this will remain here until consumed (see Figure 17 I).*

Important damage comes to maize at several critical periods. The first follows planting when too much rain (as in a marsh area) or too little (as in a higher spot) causes loss of seedlings. Again damage is great if a dry period should set in at the time when plants have formed heavy stalks or when ears are forming. Almost total crop failure was experienced this year in the Piala/Bogandé region for this reason. Livestock and monkeys can also cause serious damage to maturing plots. In storage, weavils, rodents, and termites can pose a problem.

(b) Maize planting on higher ground and around compounds must take place when the rainy season has properly begun and when risk of dry periods is lessened (late June to early and mid-July). Much of this will take place at the same time the major sorghum/millet fields are being planted or just after. When maize is planted in an especially fertile spot in a major field of sorghum and/or millet, it will be associated with the sorghum (between rows). The maize will have been planted first to be followed after sprouting by sorghum between the rows. Harvested stalks will be left around the roots of the sorghum for added organic material.

* The exception to this is if a farmer should have harvested a great deal of maize - in a quantity which would be intended for sale. In this case, once dry, the ears will be

1166

(c) The plot in front of a compound, cultivated by the head of the compound, is generally the most fertile land of a household. It is here that most of the organic refuse and manure of the household is spread out. After a first hoeing the seed will be planted in rows around the middle of June - following planting of principal sorghum/millet fields. Rows will be closely spaced because it is not usually immediately associated with another crop. Two or three rows of Sorghum are often planted around and through the plot in one or two places.

Hoeing should be done often, if possible, once every two weeks. Farmers explain that maize needs this and will grow more quickly if this is done. About the time the maize is putting on ears (end of August), the farmer will begin transplanting tobacco seedlings he has previously sown in some special spot. These seedlings will be a foot or so high by the time the maize harvest comes. Stalks will be removed from the plot and used for animal forage materials.

6.9.5 Usage/Marketing

The first maize of the season is eaten before it has completely dried out. It is roasted over coals. Later on, after harvest of totally dried ears, it will be shelled, pounded or ground into a flour as needed for saabu (the daily staple meal). As a new crop, it is greatly appreciated as a change from many months of sorghum and millet flour use. Maize flour is also used for several other minor foods or drinks. Maize is rarely sold.

6.9.6 Ownership

Men control the major percentage (93%) of the maize plots cultivated (Table IIB). Table I indicates that men possess 2% out of a total of 2.2% of the land (.16 ha.) used

cont. from page 145-
placed in a mud silo until time permits shelling and sale. Drying will often have to be done inside the large entrance hut of the compound as rains are still frequent during this time of year.

16/1

for such production by the average household. In some regions, such as Bogandé, Piela, and Bilanga, men control all the maize around the compound- women do not have their own small plots behind their huts. Women do help in planting and cultivation however. In other areas, women will have some maize in their little plots, although men will have the larger plots. Such maize, in whatever region, is intended for family consumption. As its importance as a cash crop rises, individuals will begin to draw clearer lines as to individual ownership vs. consumption needs. The crop would probably become a largely male-controlled source of income - since it will probably be the husband of a household who will control the purchase of possible future fertilizers and inputs for increased maize production.

6.9.7 Seed and/or Crop Storage

Since maize is usually quickly consumed, most storage consists of short-term open-air storage. The surrounding husks of two ears are tied together and such pairs formed into a cluster called a lijuaani. When well dried, they may be stored in a granary or silo, or remain hanging in a tree until eaten. Storage loss is often caused by weavils, rodents, and other pests. Seed maize will be stored in the ear in a well protected place, (silo or clay pot).

6.9.8 Crop Recommendations and Observations

If it is the purpose of the O.R.D. to greatly increase production of maize, the need for fertilizer will be a major concern. Land presently suitable for maize cultivation is extremely limited if fertilizers are not to be added. The problem will be (1) to convince farmers that the cost of fertilizer can be met by the increased production to be expected and that, (2) once the crop is in, the expected excess will find an appropriate outside market. Greater household consumption throughout the year would be an added benefit to farmers if appropriate means can be found for storage and preservation.

165

Maize is not generally seen as a cash crop and presently is not sold in any quantity. A market will have to be created in order to establish the needed incentives for greater production. Maize does not compete favorably with sorghum and millet over long-term use as a basic food ingredient of the daily diet. Tastes could change however.

6.10.0 Kunkundi/(Cotton)

Gossypium sp.

Cotton is not widely cultivated in the Eastern O.R.D. and does not represent much more than 1.8% of the total land under cultivation by the average household. As evidenced by the traditional male weavers found throughout the region, cotton has been cultivated for many generations. With present low prices of Western style used clothing and cloth, traditional weaving has suffered and in many areas almost died out. This suggests that until recent decades, cotton cultivation probably represented a greater share of the total land under cultivation than it does today. There was also a surge in cotton production during French colonial times as a result of a high demand for exportation, thus making it an important cash crop. At present, locally produced cotton does not bring a good price and production reflects this.

6.10.1 Important Varieties

While the common, local variety cotton is called 'Gourmantché cotton', other varieties, introduced over the past years, are generally lumped together and called 'white-man's cotton'.

169

6.10.2 Where Most Often Cultivated

Cotton is either cultivated on newly cleared land to be followed the next year by sorghum production or on land which has been abandoned by grain cultivation. In the Bogandé region, one may also see cotton planted between rows of maize, (which is several inches high at time of planting). Sometimes cotton is planted along the borders of a low area (bas fonds) in this region.

6.10.3 Associations*

- : most often cultivated as a sole crop
- : sometimes associated with corn

6.10.4 Cultivation

Plots are small. Planting is in rows. Because it is not a very important crop, it is only cultivated if a farmer should have extra time to spare. This will always follow when all important crops have been completely planted. After weeding and land preparation, the seed is planted. Two further weedings should follow. Mature cotton will be picked by either men or women and stored away in a silo or granary - usually within some kind of container (basket).

6.10.5 Usage/Marketing

Some farmers cultivate cotton for sale in the market place to women who will prepare and spin it into thread. Men then weave the thread into cloth. Other farmers produce cotton for their own household purposes. In this case the farmers give the cotton to their wives who spin it into thread. This thread will be sold or, if the husband is a weaver, he will weave it into strips of cloth. These strips may be sold or are sewn together to make garments. Both husband and wife will benefit by receiving either garments or money from sales.

* See Appendix VII

6.10.6 Ownership

Men control at least 98% of all cotton plots (Table II A). As noted from Table I, of the 1.8% of land per average household under cotton, 1.7% of this belongs to the household head with only .1% belonging to women.

6.10.7 Seed Storage

Seed storage presents little problem. Seeds are kept in a gourd or small silo until the new year.

6.10.8 Crop Observations and Recommendations

If cotton is to once again become important as a cash crop, an increase in market price will be necessary. Creating a demand for locally produced woven cloth strips and cloth for the export market would infuse new life into the local weaving industry. To do this, color-fast dyes or pre-dyed thread would need to be available.* This would produce cloth of a higher quality which could compete better with mass produced cloth.

6.11.0 Imaani/(Okra)

Hibiscus esculentus

Okra is the most important sauce ingredient, along with gijonga,** in the daily sauce eaten with the saabu (the staple daily meal). Nutritional value is high.

Table I (p.69) indicates .3% of the total land under cultivation for the average household is used for okra. Plots of okra are often under-enumerated in farm surveys. Okra is widely associated with other crops. For this reason, I would estimate okra to represent about 0.5%-0.8% of the average household's cultivated land surface.

* Such dyes are rarely available and pre-dyed thread is usually too expensive, given the price weavers receive for their work.

** A fermented substance made from a number of kinds of seeds-néré, soybeans, or roselle.

171

6.11.1 Important Varieties

Reflecting its importance is the fact that many varieties and sub-varieties are named. Two basic divisions of okra exist: (1) Okra cultivated for rainy season use and (2) that cultivated for dry season use. Okra used for rainy season sauces has at least five distinct sub-varieties.

5.11.2 Where Most Often Cultivated

Rainy season okra is cultivated in rows around compound plots and often around part of a village field of a member of the household.

Dry season okra is cultivated in the low lying areas (bas fonds) or in other relatively fertile spots in or around the village or farm community. It is cultivated as a plot. The 417 okra plots identified for 370 Gourmantché households (B.A.E.P.-78) are mostly dry season okra plots (Table II A, p.83).

6.11.3 Associations *

- : Rainy season okra is almost always cultivated in association with those crops generally found around the compound (maize, early sorghum and millet, squash, gourds, tobacco, roselle, kenaf).
- : Dry season okra is almost always cultivated as a sole crop.
- : Rainy season okra is occasionally found as a sole crop in a depression near the compound (such as a hole out of which dirt has been removed to make bricks).

* Appendix VII

6.11.4 Cultivation

Rainy season okra is often the first crop planted by women each year. Weeding occurs along with the principal crops with which it is associated. Okra consumption follows planting in about eight weeks and continues, for some varieties, for two to two and a half months. Some okra is gathered every day or two as fruit reaches a certain length and is yet tender.

Dry season okra is planted as a plot in rows following completion of the major planting of fields (end of June, early July). Two or three weedings are expected. Okra is produced at each leaf joint as the plant grows tall (up to 3 meters). Produce is left on the plant until plant stalk has dried at the end of the rains.

Maturity is approx. 3 months.

6.11.5 Usage/Marketing

Rainy season okra is cut up and used immediately in the daily sauces. As its name implies, this okra is consumed during the rainy season. Dry season okra, on the other hand, is cultivated for dry season consumption. Its harvest comes in mid-September to mid-November, depending on planting time. Dry season okra is diced, mixed with wood ashes and put out to dry. Okra leaves are also picked and set out to dry and are used as a sauce herb.

Rainy season okra is sold fresh (green) during the rainy season in the market place, while dried, dry season okra, is commonly sold during the dry season. One enterprising Fada woman sold 40,000 CFA worth of dried okra last year in the market place from her own plots.

6.11.6 Ownership

97% of all okra plots belong to women (B.A.E.P-78).

172

6.11.7 Seed and/or Crop Storage

A ceramic pot or gourd will be used for storage of dried okra and okra leaves. Wood ashes serve as a preservative. Beetle larvae sometimes cause damage in storage. Okra pods are permitted to dry on some plants for next year's seed needs. These pods are picked when dried and hung up either in or outdoors.

6.11.8 Crop Observation

A better market for dried okra could perhaps be developed in major towns and in cities where demand is considerable.

6.12.0 Ibaligi/(Kenaf)

Hibiscus cannabinus

Kenaf, a fast growing annual crop, is the most important cultivated source of fiber. Every household will cultivate what would amount to approximately .5% of the cultivated land surface with kenaf. It is, however, difficult to estimate production because it is almost always planted as a border crop.

6.12.1 Important Varieties

Four principal varieties are cultivated which are characterized by height to which they can grow, by color of stems, presence or absence of a branching tendency, and extent of flowering.

6.12.2 Where Most Often Cultivated

Kenaf is a common border crop* around compound plots and village fields. Rows are often placed in sorghum and millet fields. Paths within villages are frequently lined with kenaf. Field weeding frequently leaves the scattered self-seeded plants which come up on their own. Some farmers, instead of planting kenaf, simply sow the seed in their fields.

* Other common border crops: early sorghum varieties, rainy season okra, roselle.

6.12.3 Association *

As a border crop, kenaf is planted in single, double, or triple rows, most often around:

- : sorghum and millet
- : peanuts and earth peas
- : okra
- : Kenaf is also cultivated as a sole crop of closely packed plants in rows (Pamma and Gobinangu region). Production is high.

