A RAPID APPRAISAL OF THE IMPORTANCE OF CASSAVA PRODUCTION AND PROCESSING IN THE AGRICULTURE OF MARFOKROM

By:

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INTRODUCTION

This is a report of a rapid rural appraisal carried out to study the principal agricultural and food processing activities with a bias towards cassava, in Marfokrom. The six days field study was also an exercise in the application of rapid rural appraisal techniques. The village was selected for the exercise on the basis of information gathered on cassava production and processing by the Food Research Institute in an earlier formal survey carried out in the Akuapem South District of Ghana.

The specific objectives of the study were to gain an understanding of the:

i. general agricultural practises including the land tenure system.

ii. importance of agriculture and food processing in the livelihood of the village.

iii. the economic impact, methods and constraints in cassava production.

iv. limitations in the traditional food processing methods.

v. food storage and marketing methods and problems.

vi. feeding habits, cultural practises, health and gender issues.

The study team consisted of a food technologist, two agricultural economists, a biochemist and a technician on food processing machinery. RRA techniques used in the study included; review of secondary data, semi-structured interviews, crop and seasonal calendars, transact, map, diagrams and quotes. The checklist used for the study is reproduced in table I. The checklist was reviewed during the stay in the village to include other important aspects of the village profile and activities that were observed during the study.

TABLE I

CHECK LIST

PRODUCTION

- Crops cultivated/cultivars
- Cropping pattern
- Major crops
- Methods of cultivation
- yield/size of farms
- Harvesting
- Planting material/storage
- Deseases and pests
- Land availability
- Gender issues
- Labour requirements and organization
- Soil fertility
- Livestock

Processing, Storage, Utilization

- Types of processed products
- Methods of processing and problems
- Utilization of waste materials and problems
- Storage methods, structures and problems
- Problems of storage
- Packaging
- Food preparation and major staples

Marketing

- Income generation
- Pricing
- Marketing outlets
- Marketing agents
- Transportation/availability

VILLAGE PROFILE OF MARFOKROM

Location and Setting

Marfokrom is a large farming village about 10km to the west of Nsawam in the Nsawam Kraboa Coaltar district of Ghana. It is just off the Nsawam - Coaltar trunk road and has a population of about 1000 people.

The inhabitants who are by and large peasant farmers belong to either the akan or the ewe ethnic groups. Marfokrom has two primary schools, a junior secondary school, a Presbyterian church, an Anglican church and two pentecostal churches.

Marfokrom is situated in a semi forest zone and comprises of a large cluster of compound houses outside which the semi forest is farmed for maize, cassava, oil palm, pineapple cocoa, plantain, yam bast fiber, orange and cocoyam as depicted in fig. 1. The soils within and outside the village are sandy loam and the nim, coconut, alasa flamboyant and ornamental trees are found in the village. Okrow, wawa odum, Kapok, owatoko, osese, and some medicinal plants are found in the farms. (fig. 2).

> "Okrow if left on the farm helps the crops to grow by providing shade and humus, whilst the kapok tree helps cocoyam to sprout out of the ground on its own".

A few livestock are kept in most houses and these include sheep, goats, pigs, guinea fowls, chickens and ducks. In some of the compounds there is space and provision made for the traditional processing of cassava in gari, palm fruits into palm oil and palm kernel oil. Marfokrom has two small palm wine distillation plants for producing akpeteshie the local gin. Two cassava graters and two corn grinding mill, two tiny streams at both ends of the village and a well serve as the source of drinking water to the inhabitants.

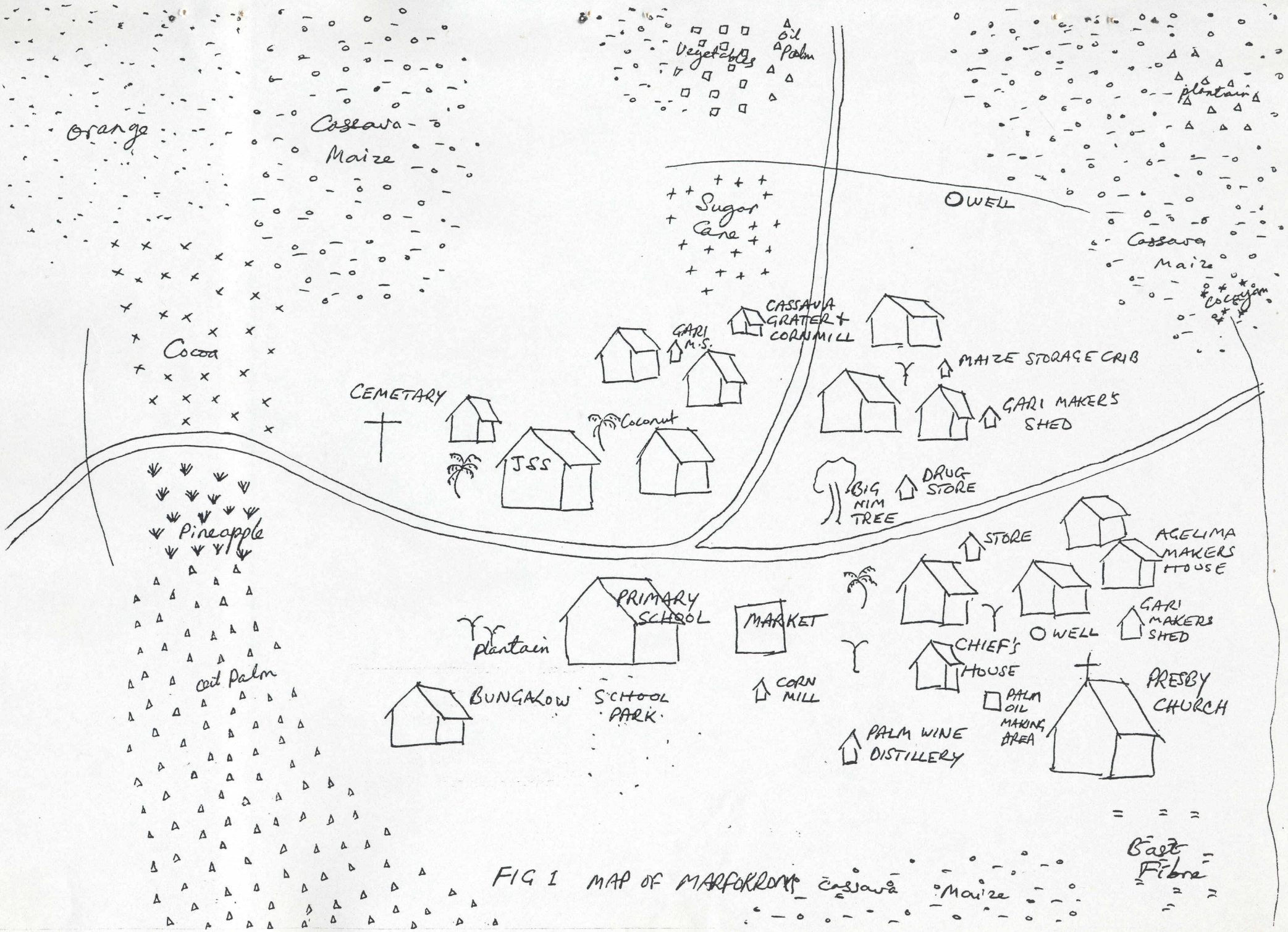
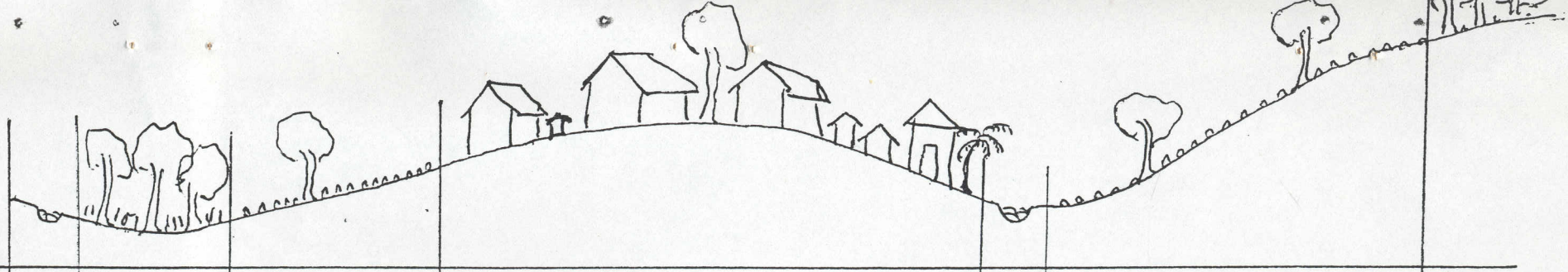


FIG 1 MAP OF MARFOKRONI



ZONE	STREAM	SEMI FOREST	FARMS	HABITATION	STREAM	FARMS	SEMI FOREST
LAND USE		Cocoa oil palm	Cassava Maize Oil palm Orange plantain Cocoa	Houses School Church cassava processing palm fruit processing Drying of pepper maize storage animal pens coconut plantain		Cassava Maize Oil palm Orange Plantain Cocoa	Cocoa Oil palm
SOIL		Sandy Loam	Sandy Loam	Sandy Loam		Sandy Loam	Sandy Loam
TREES		Kapok Odum Wawa Owateko Wild palm Okrow	Kapok Odum Wawa Owateko medicinal plants	neem tree flamboyant ornamental trees alasa		Kapok Odum Wawa Owateko medicinal plants	Kapok Odum Wawa Owateko Wild palm Okrow
LIVESTOCK			Pigs Poultry	Sheep, Guinea fowls Goats chicken Pigs ducks			
PROBLEMS		Deforestation Termites	Unreliable rainfall Mosaic virus Rodents	Erosion		Mosaic virus on cassava Stunted cassava growth Termites destroy cocoa maize and cassava	Deforestation Termites

Fig 2. Transect of Manfokrom

Marfokrom is represented by an assemblyman in the Suhum District Council and the head of the village is a female chief. The interactions of the main functional groups in Marfokrom are shown in fig. 3.

A Brief History

Marfokrom was established in 1918 by Kofi Marfo a rubber gum collector from Akim Oda.as shown in the historical profile in fig. 4. He finally settled down to farm having purchased the land from its owners at Kyebi Apapam. Kofi Larbi from Akuapem Ahwerease also settled in the village and Marfokrom gradually begun to grow. The settlers were mainly cocoa farmers but planted yam, plantain and cocoyam for food. Coffee was also later grown as cash crop.

A Presbyterian church was built in the village 1934 and a few years later a primary school. There were further settlements by people from Peki in the Volta Region in 1938 and migrants from Akepe in Togo in 1940 mainly to work on the cocoa farms. These settlers who were of the ewe stock introduced cassava and maize to the village. With their arrival the cultivation of plantain begun to decline due to a different food habit. The purchasing of cocoa by brokers in the village stopped in 1940. A well was dug in the village in 1952 and a second one in 1958. The first corn mill was installed in the village in 1960 and in 1962 The Cocoa Services Division opened a branch in the village. The cultivation of coffee was tstopped in 1965 and cocoa cultivation begun to decline. As the cocoa farms begun to die the cultivation of maize and cassava assumed prominence and became the most important crops. In 1983 there was drought and the accompanying bush fires destrayed cocoa farms. The Cocoa Services Division wound up its operations in the village in 1985 following a nationwide redundancy exercise.

The first cassava grater was installed in the village in 1986 and a second cassava grater and a corn grinding mill in 1988.

