Dissertation

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DEPARTMENT OF AGRICULTURAL ECONOMICS UNIVERSITY OF NIGERIA, NSUKKA

Labour use on smallholder food and cash crop forms : the case of momo division, North-west province, Cameroon

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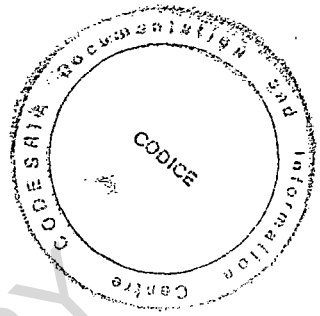
DECEMBER, 1997

LABOUR USE ON SMALLHOLDER FOOD AND CASH CROP FARMS: THE CASE OF MOMO DIVISION, NORTH-WEST PROVINCE, CAMEROON



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TITLE PAGE

LABOUR USE ON SMALLHOLDER FOOD AND CASH CROP FARMS: THE CASE OF MOMO DIVISION, NORTH-WEST PROVINCE, CAMEROON

A DISSERTATION SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL ECONOMICS, UNIVERSITY OF NIGERIA, NSUKKA, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN AGRICULTURAL ECONOMICS

BY

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DECEMBER, 1997

CERTIFICATION

Miss Dorothy Engwali Fon, a Postgraduate student of the Department of Agricultural Economics and with Registration Number PG/M.Sc./95/21321 has satisfactorily completed the requirements for course and research work for the degree of Master of Science (M.Sc) in Agricultural Economics. The work embodied in this dissertation report is original and has not been submitted in part or full for any other diploma or degree of this or any other University.

Dr. S.A.N.D. Chidebelu
Supervisor

Date: 09-01-98

External Examiner

Date: _____

Dr. E.C. Nwagbo
Head of Department

Date: 09-01-98

DEDICATION

This work is dedicated to my father, Mr Thomas Fon Muzam, who has forgone most of his pleasures to see to my education; and

To my brother, Mr Wilfred Assi Fon, for his tireless efforts to supply my educational needs.

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My profound gratitude goes to my supervisor Dr S.A.N.D. Chidebelu whose friendly commitment and meticulous nature helped a lot in directing me to the successful completion of this research work.

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Finally, I thank the Almighty God for His kindness and blessings.

ABSTRACT

This study investigated labour use on smallholder food (cocoyam) and cash (coffee) crop farms in Momo Division, North-West Province, Cameroon, mainly because of competition for available labour between them in the area.

Multi-stage random sampling technique was used to select six villages and 120 farmers. Pretested questionnaires were administered to these farmers.

Descriptive statistics and production function model were used to analyse the data.

Results showed that most of the farmers were above 40 years and 58.5% had no formal education. Farm sizes ranged from less than a hectare to approximately four hectares for cocoyam and less than one hectare to seven hectares for coffee. Most (55.2) of the farmers have been farming for over 20 years. Land ownership was mostly through inheritance. The average number of farm fields was 3.4 for cocoyam and 1.6 for coffee. On the aggregate, family labour ranked first followed by exchange/communal labour and hired labour for the two crops. Women contributed most of the labour (70.6%) in cocoyam production while men contributed most in coffee production (58.5%).

Weeding took 31.4% (highest) of the total labour required for cocoyam production, while harvesting took 52.9% (highest) for coffee production. Mixed cropping is the commonest cropping pattern.

Age, educational level, farming experience capital and labour used on the cocoyam farms had significant effects on output. For coffee, family size, farming experience farm size, capital and the type of coffee had significantly positive effects on output. The marginal products for labour and capital were positive and decreasing. The factor inputs had significantly positive effects on the output of cocoyam, while only capital had significant effect on the output of coffee. However, increased production of these crops were restricted by lack of finance, pests and diseases, infertile soil, high cost of acquiring land, and high cost of farm inputs, among others.

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CHAPTER I

INTRODUCTION

1.1 Background Information

The agricultural sector of Cameroon, upon which the economy depends, is the largest employer of labour engaging about 75-80 per cent of the population (Simarski *et al*, 1992). This is in line with what Salvatore and Dowling (1977) noted, that more than 65 per cent of the population of developing countries is engaged in agriculture. Population projections to the year 2000 suggest that Cameroon would be about 17 million from 8.7 million in 1980 (Swaminathan, 1987). The majority of growth in economic and human demand for food must take place on the existing land base by narrowing the yield gap without sacrificing the environmental basis for food production if food production rate must be higher than the population growth rate. Many technology packages introduced involve labour. For example, Chidebelu (1990) said that applying fertilizer makes extra weeding necessary. This is of same view as Delgado and Ranade (1987), who said that adoption of variable cost innovations such as fertilizer aggravated seasonal weeding bottlenecks.

Most small-scale African farmers use hoes and knives in farming. Although the use of tractors increased by over 20 per cent in the 1980s, it is only four per cent of the European level (FAO, 1989). This may apparently be due to the high cost of tractor

purchase and maintenance. Fertilizer consumption is less than one-quarter that of Asia and only 10 per cent that of Europe (FAO, 1987). Only three per cent of Africa's arable land is irrigated, 70 per cent of which is in Madagascar, Nigeria and Sudan. This compares with almost 25 per cent in Asia (FAO, 1986), and with estimates of a potential for four times the current area irrigated (World Bank, 1989). This relatively low level of mechanization, which may be due to the size of the farms, means that heavy demands are made on the family labour force.

The introduction of innovations or technology packages in cocoyam and coffee production would have implication for the size of the household, its composition and distribution. That is, whether it is ridging, weeding, land clearing or harvesting has to be done by some people either men, women and/or children. For instance, Fon (1995) said that human labour is imperative in some farming activities which form the bulk of the cost of production though which may not be commensurate with the output. She stated that a fruit yield advantage of seven per cent of staked treatment over unstaked rainy season tomatoes in Nsukka would not compensate for the cost of material and labour for staking. Thus, the relationship between labour use and population is critical as regards work to be done like fertilizer application, pesticide application and disease control amongst others.

According to Peter and Ian (1991), the traditional role of men was to clear and prepare the land for cultivation, while women concentrated, in addition to their domestic

task, on sowing and weeding. The household division of labour often resulted in men specializing in the cultivation of marketable crops while women grew food for domestic consumption.

After independence in 1960, Cameroon attached more importance to cash crop production, especially cocoa and coffee which accounted for 41 per cent of the total exports in 1980. The other cash crops include cotton, tea, rubber, oil palm and sugar cane. These cash crops constitute a major source of foreign exchange for the country (Arrah, 1992).

In the study area, coffee (arabica and robusta) is the dominant and most valuable cash crop. It is the major earner of income for the area and has elevated the producers' economic status. The mode of coffee cultivation over the years has not been static. The introduction and use of fertilizer and pesticides have increased labour demand. The family is still the basic source of labour, though marketing has gradually evolved into a cooperative system from the hitherto individual basis. There is competition for available labour during peak periods of land clearing, weeding and harvesting of cocoyam and coffee.

Scientific attention has been focused on increasing the production of cash crops while ignoring the production of food staples. Even among food crops, cereals and legumes have been given research priority over roots and tubers (Simarski *et al*, 1992), despite the fact that root and tuber crops are among the most important staple foods in

tropical Africa. Simarski *et al* (1992) noted that root and tuber crops play a vital part in the region's food security because they are very tolerant to environmental stresses and give reasonable yields under marginal soil conditions. Roots and tubers constitute about half of Cameroon's major food crops and are the country's dietary staples, along with plantain and maize.

Root crops play a key role in feeding not only the people of Cameroon but also those of many African countries. In tropical Africa, including Cameroon, it is mainly the small-scale subsistence farmers who grow root crops. The staple food crop in the area under study is the cocoyam which is grown for the carbohydrate-rich underground storage organs-corms and cormels. Cameroon produces about one million tonnes of cocoyam a year (Simarski *et al*, 1992). The different varieties of cocoyam grown are macabo (*Xanthosoma sagittifolia)* and taro (*Colocasia esculenta*). It fits well into the region's traditional agricultural systems, in which several crops are typically grown in mixtures in the same field.

1.2 Problem Statement

There are marked seasonal peak demands for labour coinciding with peak agricultural activities following the onset of rains. These peaks vary from area to area depending on the rains. Labour availability has been identified as a major bottleneck (Kline *et al*, 1969). Work peaks occur for cocoyam as well as for coffee production. However, the peak periods for these two crops at times coincide such that there is critical

competition for the available labour stock and substitution of one activity for another becomes inevitable. For instance, there is critical competition in allocating labour between weeding and pest control in cocoyam and weeding, pruning, pest and disease control of coffee in June, land preparation (clearing/ridging) and harvesting of cocoyam and weeding and pruning of coffee in December; weeding and harvesting of cocoyams occur at the same time with fertilizer application harvesting/processing of coffee in september. There is also weeding, pruning and pest control of coffee when clearing ploughing/harrowing for cocoyams is in progress. It will be of interest to investigate the labour management strategies in use to cope with the changing times.