6.12.4 Cultivation

Seed should be planted early in the season (June). Kenaf often serves to indicate the boundaries between plots of different owners (e.g. compound plots). Planting their kenaf first, owners will follow by planting their maize or early sorghum within the space outlined. Weeding takes place when these plots are hoed.

Stem length depends on when the crop is planted. Early planting will permit a four or five month maturation period resulting in fiber strands of three to four meters. It is a photoperiodic plant. Kenaf is often the last crop left standing within a village.

6.12.5 Usage/Marketing

Kenaf bark fiber produces a major portion of the rope and cordage necessary to farmers throughout the year. Wild sources of fiber do not compare in strength or resistance to rot. The standing crop will be permitted to flower and seed but is usually cut down before stalks have dried. This permits easy splitting of stalks and peeling off of fiber strips. When time is lacking, a farmer may simply cut down all stalks, split them, then bind them into bundles which he will stack against his hut or place on top of a shelter or in a tree. Termites seem to especially like dry kenaf bark fiber and precautions must be taken.

See Appendix VII

172

Kenaf is an important cash resource for any household. Every household needs a substantial amount of such fiber in order to weave the mats and roofing grass it needs each year. Sorghum stalk fences are bound up with this fiber. If kenaf is lacking, family members will either have to search for and produce wild fiber or grass rope, or purchase fiber.

In 1978, the common price for a roll of dried bark fiber was 25 CFA/roll and the expected price in mid-1979 will be about 40 CFA/roll. Each roll contains ten fiber strips which represents five kenaf stalks. Rolls of kenaf fiber are often joined into strings of 20 rolls each. This represents a minimum of 500 CFA/string, or the equivalent in price of one tin* of sorghum at this time of year. This is enough grain to feed one adult for one month. It is not unusual to find a household with at least four or five such strings with a minimum market value of at least 2000 - 2500 CFA (\$11.00).

During the rainy season, young leaves can be used like a spinach or mixed in with the staple sauce. Because of their bitter taste, however, kenaf leaves remain largely a hunger supplement.

Rope may be made from the fiber rolls and is used by the household for staking out its animals. It is also sold.

6.12.6 Ownership

Men control production and sale of kenaf fiber and rope.

* One tin = one double decaliter or 15-17 kg.

6.12.7 Storage

The top flowering section of a number of dried stalks is cut off, tied together, and hung up from a tree or post for next year's seed needs. Rolls of bark fiber are easily stored by hanging them in appropriate places away from termites. When needed, a roll will be removed, placed in water to soften the fibers, and used.

6.12.8 Crop Observations and Recommendations

Kenaf is easily cultivated and appears to grow well in the Eastern region. Because it does make a superior rope material, it would seem that a small industry set up in the region for fiber rope processing could be profitable.

6.13.0 Tigoandi/(Roselle)

Hibiscus sabdariffa

Roselle is cultivated in small quantities in most parts of the Eastern region and probably accounts for about .7% of an average household's total cultivated land resources. Like kenaf, it is most often planted as a border crop, which makes estimation of yields difficult.

6.13.1 Important Varieties

Five principal varieties are cultivated. The easiest means of differentiating such varieties comes when the calyces of flowers are present. These may be red, white, red & white, and may differ greatly in size.

6.13.2 Where Most Often Cultivated

Roselle is a common border crop around compound plots and village fields.

1977

6.13.3 Association *

As a border crop, roselle is planted in single, double, or triple rows, most often around:

- : sorghum and millet
- : maize and tobacco
- : peanuts and earth peas
- : okra

6.13.4 Cultivation

Seeds are planted in rows early in the season (June). Because of branching tendency, pockets are at least 30 cm. apart (a greater spacing than common for kenaf). Weeding takes place when the fields or plots are hoed. Maturation is between four or five months, depending on planting period. It is photoperiodic.

6.13.5 Usage/Marketing

Roselle is grown principally for the succulent calyces, seeds, and young leaves it produces. The calyces and leaves are used as a pot-herb (used in sauces) or are dried out and stored for such use during the dry season. Seeds are made into gijonga (soumbala), another important flavoring and nutritional ingredient in the daily meal.** These products are also sold in the market place. As a source of fiber, roselle is greatly inferior to kenaf. and is seldom used by farmers for this purpose (fiber strips are short because of branching tendency).

6.13.6 Ownership

Women control production and sale of roselle produce.

* See Appendix VII.

** Gijonga is for Gourmantché sauces what beef bouillon cubes are to European gravies. A common item sold in the market is the Maggi Bouillon cubes which are also used in the place of gijonga.

6.13.7 Storage

The top flowering sections of a number of plants are cut off, tied together, and hung up for next year's use. Dried produce is stored in clay pots or specially constructed fiber baskets which are hung up inside a hut for later use or sale (see Figure 17 K).

6.13.8 Crop Observations and Recommendations

Little research has been conducted to date on this crop. Its importance in the diet of farmers however, may justify greater attention. The crop requires little attention and produces well in the region. Roselle seeds are generally considered inferior to both soybean and néré seed in the preparation of gijonga (soumbala). With increasing use of soybeans for this purpose, there will probably be a decline in the use of roselle seed.

6.14.0 Ijuoni/(Soybeans)

Clycine max

Soybeans were first introduced into the Eastern region about nine years ago (1970). Within the last four or five years they have become an accepted crop of households throughout the region - due mainly to the high price offered for the crop. In 1977, approximately 9.2% of a good household's cultivated land resources, were in soybean production. As much as 8% of this would have been for sale, the rest used for household consumption. With the big price drop last year, production has fallen greatly.

6.14.1 Important Varieties

Reflecting its newness to farmers is the fact that farmers everywhere call it ijuoni.^{*} No differing varieties are yet recognized by farmers, though in fact many varieties have been tested by the C. R. D. in different parts of the region.

^{*} Ijuoni actually refers to the seed of the néré tree. To differentiate, farmers may say 'nasaali-juoni' (what's man's néré). The Camantché use the term 'nasaali' to refer to anything not of African origin.

6.14.2 Where Most Often Cultivated

Except where some O.R.D. (pre-cooperative) village groups are concerned, soybeans are cultivated on individually owned small plots located either within or near a village, or on a portion of bush field. Soybeans prefer deep, slightly sandy soils with good moisture retention.

6.14.3 Association *

Soybeans are most often cultivated as a sole crop. A row may be placed within a plot of:

- : peanuts
- : earth peas

6.14.4 Cultivation

Farmers have limited experience with this crop. Advice of extension agents suggests that planting should follow the planting of sorghum and millet fields. at about the end of June or first part of July. Early planting would result in maturation during a time when rains are still frequent (August) and rot would result.

Farmers have been placing their plots on a portion of land previously used for sorghum or millet production. Farmers are more accustomed to planting cotton, cowpeas, earth peas, or peanuts on newly cleared land for the first year of cultivation, but some are beginning to use soybeans in the same way.

Seed pockets are closely spaced and contain about four plants each. Two or three weeding are necessary. Pigeons and rabbits are pests.

Maturation is approximately 3½ months. Planting should be done at one time over the whole plot to prevent different parts of the plot maturing at different times. Plants are cut at the base as leaves begin to turn yellow.

* See Appendix VII

To wait too long is to find that pods have burst and scattered seed over the ground. These plants are spread out upon a threshing floor to dry. Here the pods will burst. Some threshing occurs followed by winnowing (by women).

6.14.5 Usage/Marketing

Farmers have begun to use the seed to replace néré seed in the preparation of gijonga for their daily meals. A household does not require a great deal of this for its own consumption however, so most of produce must be sold. Seeds are sacked, after threshing, and sold to traders in the marketplace for between 800-1000 CFA/tin.

6.14.6 Ownership

Both men and women have plots and earn a cash income from its sale. Men control most of the production. Table I (page 65) indicates that 7.2% out of 9.2% (78% or .5 ha.) of ^{land} cultivated for soybeans for the above average household was owned by men. Yet, 52% of the soybean plots were controlled by women (Table II B, B.A.E.P.-77). For the B.A.E.P.-78 data, women controlled only 43% of the plots. Women's soybean plots must be much smaller than those of the household men.*

6.14.7 Storage

Seed for next year's plots must be kept dry, usually in a clay pot or gourd inside the hut. The crop is sold as quickly as possible to prevent long term storage problems. Mud silos and burlap sacks are commonly used for storage or of large quantities until sale.

* A culturally related problem: Too high cash income for women in comparison to the men's cash income would cause severe tensions in household relationships.

6.14.8 Crop Observations and Recommendations

This excellent crop has been accepted by farmers and will reach its own equilibrium in the land/labor equation depending on the market value of the product. Household consumption is low, and unless food tastes and ways of using it change, it will probably continue to be under-used. Its main value will be as a cash crop.

6.15.0 Iheñ/(Sesame)

Sesamum indicum

Sesame is a common cash crop of the Bilanga/Piala/Bogandé region in particular, though it can be found elsewhere in the Eastern region in small quantities. It is rarely cultivated as a sole crop, but is planted in numerous rows in most sorghum and millet fields of the northern region. Table I lists no sesame at all, yet at least .5% of the land surface under cultivation in the important growing regions must be used for its cultivation.

6.15.1 Important Varieties

No varieties recorded.

6.15.2 Where Most Often Cultivated

Sesame is most often located in village and bush sorghum/millet fields, where it is planted in many single rows (spaced five or more meters apart) throughout the field. Also common across peanut and earth pea plots.

6.15.3 Association *

- : Sesame is rarely cultivated as a sole crop.
- : Planted in single rows, associated with:
- : sorghum and millet
- : peanuts
- : earth peas

* See Appendix VII

192

6.15.4 Cultivation

Wherever sorghum and millet are cultivated, farmers in the Bilanga/Piala/Bogandé region will plant sesame. The rows of sesame are often planted first, to be followed by sorghum and millet, in between. Farmers state that this divides a field into sections, which makes planting and later weeding by field-sections seem easier. Weeding of sesame takes place with the crop with which it is associated. Maturation takes place in about three months, a period during which sorghum and millet are also forming seeds and maturing. Parrots can be especially destructive at this time.

Sesame is harvested before any of the other crops with which it is associated. Hooked branches are first cut down in the bush in preparation for the harvest. The pod-bearing sections of each plant are then cut off and tied in bundles around these hooked branches. These are hung from the nearest tree. Scores of such bundles may be seen in any large grain field. Harvest of the remaining sorghum, millet, peanuts, or earth peas will come some weeks later.

Obtaining the seed from the bundles of sesame plant segments is simple. Plant sections, when tied to the hooked branches, were tied in an upright position. When dry, the pods open up. The farmer will spread out a cloth or mat and loosen the twine which has bound the bundle together. When loosened, the bundle will simply be turned upside down. The sesame falls out of the pods into the container. A little winnowing may be necessary before eventual sale.

The most time consuming aspect of sesame cultivation is that different sections of a plant do not mature at one time. This means that over a period of several weeks, the farmer must keep going through his field, down his rows of sesame, selecting those sections which need to be cut and bundled up. Harvest can not be done in one operation as with most other crops.

187

6.15.5 Usage/Marketing

Most sesame is sold. Some may be eaten after being slightly roasted, or it may be used as a sauce ingredient. Some women are able to produce oil from crushing the seed by mortar or grinding and later boiling the paste. Prices at harvest time are approximately 600 CFA/tin.

6.15.6 Ownership

Both men and women produce and sell sesame seed. Among women, it is most often the older women who own the crop.

6.15.7 Storage

Clay pots or metal containers are used for storage of the bulk of the crop until eaten or sold. Seed grain will be placed in a gourd and hung up or placed in a mud silo until the new season.

6.15.8 Crop Observations and Recommendations

Greater commercialization of the crop seems possible. Higher prices would increase production. An easier method of oil extraction would be beneficial to household consumption and sales.