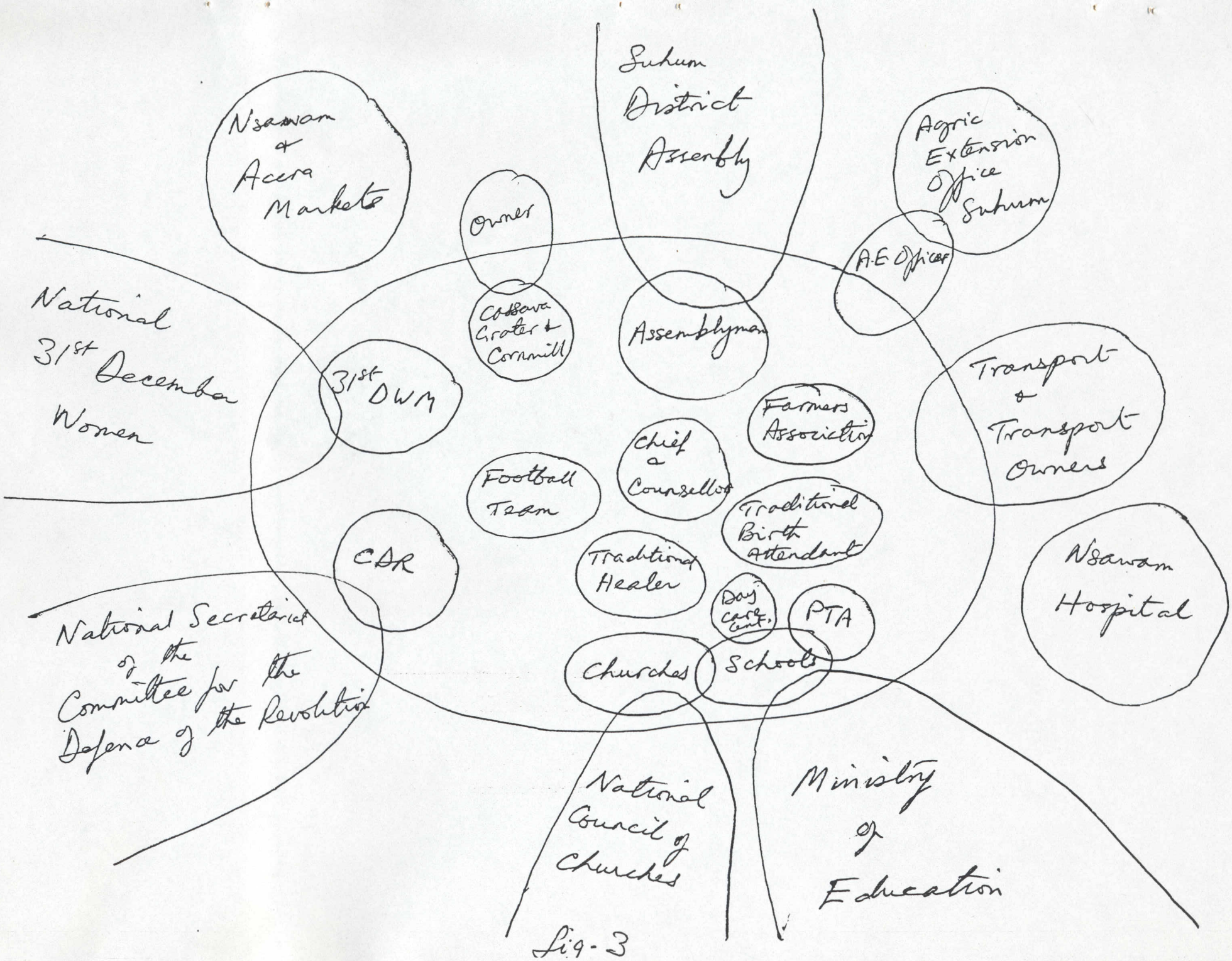

Suhum District Assembly
Nsawam & Accra Markets
Agric Extension Office Suhum
Owner
A.E Officer
Cassava Grater & Cornmill
Assemblyman
National 31st December Women
31st DWM
Transport & Transport Owners
Farmers Association
Chief & Counsellor
Football Team
Traditional Birth Attendant
CDR
Nsawam Hospital
Traditional Healer
Day care Cent.
PTA
Churches
Schools
National Secretariat of the Committee for the Defence of the Revolution
National Council of Churches
Ministry of Education

Fig-3

Historical Profile of Manfokrom

- Village established by Koji Manfo (from Akyem Oda)
- Arrival of Koji Larbi + family (from Akuapem Aburerase
- Establishment of cocoa farms + later coffee
  food crops; yam, cocoyam, plantain

1934 - Presbyterian Church built
- Presbyterian School built

1938 - Arrival of people from Peki
1940 - Arrival of migrants from Togo
Introduction of cassava and maize
Plantain cultivation decline

1945 - Purchase of Cocoa by brokers stopped

1952 - 1st well dug in the village

1958 - 2nd Well dug by Suhum Local Council
1960 - Corn mill installed

1962 - Cocoa Services Division established

1965 - Coffee cultivation stopped. Cocoa
cultivation declined drastically
1966 - Cassava and Maize cultivation
become prominent as cash crops

1983 - Drought and bushfires destroyed
cocoa farms and food crops

1985 - Cocoa Services Division folded up
1986 - 2nd Cassava grater Installed

1989 - 2nd Corn Mill + Cassava Grater installed

Fig 4

Seasonal Patterns

Agricultural and livelihood activities in Marfokrom are dominated by the bimodal rainfall pattern as shown in fig. 5, the major rains between May and early August and the minor season in late September and October.

Farming activities include land preparation which involves clearing, burning and removal of stumps; planting, weeding and harvesting. Food storage and processing activities include construction or maintenance of maize storage cribs, maize shelling, sundrying of pepper, processing of cassava into agbelima and gari and the manufacture of palm oil and palm kernel oil.

Farming activities start with land preparation and this is completed before the rains set in. This period of land preparation, February to April is a period of high labour demand. Most food crops are planted with the first few rains and would be harvested after the rains. A month after planting as the rains intensify the farms become weedy and there is high labour demand to weed the farms, ie. June, July, August. After harvest of the major crop land is immediately prepared for the minor season. Weeding in the minor season is in September and October. These are also periods of high labour demand but agricultural activities in the minor season are less intense.

The months of March, April and May is the period of food insecurity and the price of 1kg of maize in 1989 for example rose from ¢50 to ¢200. Even though the price of maize will remain high till the first harvest in August, availability of cassava improves with the onset of the rains as the softened ground facilitates harvesting of cassava.

A lot of the youngmen who go in search of jobs in the urban areas return to farm at the weekends during the farming season.

COMPOSITE SEASONAL CALENDAR

MARFOKROM

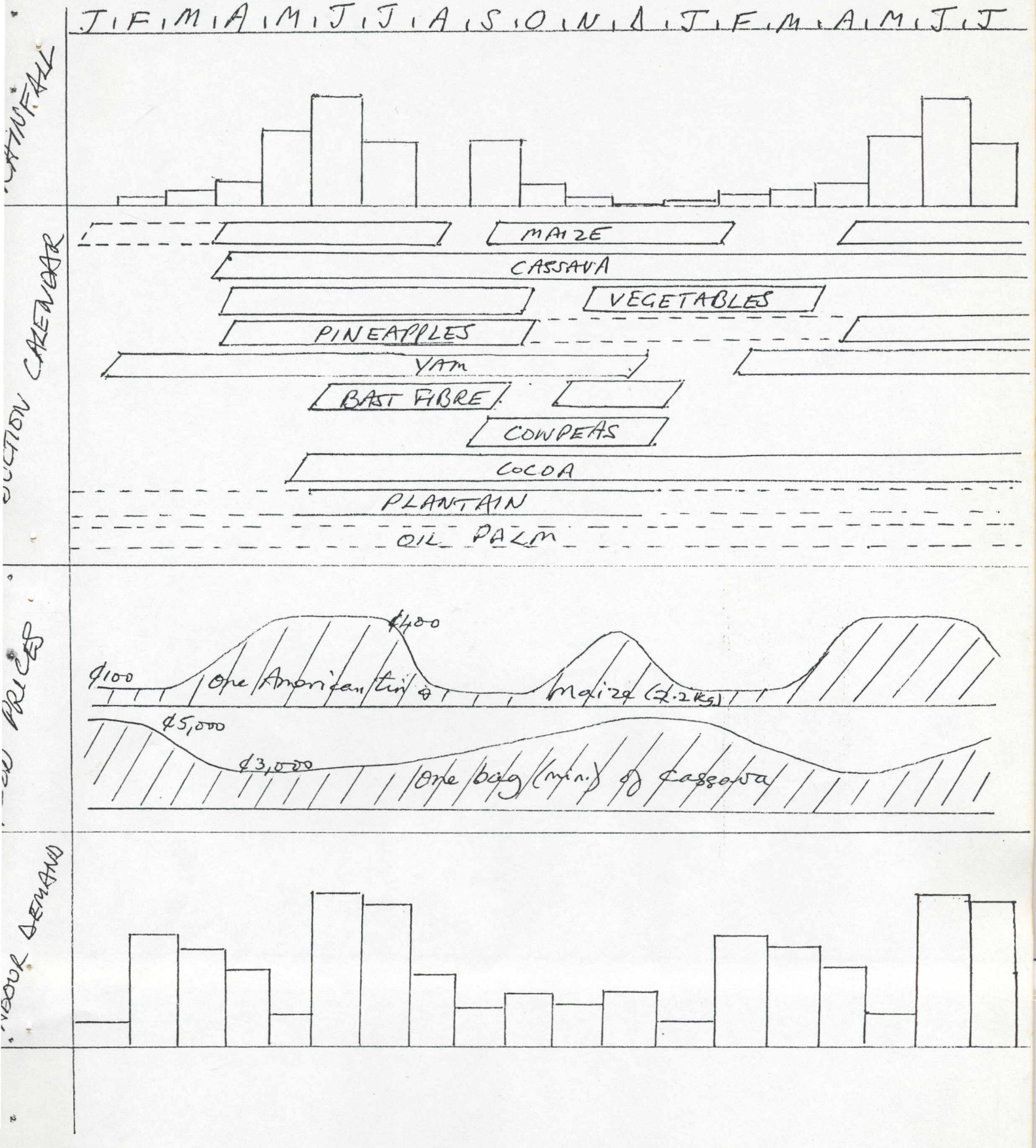


Fig. 5

AGRICULTURE

Land Tenure

Three forms of tenurial arrangements are practised in Marfokrom; ownership by inheritance, hiring and sharecropping.

Land hiring rates in 1990 ranged between ₵7000 per hectare to ₵12000 per hectare; depending on the quality of the land and probably the value of the crop to be grown. The most common tenurial arrangement for food crop production is sharecropping. Two systems prevail. Under abusa, one third of the produce is paid to the land owner whilst under abunu, the land owner retains one half of the harvest. Abusa is commonly practised for maize and abunu for cassava. Two explanations given for this are that:

> "Cassava stays longer on the land, and as maize is harvested earlier, the farmer will depend on the money from maize during the lean period".

Where land is sharecropped, the farmer does not have an indefinite hold on the land. This limitation can affect the types of crops grown and soil management practices on the land and has contributed to the decline of plantain cultivation.

Agricultural Practises

Agricultural production activities in Marfokrom include crop production, food processing and to a lesser extent, rearing of sheep, goats and poultry. The scale of livestock activities is very low as only a few animals are penned within the compounds.

Crop production is by far the most predominant agricultural activity. Processing of cassava and oil palm is an income generating activity for women.

Crops grown include maize, cassava, plantain, pineapple, oil palm, cocoa, vegetables and cowpeas. Maize and cassava are the major crops, and are grown by all farmers for both subsistence and commercial objectives. Pineapple, oil palm, cocoa and cowpeas are grown by gewer farmers strictly as cash crops. Vegetables are grown as dietary complements to the starchy staples, and as cash crops by a few farmers.

Cocoa in particular has suffered a decline since the 1960s and attempts at rehabilitation by the Cocoa Services Division of the Cocoa Development Board have failed.

> ""Cocoa production has gone down because nowadays we don't get the rains and we have also lost the forest".

In general cropping activities are centered on cassava and maize production which are mostly intercropped although there are a few cases where cassava is grown as a sole crop. Because of the bimodal rainfall pattern in sourthern Ghana, there are two cropping seasons which extend from February to July for the major season, and September to December for the minor season.

Farming activities include land preparation (clearing, burning and removal of stumps), planting, weeding, harvesting, construction or maintenance of maize storage cribs, and maize shelling.

Crop production is by traditional technology the most important resource after land being family labour which uses the hor and matchet.