Work peaks occur because critical jobs like clearing, planting, weeding and harvesting are closely related to the seasons and must be finished in a limited time. Delay, usually cause loss of yield and/or reduced quality, so the labour needed to finish the job is compressed into a peak period (Johnson, 1982). At work peaks, more labour would greatly raise total output either because of more timely completion of the job or because a larger area could be handled. Other tasks, especially repairs and maintenance work, allow greater flexibility of timing. However, seasonal unemployment or underemployment is almost inevitable in farming. Labour shortage at critical seasons has been the greatest spur to agricultural mechanization but due to lack of capital and the technology it is very unrealistic in terms of increasing output (Kline *et al*, 1969).

One of the problems facing resource-poor primary producers in Cameroon like other African countries is shortage of labour (Swaminathan, 1987). Despite increasing populations many rural households suffer from inadequate labour supplies as lack of rural development forces many young people to move to urban areas in search of white collar jobs. Yet, labour is critical to food security. Historically, it is known that apart from Japan, that raised labour productivity through biological technology most industrialised countries raise labour productivity through mechanical technology (Swaminathan, 1987). For many Africa countries like Cameroon, increased food production cannot be achieved in this way. This is because even if there is the money to purchase and maintain tractors, the existing land tenure system does not favour mechanization.

If the food security challenges are to be met for the year 2000 and beyond with production rising at rates of three to four per cent and above annually, it will be necessary to assemble and utilize the human and natural resource potentials in the most effective and efficient way possible.

Attempts to bring about the improvement of agriculture generally in Cameroon must take account of the predominance of small-holdings, shortages of capital, complicated land tenure systems, minimal opportunities for the adoption of improved tools and practices, inadequate distribution and marketing systems and penalizing environmental influences (Leakey *et al*, 1977). Sustainable increases in yield and productivity are not solely a matter of increasing the use of chemicals, water, and

8energy. Providing a steady stream of new high yielding seeds and schemes for integrated pest management are also critical and tied to that halting indiscriminate deforestation and accelerating loss of genetic resources. However, all these cannot be carried out in the present context without sufficient labour. It is from this perspective that there is need for the study of labour use on small-holder food and cash crop farms. This is especially important since the region's climatic conditions are favourable for coffee growth and the staple food for human carbohydrate source is cocoyam.

1.3 Objectives of the Study

This study is generally aimed at investigating the labour use on smallholder food (cocoyam) and cash (coffee) crop farms in Momo Division, North West Province of Cameroon.

The specific objectives are to:

(a) describe the cropping system in cocoyam and coffee based farming systems;

(b) describe the pattern, types and sources of labour used on cocoyam and coffee farms;

(c) determine the effect of socio-economic factors on cocoyam and coffee output;

(d) analyse the effects of labour and capital on cocoyam and coffee production;

(e) find out the specific constraints to increased cocoyam and coffee production; and

(f) make recommendations based on the findings.

1.4 Hypothesis

Based on the specific objectives the following null hypothesis was tested:

socio economic factors do not affect cocoyam and coffee output in the area.

1.5 Justification of the Study

Different crop enterprises need different amounts of labour. The task of raising labour productivity over the whole year is complicated by seasonality in field operations and the existence of peak labour periods. These peaks periods usually determine the labour and machinery needed on the farm throughout the year. For the family work-force and regular hired workers, the supply of labour is relatively fixed throughout the year. It is therefore probable that farmers will either have less labour than they want during work peaks, or more than they need at slack times or both (Johnson, 1982).

Effective agricultural development planning is hampered by scarcity of information on all aspects of agricultural production. It is from this perspective that a study of this nature contribute to the pool of knowledge available on food and cash crop production in Momo Division and Cameroon as a nation.

In the study area, cocoyam is the staple food crop and provides the food for consumption while coffee is the predominant cash crop and serves as the main source of income. An increase in both will increase the standard of living of people in the area.

Compared with other parts of Cameroon, like the East and the South-West Provinces, little research has been carried out in the North-West Province, and particularly, Momo Division.

Information from this study will be useful to: agricultural policy makers, students, farmers, traders and consumers as a reference material; the Tropical Root and Tuber Research Project (ROTREP) which aims at contributing to the improvement of Cameroon's farmers socio-economic welfare through increased productivity of root and tuber crops; the Institute of Agronomic Research (IRA) especially the Cameroon Root Crop Improvement Programme (CNRCIP) and Testing Liaison Unit (TLU) in relating their research package to the needs and potentials of food crop farmers and consumers in general; the African Institute of Social and Economic Development (INADES) to better understand the plight of the rural poor people; Ministry of Agriculture (MIN-AGRIC) and the Office Nationale du Café et Cacao (ONCC) (National cocoa and coffee Board) in formulating policy on cocoyam and coffee production that will enhance producers incentives through their share of the consumer prices.

CHAPTER II

REVIEW OF RELATED LITERATURE

2.1 Introduction

Domestic food production occupies a high proportion of the labour force in Africa, frequently at very low levels of productivity (Delgado and Ranade, 1987). Agricultural exports are important in Africa and generate the foreign exchange necessary for the growth of the domestic food sector. Expansion of export commodity production depends more directly on improved price ratio than in the case of food crops. Although the food sector continues to command much of the economic resources, expansion of the export commodity production requires scarce seasonal labour resources and, thus, may compete with what the farm family sees as its primary job-producing food for home consumption. The export crop production problem and the food crop production problem will continue to be inter-related and neither can be ignored (Delgado and Ranade, 1987).

Predominantly female tasks are often the limiting factor preventing expansion of hectarage as well as the adoption of proposed improved methods. This situation occurs because women contribute the majority of the total labour because of the frequent mechanization of male identified tasks (mainly land clearing), and because women have fewer hours of rest and leisure which they could add to the agricultural labour pool. Most proposed improved farming methods demand more labour. Since labour is already

short for most African small farms it is questionable whether such improvement actually addresses their needs. Improvement in yield per labour may be more important than yield per hectare.

2.2 Food And Cash Crops

According to Ndubizu (1990), a crop is any plant deliberately cultivated or protected by man for his food, fibre, medicinal purposes, aesthetics, industrial use or for the up-keep of farm animals. He said any other plant outside this is not a crop but simply a plant. Examples of crops include; cocoa, yam, cassava, coffee, cocoyam, rice, tea, banana, plantain, rubber, cowpea and cucumber.

Cash crops are crops which are grown to be sold rather than eaten by the person who grows them or are used for feeding livestock on the farm or are otherwise used but not eaten (Ray *et al*, 1991; Klett *et al*, 1992). Examples of cash crops include cocoa, coffee, rubber, cotton and oil palm.

Food crops are arable crops which are grown for human consumption and need little or no processing before consumption. Examples of food crops include, yam, cocoyam, maize, cassava, groundnut, cowpea and soybean. Martin (1984) noted that some of the characteristics of food crop production, most typical of the tropics, are diversity of crops, subsistence agriculture, production for local markets, year-round production and multiple cropping.

2.3 Types of Agricultural Labour

Labour is a group of productive services provided by human physical effort, skill and mental power. It is the work input of the people- not the people themselves. Labour is the tool with which capital and management skill are used to extract profit from the land (Johnson, 1982). He noted that there are different types of labour input, varying in the effort and skill needed. Labour is not homogenous. Labour input is usually measured in mandays. There are three main types of agricultural labour viz; family labour, hired labour and communal labour.

In traditional African agriculture, labour is the most important input accounting for most of the total production cost (Atayi and Knipscheer, 1980). When De Vries (1968) noted, that the farm family provided most of the labour on agricultural farms in Africa, it became apparent that the heart of agriculture was the farmer and his family. The farm family includes the man, his wife or wives and children, as well as dependents. Johnson (1982) suggested that family workers usually outnumbered hired workers on small holder farms. The cultivated farm size depended on the number of labourers the family could supply to work on the farm.

Chidebelu (1990) noted that the farm family was the most important source of unpaid labour. According to him, the family head supervised farming activities and allocated jobs to family members based on ability, gender, age, the nature of farm operation and custom. Johnson (1982) noted that though family labour was often the

only type of labour used on small holder farms, it was becoming less plentiful owing to the decline in polygamy and the increase in the number of children attending school. This thus necessitated the existence of hired labour on small holder farms.

Hired or wage labour is utilized primarily during periods of high labour demand when family labour is insufficient (Chidebelu, 1990). Hired labour is predominant on plantation or commercial agriculture. The reduction in family size and communal labour has forced small holder farms to hire labour according to the amount of cash they can afford. The number of hired labour, thus, depended on the quantity of family labour and also on the availability of capital at the disposal of the farmer (Kanbur and Mukerji, 1975).

Johnson (1982) categorized hired labour into three namely; regular, contract or casual labours. According to him most regular workers (labourers) are regarded as permanent workers and include the manager and his assistants who are paid wages and are sometimes given free accommodation on the farm. They may be skilled or unskilled. Contract workers usually are used for short periods for capital development projects, such as, building fences and houses, stumping and felling trees. Casual workers are used to cope with seasonal peaks, such as, weeding and harvesting.

Communal labour, Johnson (1982) noted, is often important in areas with communal land tenure. This involves supplementing family labour with that of kinsmen or members of the farmer's age group. They usually help in such farm activities as

clearing and mound-making. Communal labour could be rotatory and payment is made by providing food and drinks and accepting to work in similar manner for those who helped.

Lack of labour constrains the extent of work done in small holder agriculture because labour use in correlated with total output (Johnson, 1982; Olayide and Atobatele, 1980). The labour available for cultivation and weeding limit the amount of land a farmer can manage, and the labour available for harvesting the crops limits the final output (Olayide and Atobatele, 1980).