6.16.0 Mibelima/(Fish Poison Plant)

Because cultivation of this plant is now forbidden by the Fish and Game Department, it is difficult to find it in the Eastern region. This is a small bush, generally cultivated upon small ridges for its leaves and branches.

Because this plant is seen as a 'medicine' plant, its effectiveness was generally believed to depend on a number of ritual steps in cultivation and use. Planting in rows was done before the sun rose, for instance. A man could not have intercourse with his wife the night before weeding was to occur. Weeding was done

184

twice, after having been planted towards the end of July. When used, green leaves and branches were crushed by pounding and mixed into the waters of a small pond. Fish were stupified and would rise to the surface. There they could be easily caught. Men only cultivated and used the plant.

6.17.0 Misiema/(Indigo)

Another crop, once widely cultivated by men, was the indigo plant. Its cultivation still takes place in some remote parts of the Eastern region. The produce of such plots is intended for use in the dye-pits.*

Indigo plants are small bushes, cultivated in rows upon small ridges. The branches, leaves, and flowers are cut from the plant at the end of the season and dried. It is made up into a substance used for the deep blue dye for which it is named.

6.18.0 Tijalifadi/(Sauce Herb)

6.19.0 Tikpankpandi/(Sauce Herb)

6.20.0 Anyinkpina/(Sauce Herb)

Along with the leaves of baobab, roselle, okra, and eggplant, the three sauce herbs listed above comprise the major sources of pot herbs women use in the preparation of the sauce which is eaten with the daily meal (saabu). Each of these ingredients provides the base to produce sauce of varying flavors. In some regions, farmers need only hoe around plants which have come up on their own. The seed may have been sown by the farmer. In the Piala/Bogandé regions, the sauce herb 6.19.0 above can be found in lush growth covering large areas of the bush land. It is simply picked as needed. In the Jakpaga/Gobinangu region however, farmers must have small plots of the herb if they are to have adequate supplies.

*The once-common sight of functioning dye-pits can now be seen only occasionally in Piala/Bogandé and Gayeri regions.

When planted, plots are often in the shade of large trees. Planting is in late July to early August so that maturing will take place when rains are scarce (late October). Two weeding are required.

Leaves are harvested by women during the slack period just before harvest of the major grain fields. The entire plant is pulled out and leaves are picked from plants within the compound by women. The leaves are spread out to dry inside the compound in front of each women's small hut. When dry, a woman will strip the broad, drying leaves of sorghum and form containers into which the dried leaves are placed (See Figure 17,K). Such bundles are 18-24 inches in diameter. They are hung up inside a hut and can be used as needed throughout the dry season for sauce preparation. Some may be sold in the market place.

6.21.0 Ikambi/(Red Peppers)

Capsicum spp.

Red pepper is cultivated by some farmers as a source of cash income. Small plots are individually owned.

6.21.1 Important Varieties

Five varieties have been recorded, of which one, (tampien-juaga) is an annual.

6.21.2 Where Most Often Cultivated

Pepper varieties which are perennial are placed under the shade of karité (shea), fig, tamarind, or néré (locust bean) trees. Such trees keep their leaves during the long dry season and thus protect the dormant plants from the hot sun. Annuals can be cultivated anywhere. Most pepper plots are located near or within the bush fields of the household head. One farmer may, for instance, have four small plots under four good shade trees of his sorghum field.

156

6.21.3 Association*

- : Red peppers are almost always cultivated as a sole crop.
- : Occasionally , red peppers may be found in a garden or manioc plot.

6.21.4 Cultivation

Seed is sown early in the rainy season and seedlings are transplanted to plot location when about five inches high. Annuals do not grow very large and are therefore spaced closely (approx. 30 cm.). They are often transplanted to small ridges.

Peppers require three or four weedings for good yields, with slight banking of plants performed each time. The red peppers are picked three or more times between August and December as they turn red. These are spread out and dried. Care is taken not to crush the pepper pods.

6.21.5 Usage/Marketing

A small amount will be used by the household for its own needs in sauces during the year. The major portion is intended for sale.

6.21.6 Ownership

Men control most of the cultivation and sale of red peppers. Men possess about 92% of all pepper plots (B.A.E.P.-78, Table II A).

6.21.7 Storage

Dried peppers are kept in small silos or small grass granaries (Figure 17,A). It is essential that they be kept dry and uncrushed.

* See Appendix VII

6.21.8 Crop Observations and Recommendations

If greater commercial outlets could be developed for this crop, its production could be greatly and quickly increased. An advantage of the crop is that plants will produce well for several seasons.

6.22.0 Imuaabi/(Fonio,Atcha)

Fonio is cultivated by some Gourmantché farmers in the extreme northern edges of the Eastern region, in the region north of Jakpaga. It is unknown, even by name, to most farmers of the rest of the region.

6.23.0 Otabo/(Tobacco)

Nicotiana tabacum

Tobacco is cultivated in small plots throughout the Eastern region and accounts for about .5% of the average household's cultivated land resources. Named varieties are not commonly known.

6.23.2 Where Most Often Cultivated

Maize usually precedes tobacco on the same plot generally located within villages on the compound plots, and less frequently on a portion of a village field. Pamma region farmers cultivate tobacco as a sole crop along the banks of the Kpempienga river during the early dry season. Some Jakpaga/Gobinangu farmers plant rows of tobacco on small ridges along the edge of a marsh or other low spot.

6.23.3 Association *

- : sometimes cultivated as a sole crop
- : often associated with maize during early part of its development.

* See Appendix VII

66

6.23.4 Cultivation

Seed is sown in a specially prepared, fertile spot near the compound, usually along one edge of a maize plot. Sowing takes place around mid-July so that by the end of August seedlings are ready for transplanting. Thorn branches are thrown on top to protect the seedlings. The seedbed is weeded by hand, not hoed.

The maize plot into which the tobacco is to be placed is weeded just before transplanting. Seedlings are transplanted just after a good rain, with seedlings about 30-40 cm. apart and not generally in lines. The maize is harvested about a week or two later. If maize should be harvested before the tobacco enters the plot, stalks will be left standing to provide shade so that the seedlings will not dry out as they take root.

Farmers state that tobacco should be hoed often, even in the absence of weeds. This will encourage rapid development of plants. By the time tobacco plants are half grown, all maize stalk residue will have been removed from the plot.

A tobacco crop does not mature all at once. As lower leaves begin to turn reddish brown, they are removed and placed in a swept off spot of ground or upon a mat to dry further. After a day or two, the drying leaves are gathered into a pile and slightly crushed to permit better and quicker drying. If there should be a great quantity of leaves, a pile of them is formed and left a day or two in the sun. This will cause the leaves in the interior to wilt. They will all then be spread out to complete drying. The above process is said to improve the flavor of the tobacco.

124

6.23.5 Usage/Marketing

Much of the tobacco cultivated is sold or given away. Some is chewed or rolled into cigarettes. In a major tobacco producing area like the Pamma region, farmers were paid 1,500 CFA/tin this year. (1979). Tobacco cultivators who grew tobacco at the expense of time spent on their fields earned as much as 70,000-80,000 CFA. They then purchased the grain they needed to supplement their smaller sorghum/millet fields. Farmers with even small tobacco plots earned about 6000-8000 CFA per person. Trucks came from as far as Ouagadougou to purchase tobacco in this region.

6.23.6 Ownership

Men control cultivation and sale of tobacco.

6.23.7 Storage

Dried leaves are stored away in a woven grass container, made for the purpose (otabi-sogiligu). Farmers with great quantities will also store dried leaves in mud silos for later sale.

6.23.8 Crop Observation and Recommendations

Tobacco could be greatly expanded as a cash crop for the region if prices were higher for finished product. Better management of tobacco leaves once harvested as well as better varieties could stimulate such a market. The Pamma region seems especially open to the development of this crop.

6.24.0 Akana/(Eggplant)

Eggplant is a fairly common small plot crop of many farmers - especially in areas where rainfall is more abundant.

199

6.24.1 Important Varieties

Five varieties have been recorded. Varieties 1-4 (see Taxonomy IX, p.26) resemble knobby, hard, tomatoes to Western eyes and come in different sizes and colors. One of the sub-varieties of variety 5 represents the common reddish-brown eggplant most familiar to Westerners. The second sub-variety is similar except it is white in color.

6.24.2 Where Most Often Cultivated

Small eggplant plots may be found just about anywhere. One sometimes finds plots located in ground depressions within a sorghum and/or millet field. They are sometimes located along the fringe of an extinct giant termite hill to which animal manure is always added. Plots are often placed on the spots where trees and brush were burnt the previous year -- often located on the expanding edge of a field.

6.24.3 Association *

- : Eggplant is usually cultivated as a sole crop.
- : In the dry season, it can be associated with various other garden crops (tomatoes, okra, lettuce, etc.) in a garden.

6.24.4 Cultivation

Seeds are sown, at about the same time as the major grain fields are planted, upon plots prepared under a shade tree not far from where seedlings are to be transplanted. For dry season cultivation, seeds are sown at the beginning of the dry season (November) in an enclosed spot.

About a month after sowing, seedlings are transplanted in fairly closely spaced rows, often on top of small ridges. Plots are weeded as often as possible to increase moisture retention of soil -- even if weeds are not present.

*Appendix VII

191

Flying insects and domestic animals can be a problem to growing plants as termites are to their roots. Animal fertilizer is often sprinkled and hoed into the soil and wood ashes sprinkled over the leaves to ward off insects.

Once plants begin to bear some three months from sowing, production is constant until rains end and soils dry out. Industrious farmers with gardens will transplant the mature plants to their gardens, where, in about five weeks, they will once again begin producing.

6.24.5 Usage/Marketing

The leaves of varieties 1-4 are the best selling pot herbs in the market place. Leaves are picked off at the end of the season, dried, and made up into bundles using the broad leaves of sorghum (Figure 17,K) to form containers. These bundles are hung up in the owner's hut until sold or consumed. Such a bundle has a value of between 1,000-1,500 CFA, depending on time of year. A household may possess several bundles. The fruit of these varieties can be eaten raw. They are also sold in the market place.

Leaves of variety 5 are not usually used as a pot herb, while their fruit are cut up and stewed. They can not be eaten raw. They can be sold in the market place.

6.24.6 Ownership

Men control most eggplant production and sale, though old women may also occupy themselves with a small plot.

6.24.7 Storage

Fruit is eaten immediately. Dried leaves are stored in dry places with huts, hanging from some roof beam.

6.25.0 - 6.29.0

Onions, tomatoes, lettuce, carrots, and cabbage are common products of the small dry season gardens located near larger towns and villages in the Eastern region. Gardens are usually refenced each year with sorghum and millet stalks coming from the owner's fields. When finished fencing, small seed beds are formed for sowing. Gardens are always either alongside a body of water (bas-fonds) or in a spot where a shallow well will reach water.

Seedlings are transplanted into prepared beds which are liberally spread with animal manure. Farmers, turned gardeners during the dry season, can usually begin selling and eating some of their produce by late December and January. In most instances (100% in B.A.E.P.-78 survey), men do the gardening. Their wives sell the produce in the market.

Gardening can be seen as a response to a new source of cash income during a period of low activity. Garden produce is increasingly being used in the household diet of people in more rural communities, and promises to become important throughout the region as tastes develop for the new greens.*

The biggest constraint is that seed packets for the various greens are not usually available in Fada N'Gourma, much less the more rural areas.** Farmers have had to learn to dry their own seeds - yet hybrid varieties are lost in this way. O.R.D. sub-regional offices might perhaps attempt to purchase stocks of such seed, at least until such a time when local merchants are able to meet the demand. A supply must be assured in Ouagadougou for such purchase however.