The two major food crops are planted on flat land without ploughing. Weeding with the hoe however, permits the turning of the soil during the growing of crops. Neither chemical fertilizers nor organic manure are applied and there are no soil management practises such as terracing or preparation of dikes despite an undulating terrain.

Crop-fallow rotation system is practised as a way of maintaining soil fertility. There was however an indication that the system of hiring land and sharecropping has reduced the duration of the fallow period. Hiring allows the use of land over a limited time period during which the tenant cannot leave the land fallow for a sufficiently long time for the land to rejuvenate. Land which is sharecropping must always carry a crop to provide to the landowner.

Maize

Maize and cassava, the most important crops in Marfokrom in terms of acrage of cultivation are grown by all farmers in the village. They are mostly intercropped and one can count the few instances where either is grown as a sole crop. There are two maize cropping seasons coinciding with the two rainfall seasons. Land preparation in Marfokrom for the major cropping season is mostly for maize and cassava cultivation. The average size of cassava and maize farms are about 7 ropes. There are 9 ropes in an acre.

"Cassava fetches more money than maize
but work on cassava is more difficult
because you have to weed for a longer time".

Land preparation starts in January with land clearing as shown in the crop calendar in fig. 6. For very well grown plots, clearing takes the months of January and February whilst for previously cultivated plots clearing is in February. Land clearing is carried out by men using cutlasses. After clearing, trees on the plots are cut into pieces and left with the cleared bushes to dry. After 2-4 weeks the cleared materials are dried and these are burnt, an activity carried out by men in March.

After burning tree stumps are removed and gathered in leaps with the debris and set to fire again. Women may partake in this final land preparation. ThFarmers then wait for the first rains, expected in March or April, to sow maize.

MAIZE PRODUCTION : CALENDAR OF ACTIVITIES

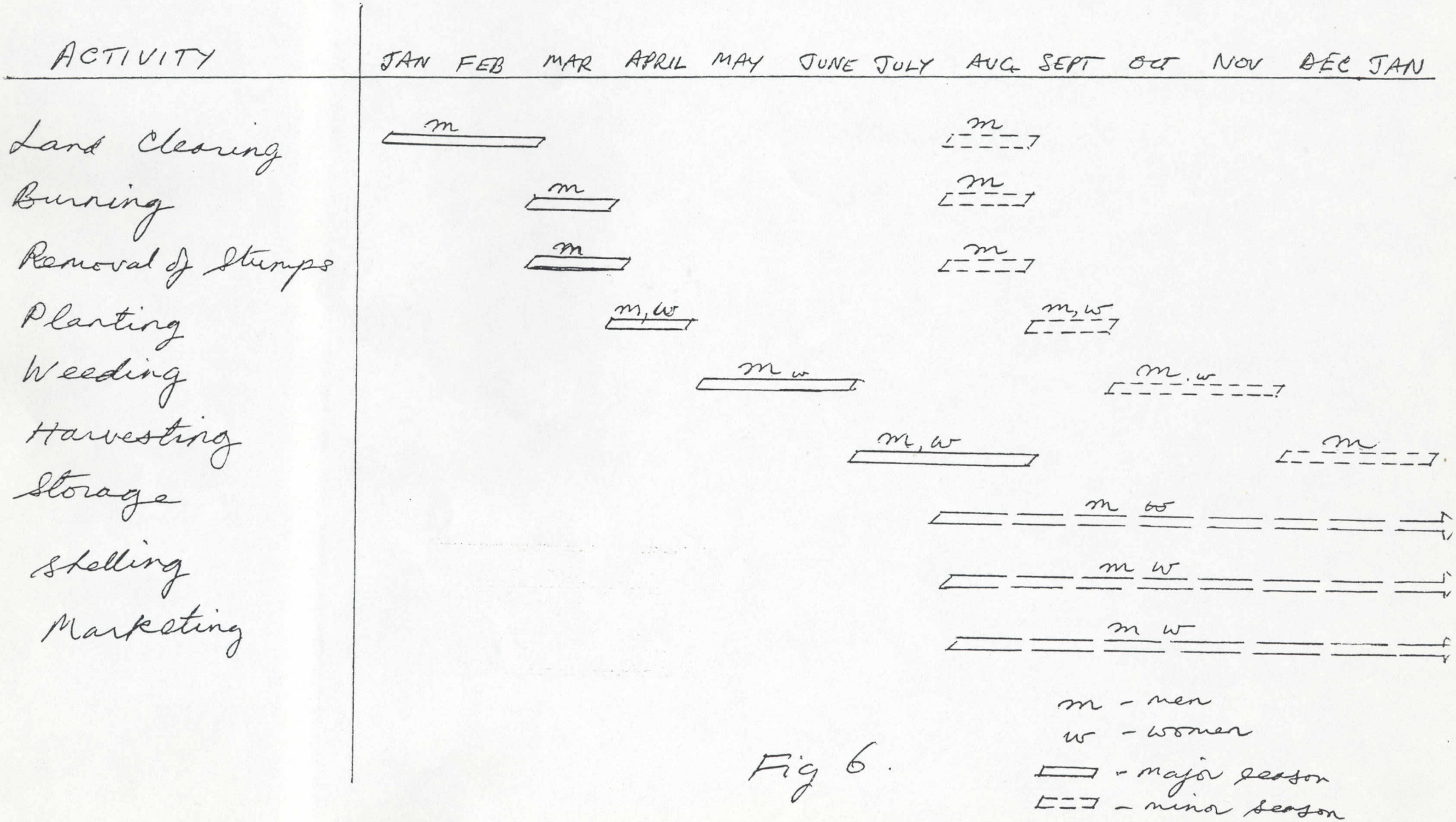


Fig 6.

Land preparation is thus an activity dominated by men except in instances where unmarried women rely on their own strength and hired labour to prepare their plots. Married women who may own farms would rely on their husbands for land preparation.

Maize varieties grown in Marfokrom are tospino and ayigbe abro. Tospino is the preferred variety because of its higher yield but does not store as well. During planting men punch holes in the ground with sharpened sticks at about 1.8 meter intervals whilst women and children follow dropping 3 or 4 seeds in a hole and covering them up.

Maize is sown hapazardly against the advice of the Agricultural Extension Officers. However one literate farmer, a former employee of the Grains Development Board when interviewed said that

> "The extension officer's method is much better because when I followed his advice and planted my seeds in sows at the specified intervals and applied fertilizer I obtained a yield of 15 mini bags per acre as against the traditional method of only 3 mini bags per acre".

The planted maize seeds germinate within 5 days and ayigbe abro matures in 40 days, tospino in 3 months. Before maturation the plot is weeded twice or thrice. Weeding is carried out mostly by men using hoes. Even though matured green maize has a higher price than dried maize, farmers prefer to leave their maize to dry on the farms. Dry maize is storable and can be prepared into food or sold for cash anytime the need arises. When maize dries up, the cobs are no longer able to stay upright on the stalks and drops ayigbe abro takes 40 days to dry, tospino 1 month.

Dry maize is harvested in July and August, an activity involving both men and women. Harvesting is by breaking off the cob and putting it into a basket which the farmer may carry on his head.

The crop is shared with the landowner on the farm using the basket as a measure. The crop may be harvested with the landowner.

After harvesting, the maize stalks left on the farm are later cut down and left on the farm to mulch and fertilize the soil.

The minor season crop is planted in September after land preparation in August. Weeding is carried out in October and November and the matured crop harvested in December and January.

Harvested maize is carried into the village in baskets and stored in cribs. Maize storage cribs are constructed by men using bamboo and palm fronts and are generally repaired every 2 years. A second storage structure is a raised platform, about 1.5m high, on which maize cobs are parked tightly in a circle and covered with polythene sheets to give them protection against the rain.

Farmers occasionally set fire under the maize storage structures to fumigate the produce. Heat and smoke destray weevils infesting the maize and one farmer estimated that without fire the farmer may lose all his produce whilst by setting fire under the storage structure one loses only about 5% of his produce.

Normally before putting the harvest into the storage structures, the farmer selects the best cobs to keep as planting material for the next cropping season. Such seed maize are stored by hanging in the kitchen above the fireplace.

Maize in storage is generally sold when it is demand and attracting a high price. Before marketing maize is shelled and put in mini or maxi bags. Shelling is carried out by both men and women. After removal of the outer husks, the cobs are put into sacks and beaten with sticks to dislodge the grains from the cob. The grains are next separated from the cobs and packed in bags.

Most of the maize is sold to middlemen who come to the village from the marketing centres to buy maize.

Cassava

Eventhough cassava may be cultivated throughout the year, the bulk of it is intercropped with maize during the major cropping season.

> "if you plant only cassava on a plot it grows faster and you need to weed only twice. When maize tassels it halts the growth of cassava".

Several varieties of cassava are cultivated in Marfokrom and these would either mature in 6-12 months or 1½ to 2 years. The six month varieties are generally called bosom nsia whilst the 1½-2 years varieties include katawere, ankra, bankye brode, tuaka and biafra

> "without maize tuaka matures in 12 months but with maize in 20 months"

> "tuaka used to mature in 6 months but now for good harvest you have to wait till it is 1½ years old because it does not rain well".

Cassava is grown almost invariably on the same plot as maize. After land preparation in January and February and the sowing of maize seeds in March and April as already been described, farmers wait for the maize to germinate and almost immediately plant cassava in between them i.e. 1 - 2 weeks after the planting of maize. The planting materials are cassava sticks cut into pieces of about 15cm long. A hole is made in the ground with a hoe and the cassava stick pushed into the spot with the nodes facing upwards. Cassava sticks are planted shallow in the ground because tuber formed deep in the soil are difficult to uproot.

"if you do not plant your cassava quickly
after the rains set in, cocoyam will sprout
first and stunt the growth of the cassava"

"if you plant cassava and maize at the same
time, the growth of your maize will be
stunted because cassava grows more vigorously".

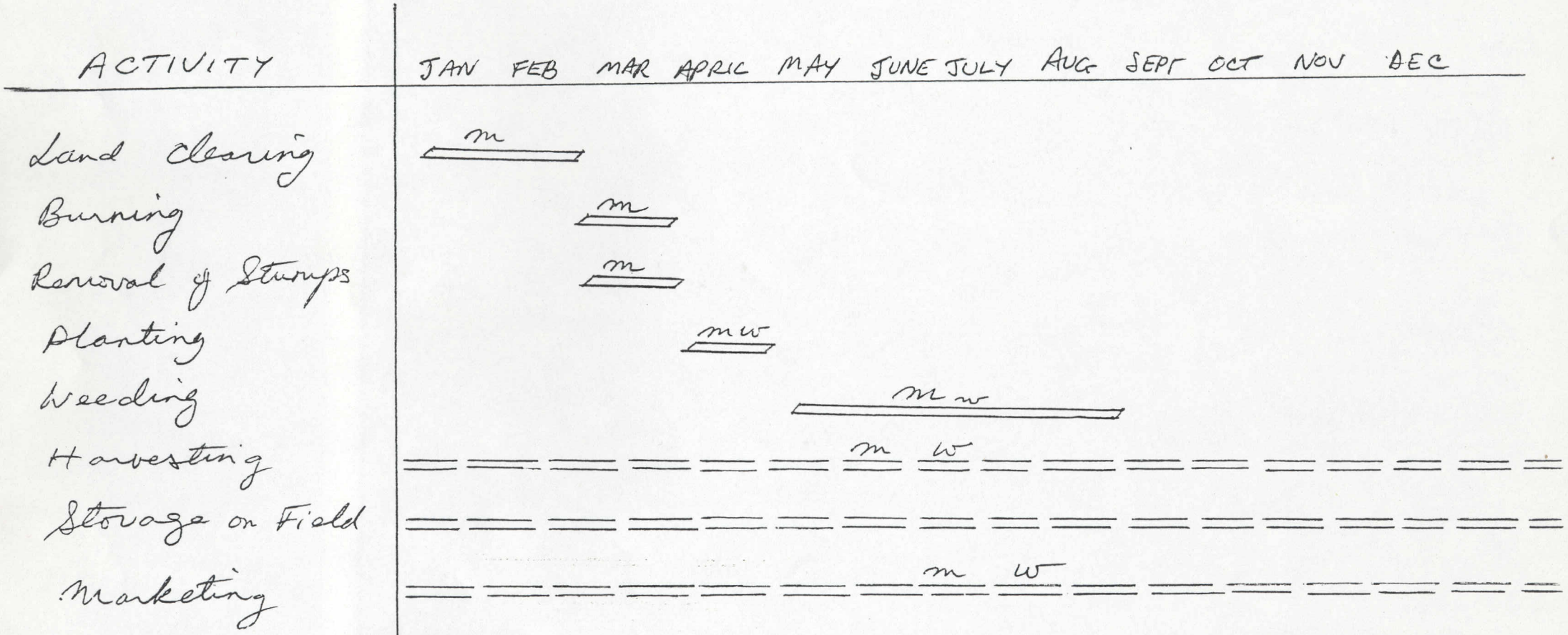
After the planting of cassava in March or April the farm will be weeded 3 or 4 times before harvesting on the first 2 or 3 occasions whilst there is maize still on the farm. The general rule is that the farmer continues weeding till cassava overgrows the weeds.