2.4 Cocoyam-Based and Coffee-Based Farming Systems

A farming system or agricultural production system is a bioeconomic activity in which the farmer or farm family manages certain resources to produce food, feed, fibre, shelter and other necessary products (Okigbo, 1986). According to him, African farming system usually consists of more than one field system, or micro-environment, located at varying distances from each other and from the homestead. In each of these field systems, there may be variations in the type of commodities produced, the number of individuals at work, the intensity of farming and the timing of activities.

The ecological conditions, under which an individual crop is grown, are determined not only by natural soil atmosphere and modifications made to this environment by the farmers- through ploughing, weeding, irrrigating and applying fertilizer- but also by the farming system of which the crop is a component (Norman,

1984). Small-scale tropical farmers, even when they are producing cash crop, normally endeavour to be as self-sufficient for food as possible. Cropping patterns are varied, with farmers diversifying risks of crop failure or poor prices and also conserving the soil by intercropping. Food and export cash crops are grown in mixed stands (cocoa or coffee with plantains or banana), while maize and other grains are intercropped with legumes, especially beans and groundnut, and this helps to maintain soil fertility (Peter and Ian, 1991).

The food cropping systems in the Southwest and Northwest Provinces of Cameroon are basically mixed cropping systems dominated by crops like cassava, maize, cocoyam (macabo and taro), yam, plantain and sweet potato. Rarely is mono-cropping practised (Nnoung *et al*, 1992). They stated that the cropping system in the Southwest Province is dominated by crops like cassava, macabo, taro and yam which are intercropped with sweet potato, corn and plantain, while corn, cassava, macabo, taro and yam dominate the cropping system in the Northwest Province and these crops are intercropped with sweet potato and plantain. Macabo is a major crop in the root crop system, with 86.8 per cent of the farmers in the Southwest and 91 per cent in the Northwest growing the crop (Nnoung *et al*, 1992). Cocoyams can be grown in full sun or partial shade as an intercrop with banana, cocoa, coconut and rubber trees (Martin, 1984). Intercropping of cocoyams with tree crops, especially cocoa, is common in Ghana and Southwestern Nigeria. In eastern Nigeria, cocoyams are often rotated with yams in

field near the homestead or in compound garden (Lagemann, 1977; Knipscheer and Wilson, 1980). In the forest zone in Cameroon, where more than half the country's cocoyam is produced, it is commonly intercropped with maize on newly cleared land and then remain as a monocrop after the maize is harvested (Dorosh, 1988).

The growing of cocoyams as an intercrop, is a common practice in many parts of the world. It is often planted between young stands of perennial plantation crops (rubber, banana, cocoa, coconut, citrus) and then harvested before the perennial crop closes canopy (Onwueme, 1978). In cocoa production in West Africa, cocoyam is often planted besides the cocoa seedlings in the field, to provide shade for the shade loving seedlings. The cocoyams are harvested when the seedlings have become well established. In Nigeria, cocoyams are often intercropped with yam. They are harvested after the yam has been harvested. In Egypt, taro is often intercropped with vegetables, such as radish, turnip and cucumber (Onwueme, 1978).

The various ways in which plantations are established give rise to different farming systems with perennial crops which can be conveniently classified according to their cropping and exploitation system (Hans, 1976). According to him, on the basis of the length of the vegetation and the amount of cultivation involved, three main cropping systems can be distinguished, viz; perennial field crops, e.g. sugar cane, pineapple, sisal, banana, shrubcrops e.g., cocoa, rubber, coconut, and oil palm. Under the exploitation systems arable farming in the tropics has been from time immemorial a domain of the

smallholders while cultivation of perennial crops for cash was carried out mainly in large estates. However, almost all types of perennial crops are grown in large estates as well as in smallholdings, although some are better suited to large-scale production than other (Hans, 1976). He noted examples of coffee estates as found in El Salvador, Brazil, Kenya and Angola. Krug and De Poerck (1968) noted that coffee is produced in Africa on large estates as well as on thousands of smallholdings. They noted that it is a means of subsistence for millions of Africans as a complementary source of income or as the main or even the sole income.

Both robusta and arabica coffee are extensively grown in smallholdings where coffee production is combined with various other activities. Three distinct types may be distinguished. Coffee may be grown under a cover of natural forest and rarely mixed with food crops. This is true for most of the robusta production in Ethiopia. Coffee may be grown in a mixture with bananas and various other food crops. This is true of some robusta coffee and much of the arabica coffee in Latin America and East African smallholdings. Finally, coffee may be grown in pure stands, except for some interculture in the early stages of plantation development. This is true of smallholder coffee in southern Brazil and Kenya (Hans, 1976).

2.5 Gender Issues in Labour Use

Some farm operations are performed predominantly by men, women or children (Chidebelu, 1990). Spencer (1976), for example, found that in Sierra Leone, men

provided 70 per cent of the labour input for export crops while women provided the majority of the labour for food crops. A survey carried out in the sub-saharan Africa by Bausmann showed that women had a significant responsibility for farming in 90 per cent of the surveyed communities and did all the work except clearing the land in 38 per cent of them (Kumar, 1987). Factors contributing include colonial policies of drawing men away from the villages and the emphasis on mining. The production of export cash crops in many African states drew women more into the production of household food (Koopman, 1983). This is in addition to the pattern of traditional obligation of men and women to their household and community.

Kumar (1987), noted that women's role in the organization of household production means reproduction and direct survival related activities, such as, fetching fuel, water and processing and preparation of food. He further noted that traditionally the Beti women in South Central Cameroon, performed most of the farmwork. However, men controlled the production process since they did the initial clearing that defined the field size and the length of fallow. Cocoa cultivation became men's work when introduced in the area. This was not entirely due to the mechination of colonial government (Guyer, 1980a). Cocoa cultivation is a permanent occupation which, as in other partrilineal societies, is solely vested in men. Consequently, women's work was extended along lines of the previous division of labour. In contrast to this, the traditional rule in western Nigeria was that most of the farm work was done by men (Guyer,

1980b). He said that women were engaged in food processing, storage, local trade and manufacturing, especially cloth. Women also helped with planting, harvesting and transporting agricultural produce in western Nigeria. Women provided only 17 per cent of labour in food production (Guyer, 1980b).

Most literature on food production indicate that women are the major actors in this enterprise. Women play a critical role in food production, cultivation, seed selection and storage and, in some regions, they are the bases for successful afforestation efforts, and provide the main labour on the minifundia in Latin America. Nyientewany (1989) indicated that cocoyam farmers in Fontem subdivision were exclusively women. Rassas *et al*, (1991) noted that root and tuber crops in Cameroon were produced and marketed by women. In Nigeria, Okorji (1983) noted that yam was stereotyped as men's crop while cassava, cocoyam, maize, legumes and vegetable were stereotyped women's crop. Endeley (1987) noted that women farmers were the principal producers of food crops in Meme division, Southwest Province, Cameroon.

The study by Bessong *et al*, (1992) showed that there was no distinct gender specific activity, but the extent of labour input in each land preparation activity varied with gender. Men cut and pruned most trees, while women prepared almost all the mounds and beds. Women also dominated in cutting of grass, raking, burning and tilling. Rogers (1980) stressed particularly that women's labour input was increasingly becoming

a constraint on the production of subsistence crops and added that weeding was very often the crucial bottleneck.

Kaberry (1968), while in a survey of the economic position of women in Bamenda (Grassfield), Cameroon, noted that unlike in the forest belt areas, where most men are reluctant to undertake trading in distant areas, the grassfield men took trading in distant areas. Thus women carried out most of the farming. She said the men argued that if they were to do more farming they would not have time to earn money for household, as well as perform the heavy and strenuous tasks, such as, house building, hunting, clearing of the high bush, cutting of thatching grass and big firewood. This is not to deny that the men have more leisure than the women. This is because the men work less consistently. But it is doubtful whether any additional assistance they might give to the women in their slack periods would make an appreciable difference to the size of the farm, yields granted present methods of cultivation. The European observer confronted by the spectacle of women bending over their hoes through the day, while a number of men may be seen lounging in the compound, was apt to regard the division of labour as not only inequitable but as an exploitation of the female sex. Kaberry (1968) stated that if ever a woman was not found in the compound, her children or husband could generally tell to which farm she had gone but she on her side was often ignorant of the whereabouts of her husband and regarded a display a curiousity as almost unseemly.

2.6 Origin and Environment for Cocoyam and Coffee

The cocoyams, *colocasia* and *xanthosama*, are the most important and more extensively cultivated genera of the family Araceae (IITA, 1982). Others include *Alocasia*, *Cryrosperma* and *Amorphophallus* which are important as food plants only in the pacific basin (Doku, 1981).

Colocasia (taro) is considered to have originated from south-central Asia, perhaps India or Malaysia. *Xanthosoma* (tannia) originated from tropical America and was first brought under cultivation there (IITA, 1982).