* It should be noted that the best, and most numerous gardeners in Niamey are the Gourmantché.

** Even in Ouagadougou, it is sometimes difficult to purchase the seed varieties one wants at the time of year one wants them - the demand is so great.

193

6.30.0 - 6.35.0

Papaya, banana, sugar cane, and guava trees are found in regions where ground water is near the surface all year long. This water permits the creation of long term gardens. Land of this nature is in great demand. Mango and lime trees require less water. All these products are consumed locally. Guava and citrus trees are not yet greatly appreciated but demand for them is also growing as people come to enjoy the fruit.

6.36.0 Tangumbo/(Manioc)

Manioc is cultivated throughout the Eastern region, but is particularly widespread where rainfall is more abundant (Jakpaga/Gobinagu region though to Pamma). This crop represents about .4% of an average household's land under cultivation (Table I). In years past, its principal role was to provide food during the potential hunger months, just before a new season's harvests.

6.36.1 Important Varieties

Three varieties have been recorded. All varieties are white inside while they differ in color of root (white, reddish, dark brown) skins. There are no 'poison' varieties that need special preparation in order to eat.

6.36.2 Where Most Often Cultivated

Farmers do not seem to place manioc into any kind of rotation schedule. Their basic concern is to find a piece of land which is fertile and sandy enough to produce good tubers - which is probably why 39% of all manioc plots are upon borrowed land (B.A.E.P.-78, Table II A). These plots may be found around the edges of a village or bush field. Manioc does well in some of the enclosed gardens located near a marsh or stream bed. New land may be cleared for a plot, or part of a cleared field given over to its cultivation.

6.36.3 Association*

- : Manioc is usually cultivated as a sole crop and fenced from domestic animals during dry season.
- : sometimes placed in fenced vegetable and fruit gardens

6.36.4 Cultivation

In August, when rains should be frequent, the farmer will seek land which possesses deep dark (loamy) or sandy soil. He will weed and loosen up the soil to form a plot, sometimes forming small mound/ridges as he goes. Having no cuttings of his own, a farmer will seek someone who does have a plot from last year. There, he will either be given or sold some branches.

Branches are cut into two foot segments and thrust into the soil or mounds at about 3 foot intervals. When the rainy season is almost over (late September, early October); the farmer will further weed and ridge the plants which by now are well in leaf and branching. This activity traps additional moisture in the soil which will last the plant well into the early part of the dry season.

Just before sorghum and millet harvest (November), the farmer will enter the bush land and cut down enough posts to build a fence around his manioc plot. When harvests are over, sorghum and millet stalks are carried over to the plot, and after setting in the posts, will be tied to them. The resulting fence will last until the early part of the rainy season. If this is not done, domestic animals will destroy the plot during the dry months to come.

The plot is now left alone. Plants are not given water during the dry season. In spite of this, they keep growing slowly. With the coming of the first early rains, the manioc grows and matures rapidly. Towards July and August, the farmer will begin probing around the base of

each plant looking for well developed tubers to cut out and eat. From this time on until the end of the rainy season, tubers can be removed for consumption. Each plant may yield as many as six or seven tubers.

Farmers will not cut down an entire plant and leave tubers in the ground for later harvest. Doing this will cause the tubers to lose much of their good flavor. Some branches will be cut in August and thrust into the soil around the old plants or placed in a new plot for next year's needs.

6.36.5 Usage/Marketing

While this crop may have been most important in the past as a 'hunger food' during July-August-September, it now plays an important role in the food stocks of many households each year. Some are sold as well. Consumption begins 11-18 months following placing of branch-cutting into the ground. Sometimes tubers are left in the soil for up to two years in which case they approach the size of large yams. Manioc is either boiled or roasted in hot coals and eaten. It may be cut up into small pieces, dried, and pounded or ground into flour to make a thick porridge eaten with sauce.

6.36.6 Ownership

Men control about 83% of the cultivation and sale of manioc (Table II A, p.83).

6.36.7 Storage

Manioc is not stored. After removal from soil, it is either eaten immediately, given away or sold. If the farmer does not need tubers for these purposes, he will leave the tuber to grow further until he does need it.

6.37.0 Atuuna/(Cowpeas)

Vigna sinensis

Cowpeas represent, next to peanuts, the most widely cultivated legume crop of the Gourmantché farmer. Every household has at least some associated with one or more of their sorghum and/or millet fields. Farmers do not permit cowpeas to compete with other crops in terms of land cultivated or time spent on its care. It is seen as a much appreciated bonus crop. It is planted, if production is good, the household is fortunate, if production isn't good, they will simply have to do without. If production is greater than household consumption needs, sales are possible.

6.37.1 Important Varieties

Reflecting somewhat its importance is the fact that eight local varieties are recognized. Though the O.R.D. has experimented greatly with cowpeas, none of these varieties seem to have diffused to the farmer. When they do, they will probably be called nasaali-tuuna. Varieties differ in color, size and shape of pods and seeds, and pod length at maturation. Variety 6 (see Taxonomy IX) is called "can't steal at night time". It is cultivated by Bogardé/Piala farmers who have had a special problem with thieves entering their fields at night and removing cowpeas. These pods are dark and black spotted and are difficult to spot in the dark (normally pods are yellow-brown in color).

6.37.2 Where Most Often Cultivated

Cowpeas are occasionally cultivated as a sole crop on newly cleared bush land during the first year of cultivation. Otherwise, anywhere sorghum or millet is cultivated, one may expect to find cowpeas associated on part or all the field. Low areas, where water may stand for a few days, will not permit cowpeas growth.

6.37.3 Association*

: Occasionally cultivated as a sole crop
: usually with sorghum and/or millet (and sesame)

6.37.4 Cultivation

Three major methods of cowpea cultivation are practiced.

(1) Cowpeas can be grown as a sole crop. When all fields and plots have been planted and are in order, a farmer may wish to increase the size of his major field for next year. If he should clear some land in late July or early August, he may be able to plant cowpeas (it is already too late for sorghum or millet). Planting is in closely spaced rows (approx. 1 meter). Hoeing must be frequent, even in the absence of weeds, to permit rapid development of plants. When the soil appears too compact after three or four rains, the farmer will loosen up the soil again. Since the rainy season is already past mid-point, little or no yield would be realized if this were not done. Seed yield is dependent on the total length or size of plant before onset of flowering. Picking mature pods from such a plot is hard work. The vines have all grown together. There is no shade under the hot October sun and pods must be picked stooping, one at a time.

(2) From Fada N'Gourma up towards Bilanga/Piala/Bogandé, many farmers mix their cowpeas with sorghum and/or millet and plant in the same pocket across their fields. After sprouting and early growth however, the good farmer will make sure the vining cowpeas are pulled down to the soil and do not remain upright in the middle of the young cowpea plant and grain seedlings. If this is not done, young plants will compete with each other and retard growth.

* See Appendix VII

190

Harvest of cowpeas before the harvest of sorghum and millet is again an arduous, time consuming task, especially since the vines may be found in any part of the large field and may be much intergrown in some places.

(3) The third system of cowpea cultivation is the system practiced in the rest of the Eastern region. There, about six days after planting a sorghum field (2-3 days for a millet field), a farmer will take cowpeas and plant widely spaced rows (approx. 3 meters) across his field. Poorer soils (usually associated with millet fields) require greater spacing between rows. Farmers using this system state that spacing gives the vines enough room to mature properly, that they do not 'eat' each other (compete for same soil nutrients and moisture). Weeding is also easier because widely spaced rows do not permit intergrowth of vines from other rows. Vines can be kept in one row down a field which simplifies harvest as well. Weeding is done when the sorghum or millet is weeded - usually three times.

During growth, various insects, birds, wild animals (rabbits, warthogs, squirrels) cause damage. Domestic animals relish vines and pods. Too much rain during flowering time (September) results in poor onset of pods. Harvest must come just before the sorghum and millet is harvested, at the end of October or early November.

Pods are picked, one by one, usually by women and children, under hot and dry conditions. They are placed on a threshing floor, threshed and winnowed.

6.37.5 Usage/Marketing

Most of the produce is consumed by the household. Preparation is as a sauce, or bean cakes, or as many other tasty dishes. Excess is easily sold for a good price. Cowpeas were selling for 3,000 CFA/tin in Fada in April 1979. Right after harvest the prices are about half of this.

6.37.6 Ownership

Both men and women cultivate cowpeas in their personal grain fields. The cowpeas in the field of the household head are for household use. Production on the personal fields of other household members is sold by these individuals as a cash crop.

6.37.7 Storage

Cowpeas are mixed with wood ashes and put into a mud silo. A covering layer of ashes is put in and then water sprinkled on top. The wet ashes form a solid barrier against insect penetration. Silos are then sealed with mud. If the silo should be located outside in the direct sunlight, a grass mat will be placed on top to reduce the heat inside the silo.

6.37.8 Crop Observations and Recommendations

Farmers explicitly state that they do not cultivate more cowpeas than they do because harvest of the crop is so arduous and time-consuming. Men cause their wives and children to pick the pods, not wanting to do it themselves. Some farmers comment: "If only one could cut the base of the plant and simply thresh it to obtain the seeds". Maybe this will become possible with smaller erect plants of new varieties to be introduced!

The spreading vines of local varieties also cause problems in the weeding stages of farmers using animal traction. If farmers insist on planting these vining varieties, it would be better if special plots were set aside for this purpose. By the second weeding of a sorghum and millet field, it is impossible to weed down the row if vines have grown together across the rows. The time spent in removing them by hand and then placing them back in the rows is too great.

Instead of planting single rows of cowpeas between pockets of the sorghum or millet, cowpeas must be planted within the rows of grain crops. The erect, non-spreading type of cowpea must be used. This not only facilitates weeding, but could also answer the problem of harvest.

If the O.R.D. were to emphasize these important advantages of new varieties, farmers would almost certainly wish to use them. If the new varieties taste as good as the old varieties, major increases in cowpea production would not be long in coming.

6.38.0 Otungu/(Gourd and Calabash Plant)

Six varieties of gourds and calabash plants are cultivated. These are the sources of most of the non-clay food containers used throughout the year by a household.

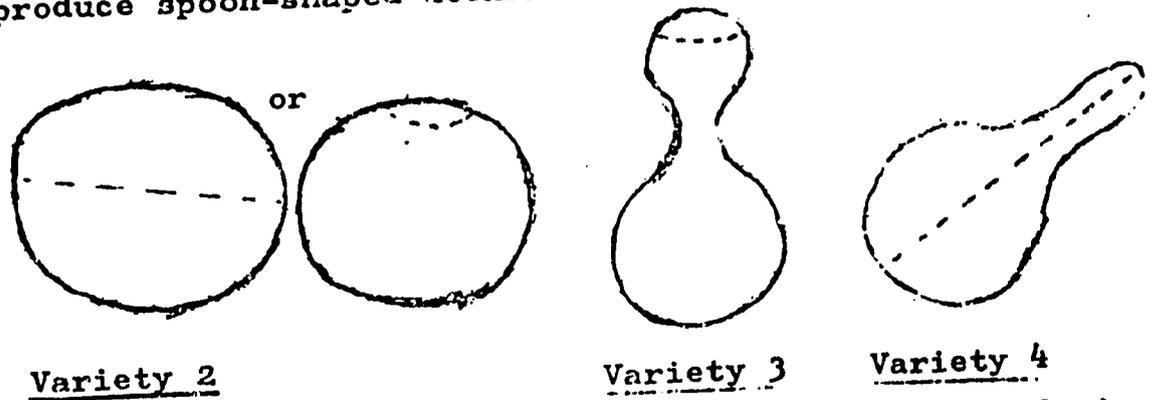
Variety 2 (Taxonomy IX) plants produce large round gourds which are cut in half when mature and scraped out to form a calabash.* Size of gourd depends largely on fertility of spot where plant grew. A large container may be formed by cutting a four or five inch diameter hole at one end.