Cassava tubers are harvested by cutting off the stem and leaving a piece in the ground. This is held and pulled out of the ground bringing along the tubers with it. The tubers are cut off the main stem and packed in bags or baskets. Generally farmers do not uproot all of their cassava at the same time. A quantity that is needed at a time is harvested and the rest left on the farm. The farmer harvests as and when is needed. This is the most common and efficient method of cassava storage.

One rope of a cassava farm about 0.1 of an acre yields 3 mini bags of cassava. 1 rope of a matured farm may be sold outright for between ₵6,000 and 12,000 depending on yield and time of year. A farmer may normally keep 1 or 2 ropes of the farm for food and sell the rest, about 4 - 7 ropes for cash. Cassava is often purchased in the village by middlemen from Accra.

Planting materials i.e. cassava sticks are stored for the next planting season by typing them up in bunches and putting them up right under a shady tree. A second method is to lay the bunches flat on the ground and cover them up with grass. The crop calender for cassava is shown in fig. 7.

CASSAVA PRODUCTION : CALENDAR OF ACTIVITIES



m - men
w - women

Fig. 7.

Vegetables

Vegetables cultivation as a commercial activity is carried out by only a few inhabitants of Marfokrom. There are two cropping seasons. Vegetables cultivated are pepper, tomatoes with a little okro and garden eggs.

Land preparation for vegetable cultivation involves land clearing, burning and removal of stumps. This is between February and March. Planting materials are either seeds or seedlings. Some farmers nurse their own seeds whilst others purchase seedlings from scuh farmers. Seedlings are normally ready for transplanting at the onset of the rains in April or May. Tomatoes are transplanted at 4 weeks whilst pepper is transplanted at 5 or 6 weeks. Seedlings are transplanted at intervals of 1 - 2 feet.

The first weeding is carried out about a month after transplanting and the farm will be weeded twice more before the vegetables are ready for harvest. Harvesting by hand picking is between September and December. Pepper may be harvested thrice depending on rain. A second crop is planted in the minor season starting with land preparation in August and September. The minor season crop is harvested between January and March. Vegetables are sold in the Nsawam and Accra markets. A quantity of pepper is sundried, stored and marketed much later on in the year when prices are higher.

Pineapple

Although pineapple is cultivated by only a few young farmers in Marfokrom it is expected to assure greater importance in the village because of its higher dividents.

Land clearing for pineapple cultivation starts in early March. Two weeks after clearing the bush is burnt and stumps removed. All this is completed before the end of March.

Planting starts at the beginning of April. The planting materials are suckers which are planted in line. A sucker cost ¢10. About 1000 suckers can be planted in a day by 3 persons.

The suckers are well established by June and the sulphate of ammonia fertilizer is applied. Between June ending and July, a weedicide, Speaker 60 or Speaker 30, is applied to control weeds. About ½lb of weedicide is applied to 2 'ropes' of pineapple farm.

A second and third application of fertilizer is carried out in August and early December respectively, using sulphate of ammonia.

In the April of the following year, suckers are forced to fruits through the application of Calcium Carbide. About 2lbs of Calcium Carbide are dissolved in half a barrel of water and about 200ml, 1 milk tin full, of this applied to each plant. The plants fruit is approximately six weeks.

The fruits mature by the middle of September and ripen in the middle of October. For the export market, uniformity of ripening is ensured by the spraying of fruits with ethylene at the ned of September. The fruits are harvested within 4 to 7 days.

After harvest the farm is weeded in November and the plants left on the farm to develop more suckers. Suckers are removed in January. One pineapple plant yields about 20 suckers over a 5 year period.

Yam

The cultivation of yam is of minor importance in Marfokrom since only a handful of farmers grow it as a commercial activity. Other farmers intercrop a few for food.

Land is prepared in December and January and seed yam planted in February. Planting takes about 3 weeks on a ¾ acre farm. The farm is staked in March. This takes 1 week and the farmer starts weeding in April. Whilst weeding he guides the vines to climb the stalks. Milking is carried out in May and June by removing the original planting material and leaving vines. The first harvest is carried out in August and September and sold for cash. The final harvest which is in December is for food and seed.

The seed yam is dried and used for planting in February. In 1989 ¾ of an acre of white yam fetched ₵6,000.00.

Bast Fibre

The cultivation of bast fibre, a raw material for jute bags manufacture, was started in 1989 by the Presbyterian church on the advice of a former employee of Gihoc Jute Factory in Kumasi.

> "they said that the soil here is good
> for everything so we should plant
> bast fibre".

Farming was by voluntary labour but the church has been unable to continue this. The farm is now run by the farm manager, the former employee of the Jute factory.

Land is prepared in May and seeds supplied by the Jute Factory sown in rows in June. The seeds germinate after 4 days and within 3 weeks weeding by thinning, ie. pulling out weeds, starts. Weeding takes 2 weeks and the plants mature 2 months after planting. Harvesting by cutting the stalks occurs between August and mid October.

Whilst harvesting the land is prepared again for the minor season crop ie. in September and October. Since seeds from the old plants give poor yields, new seeds are purchased and sown in October. The farm weeds are thinned out in November and the bast fibre harvested between December and early January. The yield for the minor season is about half the yield of the major season.

The harvested stalks of the bast fibre plants are left in a steam for 10-15 days. This retting process causes the plants to lose their green colour leaving only bfibre. The fibre is stripped off the stalks, washed and dried, and conveyed to the house. They are kept in a dry room and later sold to agents from the Jute Factory. In 1989 the factory paid ₵210 for a kg of bast fibre and the $\frac{3}{4}$ of an acre farm fetched ₵26,000.00.

Cowpea

Asontem, a red cowpea variety is grown by a few individuals in the minor season as illustrated in fig. 8. Land preparation is in August and planting in September. The crop is harvested in December and sundried for a week. Processing following drying involves threshing and winnowing after which the cowpeas are sprayed with actelic 25 to prevent pest infestation. These activities are completed by February and the produce are sundried for 3 days, packed in jute bags and kept till May when it has a high market price.

Fig. 8 also illustrates the crop calendars for pineapple, the vegetables, and bast fibre.

Other Inputs

Planting material is usually obtained from farmers previous season's crop. Although the crop varieties grown may have good yield potentials, these potentials cannot be realised due to absence of knowledge on row planting and appropriate planting

CROP CALENDAR FOR PINEAPPLE, YAM, COWPEAS, BAST FIBRE

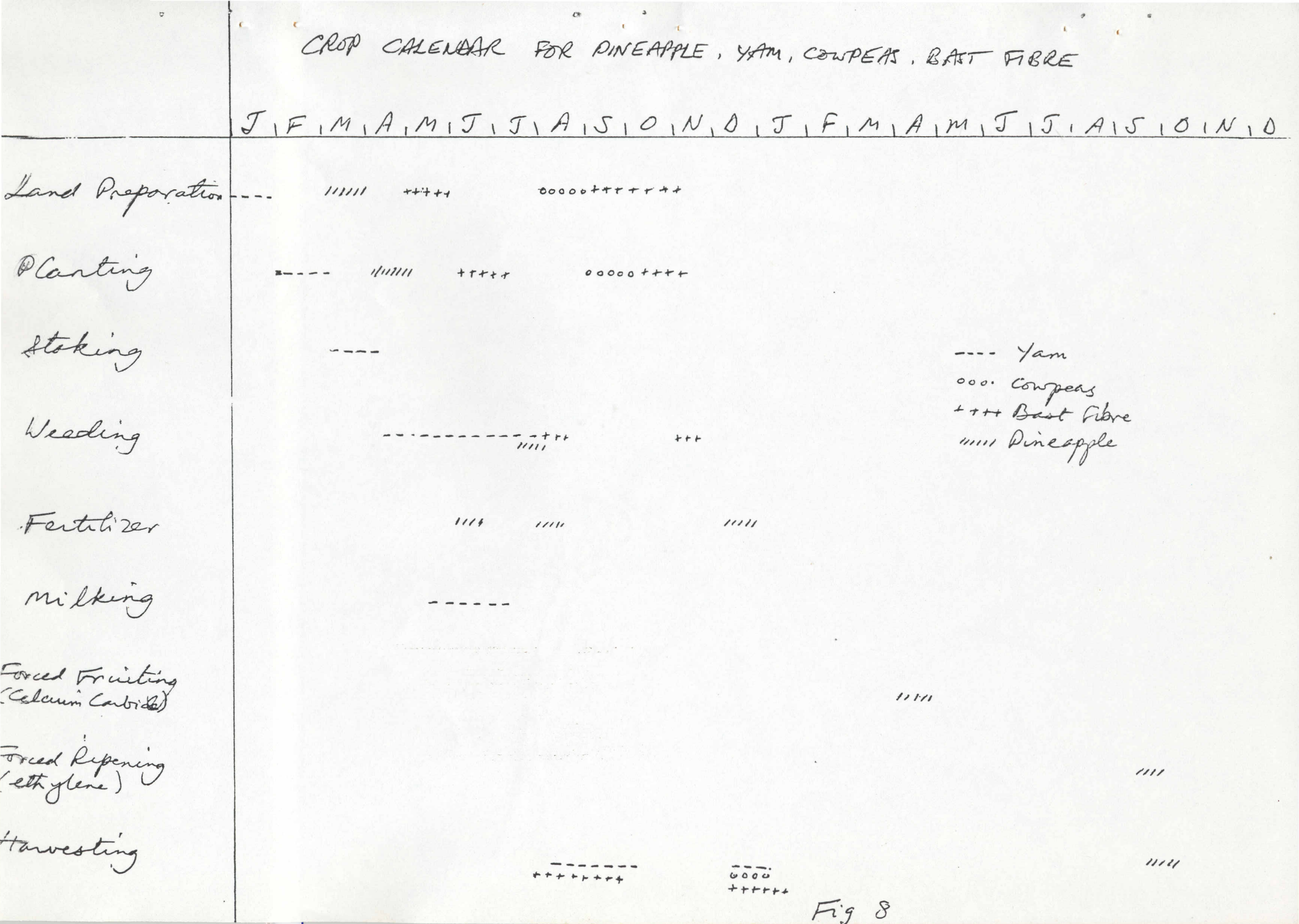


Fig 8

densities, and fertilizer use. The delay in the maturation of the tuaka variety of cassava which one farmer attributed to poor rainfall in recent years is suspected to be due to the use of the same planting material. Agricultural extension services are most lacking in the care. It was said that extension personnel would come to help any farmer if they were invited. Probably farmers do not find it worth the extra cost of travelling several kilometers to Suhum, where the District extension office is.

Crop production is highly labour intensive and farmers depend solely on family labour. There are specific gender roles regarding farm labour; but women may own farms or support their husbands on their farms. Fig. 9 3 illustrates the labour calendars for men and women respectively. These calendars reflect the roles played by each gender.