In less developed tropical agricultures with poor resources, the environment more often influences crop productivity than so in more developed temperate agricultures (Lyonga and Nzietchueng, 1987). Cocoyams can survive under both water-logged and upland conditions and its ability to thrive under conditions otherwise adverse for most areas where technology is lacking (IITA, 1982). Its tolerance of water-logged and reduced conditions is allegedly due to the ability of the plant to transport oxygen vital to normal roots functioning, from the leaves to the roots, which may also account for the ability of the plant to withstand highly reduce soil condition (Onwueme, 1978; IITA, 1982). For taro, flooding and water-logging of the soil are well tolerated and are indeed preferred by certain cultivars. Tannia, unlike taro, cannot tolerate water-logging; it therefore grows best on deep, well drained soils (Agueguia *et al*, 1985; Onwueme, 1978). In Nigeria, Knipscheer and Wilson (1980) reported that cocoyam is best grown

in well-drained fertile upland soils. For all cocoyams, a soil PH of 5.5 to 6.5 is preferred (Onwueme and Sinha, 1991).

Plant growth environments are mainly determined by the amount and distribution of rainfall and incident solar radiation, which in turn determines the temperature (Lyonga and Nzietchueng, 1987). An important characteristic of cocoyams is their requirement for moisture. Both taro and tannia require rainfall above 2000mm per annum for the best yields to be obtained. When rainfall is low, corm growth is reduced (Onwueme, 1978). Cocoyams are essentially lowland, warm weather crops which require a daily temperature of above 21°C. They cannot grow well under frosty conditions (Onwueme, 1978; Ustimenko-Bakumovsky, 1982; Onwueme and Sinha, 1991).

The coffee plant belongs to the family Rubiaceae, which is one of the many families of dicotyledons and genus *coffea* (Rodriquez, 1961). Four important species of this genus are *C arabica*, *C robusta* syn *canephora*, *C liberica* and *C stenophylla* (Yayock *et al*, 1988). The most important species are *C arabica*, which contributes about 80 per cent world's coffee, and *C canephora* (robusta) which contributed nearly 20 per cent (Purseglove, 1991).

Arabica coffee is an upland species occurring naturally as an under-storey tree in forest (Purseglove, 1991; Krug and De Poerck, 1968). Longevity of coffee plantation depends upon the environmental conditions and management. Coffee is generally considered to be a fairly demanding crop in terms of fertilizer requirement and the lack

of response to fertilizers in some cases may be attributed to frequent use of good soils in coffee growing (William, 1975). The main bulk of coffee is derived from *coffea arabica* (Rodriquez, 1961) which is believed to have originated from the Abyssinian Highlands of Ethiopia (Kochhar, 1986; Moss, 1956; Purseglove, 1991) and Brazil is the principal producing country (Mcllroy, 1967). Robusta coffee originated from the Congo basin (Yayock *et al*, 1988) and is grown in those areas of the tropics where arabica will not thrive. It is a soft and mild coffee with smaller beans than arabica coffee. It requires high humidity, a well distributed rainfall and warmer temperature than *C arabica* (Mcllroy, 1967).

Coffee requires, in general, an evenly distributed rainfall of well over 1500mm per annum for healthy growth and productivity (Kochhar, 1986). A soil reaction below PH 7.0 seems most favourable for the growth of the coffee plant. The plant requires a soil that is permeable, porous and deep to permit good root development and the rapid percolation of excessive water. Photosynthesis and growth of the coffee plant are a little more rapid under partial shade than in full sunlight (Cambrony, 1992; Rodriquez, 1961).

Cambrony (1992) stated that the suitability of a given site for good coffee production is determined by four basic environmental variables - temperature, available water, light intensity and soil conditions. All other geographical factors only affect the coffee plants in so far as they interact with the four basic variables. No species can survive at temperature below 0°C but arabica, which is more tolerant can withstand a

temperature of 2°C up to six hours without damage. *C robusta* requires a temperature more than 5°C and lesser temperatures cause dwarfing and leaf discoloration. However, temperatures above 30°C are disastrous for all varieties of coffee plant. A temperature range of 18°C - 25°C is desirable with 15°C as the fixed lower and 30°C the fixed upper, respectively, which corresponds to most locations between the tropic of Capricorn and Cancer. A rainfall of 1200-2000mm annually is favourable for coffee. However, below 800mm for arabica and 1000mm for robusta can cause uncertainty in the economic life of the plants (Cambrony, 1992).

However, in Cameroon, and Momo Division in particular, the natural environment is quite favourable for cocoyam and coffee production. A rainfall range of 2200 to 3000mm, with an average of 2400mm per annum and an average daily temperature for the year ranging from 21.7°C to 27°C, with minimum and maximum daily temperature at 15°C and 31°C respectively. The soil type, which has been identified as ferrallitic, is favourable to cocoyam and coffee growth.

2.7 Importance, Harvesting, Processing and Utilization of Cocoyam and Coffee

2.7.1 Importance, Harvesting, Processing and Utilization of Cocoyam

Root crops contribute importantly to income and food security in developing countries. These commodities are grown mainly by small-scale farmers and most yield more (in terms of calories per hectare per day) than other crops (Wheatley *et al*, 1995). From 1976 to 1981, the combined production of taro and tannia dropped from 1.8 x 10^6t

to 7.76 x 10^5t (Cameroon Department of Agriculture, 1981). The total world cocoyam production was estimated at 5 x 10^6t in 1983 with more than half of than production (3.4 x 10^6t) from Africa. Nigeria is the world's largest producer of cocoyams with 2.0 x 10^6t followed by Ghana with 1.4 x 10^6t. The cocoyam output of Cameroon was 1.8 x 10^6t in 1976/77 and 0.8 x 10^6t in 1980/81 (Cameroon Ministry of Agriculture, 1981). Simarski *et al*, (1992) reported Cameroon cocoyam production to be almost one million tonnes a year. Cocoyam is the second most important root crop in Cameroon, Ghana and Gabon (IITA, 1982).

In many parts of Africa, cocoyam, *xanthosoma* and *colocasia* are used for food. More than three quarters of the world's cocoyam production comes from Africa. The fresh cocoyam corm is composed of 70-80 per cent water, 20-25 per cent starch and 1.5-3 per cent protein. It also contains significant amounts of vitamin C, thiamin, riboflavin, niacin and carotene (Onwueme and Sinha, 1991). They further stated that the starch from taro is more easily digested than those of yam, cassava and sweet potatoes. The protein content of taro tannia is higher than that of other tropical tuber crops. Cocoyam leaves are used for human food in various parts of the world. The leaves are very nutritious since they contain up to 20 per cent protein on a dry weight basis, in addition to appreciable amounts of vitamins and minerals (Onwueme and Sinha, 1991). Taro tubers are particularly good for child nutrition and for patients with stomach disturbances (Ustimenko-Bakumovsky, 1982).

Cocoyams are ready for harvesting when most of the leaves begin to turn yellow. Apparently there are no morphological changes indicating maturity, but physiological maturity corresponds to the time when sugars in the corn are at a minimum (Hashad *et al*, 1956). The time of planting to harvesting varies with the cultivar as well as the method of cultivation. For both taro and tannia, no serious deterioration occurs if the crop is left in the ground for a few weeks after maturity. To some extent, therefore, harvesting may be done at the convenience of the farmer (Onwueme, 1978), and most of the cocoyams grown in the world are harvested by hand or by use of hand tools.

In Cameroon, like Nigeria, cocoyam is mainly traditionally processed and utilized in boiled, cooked, chipped, fried and fufu forms. The Cameroon's subsistence farmers consume the bulk of the fresh crop-boiling, roasting and baking the tubers for various sauces and soups. Given the rapid increase of Cameroon's population over the past few decades, roots and tubers may well assume an even more vital role in the future. Their dependable yield in an uncertain climate, particularly in the face of drought, added to the many different forms in which they are eaten underscore their potential to stabilise, increase and diversify the nation's food supply (Tambe, 1994).

2.7.2 Importance, harvesting, Processing and Utilization of Coffee

Coffee production lies mainly in the hands of a large number of small planters, there being few private or state plantations, hence its great social importance (Cambrony, 1992). Coffee production has undergone rapid expansion, four or five years being

sufficient for production to get underway, but it is subject to sharp decreases. This may be attributable to climatic conditions or those resulting from political troubles. For instance the severe frost of 1975 in Brazil. The coffee production tonnage of Angola decreased to 30,000 tonnes per year after the war from 200,000 tonnes per year previously. This was also true of production in Uganda when it was suddenly affected by political instability (Cambrony, 1992).

Coffee trees come into bearing three to four years after planting and are in full bearing six to eight years. Fruits mature seven to nine months after flowering depending upon climatic conditions (Purseglove, 1991; Kochhar, 1986). The harvesting operation in coffee has become, in many places, the feature around which some of the best folk skill in coffee production has developed. Harvesting is influenced a great deal by cultural practices throughout the year. It is the operation that requires the greatest amount of labour and is usually spoken of as the most costly item in coffee production. In addition, coffee quality is greatly affected by harvesting methods. Ripening takes a longer period for robusta (*canephora*) than for arabica, but cherries of robusta are held on the fruiting branch for months (Wellman, 1961).

Two methods of processing are used, the dry method and the wet method (Muller, 1988; Purseglove, 1991). In the dry method, whole cherries are spread out thinly and dried in the sun with protection from rain when necessary taking about 15 to 21 days (Purseglove, 1991; Ian and Low, 1984; and Muller, 1988). In the wet method, cherries

are pulped as soon as possible after picking and not longer than 24 hours or they begin to ferment (Ian and Low, 1984). Pulping removes the exocarp and part of the fleshy mesocarp. Fermentation then takes place in fermenting tanks by enzymes, yeasts and bacteria removing the mucilage adhering to the endocarp. Fermented parchment is washed and graded and may then be sun dried and usually protected from rain and dew (Purseglove, 1991; Muller, 1988).