Variety 3 produces gourds resembling an hour-glass in shape (Figure 17,E). These vines are usually cultivated near compound huts in order to permit vines to climb over huts. This allows forming gourds to hang down, resulting in straight necks. Especially large ones are propped up from below or attached to the hut or fence to prevent the heavy yet green gourd from pulling the entire vine to the ground. Only the upper half of the top section is cut off when the gourd is mature and not yet dry. The inside is allowed to rot out, is then scraped and cleaned as much as possible. The cut-off section may be used as a sort of lid. Large gourds of this kind can hold up to 20 liters of beer, milk, or water. They also make good containers for storage of seed grain and dried pot herbs.

* Gourd cutting and scraping is an activity of men.

221

Variety 4 plants are also cultivated in compound plots to permit climbing vines access to huts and fences for support. These gourds when mature are cut length-wise and produce spoon-shaped utensils needed by all households.



These and other gourds are utilitarian and given adequately fertile soil, fairly easy to produce. They also produce a substantial cash income. One medium size calabash will sell for about 350 CFA (two from one gourd). Large liquid containing gourds can sell for as much as 800 CFA.

6.39.0 Afela/(Squash)

Squash provide an added source of much appreciated food to many households, particularly in regions where rainfall is adequate (approx. 800 mm. or more). They are cultivated in association with maize, rainy season okra, gourds, kenaf, roselle, and early maturing varieties of sorghum upon small plots located behind (around) each compound. Squash are also associated with sorghum and mill upon the village fields. Like gourds, some varieties of squash are encouraged to grow up fences and across hut roof

Nine named varieties have been identified. Most vines produce very large squash when soils are rich and rainfall adequate. Varieties differ greatly in shape, external texture and color. Squash is cultivated for household consumption by the women of a household. When an abundant crop is realized, the excess is often given away to friends and neighbors. It is sold in large towns and villages.

When eaten, squash is cut into segments and slightly dried and then boiled and consumed. For storage, segments will be smaller, and drying will be complete. Kept dry in a gourd or clay pot, these segments may be stored for up to a year.

Seed exchanges are common among women. Many households do not cultivate squash, however, because they do not possess the seed. Commercial distribution of seed for important local varieties would be greatly appreciated by farmers and would add a bonus to the food reserves of these families.

6.40.0 Kuudiku/(Sweet Potatoes)

Ipomoea batatas

Sweet potatoes are a much sought after household consumption crop and are cultivated in individually owned small plots. In the Gobinangu and Famma regions, one can expect one out of every two households to have a sweet potato plot. Elsewhere, farmers will cultivate this if the right kind of land and vines are available at the proper time.

6.40.1 Important Varieties

Six named local varieties have been recorded. External characteristics easily differentiate them. Variety 1 has reddish skin and white flesh, Variety 2 is white inside and outside, Variety 7 is the sweetest and has orange-yellow flesh and a similar skin. Other varieties are differentiated by leaf shape.

6.40.2 Where Most Often Cultivated

Sweet potatoes require fertile, rather sandy soils located in low areas under shade of trees or along the fringe of marshes and low areas (bas fonds). They are often located in gardens. Sweet potato plots are occasionally placed near sorghum and millet fields on high ground where, if rains are sufficient, a reasonable crop can be expected.

6.40.3 Association *

- : Sweet potatoes are usually cultivated as a sole crop
- : They may be associated with garden crops (banana, sugar cane, rice, maize)
- : rice, (sometimes planted in hollows between rows where water collects)
- ; yams and okra

6.40.4 Cultivation

When rains have become frequent in early August, farmers will begin to prepare mounds or long ridges by turning over the earth and (already high) grass into piles. Grass is purposely left to increase organic material into which the tuber will form. Vines are sought and cut into segments of 2-3 leaf joints each. Half the length of two such segments are placed root-end into holes. Spacing is about 20-30 cm. apart. Two segments are used in case one should die before rooting has taken place. Some farmers simply take a long, two-to-three meter length of vine and push portions of it under the soil along the top of a ridge (without cutting into segments). This is the least effective method.

When snippings have started leafing out, the farmer will hoe a little around each pocket to remove any weed growth which might be emerging. After this, any further weeding will be done by hand.

Three months later (late October), the farmer will start checking into the mounds to see if tubers are developing (he will look for cracking earth). Some will be removed for consumption. By November, the vines will be drying out and the crop ready for harvest. The ridges will be dug up and tubers removed. Large ones will be set aside for sale or later consumption.

* See Appendix VII

Several weeks after the first rains of a new season, the farmer should find that a number of missed tubers and segments are sprouting in the old mounds or ridges. He should obtain thorns and cover these spots carefully or put a mat around the area so that by early August he will have a good supply of vines for new plots. If he does not do this, domestic animals will consume the vines.

6.40.5 Usage/Marketing

Many farmers cultivate only enough sweet potatoes for household consumption. They may not have enough time or vine snippings for more. Others cultivate large plots for sale purposes. They will actually purchase vines if they can obtain them during the beginning of the season.

6.40.6 Ownership

Men own about 97% of all sweet potato plots (B.A.E.P.-78, Table IIA). A rare plot belongs to a woman.

6.40.7 Storage

A large hole several feet deep is dug and covered at the bottom with sand and then wood ashes. Sweet potatoes are then placed inside, sprinkled with more wood ashes and covered with soil. This action inhibits sprouting and attack by termites. When needed for consumption or sale, these will be dug up. To simply leave sweet potatoes in the old mounds until needed is to invite serious loss through sprouting and termite damage.

6.40.8 Crop Observations and Recommendations

Lack of suitable land is one of the major reasons why more farmers do not cultivate this crop. Another important reason is a lack of vines to set out when the time comes. Dry season gardeners should perhaps be encouraged to commercialize in growing and selling vines from their gardens.

2.0

6.41.0 Anuga/(Yams)

Dioscorea spp.

Yams have been cultivated in the Pamma region (and to a lesser extent in the Gobinangu region) for many years - probably occupying about 5% of the total cultivated area of those who have them. Pamma in colonial times was a major producer of yams. During the last fifteen to twenty years production has dropped to almost nothing.* During the past few years, bush villages of the Bariba ethnic group (east of Tambaliga) have been producing large quantities of cheap yams. Merchants with trucks have been attracted from Fada and as far away as Ouagadougou. This trade has once again stimulated Pamma region farmers to return to yam cultivation.

Yam plots are still on the increase in this region but irregular removal of yams by merchants causes considerable loss (plots are dug up expecting a truck which never arrives - yams spoil). Prices the farmers receive hardly justify the intense labor and care required to produce yams.

* Farmers recall that interest in yam cultivation in this region first began several decades ago when Gourmantché farmers took shea butter and soumbala (balls of néré seed sauce flavoring) into Bariba country to exchange for yams. Upon their return home farmers began to think of cultivating their own yams. Farmers state that "in the old days" the land was very fertile so that even a small plot of yams yielded extensively. Small grain fields yielded sufficient harvests of grain. More time was spent in obtaining wild meat and bush foods. All this had the result of permitting farmers to begin cultivating large plots of yams - some households having over 1000 hills. One informant, remembers as a boy, his father giving a two year old sheep in exchange for 100 seed yams (and another time, two young goats for 100 seed yams). Prices for yams did not keep up with the price of cereal during these colonial times, however, so farmers abandoned yams for greater grain production.

6.41.1 Important Varieties

Six locally named varieties have been identified. They differ greatly in size, shape, and flavor of their tubers. Tuber flesh is white in all varieties.

6.41.2 Where Most Often Cultivated

Yam plots are kept as close^{to} the village as possible because of the great damage elephants and baboons cause in more isolated locations. Plots (asoga), are most often located as the first crop on land cleared from bush or fallow. Farmers with less energy or more man_{power} resources sometimes locate on recently fallowed land.

6.41.3 Association*

- ; Yams often cultivated as a sole crop
- ; sometimes cultivated in combination with one or more of the following: rice, okra, sweet potatoes, manioc
- ; Cotton was, at one time, associated with yams

6.41.4 Cultivation

Yams prefer fertile, dark, well-drained soils (tin-boanga). A farmer would like to locate a plot on a spot where a very tall (2-3 meters) grass variety grows (oŋmanjali-baabu).

Before rains have terminated (September), a farmer should prepare the soil of the future yam plot by digging it up to some depth.** This will permit the soil to retain additional moisture until the time, several months later, the farmer begins to make rows (icaani) of almost meter-high yam mounds/hills.

* See Appendix VII

** Yam cultivation requires the use of a special kind of wide-bladed digging hoe called a tampaan-kuuli.

107

Farmers will use either small seed tubers or the top section of larger yams for planting.* The former are said to produce larger yams. One seed tuber or set (called mibalima) is placed about 10-15 cm. deep in the top of each mound during December or January (the center of these mounds is still moist). Each hole will be capped with a clump of grass and dirt.

Young shoots will begin appearing in earnest on these mounds some two or three months later. Branched stakes will be set up on each yam hill to which vines will be tied as they grow longer. Vines permitted to fall to the ground will destroy the plant. Plots must be kept free of weeds.

Harvesting is done in the early dry season months (September-December) though yams planted in December/January of the previous year may be used for household consumption as early as July and August. Each hill should yield three or four large yams.

6.41.5 Usage/Marketing

While yams provide an important mid-rainy season supplement in the diet of many farmers of the Pamma and Gobinanguregions, yams are primarily cultivated as a cash crop. Merchants and civil servants often contract with farmers for a given number of hills. The merchant 'buys' 20 mounds in December, giving an advance in payment.** The farmer is obligated to have 20 hills of yams for harvest the following dry season. If wild animals or other natural hazards have destroyed some of the plots designed for the merchants, the farmer will have to replace the lost hills from those prepared for his own consumption.

* The top sections or crowns of large yams (anugi-yula) are removed and set aside. These will have begun sprouting before they have been planted.

** This advance is the real reason farmers permit such a contract agreement.

A farmer will either leave his yams in the ground until the buyer (or contractor) appears, or else he will dig up the mounds and permit the surface of the yams to dry off for several days. They are then carefully stacked in a cool dry corner of a hut or placed in a shaded, deep, dry hole and covered with earth. No moisture must be present or rot will occur. Yams are easily bruised which in turn seems to increase various fungal rot diseases.

In the yam producing regions, individual yams sell from between 150 CFA for small tubers to 300 CFA for large ones. Files of three average size tubers cost 700 CFA. Transportation to Fada N'Gourma adds fifty to 75 CFA per medium size tuber .

6.41.6 Ownership

Because of the strenuous labor associated with yam cultivation, men possess most yam plots. Some women may have their own small plots.

6.41.7 Seed/or Crop Storage

Yams, as noted above, store poorly and are sold as quickly as possible. Seed tubers and sets are only kept on hand for a couple months at most before replanting. Any sprouting that occurs in the interim is helpful to later development of plant.

6.41.8 Crop Recommendations and Observations

Commercialization schedules for yams should be better organized. This might be accomplished if yam farmers were to organize into pre-cooperative groups with access to credit. Not only could they then hire their own transportation to centers like Fada N'Gourma, but they could protect themselves from speculating interests of merchants and civil servants described above.

109

6.42.0 Apaala (Bush Potato) (Potatoes)

Apaala are potato-like tubers which generally grow wild in the bush. Farmers, in the Gobinangu region in particular, have managed to domesticate the bush potato by cultivating it in the same locations and in the same manner as sweet potatoes. They possess dark brown skins, white flesh, and are about twice the size of earthpea pods when mature.