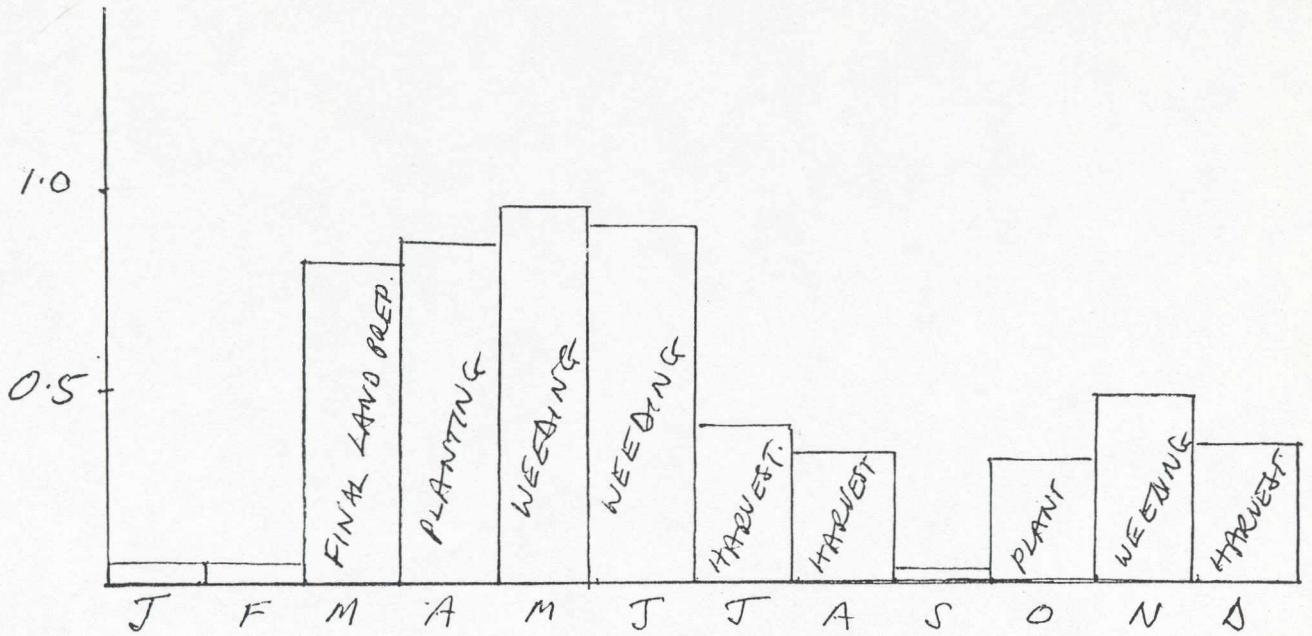
A low level of purchased inputs (both material and labour) by most farmers suggests a low level of commercialisation of agriculture in the village despite a sales objective of farmers in crop production. With such rudimentary food crop production technology, the sales objectives will be met only partially because of a lower marketable surplus.

A higher level of technology however prevails for specific cash crops, especially pineapples, grown only by a few individuals. It is important that the complex set of cultural practices associated with pineapple production was learned from more experienced pineapple growers around Nsawam. The motivation for adoption in terms of returns to investment must be very high.

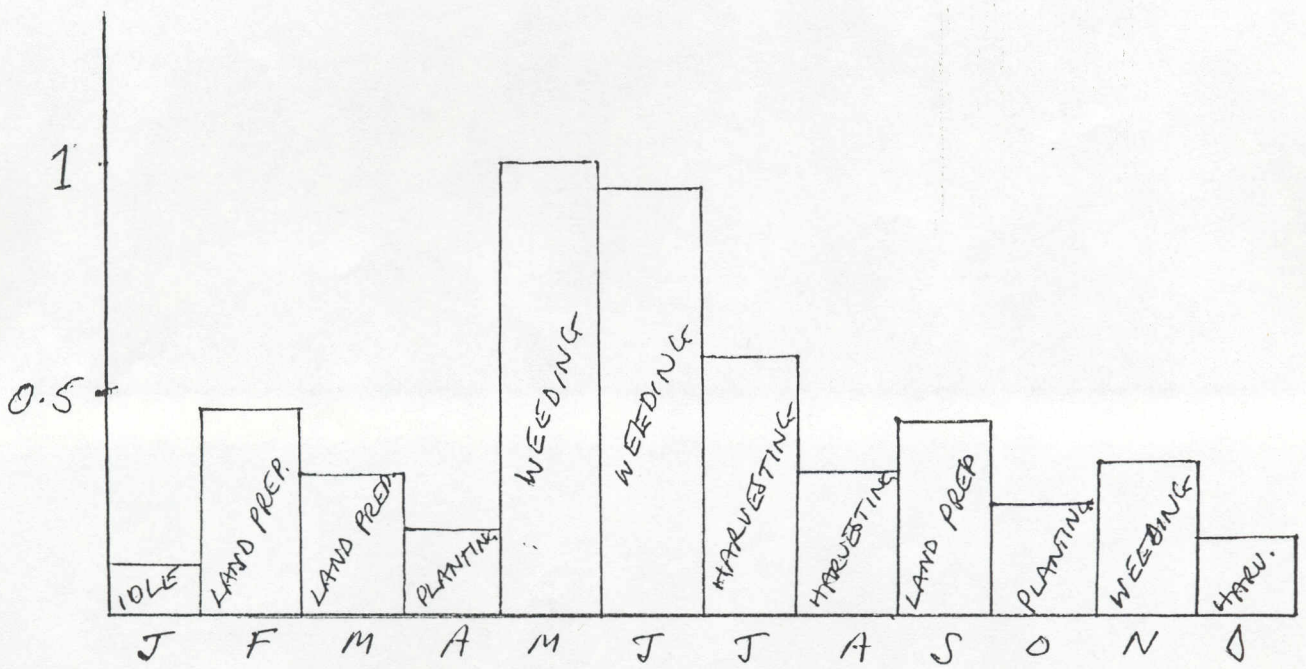
Marketing

Overall, farmers of Marfokrom have access to markets where access is measured by distance from the nearest market, state of the road, and availability of transport. Nsawam and Accra (10 and 20 kilometers away) are the principal trading centers. The road

MEN'S & WOMEN'S LABOUR CALENDAR



WOMEN'S CALENDAR (Low confidence)



MEN'S CALENDAR

Fig 9.

from Accra to Nsawam is a first class tarmac road, while that from Nsawam to Marfokrom is a dirt road but motorable in all seasons. The village is served by a number of privately owned lorries for the transportation of both passengers and goods.

The channel of marketing from the farmer or processor in Marfokrom is a simple one. Produce moves from the farmer or processor to the trader, and to a smaller extent, the consumer, However, the marketing strategy for fresh cassava roots differs from the strategy for sale of other farm produce and processed products.

Maize may be marketed green or as grain. Buyers of green maize come to the farms to buy. Although green maize fetches a higher price than the grain, most farmers prefer to store the grain and sell it gradually as the need for cash arises. This implies that maize grain has a higher security value.

Maize is stored on the cob in storage sheds/cribs at home, and treated with smoke. It is then shelled forsale. The shelled maize is transported to Nsawam or Accra and sold to traders. Vegetables, cowpeas, cassava products and oils are also marketed through the same channel as for maize.

Most farmers sell fresh cassava by the field, i.e. before harvesting. Thus traders or processors go to the farm and assume the responsibility of harvesting and transporting the produce. Although by this strategy the farmer saves on harvesting, labour and transportation costs, he is more likely to have a lower bargaining power especially during the peak harvesting period.

Processors prefer to buy fields of cassava because it ensures a regular supply of fresh roots. It is also believed that buying fields of cassava provides more cassava per cedi than any other mode of purchase.

Finally, pineapples are produced largely for the export market. Agents of exporters visit farms and purchase the crop by weight. These agents ensure that the mature crop is harvested green but sprayed with ethylene, a ripening agent.

Problems and Constraints

The specific probelsm of agricultural production are rudimentary technology for both farming (especially of food crops) and processing, lack of credit and crop disorders and pests. Food crop farming and processing are by traditional methods with family labour being the critical factor, and therefore a limitation on the scale of production. In these traditional systems, the use of purchased inputs, both physical and hired labour, is rather low, Land hiring or sharecropping are the only indications of purchased inputs. Other purchased inputs such as fertilizers, improved seed, mechanical services are all associated with higher productivity; thus their absence necessarily implies productivity of land and labour.

The absence of credit facilities, both formal and informal may have contributed to the limited use of purchased inputs. The only form of credit available is on land through sharecropping.

Apart from the financial limitations, awareness of farmers on benefits to be derived from improvements in their production techniques is probably also low. Agricultural extension personnel should intensify their activities in and around Marfokrom.

During the survey, the research team observed widespread and severe mosaic virus attack and spider mite infestation on cassava. Farmers also complained of rotting of mature cassava roots which can limit field storage of cassava. Grows and rodents were also cited as serious pests on cassava.

With respect to maize, there were complaints of unidentified pests which uproot maize seedlings. Crows and squirrels are also a menace on maize fields.

Finally, the system of sharecropping and short-term land hiring can limit agricultural land use in terms of types of crops grown and rotation systems practised to ensure maximum productivity of the land.

FOOD PROCESSING

Food processing forms an integral part of the livelihood activities of Marfokrom and is mainly carried out by women using traditional methods.

Cassava processing, and the extraction of palm oil kernel oil are the principal food processing activities in the villages. They form good sources of income for women although they may not be the only fsources given that most women also own farms.

Cassava is processed into gari and agbelima (cassava dough). Processors process cassava from their own farms but more often depend on cassava purchased from other farmers. The processors may either buy a matured cassava from or an inmature farm and tend the farm till it can be harvested. Although cassava may be processed for most part of the year, a seasonal peak occurs, coinciding with the major rains when cassava matures and is easy to harvest.

Technology in cassava processing is largely traditional, labour intensive and tedious, if not hazardous. Grating is the only mechanized sub-process.

Extraction of palm oil and palm kernel oil is seasonal. Palm fruits and kernal are purchased from within Marfokrom and surrounding villages. Again the technology for extraction of these oils is largely traditional and tedious. Dried pepper is also produced on a very limited scale.

Processing is done weekly to supply Accra and Nsawam the principal markets. The frequency may also be determined by the length of the processing period for a batch, which ranges between 5 and 7 days.

Gari

Even though the processing of cassava into gari is more tedious than agbelima making, it is the preferred activity because of the storability of the product and a larger market. The processing of cassava into gari is shown in fig. 10.

The cassava is harvested either by the processor and her family or by hired labour and conveyed to the house.

The cassava tubers are peeled, washed and grated in a mechanical grater in the village at a fee.

Prior to the installation of the grater the traditional had held rasper made of perforated iron sheets was used.

The grated mash, is dewatered or pressed in two stages. In the first stage the grated mash is loaded into a polypropylene sack, placed upright on a horizontal, flat wooden plank and leaned against another vertical wooden plank. A heavy stone is placed on top of the sack for 24 hours, during which period dewatered and fermentation takes place concurrently.

GARI MAKING

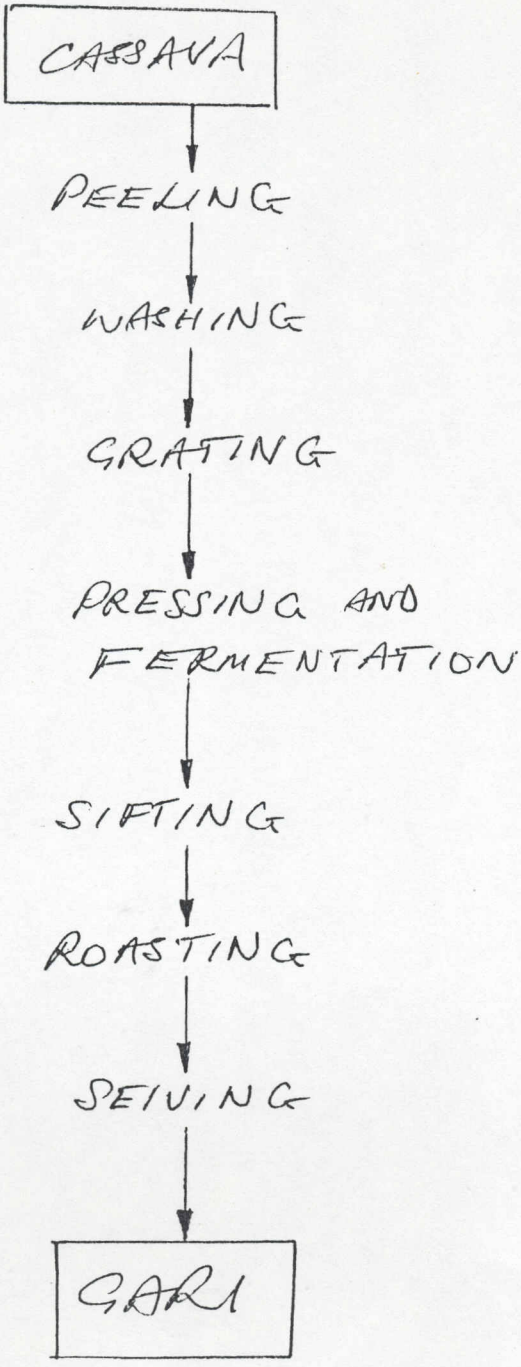


Fig 10.