However, for the producer of the tropical third world it is a raw material of great economic and social importance (Cambrony, 1992). In world trade, although it is overtaken by cereals in tonnage in value terms, in commercial dealings, it follows closely after oil. It is an important earner of strong currencies, contributing in varying degrees to the national income of the producing countries for which unlike food crops of self-sufficiency, it guarantees solid basis for the promotion of economic development. It is this role which historically, it has played in Brazil and which it is still playing in some of the relatively unindustrialised countries of central America or Africa, for example Colombia, Cameroon, Rwanda and Kenya among others (Cambrony, 1992).

2.8 Constraints to Cocoyam And Coffee Production

Falusi and Olayide (1980), said that land and labour constituted the major inputs used in production by an overwhelming majority of small farmers. They noted that labour was the second most important input on small farms. In a rain fed economy,

human labour appeared to be the most crucial and limiting (Olayide and Atobatele, 1980). It is estimated that human labour accounted for almost 90 per cent of all farm operations in the non-mechanized systems of peasants farming. In areas where mechanization was possible human labour requirements made up 50 to 60 per cent of all farm operations. Farm labour supply during planting, weeding and harvesting constitutes serious bottleneck. Atayi and Knipscheer (1980) found that labour was the most limiting factor of production and recommended that research be focused on technologies that would reduce the labour requirement of farm operations, such as land clearing and weeding.

Wellman (1961) noted that harvesting operation in coffee has been where the best folk skill in coffee production had developed. It is the operation which requires the greatest amount of labour and is usually spoken of as the most costly item in coffee production. Human labour for coffee production is very important as noted by Mejia (1950, cited in Wellman, 1961). He noted that colombia, with a population of 11 million, required over 2.5 million rural and urban people to man its coffee production.

Johnson (1982) identified communal land tenure system, which predominated in subsistent farming, as one of the factors leading to low agricultural productivity. This system, he said, led to fragmentation of farm land, little incentives in improvement and security of tenure. Upton and Anthonio (1975) noted that as farms became smaller through fragmentation land became a serious limitation to farming resulting in farmers

tending to reduce the length of the bush fallow which eventually lead to low soil productivity Strohl (1981) identified capital and land to be generally scarce resources on small farms and they therefore serve as constraints to cocoyam and/or coffee production.

Poor supply of plantable setts is one of the major constraint of cocoyam production (Lyonga and Nzietchueng, 1986). Cocoyam like yam but unlike cassava suffers the disadvantage that part of the edible harvest must be reserved as planting material. Up to 10 per cent of the yield of corms is often reserved for subsequent use as planting material (Onwueme, 1978). Coursey (1984) mentioned that some cultivars were sensitive to calcium oxalate (causes irritated) thereby making them unsafe for eating unless thoroughly cooked. Most types of cocoyams do not keep well for long periods and in many instances, the farmer is tempted to leave them in the ground and harvest them as needed (Onwueme, 1978).

Low cocoyam and coffee yield in Africa is mainly attributable to diseases and pests (Arene and Okpala, 1981). The major diseases of cocoyam are *corticium rolfsii* in Nigeria and root rot disease of Xanthosoma spp (*Phythium myriotylum*) in Cameroon, reduce yield by up to 90 per cent (Lyonga and Nzietchueng, 1987; Simarski *et al*, 1992). The major diseases of coffee are the coffee leaf disease, *Hemileia vastatix* (Moss, 1956) are coffee berry disease (CBD), *Colletotrichum coffeanum* (Williams, 1975).

CHAPTER III

METHODOLOGY

3.1 Study Area

The Republic of Cameroon lies to the north east of the Gulf of Guinea between longitudes 8° and 16° East of the Greenwich and latitude 2° and 13° North of the Equator (Ngwa, 1978). The country covers an area of 475,442km^2 inhabiting 10,493,655 people as at April 1987 census but officially estimated at 11,540,000 in mid 1989. The population is growing rapidly (by an average of 3.2 per cent per year between 1980 and 1989) according to Clarke (1993). Cameroon's dramatic landscape habors examples of virtually all environments of tropical Africa presenting agricultural scientists with a considerable challenge in tailoring new varieties and better growing methods to a wide range of rainfall, topography and soil conditions. Between the humid coastal lowlands fringing the front of Mount Cameroon and the arid northern plains, bordering Lake chad, lies a spectrum of ecological zones characterised from south to north by decreasing rainfall and a longer dry season (Simarski *et al*, 1992).

The Northwest province, one of the ten administrative regions of the Republic of Cameroon, lies between latitudes 5° 15′ and 7° 10′N of the Equator and stretches from longitudes 9° 17′E to longitudes 11° 25′E of the Greenwich Meridian. It is bounded to the east by the West Province, to the northwest by the Adamawa Province and to the

west by the Federal Republic of Nigeria. The Northwest Province comprises seven administrative divisions (Mezam, Momo, Bui, Menchum, Boyo, Donga-Mantung and Ngoketunjia). Momo Division is bounded to the north by Menchum Division, to the south and west by the Southwest Province and to the east by Mezam Division. It is geographically located between latitudes 5° 45′ and 6° 15′ N and longitudes 9° 40′ and 10° 10′ E. The population of Momo Division with reference to the National census of 1986 stood at 286,932 inhabitants with a land area of 1790km^2, thus giving a population density of 160 inhabitants/km^2. Momo Division the focus of this study, has five sub-divisions, namely; Batibo, Mbengwi, Ngie, Njikwa and Widikum (see figure 3.1).

The Northwest province, of which Momo Division is a part, falls in zone 1 of Cameroon's agro-ecological zones (Western Highlands) and has the characteristics of highland savanna with highland monsoon types of equatorial climate, high rainfall and short dry season. Average temperature is 21°C with a range of 15° to 30° (Simarski *et al*, 1992).

Farming is a predominant occupation in the area. The pattern of rainfall dictates the farming season. The inhabitants are mostly subsistent farmers. The food crops include, plantain, banana, yams, cocoyam, cassava, maize, groundnut and vegetables, while the cash crops include, coffee (robusta and arabica spp) , kola nut and oil palms. Goats, poultry, cattle and pigs constitute the important livestock enterprises. Shifting cultivation is still the rule throughout Momo Division and the need to leave land in fallow and to escape damage from goats and pigs causes most fields to be distant from the homestead.

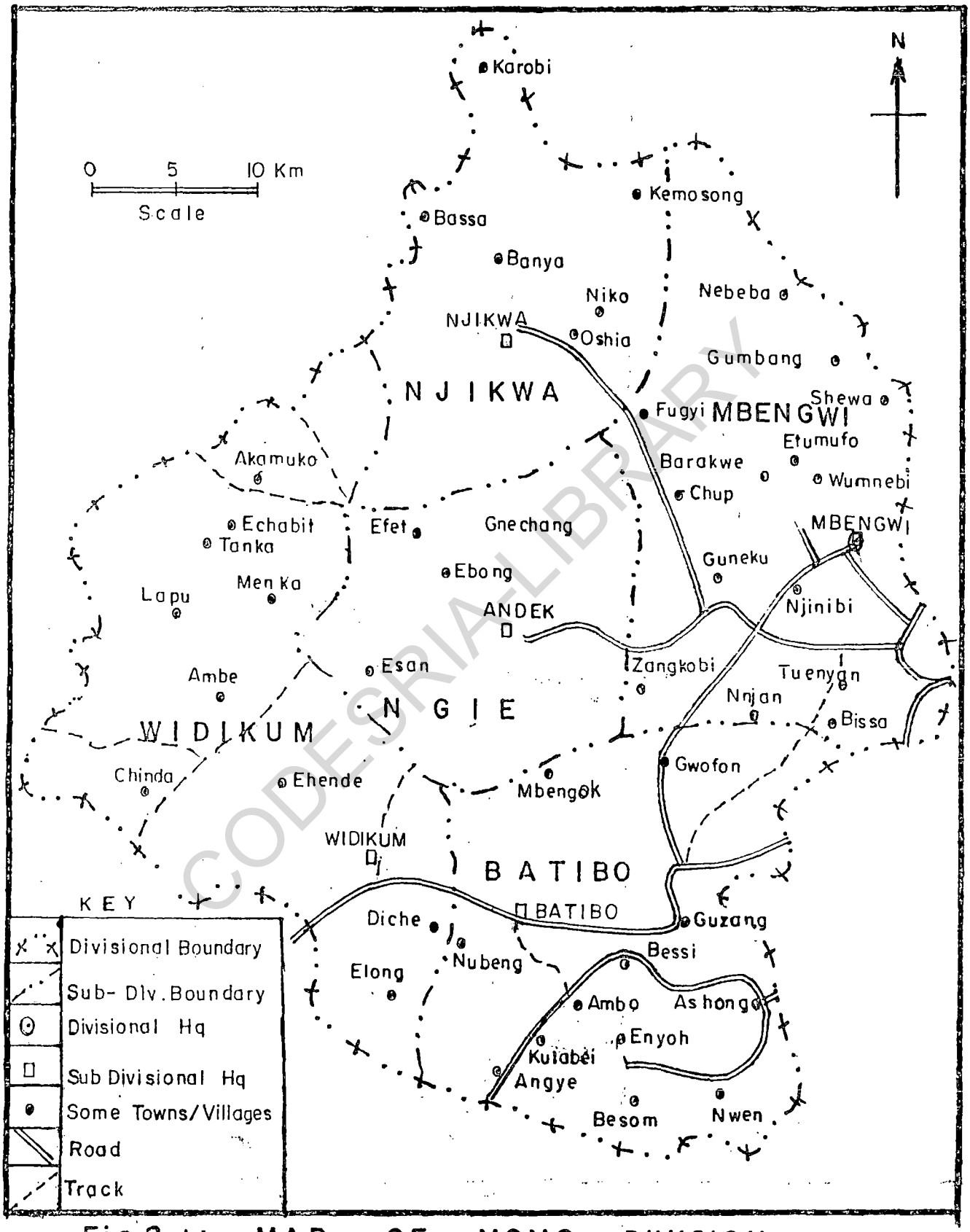

Fig.3.1: MAP OF MOMO DIVISION

Where cattle are kept, mixed farming is practised. Momo Division is purposively selected because for human livelihood the inhabitants of the area produce cocoyam as their main staple food and coffee is the major source of income. While they feed on the staple for continued existence, the revenue generated from coffee is used to send their children to school among other things.