They are eaten like boiled potatoes. Being small, the biggest problem in their conservation after harvest is drying up. They are kept in a dry hole covered with earth. Apaala are sold in the market place.

Irish potatoes are called nasaali-paala (white man's paala).

6.43.0 Imankani, Ibankani/(Taro)

Taro is presently cultivated in small amounts beyond the Gobinangu chain. Its presence in the region can be traced to workers returning from the coastal regions of Togo and Ghana. The high rainfall of the area permits the lush growth of this plant - the large, broad leaves of which resemble elephant ears. Taro is cultivated in gardens, with tubers becoming as large as manioc. Farmers in Cindi-Kombu have even put fertilizer into some of the mounds, resulting in even larger tubers. The leaves of the taro plant are used as a sauce herb.

6.44.0 Iqmali/(Bamboo)

Bamboo is not considered a crop by most Gourmantché farmers. In fact, most farmers do not even know what it is. In the Jakpaga/Gobinangu region, however, it grows wild. It is in great demand there by those who have access to it for construction of fences and for hut roofing poles. Because of the great demand, it is difficult to obtain really large

A good extension agent of the E.O.R.D. has introduced the cultivation of bamboo to the Dabessma dam area. Here farmers have their own individual plots of bamboo. In two years the bamboo grows to great height and provides 2-3 inch diameter straight poles used in fencing of livestock and house building. Those who have such plots are under great pressure from neighbors to give them some shoots to begin their own plots.

Bamboo cultivated in this way could become an important source of construction wood in all the regions where dams have been formed. It should be made available to farmers in these regions so that a start can be made in its cultivation. Once the start has been made around a particular dam, local demand will assure its increase.

7.0 Conclusions

The conclusions of the present document, as with the preceding document, Gourmantché Agriculture, Part I, are summarized in the final research projet report Document No. 9. There, implementable recommendations for further development interventions among the Gourmantché are addressed.

211

APPENDIX IV

Gourmantché Terms for Sorghum and Millet Plant Parts, and Cultivation and Growth Phases

Note: In using these lists, extension agents should remember that the people of their region may employ slightly different expressions from the Fada speech used here.

Sorghum, Millet Plant Parts:

- (1) budibu : the grain plant itself
- (2) likankagili : the grain stalk
- (3) akagikpela : old grain stalks (last year's)
- (4) litugili : stalk joint
- (5) akasuanga : fresh, damp stalks (just cut down)
- (6) okacangu : broad leaf of grain plant, the especially broad ones of sorghum can be used for forming containers for storage of dried produce (herb leaves, tobacco, baobab leaves) called kpin-ciigu, opiligu.
- (7) mikagidaama : sweet juice of grain stalks
- (8) midiyama : inside point of growth of growing plant
- (9) okafuuligu : dry pulp inside grain stalk
- (10) okalin-siinu : sharp outer part of stalk often used to cut in place of knife; a hazard of harvest
- (11) midibima : the grain seed
- (12) adipala : secondary branchings which hold seeds on sorghum panicles
- (13) apugida, afiada : grain husks still possessing seed
- (14) oduobu : seed shells, linings, used for feeding livestock.
- (15) mifemma : chaff debris; such debris from millet is especially irritating when harvesting or threshing
- (16) ofengu : husks of grain left over from pounding or winnowing
- (17) adikpela : new shoots from parent stalk which can also produce a head of grain; especially true of millet. One shoot can result in numerous off-shoots which together produce as much grain as would three or four seeds from the same pocket.
- (18) idijiini : grain plant roots

212

- 14-
- (19) lidinyiali : 'trunk' of grain plant (from roots up to first joint)
- (20) oka-tulu : 'throat' of grain plant (the end of stalk just before head)
- (21) odibin-nyuabu : 'seed mouth' (where sprout emerges)
- (22) odimaamo; opoligu : the flowering debris from ripening heads of grain, especially millet
- (23) odisiangu : sorghum type of panicle
- (24) lidibin-juoli : 'seed tail' (opposite side of seed from point of sprouting)
- (25) lidikali : candle millet type of panicle
- (26) anan-yuana, kpikpilo: a seed rot of immature heads of grain *

Cultivation

- (1) litipeli : cutting down of trees, clearing brush
- (2) likaagili
limoacikaagili : clearing grass and smaller brush, some hoeing
- (3) gi bali afiana gi
sia, tibaligidi : making brush/grass piles and burning, includes gathering and burning of last year's grain stalks
- (4) gi coagi : planting with hoe and small calabash by one person; planting is not in line
- (5) gi buli : planting, where one person makes holes with a long stick, another comes behind and puts seeds in by hand and covers with foot; planting is in lines
- (6) gi wali : hoeing on dry ground, just before rains or during a dry period between rains at the beginning of the season. Refers to the scraping effect of hoeing over dry ground where little soil can be lifted.
- (7) gi lidi : all hoeing/weeding activity following the first hoeing

* One farmer explains the rot in this way. When grain heads are ripening and forming seeds, a hot sunny day will cause the grain husks to open up. If rain should come quickly at this time of day, it may enter the open husks before the cooling air has caused them to close completely. When it does close, moisture has already gotten inside. The seed will then rot (turn black).

- (8) milidi-kiama : the second hoeing, the first weeding
- (9) milidi-liema : the third hoeing, the second weeding
- (10) milidi-taama : the fourth hoeing, the third weeding
- (11) milidi-naama : the fifth hoeing, the fourth weeding
- (12) cacaagu, koaligu : banking roots of plant with soil, takes place during last hoeing/weeding
- (13) lidipeli : cutting of grain
- (14) lidiguunli : storing of grain in granaries
- (15) bukpaabu : all hoeing activity (5-11 above)
- (16) jatuli : spacing down a row, between pockets, can be 'narrow' or 'wide'
- (17) cuagi-niani
ijasani : the rows or lines of cultivated plants
- (18) okua-guudu : watching/guarding field
- (19) gi yend okuanu : to cut out ripening grain heads from the field, usually done when there is hunger
- (20) gi yendi : cutting off of grain heads after stalks are cut down
- (21) gi bili adikoga : put grain just cut in small piles
- (22) gi tugi ojala po
gi bili, liditugili: to carry small piles of grain heads to the threshing ground
- (23) gi ladi, gi deni : to spread out to dry in sun
- (24) liditinli : the large pile of grain heads upon the threshing ground
- (25) opadigu : when the pile of grain on the threshing floor is too big to thresh at one time, the pile will be divided up into several piles. Each pile is called opadigu.
- (26) ojalu : the threshing ground
- (27) gi pua idi : to thresh grain
- (28) gi lendi : to winnow the grain
- (29) gi gbedi : after winnowing, grain will be placed in a large calabash and shaken from side to side, in this way removing the non-seed grain debris remaining. Grain stored or sold will reach this level of preparation if threshed.

Growth Phases:

- (1) asakuana
atanyimbagina : period of time from coming of first rain (April/May) until end of first planting
- (2) tijaadi yogunu : the planting period (May/June)
- (3) kujaagu : the hole in which grain seeds have been planted but have not yet sprouted
- (4) idi pani/pudi : seeds are sprouting (sorghum or millet)
- (5) ajapiama
idi-cela : the sprouting grain seedlings are just beginning to emerge from the soil.
- (6) gi nu, minuuma
yogunu : to transplant, seedlings can be used up until they begin to form stalks, transplanting and thinning of grain takes place at second hoeing or just after, depending on the rains.
- (7) idin pua akaga
yayogunu : grain plants are beginning to form stalks, joints are appearing, now too late for transplanting
- (8) idin nali iyama
yayogunu : the period in which vegetative growth terminates; literally means: 'the grain has swallowed its growing point'
- (9) liditugi-pumbili
yogunu, li puoni : the period in which the grain plant has not yet started to mature, panicle has not yet begun to emerge, yet one can see it forming inside by the bulging end of the stalk
- (10) dimaangu
caanpiengu : from the time the panicle begins to emerge until it has completely emerged, no seeds have formed (the heading-out phase)
- (11) adicabi-kaana
yogunu : Period when panicles are in seed-forming stage, seeds are soft, unripe (the filling-out stage, -one month; Oct/Nov)
- (12) oditonu : period beginning at 8 above and lasting until grain-cutting period
- (13) oditon-kagiboangu : period beginning at 8 above and lasts through 11 above.
- (14) oditon-pienu : starts at end of 11 and lasts through until grain-cutting period.

204

Percentage of land under cultivation per crop by owner category in 8 villages among 21 household units,

Village Data	CROPS																Sub-Total	TOTAL %
	Sorghum	Millet	Scr/ Millet	Maize	TOTAL %	Soybeans	Peanuts	Cotton	Earth Peas	Rice	Tobacco	Indigo	Sweet Potatoes	Okra	Manioc	Cow Peas		
<u>Cicideni</u>																		
Household Head	30.6	-	18.1	.3	49%	7.2	3.7	-	.3	2.4	-	-	.2	-	-	-	-	13.8%
Wives, Daughters	-	-	-	-	-	3.6	-	-	-	-	-	-	-	.1	-	-	-	3.7%
Sons, Other Men	-	26.7	-	-	26.7	1.5	2.6	-	-	-	-	-	-	-	-	-	-	4.1%
Total	30.6	26.7	18.1	.3	75.7	12.3	6.3	-	.3	2.4	-	-	.2	.1	-	-	-	21.6%
Total Hectares: 6.625 ha.																		
<u>Pociamanga</u>																		
Household Head	21.0	26.0	-	1.9	48.9	1.9	1	-	-	1.6	-	-	-	-	-	-	-	4.5%
Wives, Daughters	8.1	-	-	-	8.1	-	-	-	-	.6	-	-	-	.2	-	-	-	.8%
Sons, Other Men	-	-	-	-	-	15.3	-	-	-	20.7	-	-	-	-	-	-	-	36.0%
Total	29.1	26.0	-	1.9	57%	17.2	1	-	-	22.9	-	-	-	.2	-	-	-	41.3%
Total Hectares: 5.625 ha.																		
<u>Juali</u>																		
Household Head	35.7	12.0	-	3.3	51%	7.2	1.6	-	.6	1.7	(1)	-	-	-	.9	.3	.6	12.9%
Wives, Daughters	6.9	2.1	-	.6	9.6	8.2	.2	-	.3	.5	-	-	-	.9	-	-	-	10.1%
Sons, Other Men	9.6	-	-	-	9.6	4.2	.5	-	-	-	-	-	-	-	-	-	-	4.8%
Total	52.2	14.1	-	3.9	70.2	19.6	2.3	-	.9	2.2	-	-	-	.9	.9	.3	.7	27.8%
Total Hectares: 12.0370 ha.																		
<u>Koyerga</u>																		
Household Head	37.7	19.8	1.6	2	61.1	4.0	2.1	2.7	.8	.8	(1.8)	3.7	.4	-	.7	-	-	15.2%
Wives, Daughters	1.2	6.9	-	-	8.1	-	.9	-	-	-	-	-	-	.5	-	-	-	1.2%
Sons, Other Men	-	12.4	-	-	12.4	-	1.2	-	-	-	-	-	-	-	-	-	-	1.2%
Total	38.9	29.1	1.6	2	81.6	4	4.2	2.7	.8	.8	(1.8)	3.7	.4	.5	.7	-	-	17.8%
Total Hectares: 12.0370 ha.																		