The second stage may be carried out by one of two methods. The last another 24 - 48 hours.

In the first method two heavy stones instead of one are now placed on the sack to increase the pressure and consequently the rate of dewatering. Further fermentation takes place.

In the second method the dough is reloaded into another sack a and packed well to ensure anaenobic conditions. Two heavy stones are then placed on the sack to increase the pressure and hence facilitate the dewatering process.

> "It changing the sack after the first day is good because the holes get blocked and the starchy water cannot flow out of the sack freely".

The two stages dewatering process according to the processors, is necessary because the loaded sack is unable to stand upright under the weight of two heavy stones during the first day of processing when moisture content of the mash is high.

The pressed fermented dough is sifted using a traditional bamboo cane sieve to remove the fibre and also obtain a granulated dough. The granulated dough is then roasted.

In a metal ware pan on the traditional clay tripod stove using firewood.

Agbelima

Three methods were identified for the processing of cassava in agbelima, fermented cassava dough which is used as an inter-mediary product in the preparation of several local dishes. The differences in the methods is centered around the objective of trying to obtain a smooth textured dough. In the two most common methods, an

innoculum is added to cassava before grating to obtain a smooth dough. The methods differ in their preparation of the innoculum. In the third method, cassava is grated twice to obtain a smooth dough attracting a higher milling fee hence its unpropularity eventhough it is often the preferred product.

The processing of agbelima using the first method is shown in the flow chart in fig. 10 - 13. The innoculum is prepared by cutting peeled cassava into small chuaks and roasting slightly over low heat. The chunks are tired in polythene to retain the heat and kept overnight. In the second method fig. peeled cassava is sliced and sundried into kokonte. The sundried chips are soaked in water overnight to form the innoculum. In either method the innoculum is added in a ratio of 1.50 to peeled, washed cassava and grated into smooth mash is the village mill. The grated mash is packed into polyproplyene sacks and dewatered by placing a heavy object on top. It is held in this position for 2 days to dewater and ferment into agbelima. However agbelima intended for the market in Accra is not deliberately pressed or dewatered. The grated mash is packed into small baskets lined with polypropylene sacks and transported to the market. During transportation, the basket are loaded one on top of the other or placed under other goods being transported.

This method of handling during transportation results in the dewatering of the product. Further fermentation takes place during marketing.

The third method of agbelima making shown in fig. 3 involves peeling, washing and dewatering a process similar to the methods described above except that no innoculum is added and the cassava is grated twice.

PROCESSING OF CASSAVA INTO AGBELIMA

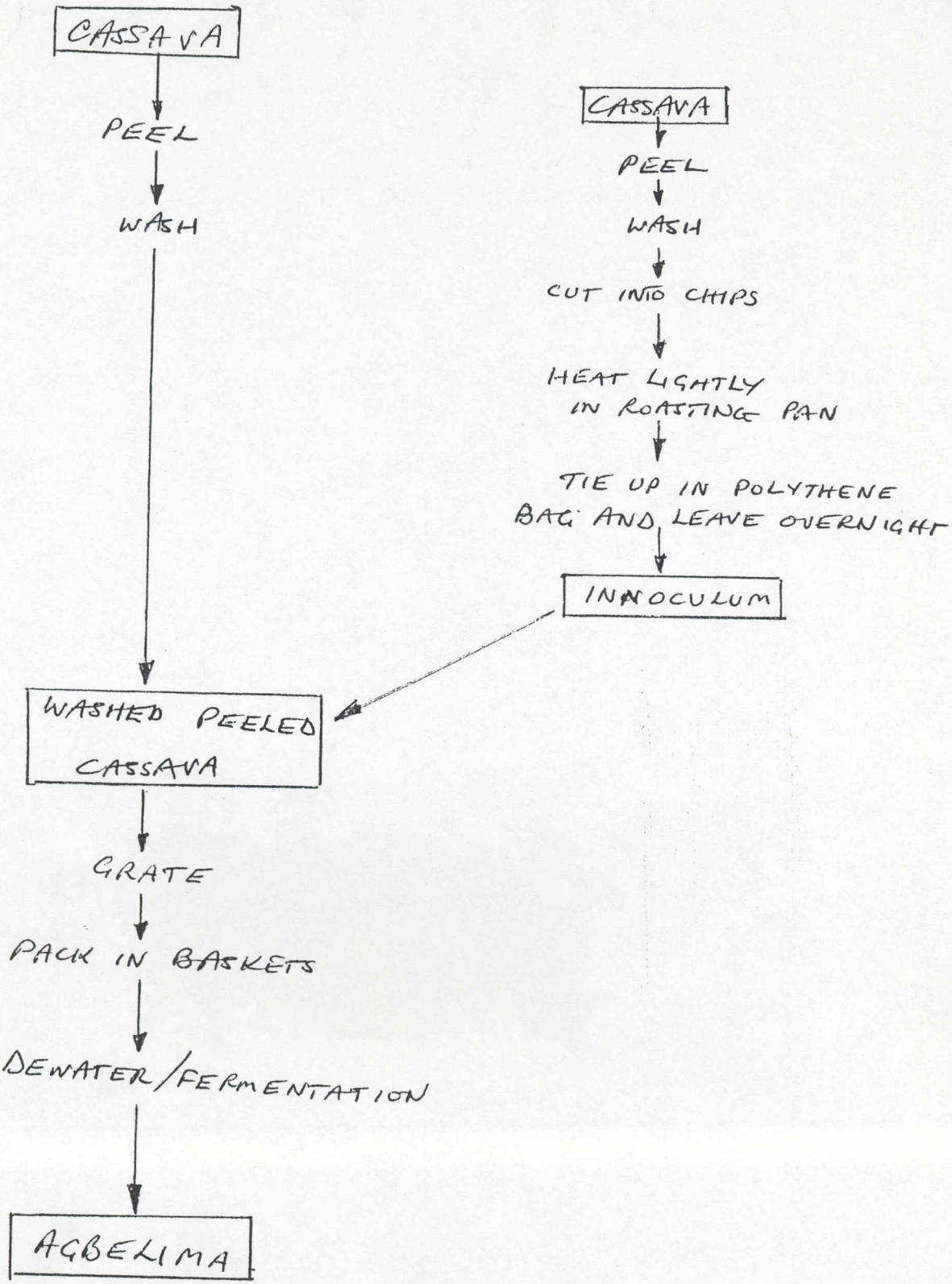


Fig IIa: Method 1

PROCESSING OF CASSAVA INTO AGBELIMA

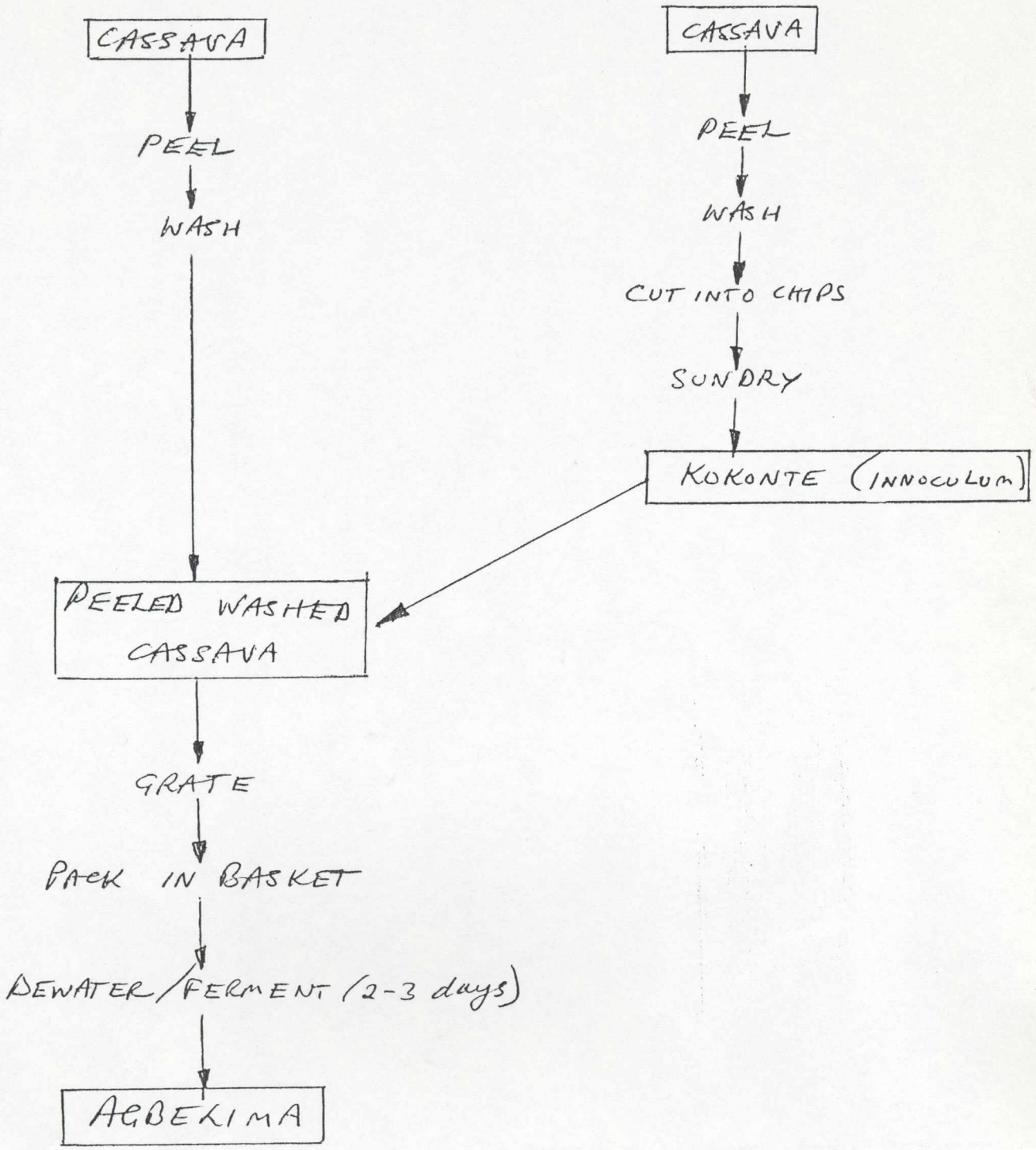


Fig 11b : Method 2.