3.2 Sampling Plan

Multi-stage random sampling was used for this study.

In stage one, there was a random selection of two cocoyam and coffee producing subdivisions out of a total of five in the division.

In stage two, three villages were selected at random from each of the two sub divisions initially selected. This brought the study area to six villages.

In stage three, 20 farmers were randomly chosen from each of the three villages initially selected. This gave a total sample size of one hundred and twenty respondents/farmers for the study.

3.3 Data Collection

Data for the study were obtained from both primary and secondary sources. However, most of the data were from primary sources.

The primary data were collected using a set of structured and pretested questionnaires which were administered to the farmers. Direct observations during the field visits also provided part of the required data. The questionnaire provided

information on personal and socio-economic characteristics of the farmers, types, and sources of labour used in the different farming operations involved in cocoyam and coffee production, prices and constraints to increased cocoyam and coffee production, among others.

The researcher was assisted in the administration of the questionnaire by some extension and agricultural officers based in the villages.

Secondary data relevant to the study were collected from annual reports from ministry of agriculture, research reports from Institute of Agronomic Research (IRA), Divisional and Sub-divisional Delegation of Agriculture, published and unpublished works, textbooks, journals, seminar papers and conference proceedings.

3.4 Data Analysis

Descriptive statistics, especially means and percentages were used to realize objectives (a) and (b), objective (c) and (d) were realized using a production function model with the best fit. Also, the marginal products, of the factors (resources) used in the production of the crops, were calculated and the factor intensity ratio was used to determine whether the farming operations were labour or capital intensive. The hypothesis was tested based on the coefficients of the variables in the selected model and the Cobb-Douglas Production function and *a priori* signs of the estimated parameters.

3.4.1 Model Specification

The production function used in realizing objectives (c) and (d) is expressed implicitly as follows:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8) + U$$

where:

Y = output of cocoyam or coffee (physical terms),

X_1 = Age of the farmer (years),

X_2 = Family size (number),

X_3 = Level of formal education of the farmer (years),

X_4 = Farming experience (years),

X_5 = Size of the farm (cocoyam or coffee) (ha),

X_6 = Labour used on the farm (cocoyam or coffee) (mandays) and

X_7 = Capital

X_8 = type of coffee (0 for arabica; 1 for robusta)

U = Error term.

Note: No need for X_8 for cocoyam farmers

The linear, semi log, and double-log forms were tried viz:

Linear: $Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + U$

Semi-log: $Y = b_0 + b_1\log X_1 + b_2\log X_2 + b_3\log X_3 + b_4\log X_4 + b_5\log X_5 + b_6\log X_6 + b_7\log X_7 + b_8X_8 + \log U$

Double-log: $\log Y = b_0 + b_1\log X_1 + b_2\log X_2 + b_3\log X_3 + b_4\log X_4 + b_5\log X_5 + b_6\log X_6 + b_7\log X_7 + b_8X_8 + \log U$

Note: X_8 is not in cocoyam model.

3.4.2 Analytical Framework

The growth, development and yield of a plant is a function of its genetic make up, the environmental conditions and the complex interactions between the crop and several factors, the crop production and management practices as well as the existence and application of scarce resources (Kay, 1986; Ezedinma, 1986). The control of these factors and conditions in the environment that affect crop growth and yield is essential. Eze (1991) stated that the establishment of research institutes aims at the selection and improvement of the crops' resistant to these factors especially the biological factors.

The production techniques in use which may include land preparation, planting, weeding, pruning, spraying of chemicals, cropping systems and harvesting may add or subtract from the yielding ability of any crop in any environment. For instance, early

weeding encourages suckering and a good yield in cocoyam (Chinaka *et al*, 1987) and weed control under integrated weed management showed a higher output than one without good weed management strategy (Akobundu, 1981; Chinaka *et al*, 1987). Variations in yields also result from differences in capital and labour inputs.

A great deal of effort and time have been devoted by economists and statisticians to the measurement of production functions. The methods that have been applied in most studies are statistical analysis based on time-series data of inputs and outputs, statistical analysis based on engineering data. This study made use of the statistical analysis based on cross-sectional data.

Economic theory usually postulates a one way casual relationship between outputs and inputs. Mathematically stated,

$Y = f(X_1, X_2)$, where Y = output, and X_i are inputs.

The model used in the establishment of the relationship and in investigating the nature of returns to scale accruing to the cocoyam and coffee enterprises is the Cobb-Douglas production function. In its parametric form the model is stated as

$$Y = b_0 X_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} X_5^{b_5} X_6^{b_6} X_7^{b_7} X_8^{b_8} U$$

Y = output of cocoyam or coffee (physical terms)

X_1 = Age of the farmer (years),

X_2 = Family size (number),

X_3 = Level of formal education of the farmer (years),

X_4 = Farming experience (years),

X_5 = Size of the farm (cocoyam or coffee) (ha),

X_6 = Labour used on the farm (cocoyam or coffee) (mandays) and

X_7 = Capital

X_8 = type of coffee (0 for arabica; 1 for robusta)

b_0 = Efficiency parameter

b_i = Elasticities of output with respect to X_i where i = 1 - 8.

U = Error term.

Note: No need for X_8 for cocoyam farmers

Unlike the other variables, the error term U is not observable. The error term, which accounts for the unexplained variation of functions, absorbs factors like entrepreneurship, technological differences in skills or organization and other factors which are not considered in the functional analysis.

The coefficient, b_0, is a measure of managerial efficiency and the factor intensity is measured with the ratio, b_7/b_6. The higher the ratio is, the more capital intensive is the crop production enterprise and the lower the ratio is, the more labour intensive is the crop production enterprise.

In regard to the parametric form of the Cobb-Douglas production function, the theory of production concentrates on levels of employment of the factors over which their

marginal products are positive but decreasing that is

$$\frac{dy}{dX_i} > 0 \qquad \text{but} \qquad \frac{d^2y}{dX_i^2} < 0$$

where i = 1 - 8.

This will be the case if the farm enterprise is producing at stage two of the production function (economic region of production) where marginal products are positive but decreasing. This implies that each addition to a factor input results in increased output but at a decreasing rate.

Since the study was based on cross-sectional data, there are possibilites of autocorrelation if there is mis-specification of model, omission of important variables or there is measurement error. There is no need to make use of the Durbin-Watson d statistic test which is mostly for time-series data. Thus no test was carried out for serial correction of the disturbances (autocorrelation). However, since observations on economic variables are not generated under controlled conditions as is witnessed in the physical sciences, as a consequence, there is always some general intercorrelation between the explanatory variables. The name given to the phenomenon is multicollinearity. According to Koutsoyiannis (1987) multicollinearity means the presence of linear relationships (or near linear relationships) among the independent variables. The test required the examination of such statistical values as standard errors

of the estimated parameters, the coefficient of multiple determination,

$$R^2_{Y,X_1,X_2,\ldots,X_k}$$

and the correlation coefficient of one explanatory variable on the other.

If there occurs a perfect linear correlation between variables (ie if $r_{ij} = 1$), the parameters become indeterminate. On the otherhand, if the explanatory variables are not intercorrelated ($r_{ij} = 0$), it means that the problem of multicollinearity does not arise. Though multicollinearity of the explanatory variables does not constitute a breakdown of the assumptions of multiple regression except in the extreme case (where there is perfect multicollinearity in which the estimation fails), its presence affects the precision of estimated parameters as well as their interpretation.

Klein (1967) stated that in a model with two explanatory variables if the overall multiple correlation of the relationship,

$$R^2_{Y,X_1,X_2,\ldots,X_k} \geq r^2_{X_iX_j} ,$$

between any two explanatory variables then there is no problem of multicollinearity in the model, but if

$$R^2_{Y,X_1,X_2,\ldots,X_k} \leq r^2_{X_iX_j} ,$$

then there is a problem of multicollinearity, the latter method was adopted in this study.