Appendix V Percentage of land under cultivation per crop by owner category in 8 villages among 21 household units -196-

Crops Village Data	Sorghum	Millet	Sor/Millet	Maize	TOTAL	Soybeans	Peanuts	Cotton	Earth Peas	Rice	Tobacco	Indigo	Sweet Potatoes	Okra	Manioc	Onion	Sub-Total	TOTAL
<u>Doyaana</u>																	3.3%	
Household Head	61.0	2.2		1.6	64.8%	3.3	-	-	-	.1	-	-	-	-	-	-	27.4%	
Wives, Daughters	-	1.3	3.1		4.4	-	26.4	-	.9	-	-	-	-	.1	-	-	-	
Sons, Other Men	-	-	-	-	-	-	-	-	-	-	-	-	-	.1	-	-	30.75	99.9%
Total Total Ha. 6.625	61.0	3.5	3.1	1.6	69.2	3.3	26.4	-	.9	.1	-	-	-	.1	-	-		
<u>Dabessma</u>																	3.9%	
Household Head	28.4	418	-	2	72.2%	-	1.6	-	-	1.1 (1)	(1)	.1	-	-	-	(1)	14.4%	
Wives, Daughters	-	106	-	-	10.6	-	14.4	-	-	-	-	-	-	-	-	-	-	
Sons, Other Men	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(1)	18.3%	100.1%
Total Total Hectares 22.873 ha.	28.4	525	-	2	82.9%	-	16	-	-	1.1 (1)	(1)	.1	-	-	-	(1)		
<u>Yambi</u>																	19.7%	
Household Head	.9	-	56.3	3	60.2	6.1	5.5	5.0	-	2.8 (6)	(6)	-	.2	-	.1	-	1.6%	
Wives, Daughters	-	5.2	4.3	.3	9.8	1.2	.4	-	-	-	-	-	-	-	-	-	3.4%	
Sons, Other Men	-	4.6	-	-	4.6	.8	2.6	-	-	-	-	-	-	-	.1	-	24.7%	99.3%
Total T.Ha. 24.081 ha.	.9	9.8	606	3.3	74.6	8.1	8.5	5.0	-	2.8 (6)	(6)	-	.2	-	.1	-		
<u>Konrmaadigu</u>																	11.0%	
Household Head	9.2	331	-	2.1	44.4%	4.2	1.2	5.5	-	.1	-	-	-	-	-	-	3.9%	
Wives, Daughters	5.7	117	2.5	.5	20.4%	2.7	-	.9	-	-	-	-	-	.3	-	-	3.2%	
						2.4	.5	.3	-	-	-	-	-	.3	-	-	18.1%	100.1%

Indigo, kenaf, sauce herbs, others.

217

Village Data Kind of Field or Plot	1 Boanboanyenga					2 Lanyabidi					3 Ghanlemba				
	Household Head	Household Women	Other Household Men	Total	Fields/Plots Borrowed	Household Head	Household Women	Other Household Men	Total	Fields/Plots Borrowed	Household Head	Household Women	Other Household Men	Total	Fields/Plots Borrowed
Sorghum/Millet Personal Field	7	32	14	53	18	3	32	3	38	9	-	27	16	43	15
Sorghum/Millet Principal Field	28	1	-	29	8	27	-	1	28	3	34	1	-	35	1
Back of Compound Plot	11	-	-	11	4	10	-	-	10	1	2	-	-	2	1
Peanut Plot	1	42	2	45	14	-	34	-	34	12	5	32	5	42	10
Okra Plot	1	1	1	3	2	-	1	-	1	0	-	1	-	1	-
Rice Plot	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-
Maize Plot	24	1	6	31	4	19	-	-	19	1	17	-	-	17	6
Earth Pea Plot	1	11	-	12	7	-	10	-	10	3	1	3	-	4	2
Sorghum/Millet Village Plot	3	-	-	3	-	2	-	-	2	-	6	-	1	7	3
Front of Compound Plot	1	-	-	1	1	1	-	-	1	-	1	-	-	1	-
Soybean Plot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manioc Plot	1	-	-	1	-	1	-	-	1	-	-	-	-	-	-
Cotton Plot	1	-	1	2	1	3	-	1	4	2	-	-	-	-	-
Local variety Sauce Herb Plot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sweet Potato Plot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Roselle Plot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dry Season Garden	-	-	-	-	-	1	-	1	2	-	-	-	-	-	-
Tobacco	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yam Plot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red Pepper Plot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
* All other plots	3	-	-	3	2	1	-	-	1	-	-	-	-	-	-
TOTAL	82	88	24	194	61	68	77	6	151	31	67	64	22	153	

* Present crops indigo, kenaf, sauce herbs, others.

APPENDIX VI (Cont.)

Village Data Kind of Field or Plot	7 Buodi					8 Ugalu					9 Diapangu			
	Household Head	Household Women	Other House- hold Men	Total	Fields/Plots Borrowed	Household Head	Household Women	Other House- hold Men	Total	Fields/Plots Borrowed	Household Head	Household Women	Other House- hold Men	Total
Sorghum/Millet Personal Field	-	29	13	42	7	2	38	16	56	8	1	39	4	44
Sorghum/Millet Principal Field	26	1	1	28	7	21	-	1	22	6	23	5	-	28
back of Compound Plot	2	33	5	40	7	2	29	2	33	4	16	20	-	36
Peanut Plot	2	39	1	42	6	4	33	2	39	4	19	32	4	55
Okra Plot	-	15	2	17	2	-	9	-	9	3	2	37	-	39
Rice Plot	-	-	-	-	-	-	1	1	2	-	4	5	2	11
Maize Plot	5	-	4	29	5	19	-	2	21	6	12	-	1	13
Earth Pea Plot	4	6	-	10	1	8	8	3	19	2	3	10	-	13
Sorghum/Millet Village Plot	-	-	1	1	-	-	-	-	-	-	19	2	1	22
Front of Compound Plot	3	-	-	3	-	5	-	-	5	1	14	-	-	14
Soybean Plot	-	-	-	-	-	-	-	1	1	-	13	19	2	34
Manioc Plot	1	-	2	3	-	6	-	-	6	-	9	-	2	11
Cotton Plot	6	-	9	15	3	1	-	-	1	-	2	-	-	2
Local Variety Sauce Herb Plot	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sweet Potato Plot	-	-	-	-	-	3	-	-	3	2	7	-	1	8
Roselle Plot	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dry Season Garden	2	-	-	2	-	-	-	-	-	-	6	-	-	6
Tobacco Plot	1	-	-	1	-	1	-	-	1	-	-	-	-	-
Yam Plot	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red Pepper Plot	-	-	-	-	-	-	-	-	-	-	2	-	-	2
All other plots*	3	-	-	3	-	1	-	-	1	-	15	1	-	16
TOTAL	75	123	38	236	38	83	108	28	219	34	157	169	18	354

* Eggplant, cowpeas, indigo, kenaf, sauce herbs, others.

APPENDIX VI (Cont.)

Village Data Kind of Field or Plot	10 Tilonti					11 Ponyinkonli					12 Ugalu				
	Household Head	Household Women	Other Household Men	Total	Fields/Plots Borrowed	Household Head	Household Women	Other Household Men	Total	Fields/Plots Borrowed	Household Head	Household Women	Other Household Men	Total	Fields/Plots Borrowed
Borghum/Millet Personal Field	1	13	3	17	6	2	4	5	11	4	-	17	9	26	2
Borghum/Millet Principal Field	9	-	1	10	1	17	1	1	19	6	26	-	1	27	6
Jack of Compound Plot	8	12	-	20	6	5	12	1	18	2	6	21	1	31	7
Manut Plot	6	-	1	7	3	3	-	3	6	4	8	6	3	17	5
Mara Plot	-	1	-	1	-	-	27	2	29	4	-	46	-	46	11
Mice Plot	2	-	-	2	-	7	2	4	13	1	16	10	10	36	2
Mize Plot	1	-	-	1	-	18	1	1	20	10	9	-	-	9	1
Marth Pea Plot	3	4	-	7	1	1	5	4	10	2	2	7	-	9	3
Borghum/Millet Village Plot	8	1	-	9	2	1	2	-	3	1	6	1	1	8	5
Front of Compound Plot	8	-	-	8	3	4	-	1	5	-	13	-	1	14	6
Soybean Plot	-	-	-	-	-	2	-	-	2	-	8	14	1	23	5
Manioc Plot	4	-	-	4	2	6	3	1	10	5	9	-	1	10	2
Cotton Plot	2	-	-	2	1	3	-	1	4	3	4	1	-	5	1
Local Variety Sauce Herb Plot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sweet Potato Plot	3	-	-	3	2	-	-	-	-	-	-	-	-	-	-
Rosella Plot	-	-	-	-	-	1	9	1	11	3	-	1½	-	14	10
Wet Season Garden	1	-	-	1	-	1	-	1	2	-	3	-	-	3	-
Tobacco Plot	1	-	-	1	1	4	-	1	5	2	1	-	-	1	-
Sam Plot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red Fepper Plot	2	-	-	2	1	-	-	-	-	-	1	-	-	1	-
All other plots*	1	-	-	1	-	-	-	-	-	-	1	-	-	1	-
TOTAL	60	31	5	96	29	75	66	27	168	47	113	137	31	281	63

* Eggplant, cowpeas, indigo, kenaf, sauce herbs, others.

220

Village Data Kind of Field or Plot	13 Moodangn				14 P. Mancangu				15 Foamboanli					
	Household Head	Household Women	Other Household Men	Total	Fields/Plots Borrowed	Household Head	Household Women	Other Household Men	Total	Fields/Plots Borrowed	Household Head	Household Women	Other Household Men	Total
Sorghum/Millet Personal Field	1	16	12	29	1	-	30	9	39	5	-	1	3	4
Sorghum/Millet Principal Field	21	-	-	21	5	21	1	-	22	1	17	1	1	19
Back of Compound Plot	2	30	-	32	6	2	27	1	30	3	18	18	1	37
Peanut Plot	2	2	1	5	1	6	-	1	7	0	9	-	1	10
Okra Plot	-	12	-	12	2	-	24	-	24	4	-	22	-	22
Rice Plot	1	-	-	1	-	1	-	1	2	-	4	1	7	12
Maize Plot	4	-	-	4	-	3	-	-	3	-	-	-	-	-
Earth Pea Plot	7	-	3	10	-	2	-	-	2	-	4	-	-	4
Sorghum/Millet Village Plot	1	1	-	2	-	4	-	-	4	2	10	9	4	23
Front of Compound Plot	9	-	-	9	6	6	-	-	6	-	13	-	3	16
Soybean Plot	1	-	-	1	1	1	-	-	-	-	1	2	-	3
Manioc Plot	3	-	1	4	-	7	-	-	7	2	17	-	1	18
Cotton Plot	5	-	-	5	-	5	-	1	6	1	3	-	-	3
Local Variety Sauce Herb Plot	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sweet Potato Plot	-	-	2	2	7	2	3	-	3	-	4	-	-	5
Rose lile Plot	-	1	-	1	1	-	-	-	-	-	-	1	-	1
Dry Season Garden	-	-	-	-	-	1	-	-	1	-	1	-	-	1
Tobacco Plot	1	-	-	1	-	-	-	-	-	-	-	-	1	-
Yam Plot	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Red Pepper Plot	-	-	-	-	-	1	-	-	1	-	1	-	1	-
All other plots*	-	-	-	-	-	-	2	-	2	-	-	-	-	-
TOTAL	63	62	19	144	21	62	84	13	159	18	103	55	24	18

*Eggplant, cowpeas, indigo, kenaf, sauce herbs, others.

APPENDIX VI (Cont.)