PROCESSING OF CASSAVA INTO AGBELIMA

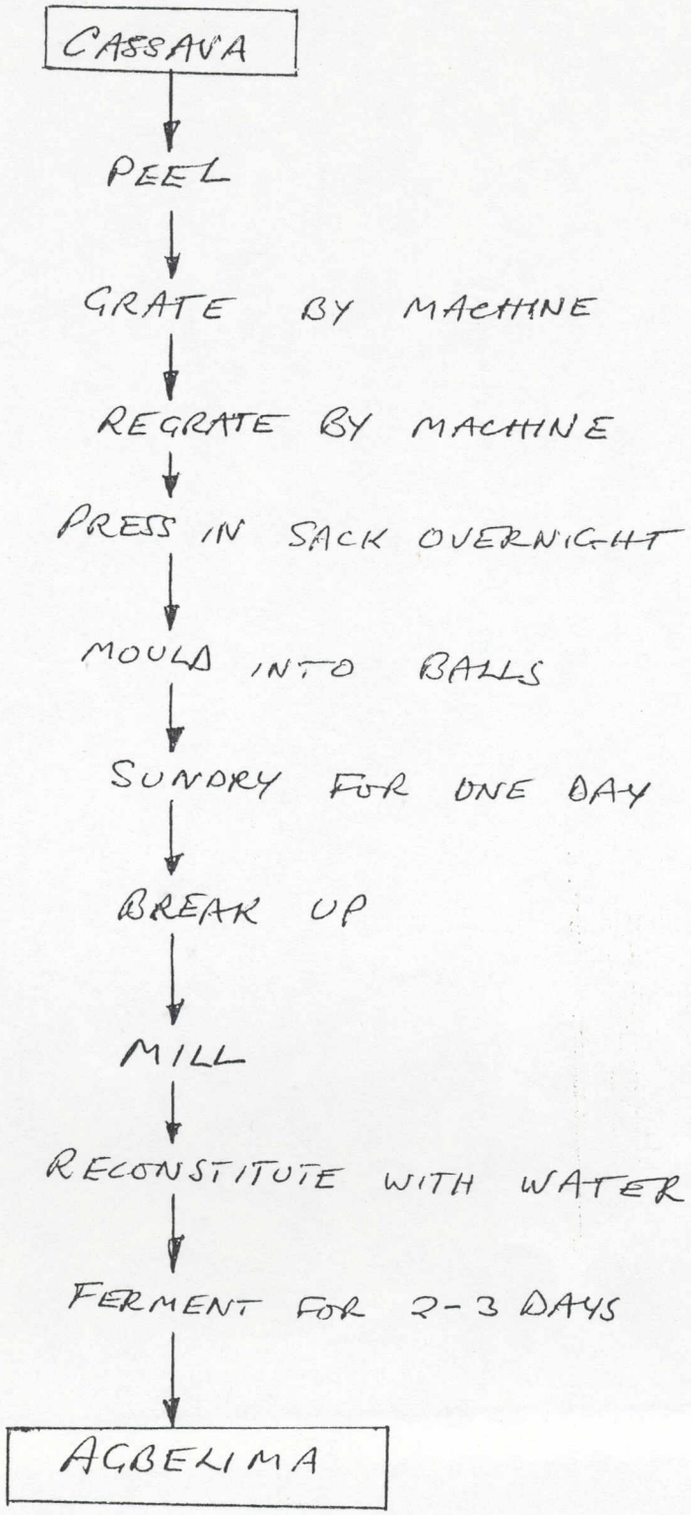


Fig 12 ; Method 3.

Palm Oil

The women who make palm oil purchases palm fruits from Marfokrom and the surrounding villages on Tuesday, Wednesdays and Thursday. Fridays and Saturdays are spent on the farms and processing started on Saturdays night and is finished by Sunday evening. The product is sent to the market at Nsawam on Mondays for sale. Fig. 14 illustrates the processing of palm fruits into palm oil.

The palm fruits are boiled overnight to ensure thorough cooking. Normally 5 'kerosene' tinfulls ie. about 20 gallons, are processed in a batch.

The boiled fruits are pounded in a dugout mortar in the gro ground for about 2-3 hours on the Sunday morning to separate the flesh from the kernel.

After pounding, about 10 basinfulls of water are added to the pounded fruits and mashed with the feet. During mashing the oil separates and floats on top of the water as an oil-water emulsion, and is skimmed off from time to time. This skimmed off emulsion usually contains osome pieces of fibrous material from the mesocarp. Mashing and skimming takes about 6 hours. The oil-water emulsion is then boiled to evaporate the water it may contain and sieved; first with a basket and then with a finer sieve to remove pieces of fibre.

The sieved oil is boiled again with constant stirring to prevent frothing. Boiling is stopped when frothing ceases completely. This takes about 5 minutes.

The oil is cooled overnight and filled into gallons, ready for sale.

PALM OIL MANUFACTURE

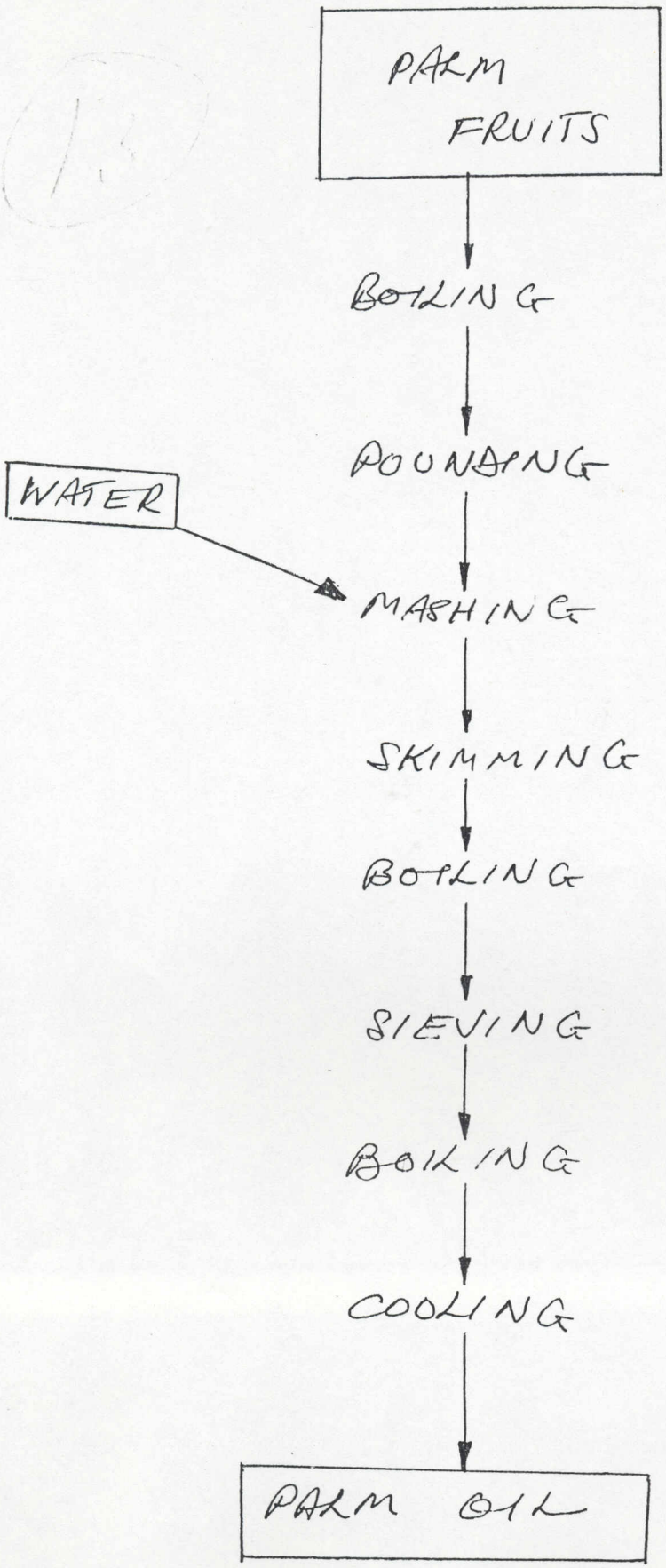


Fig 13

Palm Kernel Oil

The making of palm kernel oil (fig. 15) which is less tedious than the making of palm oil, starts with the processors going round the villages to purchase already cracked palm kernel.

The nuts are roasted together with a little dry copra in a ratio of about 2 kg of palm nuts to 2-3 dried coconut flesh.

> "we add the coconut because it increases the yield of oil from the palm kernel, improves the taste and flavour of the oil and also prevents the oil from solidifying"

The roasted nuts are milled in the village mill. During milling, a lot of heat is generated causing the oil to run. Water is therefore added in small amounts during milling to cool and solidify the fat. Warm water is next added to the milled product and put on fire to boil while stirring. While boiling the oil is skimmed off the top. After boiling the residue left is allowed to cool for 3 days and mashed with water. It is reboiled and more oil skimmed off the top. All the oil obtained are filled into gallons and sold at the Nsawam market.

Dried Pepper

Two distinct methods were identified for the preservation of pepper by sundrying. In the first method, pepper is blanched by immersing in boiled water for 10-15 minutes. The blanched pepper is then sun-dried for 3 or more days. The dried pepper is stored in sacks, line with polythene and can be kept for at least 3 months.

PALM KERNEL OIL MAKING

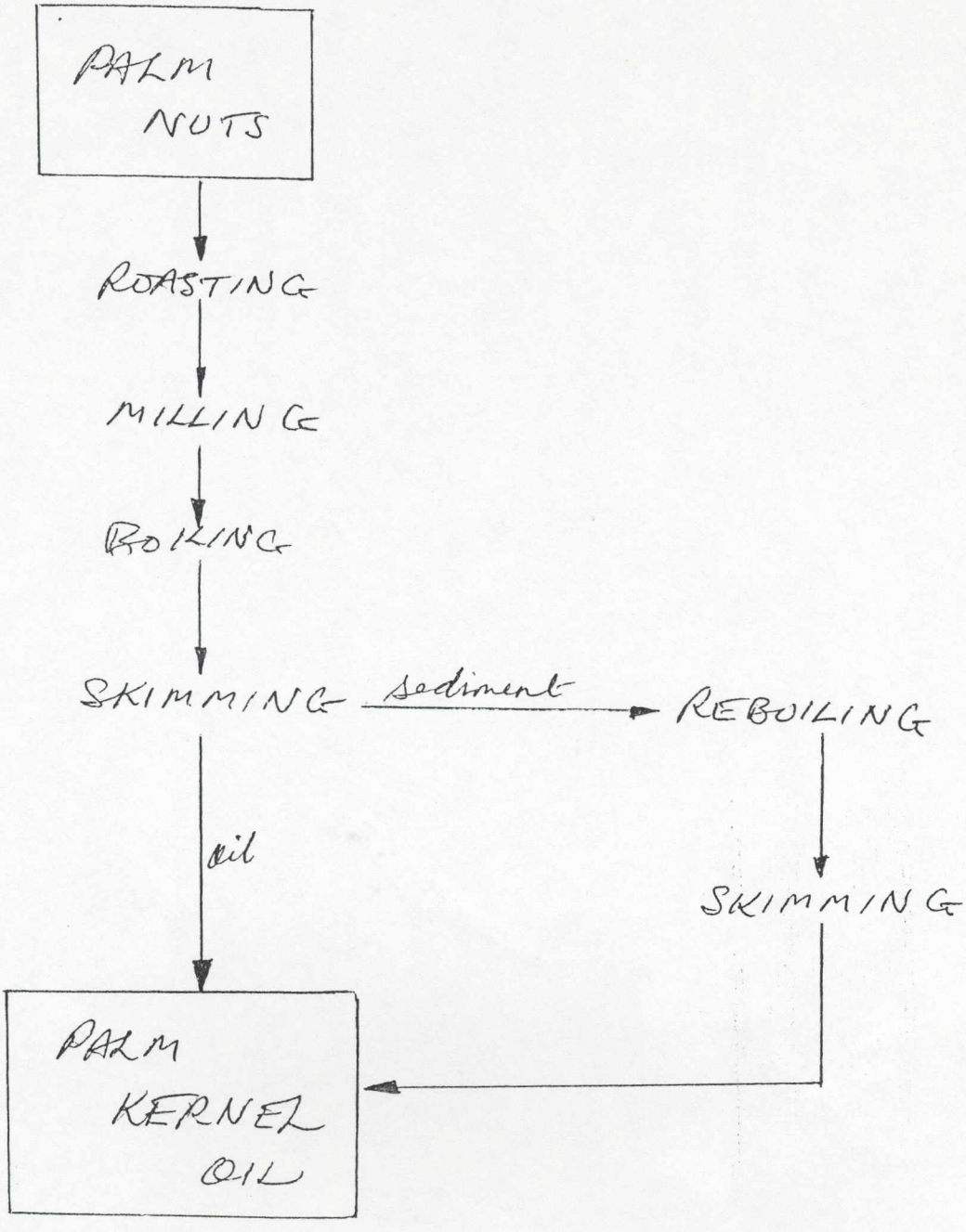


fig 14

In the second method about 250ml of water is placed in a heating bowl and some salt added. About two thirds or a mini-bag of pepper is poured into the bowl and heated. The pepper is turned and the heating continued till all the water is evaporated. The pepper is removed and sun-dried for 3 or more days.