CHAPTER IV

RESULTS AND DISCUSSION

4.1 Socio-economic Characteristics of the Respondents.

Socio-economic variables have been shown to influence farmers' production as to how to utilize a specific piece of land. Whether the land is owned or rented provides information on the type of crop(s) to grow and the combination of crops and/or animals to keep, the cropping systems and farm practices involved, among others. These characteristics also determine the availability and use of farm labour as they affect not only labour in quantitative terms but also the choice of type and source of the labour used (Collinson, 1982). In the study area such socio-economic variables like age, sex and marital status, family size, educational attainment and farm size were considered.

4.1.1 Age distribution

The age distribution of respondents are presented in table 4.1.

Table 4.1: Distribution of Respondents According to Age

Age (years)	Respondents	
	Number	Percentage
21-30	1	0.9
31-40	21	18.1
41-50	40	34.5
51-60	35	30.1
above 60	19	16.4
mean = 49.8		
Total	116	100.0

Source: Field Survey Data, 1997

Table 4.1 shows that the largest cohorts were of age 41 to 50 (34.5%) and 51 to 60 (30.1%). Thus 64.6% were between 41 and 60 years old. The implication of this is that a higher proportion of older people are engaged in cocoyam and coffee production in the area.

4.1.2 Sex and Marital Status of the Respondents

Sex-stereotyping of crops and farm role is common in many countries. This is based mainly on the socio-cultural significance traditionally ascribed to certain crops relative to others (Okorji and Obiechina, 1985). Cash crops are considered men's crop and food crops women's crop. Even if men are to produce food crops, Okorji (1983) considered yam and not cocoyam to be a man's crop. Men usually involved themselves in revenue generating crops and not crops for domestic consumption. This is true as Okorji and Obiechina (1985) in Nigeria have shown that cassava though considered a woman's crop is increasingly being produced by the men mainly due to the relatively high returns from the enterprise compared with other arable crops.

Data on table 4.2 show that 94 per cent of the household heads were males while only six per cent were females. Cocoyam production is normally carried out by the women and coffee production by the men. This means that the married women cultivate cocoyam on their husbands' plot of land since they own the land and control household and farm resources. However, at times the men could also get land on leasehold basis for their wives to cultivate. It should be noted that six per cent female household heads

are widowed. This means that they take care of their late husband's coffee plots and also cultivate cocoyam on the other family plots.

Table 4.2: Distribution of Respondents According to sex and Marital status.

Sex/Marital status	Respondents	
	Number	Percentage
Male	109	94
Female	7	6
Total	116	100
Married	109	94
Widowed	7	6
Total	116	100.0

Source: Field Survey Data, 1997

4.1.3 Family Size

The family here is made up of the husband, his wife or wives, children and dependents. Table 4.3 shows that about 42 per cent of the respondents had family sizes of 10 and above persons. Family sizes ranged from two to 20 persons with an average of nine persons per family.

Table 4.3: Distribution of Respondents According to Family Size.

Family size	Respondents	
	Number	Percentage
1-3	10	8.6
4-6	25	21.6
7-9	32	27.6
10-12	32	27.6
13-15	12	10.3
above 15	5	4.3
mean = 9		
Total	116	100.0

Source: Field Survey Data, 1997

This has implications for the amount of family labour available for agricultural production. The relatively large family size among farmers in the study area is due to the predominance of the African extended family system, polygamy and the traditional method of farming. Family labour supply is the major source of farm labour, consequently this has encouraged large family sizes. Not only is hired labour costly to employ, its availability is not always guaranteed as labour is required for arable cropping at about the same time by all farmers. Also, during peak periods of both cocoyam and coffee production (when extra labour is needed most) all family members have always been engaged in the farm to meet the timeliness, required in farm production (Okorji and Obicchina, 1985).

4.1.4 Educational attainment

The number of years of formal education aquired by the respondents was investigated. This is expected to affect decision making especially as regards who goes to the farm and the farm operation to be performed by each individual. As Gouranga *et al* (1985) noted, education enables individuals to gain knowledge and skill and thus increase their power of understanding. Table 4.4 shows that about 59 per cent of the respondents had no formal education. While 39.6 per cent spent between one and seven years in formal education only approximately two per cent of the respondents had spent eight years and above in formal education. This is relatively low.

Table 4.4: Distribution of Respondents according to their educational attainment.

Level of education (years)	Respondents	
	Number	Percentage
zero	68	58.6
1-7	46	39.6
8-12	1	0.9
above 12	1	0.9
Total	116	100.0

Source: Field Survey Data, 1997

Education has an inverse relationship with the amount of family labour used (Knipschees, 1980). This means that as educational level of the farmer increases, there is the tendency for him/her to resort to hired labour or leave farming for off-farm activities (Knipscheer,

1980). Farmers also tend to send their children to school or train them in other trades or occupation other than farming.

4.1.5 Farm size

Table 4.5 shows that farm size per family for cocoyam ranged from less than one hectare to approximately four hectares, while that for coffee ranged from less than one hectare to seven hectares.

Table 4.5: Distribution of Respondents According to the size of Cocoyam and Coffee Farms.

Farm size	Respondents			
	Frequency		Percentage	
	Cocoyam	Coffee	Cocoyam	Coffee
Less than 1	69	50	59.5	43.1
1.0 - 2	31	42	26.7	36.2
2.01 - 3	12	18	10.3	15.5
3.01 4	4	2	3.5	1.7
above 4	0	4	0.0	3.5
Total	116	116	100.0	100.0

Source: Field Survey Data, 1997

About 60 per cent of the farmers cultivated less than one hectare of cocoyams, while 43 per cent grew coffee on farms less than one hectare. About 13.8 per cent of cocoyam farms was greater than 2 ha as against 20.7 per cent for coffee. The cocoyam plots were not only small in sizes, they were also scattered thereby making it relatively

difficult for farmers to cultivate using such modern equipment like tractor if they were available (Kline *et al*, 1969). The average farm sizes were 1.24 hectares for cocoyam and 1.54 hectares for coffee.

4.1.6 Farming experience

The distribution of respondents according to farming experience (Table 4.6) shows that most of the farmers (55.2%) had more than 20 years of farming experience.

Table 4.6: Distribution of Respondents according to farming experience.

Farming experience (years)	Respondents	
	Number	Percentage
6-10	10	8.6
11-15	8	6.9
16-20	34	29.3
above 20	64	55.2
Total	116	100.0

Source: Field Survey Data, 1997

This could probably be because most of the farmers had worked with their parents in their farms. Farming experience enhances adoption of innovations in agricultural enterprises. However, none of the farmers has been involved in any agricultural training.

4.2. Land Ownership

Land for the family can be inherited, purchased, leased, obtained as a gift or is

communal. The distribution of cocoyam and coffee farmers according to source of farm land for cocoyam and coffee production is presented in table 4.7.

Table 4.7 shows that most of the land used in cocoyam production 93.1 per cent and coffee production 85.4 per cent were inherited. Communal land is not used for coffee production because of its long gestation period. Since coffee production requires relatively large plots of land and it is not an annual crop, which can be changed at the end of one farming season, the source of land for its production were principally by inheritance and purchase. In cocoyam production, leasing was an important source of land.

Table 4.7: Distribution of Respondents according to their source of farm land for cocoyam and coffee production.

Source of farm land	Respondents			
	Number*		Percentage*	
	Cocoyam	Coffee	Cocoyam	Coffee
Inherited	108	99	93.1	85.4
Purchased	41	39	35.4	33.6
Leased	30	1	25.9	0.9
Gift	19	6	16.4	5.2
Communal	5	0	4.3	0.0
n = 116				

*: Multiple responses were recorded

Source: Field Survey Data, 1997

While most of the cocoyam plots/fields were located farther from the homestead-usually in search of virgin forest or where the fertility is adequate for cocoyam production or as Tambe (1994) put it where there is perceived fertility, the coffee plots are mostly within the compound and very few are located farther away from the neighbourhood. The location of cocoyam farms farther from home is however also to avoid destruction of the crops by livestock like pigs and poultry. Despite the advantages of neighbourhood cocoyam cultivation, like effective and efficient supervision, management as well as reduced cost of transportation and harvesting, the perceived fertility of the land and fallow practice adopted in distant lands tended to strongly influence the decision on where to cultivate. The cocoyam farms were located at distances of between 2km and 4km.

The average number of farm fields for cocoyam was 3.4 and 1.6 for coffee. Table 4.8 shows that farmers had multiple plots of both cocoyam and coffee. Cocoyam plots ranged from one to more than four with 51.7 per cent of farmers having 2 to 3 plots. Coffee farmers cultivated one

Table 4.8: Distribution of respondents according to the number of cocoyam and coffee farms cultivated in 1996.

Number of farms (plots)	Respondents			
	Number		Percentage	
	Cocoyam	Coffee	Cocoyam	Coffee
1	9	62	7.8	53.4
2	39	40	33.6	34.5
3	21	11	18.1	9.5
4	18	3	15.5	2.6
more than 4	29	0	25.0	0.0
Total	116	116	100.0	100.0

Source: Field Survey Data, 1997

to four plots with 53.4 per cent having only one plot. Since coffee needs relatively large plots of land for cultivation compared with cocoyam, the land constraint accounts for the fewer number of coffee plots. None of the coffee farmers had more than four plots.

4.3 Labour

Labour is a group of productive services provided by human physical effort, skill and mental power. It is the work input of the people and not the people themselves (Johnson, 1982). He further noted that it is the tool with which capital and management skill are used to extract profit from the land.