Village Data Kind of Field or Plot	19 Loagibu					20 Kpajali					21 Tindangu				
	Household Head	Household Women	Other Household Men	Total	Fields/Plots Borrowed	Household Head	Household Women	Other Household Men	Total	Fields/Plots Borrowed	Household Head	Household Women	Other Household Men	Total	Fields/Plots
Sorghum/Millet Personal Field	-	3	4	7	4	7	12	8	27	3	-	10	5	15	
Sorghum/Millet Principal Field	37	-	-	37	21	20	-	-	20	2	24	-	3	27	
Back of Compound Plot	8	34	2	44	14	8	10	4	22	7	8	17	6	31	
Peanut Plot	16	1	-	17	11	12	-	2	14	1	4	-	3	7	
Ckra Plot	3	33	-	36	16	-	26	-	26	1	-	18	-	18	
Rice Plot	12	11	4	27	10	7	-	3	10	2	13	7	3	23	
Maize Plot	7	2	1	10	6	2	-	2	4	-	3	1	-	4	
Earth Pea Plot	11	3	1	15	8	10	8	2	20	2	10	7	3	20	
Sorghum/Millet Village Plot	15	-	1	16	6	6	1	-	7	1	9	5	2	16	
Front of Compound Plot	19	-	-	19	10	6	-	-	6	1	8	-	-	8	
Soybean Plot	10	1	-	11	6	13	6	1	20	2	5	7	-	12	
Manioc Plot	8	-	1	9	7	2	-	-	2	-	4	-	-	4	
Cotton Plot	5	1	-	6	3	18	-	1	19	1	3	-	3	6	
Local Variety Sauce Herb Plot	1	30	-	31	12	-	-	-	-	-	-	-	-	-	
Sweet Potato Plot	1	-	2	3	-	9	-	6	15	1	9	-	10	19	
Roselle Plot	1	-	-	1	1	-	-	-	-	-	-	-	-	-	
Dry Season Garden	13	-	1	14	5	-	-	-	-	-	2	-	-	2	
Tobacco Plot	1	-	-	1	1	2	-	-	2	1	5	-	-	5	
Yam Plot	4	-	-	4	4	15	-	10	25	4	4	-	-	4	
Red Pepper Plot	3	-	1	4	-	2	-	-	2	-	-	-	-	-	
All other plots*	7	9	1	17	8	-	-	-	-	-	2	-	-	2	
TOTAL	182	128	19	329	153	139	63	39	241	29	113	72	38	223	

* Eggplant, cowpeas, indigo, kenaf, sauce herbs, others.

APPENDIX VI (Cont.)

Village Data Kind of Field or Plot	16 Boammoandi					17 Lampoanpuoli					18 Cindi-Kombu				
	Household Head	Household Women	Other Household Men	Total	Fields/Plots Borrowed	Household Head	Household Women	Other Household Men	Total	Plots/Fields Borrowed	Household Head	Household Women	Other Household Men	Total	Fields/Plots Borrowed
Sorghum/Millet Personal Field	-	7	13	20	13	-	21	14	35	13	-	15	12	27	13
Sorghum/Millet Principal Field	20	8	9	37	12	41	6	4	51	27	25	-	2	27	12
Back of Compound Plot	10	35	9	54	21	15	40	8	63	36	6	31	2	39	15
Peanut Plot	7	4	5	16	8	12	1	18	31	19	15	-	3	18	10
Okra Plot	-	38	-	38	12	1	43	-	44	27	2	27	-	29	17
Rice Plot	10	7	14	31	6	5	14	8	27	9	8	11	6	25	8
Maize Plot	5	-	3	8	5	2	4	-	3	1	11	-	-	11	4
Earth Pea Plot	3	3	2	8	4	1	1	-	2	2	7	7	2	16	7
Sorghum/Millet Village Plot	3	8	1	12	5	24	7	1	32	8	14	2	3	19	7
Front of Compound Plot	13	-	1	14	6	20	-	-	20	13	6	-	-	6	2
Soybean Plot	9	12	12	33	22	2	3	-	5	4	4	2	1	7	4
Manioc Plot	10	-	10	20	7	8	-	1	9	5	13	4	-	17	11
Cotton Plot	3	-	1	4	0	2	-	-	2	1	6	-	2	8	5
Local Variety Sauce Herb Plot	-	-	-	-	-	-	33	-	33	19	-	23	-	23	9
Sweet Potato Plot	2	-	1	3	1	4	2	3	9	6	2	1	4	7	1
Roselle Plot	2	17	-	19	5	-	1	-	1	-	-	2	-	2	-
Dry Season Garden	-	-	-	-	-	1	-	-	1	-	4	-	1	5	2
Tobacco Plot	7	-	4	11	3	4	-	2	6	-	6	1	-	7	2
Yam Plot	4	-	-	-	-	3	-	2	5	1	-	-	-	-	-
Red Pepper Plot	6	-	-	6	2	5	2	-	7	4	7	1	-	8	3
All other plots	4	-	2	6	1	5	1	1	7	3	7	3	3	13	2
TOTAL	114	139	87	340	133	155	176	62	393	198	143	130	41	314	139

Eggplant, cowpeas, indigo, kenaf, sauce herbs, others.

223

APPENDIX VII-D : CRCP ASSOCIATION

Combinations Villages *	Millet Sesame	Sorghum Millet Sesame Cow- peas	Okra Squash Calabash	'Grain' Maize Okra	Maize Rainy & Dry Season Okra	Sorghum Cowpeas Roselle	Red peppers	Tobacco	Okra Calabash	Sauce Herb (Dallifadi)	Miscellan- eous Associa- tions:ll- 3 occur- rences	
	1 Boamboanyenga	3	-	-	-	-	-	-	-	-	-	-
2 Lanyabidi	9	7	-	-	-	-	-	-	-	-	-	
3 Gbanlamba	5	-	-	-	-	-	-	-	-	-	-	
4 Komboassi	-	11	-	-	-	-	-	-	-	-	-	
5 Dabessma	-	-	-	-	-	-	-	-	-	-	-	
6 Piala	-	-	-	-	-	-	-	-	-	-	-	
7 Buodi	-	-	-	-	4	-	-	-	-	-	-	
8 Ugalu	-	-	-	-	-	-	-	-	-	-	-	
9 Diapangu	-	-	-	-	12	-	-	-	-	-	16	
10 Tilonti	-	-	-	-	-	-	-	-	-	-	-	
11 Ponyinkonli	-	-	-	-	-	-	-	-	-	-	3	
12 Ugalu	-	-	-	-	-	-	-	-	-	-	10	
13 Moodaagu	-	-	-	-	-	-	-	-	-	-	-	
14 Dmancangu	-	-	-	-	-	15	-	-	-	-	8	
15 Fomboanli	-	-	-	8	-	-	5	10	-	-	17	
16 Boammoandi	-	-	-	8	-	-	-	-	-	-	22	
17 Lampoanpuoli	-	-	-	-	-	-	-	-	13	-	10	
18 Cindi-Kombu	-	-	17	-	-	-	10	-	-	-	7	
19 Loagibu	-	-	-	-	-	-	-	-	-	11	20	
20 Kpajali	-	-	-	-	-	-	-	-	-	-	15	
21 Tindangu	-	-	-	-	-	-	-	5	-	-	5	
Total	18	18	17	16	16	15	15	15	13	11	133	

* Villages are grouped by sub-region. Major agro-climatic aggregations would be villages 1-8, 9-12, 13-16, 17-21.

APPENDIX VII-C: CROP ASSOCIATION

Combinations Villages *	Rainy & Dry Season Okra	Maize Calabash Squash	Peanuts Sesame Roselle	Dry Season Okra Roselle	Maize Dry Season Okra	Maize Cotton	Maize Tobacco	Peanuts Cowpeas	Maize Cotton Okra	Maize Okra Calabash	Maize, Okra Sorghum Calabash	Maize Sauce Herbs	'Grain' Roselle	'Grain' 'Kenaf
1 Boamboanyenga	-	-	-	-	-	8	-	-	-	-	-	6	-	-
2 Lanyabidi	-	-	15	-	-	8	-	-	5	-	-	-	-	-
3 Gbanlamba	-	-	-	-	-	0	-	-	5	-	-	-	-	-
4 Komboassi	-	-	-	-	-	15	-	-	11	-	-	-	-	-
5 Dabessma	-	4	-	-	-	-	-	-	-	-	-	-	-	-
6 Piala	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7 Buodi	4	-	-	-	8	-	-	6	-	7	-	-	-	-
8 Ugalu	6	-	-	-	9	-	-	-	-	13	-	-	-	-
9 Diapangu	21	-	-	-	-	-	-	17	-	-	-	10	-	-
10 Tilonti	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 Ponyinkonli	-	-	-	-	-	-	13	-	-	-	-	-	-	-
12 Ugalu	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13 Moodaagu	-	-	-	-	-	-	-	-	-	-	-	-	19	-
14 Dmancangu	-	-	-	4	-	-	-	-	-	-	-	-	-	-
15 Foamboanli	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16 Boammoandi	-	28	-	14	-	-	-	-	-	-	20	-	-	-
17 Lampoanpuoli	-	-	18	-	-	-	-	-	-	-	-	-	-	-
18 Cindi-Kombu	-	-	-	-	-	-	-	-	-	-	-	-	-	18
19 Loagibu	-	8	-	12	16	-	10	-	-	-	-	-	-	-
20 Kpajali	7	-	-	4	-	-	6	-	-	-	-	4	-	-
21 Tindangu	5	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	43	40	37	34	33	31	29	23	21	20	20	20	19	18

* Villages are grouped by sub-region. Major agro-climatic aggregation would be villages 1-8, 9-12, 13-16, 17-21.

APPENDIX VII-B : CROP ASSOCIATION

Combinations Villages *	'Grain' Cowpeas Sesame	Manioc	Millet Cowpeas	Maize	Sweet Potatoes	Sorghum Cowpeas Sesame	Peanuts Sesame	Sorghum Early Millet	Sauce Herb (Kpan- kpanli)	Cotton	Sorghum Maize	Roselle	Maize (Cotton) Okra	Rainy Season Okra
1 Boamboanyenga	-	-	-	-	-	15	31	-	-	-	-	-	-	9
2 Lanyabidi	-	-	-	-	-	10	9	-	-	-	-	-	-	-
3 Gbanlamba	58	-	-	-	-	31	10	-	-	-	-	-	-	-
4 Komboassi	32	-	-	-	-	-	-	-	-	-	-	-	-	-
5 Dabessma	-	-	-	3	-	-	11	-	-	-	13	-	-	10
6 Fiela	-	-	-	-	-	17	7	-	-	-	-	-	-	9
7 Buodi	-	-	32	13	-	-	-	-	-	14	-	-	-	9
8 Ugalu	-	6	28	9	-	-	-	-	-	-	-	-	-	7
9 Diapangu	16	12	32	5	5	-	-	-	-	-	-	-	12	-
10 Tiloni	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 Ponyinkonli	-	7	-	13	-	-	-	-	-	-	10	14	-	-
12 Ugalu	-	8	-	14	-	-	-	-	-	5	-	17	-	-
13 Moodaagu	-	-	-	4	9	-	-	-	-	-	-	-	-	-
14 Dmancangu	-	8	-	-	-	-	-	-	-	5	11	-	6	-
15 Foamboanli	-	17	-	-	5	-	-	-	-	-	-	-	-	-
16 Boammoandi	-	18	-	-	-	-	-	-	-	-	15	15	4	-
17 Lampoanpuoli	-	-	-	-	10	-	-	49	27	-	-	-	16	-
18 Cindi-Kombu	-	16	-	13	8	-	-	18	16	5	-	-	7	-
19 Loagibu	-	8	-	-	2	-	-	-	21	-	6	-	-	-
20 Kpajali	-	-	-	-	-	-	-	-	-	20	-	-	-	-
21 Tindangu	-	-	-	5	19	-	-	-	-	6	-	-	-	-
TOTAL	106	100	92	79	74	73	68	67	64	55	55	46	45	44

* Villages grouped by sub-region. Major agro-climatic aggregations would be villages 1-8; 9-12, 13-16; 17-21