It was claimed that the second method yields a better product. The pepper is attractive with a shiny appearance and bright colour.

The dried pepper is stored in sacks lined with polythene and can also be stored for at least 3 months.

Processing constrainst - Other Issues

The very rudimentary traditional technology of gari making is admitted by the processors to be extremely labourious. In fact a lot more women would wish to engage in the activity but find it too tiresome. Such individuals would however process part of their cassava harvest into gari multiplying their profit. However, they would not engage in gari making as a regular income generating activity eventhough they consider it lucrative. A few men also process part of their harvest into gari.

The drugery and problems associated with the traditional method of gari making as recounted by processors interviewed and observations by the survey team is reproduced in Table II below.

TABLE II

Problems Associated with Gari Making

General Observation

* labour intensive
* wasteful
* or proper costing and bookkeeping

Peeling

* slow, time consuming; rate 35 - 50kg/hr
* processor may cut her finger

Washing

* may have to walk long distances to fetch water

Manual Grating (Using Hand held Grater)

* time consuming; rate 5-10kg/hr
* extremely labourious
* processor may injure her fingers
* very small pieces of cassava cannot be grated for fear of injuring fingers
* difficult to clean

Customer Service Grater

* kept under very unhygienic conditions
* processor has to carry peeled cassava to the mill and wet grated cassava back to the house.
* village grater not well designed; processor has to scoop grated material out of the mill

Dewatering and Fermentation

*. carried out under very unsanitary conditions
* women have to lift heavy objects to place or bagged dough; difficult relies on others
* exudate though high in starch content not collected
* fermentation process not understood by processors
* fermentation period not standardized therefore no quality assurance

Roasting

* processor has to sit behind fire continuously for about 2 days to complete roasting of a batch: very tiresome
* heat and smoke bothersome; pose health hazard causes headache, weakness bodily pains, fever, reddening and watering of eyes, other eye defects, heat rashes, profuse sweating, diarrhoa and miscarriage in some women.

Packing and Storage

* product packed in polyproplene and jute bags pick up moisture losing crispiness
* on prolonged storage may pick up enough moisture to grow mouldy.

The recognision of the problems of the traditional technology by the Food Research Institute has led to the establishment of the Cassava Processing Demonstration Unit at Pokuase in a joint project with the Industrial Research Institute and the African Regional Centre for Technology based in Dakar. The Unit domonstrates cassava processing equipment and improved processing methods which alleviates the drugery associated with the traditional method of gari making.

The processing of cassava into agbelima is less labour intensive but limited to only a few individuals. This is probably because the product is sold in an active state of fermentation hence has to be marketted in a limited time.

Cassava processing in Marfokrom peaks in May, June, July, During this period the village mill services about 10 customers a day grating between 400 - 600kg of cassava. In the lean season only 1 - 3 persons use the mill in a day.

Traditional food processors generally have no knowledge of basic accounting and bookkeeping. The cost of products only reflect raw material costs and a margin. Processors generally engage the services of their family to harvest cassava, peel, fetch water sift and roast during gari making. In palm fruit processing family members help with fetching of water and pounding of fruits. All these labour costs including that of the processor are not evaluated and built into the cost of the product.

The survey team attempted to assess the cost of producing palm oil. This reproduced in Table III below:

TABLE III:

Production Cost of Palm Oil

5 kerosene tinfulls of palm fruits	-	₵7,500.00
Firewood	-	300.00
Pounding (labour cost)	-	200.00
Other labour costs eg. fetching water	-	1,000.00
Total cost of production	-	9,000.00
Yield; 6 gallons @ 1,800	-	10,800.00
Profit per batch	-	1,800.00

Traditional processing of palm fruits into palm oil is also labour intensive. Pounding of fruits is very labourious and exhausting whilst fetching water is tiring.

METHODOLOGY OF THE STUDY

One of the objectives of the study was to identify the principal agricultural activities in Marfokrom as an exercise in the application of the Rapid Rural Appraisal Technique. Thus the study was both a farmer problem identification and a methodological test.

Choice of Study area

The village was selected for the exercise on the basis of information gathered on cassava production and processing by the Food Research Institute in an earlier survery. Marfokrom had been identified as a major cassava producing village. This aroused interest of the food technologist working on cassava processing to study this village as part of a programme for the development of appropriate cassava processing technologies.

A study to develop appropriate technology must first identify current farmer practices and constraints to gain understanding of the need for innovation and the type of technology required. This process has been referred to as the task of diagnosis and understanding (Mcrobie, 1976). This phase may also be likened to the diagnostic phase of a farming systems approach (Collinson, 1982 and Vordzogbe, 1986).

The general methodology adopted for the development or selection of appropriate technology for cassava processing is the systems approach because in a rural, resource poor community, production, processing and consumption are closely related in their demands for resources, particularly of labour and management, and the generation of income. In addition, one of the criteria for an appropriate technology is that it should be

compatible with local cultural and economic conditions, i.e. the human, material and cultural resources of the community (Lawand et al. pg 124).

The key stages in the systems approach are:

1. collection of background information on the circumstances of the target population,
2. diagnostic survey
3. verification survey, and
4. participatory experimentation. (Collinson, ibid)

This study applied the rapid rural appraisal technique to identify farmer circumstances, practices and constraints in the pursuance of stages 1 and 2 above.

Rapid Rural Appraisal

This is a systematic but semi-structured activity carried out in the field or workshop by a multidisciplinary team and designed to learn relatively quickly from rural people so as to generate new hypothesis about rural life.

Rapid Rural Appraisal has been developed over the last ten years in response to concerns over commonly encountered pitfalls to conventional approaches for rural research and development.

RRA is essentially a process of learning about rural conditions in an intensive, iterative and expeditious manner. It characteristically relies on small interdisciplinary teams that employ a range of methods, tools and techniques, specifically selected to enhance understanding of rural conditions, with particular emphasis on tapping the knowledge of local inhabitants and combining that knowledge with modern scientific expertise.

Many RRA techniques have been adopted to achieve increased accuracy at low cost, in terms of time and money. But RRA is characterised by accelerated learning not just overall speed; rapid rounds of field interaction that results in the acculumation of increasingly accurate knowledge (Khon Kaen conference)

There are several principles that illustrate the key features of Rapid Rural Appraisal. RRA should not be thought of as a pre-set methodology in package form, instead it comprises of a series of choices for any given isituation. Investigators can thus select from a basket of choices according to their needs and experience. The process is iteractive and is modified by the team as information is progressively revealed. In this study the origional focus was only on cassava production and processing but as the complexity and interelationships in the cropping system of the village became clearer and clearer the origional topic was modified.

During RRAs, insights arise because of the multidisciplinary nature of the investigatory team. RRAs encourage team members to be inventive and thus there is no standard procedure. The procedure is systematic and semi-structured, whilst maintaining flexibility and adaptability. Accuracy is achieved through triangulation, which invelves the use of diverse methods and information sources rather than statistical replicability. Unnecessary detail is avoided through optimal ignorance and the key trade offs between prescision, breadth, depth and timeliness are made explicit through appropriate imprecision. Finally it is recognised that investigators interfere and RRAs thus attempt to make biases explicit.

The RRA tool kit or techniques include review of secondary data, semi-structured interviewing, direct observation, diagrams, maps, transacts, crop calendars, historical profiles, venn diagrams, preference ranking, wealth ranking, analytical games, portraits.stories, workshops, notable quotes, use of photographs and quantification techniques.

Application of the RRA

The research team

The research team consisted of two food technologists, two agricultural economists, and a technician on food processing machinery. The bias of the team composition in favour of food processing was obviously due to the primary objective of the study.

Background data collection

Very scanty background data on Marfokrom was obtained from the Suhum - Krobo Coaltar District Council.

Preliminary visit

Two members of the research team paid a preliminary visit to the village to assess its suitability for the study and to prepare the village to receive the team.

(Note: *background and preliminary visit to be written by Food Research Institute team members).

The Survey

The five member research team spent five days in the village, interviewing and making observations. This allowed interaction between the research team and the community. Interviews were conducted during the day and the nights were reserved for discussions among team members, and often with members of the community who paid courtesy calls on the team. The list of semi-structured interviews and group meetings is shown in fig

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TABLE III

LIST OF INTERVIEWS AND MEETINGS

	WHO	WHERE	OBJECTIVE
DAY 1			
1.	School Teacher CDR Secretary & 2 men	Residence	SSI
DAY 2			
2.	School Teacher	Village	Transcet
3.	2 gari makers (women)	House	SSI
4.	Chief, elder and about 40 people	School	Protocol, courtesy
DAY 3			
5.	Man	House	SSI
6.	Chief and Elders	House	Historical profile
7.	Man	Farm	SSI
DAY 4			
8.	Mill Operatore	Mill	SSI
9.	Assemblyman	House	SSI
10.	Youngman	Farm	SSI
11.	Women (Agbelima maker)	Yard	SSI
12.	4 Women	House	SSI
DAY 5			
13.	Teacher and CDR Secretary	Village	Men labour calend
14.	Woman (gari maker)	Yard	SSI
15.	President 31st DWM (Woman)	House	SSI
16.	Old Man	Village	Historical profil
17.	Man	Farm	
DAY 6			
18.	Man	Farm	SSI
19.	Man	Farm	SSI
20.	Group Meeting	Village	Protocol

The team arranged for a village meeting before any individual interviews were carried out, Unfortunately this had to be postponed to the second day because of a heavy down pour of rain. At this meeting, the mission of the team was re-stated and general questions such as principal agricultural enterprises, major crops and common varieties were asked. On the history of the village, the meeting identified the chief and two other elders as the best sources for this information.

The meeting provided useful background information on crop production in the village. For example, it revealed that cassava, maize and oil palm are the major crops. Furthermore, cassava and maize rank equally on their importance as staple food crops. Pineapple production is a new but growing commercial enterprise. Land preparation by the hoe and matchet, and a variable rainfall pattern were given as the major farming problems.

The team constructed a transect of the village by walking through the length of the village on the principal road. Features on soil, vegetation (including tree species), farms and major landmarks were observed. This also provided the team an opportunity to interview two women processing gari at the time.

Visits were made to farms, homes processing centers, and neighbouring villages to observe similarities and differences in vegetation, topography and farming activities. Linkages between Marfokrom and neighbouring villages were also identified.

Limitations of The Methodology

By its nature, the output of the RRA is purely qualitative and descriptive. No measurements were made and quantifiable data such as average field size, yields, recovery rates in processing, price variability and labour profiles were derived from information provided by farmers. Some of this data, especially recovery

rates in processing, were no more than farmers' best guesses. A verification survey, using a more formal survey method, will be useful in properly quantifying these kinds of data.

The survey period of six days was short and did not provide enough room for the identification and subsequent rectification of information gaps. Origionally the team had planned to go back to the village after 2 days for this purpose but this could not materialize since some of the team members had other pressing engagements.

The The community may have misunderstood the intentions of the research team. Questioning on cassava processing and land tenure systems created the impression that the research team planned to establish a cassava processing factory in the village. The erroneous impression was corrected before the team left, but it is not clear if the clarification dampened the interest of the community in the research.

Previous experience with an extension officer and an agricultural credit institution created an initial apathy toward the research team among some young farmers in the village. The credit institution had failed to approve a loan application after the youth were convinced by the extension officer to make a commitment in hiring and preparing -- hectares of land. This has created a mistrust for all agricultural officers'. The young people opened up after the team explained that they were in the village to learn from the community and to develop an understanding of their problems.

In a rural setting, key informants are usually opinion leaders. Where such individual(s) need political clout their association with an outside team is a good opportunity for this realization. An informant with such interest can mislead the research team, and if not properly controlled, steer the team outside their sphere of investigation; thus making them lose valuable time. To avoid such a situation, the research team must not associate too closely with key informants.

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