4.3.1 Labour types on cocoyam and coffee farms

The farmers used three types of labour for cocoyam or coffee production, namely, family, hired and exchange/communal (Table 4.9)

Table 4.9: Distribution of Respondents According to the type of labour used in cocoyam and coffee production.

Type of Labour	Respondents			
	Number*		Percentage*	
	Cocoyam	Coffee	Cocoyam	Coffee
Family	116	116	100	100
Hired	104	77	89.7	66.4
Exchange/communal	106	76	71.4	65.5

*: Multiple responses were recorded

Source: Field Survey Data, 1997

All farmers used family labour in the production of both cocoyam and coffee. The somewhat surprising result is that 89.7 per cent of farmers used hired labour in cocoyam production compared to 66.4 per cent for coffee. Normally, hired labour is used more in cash crop production.

On the aggregate, family labour ranked first, exchange/communal labour second and hired labour third for cocoyam production, while in coffee production family labour was ranked first, hired labour second and communal a close third. Where the family labour is insufficient, exchange/communal and hire labour were competing in their usage

to cope with the timeliness of the farming operations like weeding in cocoyam and coffee, harvesting of coffee and land clearing for cocoyam. Exchange/communal labour involves peers or different family members who usually come together to form work gangs of two to five persons. Their mode of operation is to work on their individual farms in rotation. Since each member benefits from the arrangement, no cash payment is made. However, meals and drinks are provided to members during the work period (Chidebelu, 1990). This arrangement has brought relief to many farmers as it helps to alleviate the problem of labour bottleneck arising from scarcity of labour, high wage rates charged by available ones and timeliness in the farming operation.

Men, women and children provided their labour for the performance of different operations on cocoyam and coffee farms. Table 4.10 shows that some farm operations were gender dominated. For example, in cocoyam production women dominated ridge making, planting, weeding, harvesting and marketing.

All labour types were engaged in cocoyam production in the study area, and there was sex-stereotyping of farm operations. The men were primarily involved in land clearing while children were largely involved in weeding and transportation.

In coffee production, however, men dominated in pruning, transportation and marketing while women were largely involved in weeding and harvesting. Children participated mainly in harvesting and weeding.

Table 4.10: Distribution of Respondents According to the type of Labour used during each Farm Operation in Cocoyam and Coffee Production

Farm Operation	Number of Respondents* (n = 116)						Percentage*					
	Cocoyam			Coffee			Cocoyam			Coffee		
	Men	Women	Children	Men	Women	Children	Men	Women	Children	Men	Women	Children
Landclearing	75	87	20	-	-	-	64.7	75	17.2	-	-	-
Ridge making/Digging planting holes	4	116	37	-	-	-	3.5	100	31.9	-	-	-
Planting	3	116	16	-	-	-	2.6	100	13.8	-	-	-
Weeding	0	116	56	94	70	61	0.0	100	48.3	81.0	60.4	52.6
Pruning	-	-	-	116	0	0	-	-	-	100	0.0	0.0
Fertilization	-	-	-	5	1	0	-	-	-	4.3	0.9	0.0
Spraying of chemicals	-	-	-	26	0	0	-	-	-	22.4	0.0	0.0
Harvesting	2	116	38	103	93	90	1.7	100	32.8	88.8	80.2	78.0
Drying	-	-	-	109	17	46	-	-	-	94	14.7	39.7
Transportation	5	116	66	105	42	44	4.3	100	56.9	90.5	36.2	37.9
Sale (Marketing)	0	113	3	109	5	4	0.0	97.4	2.6	94.0	4.3	3.5
Percentage							8.1	70.6	21.3	58.5	20.0	21.5

*: Multiple responses were recorded
Source: Field Survey Data, 1997

Some farm operations were commonly carried out by both men and women, such as, land clearing for cocoyam production and weeding for coffee.

In cocoyam production labour for land clearing involved multiple sources. Largest frequency was women (75%), followed by children (17.2%). For ridging, all used labour women (100%), followed by children (32%), and men, (3.5%). For planting, all farmers used women (100%), with a few using children (13%) and men (3%). Both first and second weeding are exclusively done by women and children. This is in line with what Chi (1989) found that women supplied most of the labour force in cocoyam production followed by children in weeding. Harvesting, which is being carried out as the need arise, was predominantly done by women. Harvesters harvest and carry the load. However, men could help in the transportation if they had the means. Sales, were done by the women or children, who were usually instructed on the price to receive for the quantity.

For coffee production, all labour types were also involved. Since all the surveyed farmers had old coffee trees which most never planted by themselves (inherited), land clearing, digging of planting holes and planting were not considered. In coffee weeding, the highest labour contribution was by men, followed by women and children. Fertilizer application, which rarely took place, was mostly by men. Spraying of chemicals to control pests and/or diseases is exclusively men's role. Harvesting of coffee and pre-processing were done by men, women and children in almost equal proportion. Drying,

transportation and sales were predominantly men's work.

On the average, the men contributed 8.1 per cent of the total labour needed for cocoyam production in the study area, women accounted for 70.6 per cent and children 21.3 per cent. In coffee production, men contributed the highest (58.5 per cent), followed by children (21.5 per cent) and women (20 per cent). This is presented in figure 4.1.

4.3.2 Labour Sources Used for cocoyam and Coffee Production

Family labour was used in all the farming operations in cocoyam production. Hired and exchange/communal labour were used only during land clearing, ridge making and weeding. This was to cope with the timeliness of the farming operation (Table 4.11). On the overall, family labour accounted for 81.4 per cent of the total labour required for cocoyam production, exchange/communal labour followed with 13.8 per cent, while hired labour contributed five per cent (See figure 4.2).

For coffee production, family labour was also the major source of labour accounting for about 86.8 per cent of the total labour used for coffee production as it was used in all farming operations. This was followed by hired labour with 8.6 per cent and exchange/communal labour with 4.6 per cent. This is presented in figure 4.2. Hired and exchange/communal were mostly used during weeding, pruning and harvesting of coffee. The high degree of family labour used as a source of farm labour shows a high degree of subsistence farming in the area under study.

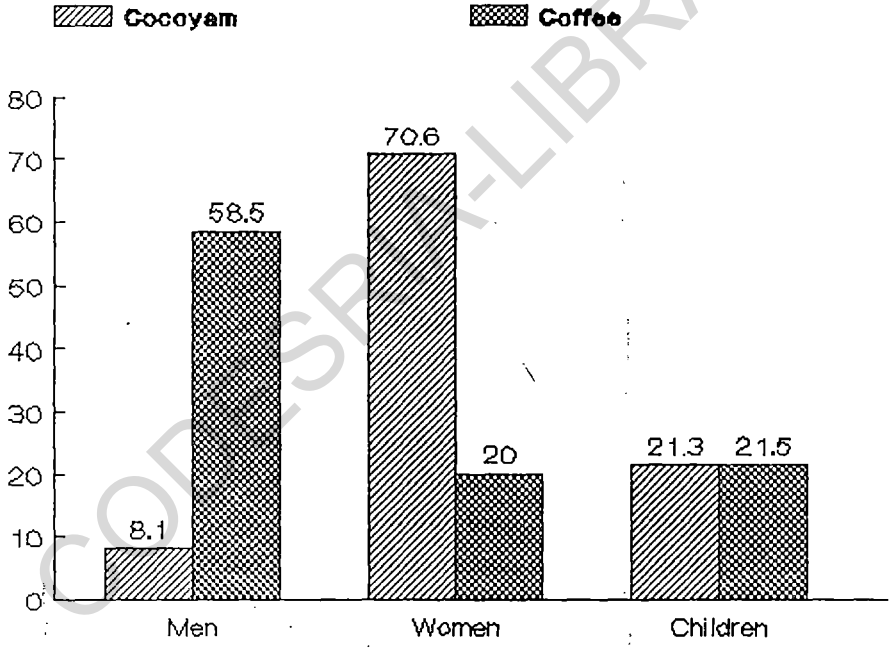

Figure 4.1: Percentage Distribution of Labour used on cocoyam and coffee farms According to type (men, women, and children) in all farm operation.

Table 4.11: Per cent Distribution of Respondents according to source of labour used on cocoyam and coffee farms for the various farm operations.

Farm operation	Percentage*					
	Cocoyam			Coffee		
	Family	Hired	Exchange	Family	Hired	Exchange
Landclearing	94	27	28	-	-	-
Ridge making/Digging planting holes	100	7.8	50	-	-	-
Planting	100	0	0	-	-	-
Weeding	100	6.0	39.7	100	28.5	18.1
Pruning	-	-	-	72.4	14.7	4.3
Fertilizer application	-	-	-	4.3	0	0
Spraying of Chemicals	-	-	-	22.4	0	0
Harvesting	100	0	0	100	12.9	9.5
Drying	-	-	-	100	2.6	0
Tansportation	100	0	0	100	0.9	0
Sale (marketing)	100	0	0	100	0	0
Percentage	81.4	4.8	13.8	86.8	8.6	4.6

*: Multiple responses were recorded

Source: Field Survey Data, 1997

4.3.3 Labour allocation for different farm operations on cocoyam and coffee farms

Table 4.12 shows that weeding was the most important farm operation in cocoyam production in terms of labour requirement (31.4%). This was followed by ridge making, 21.6 per cent, and harvesting, 19.6 per cent. This is in line with what Tambe (1994) found in Many Division with smallholder farmers in cocoyam production. Planting and

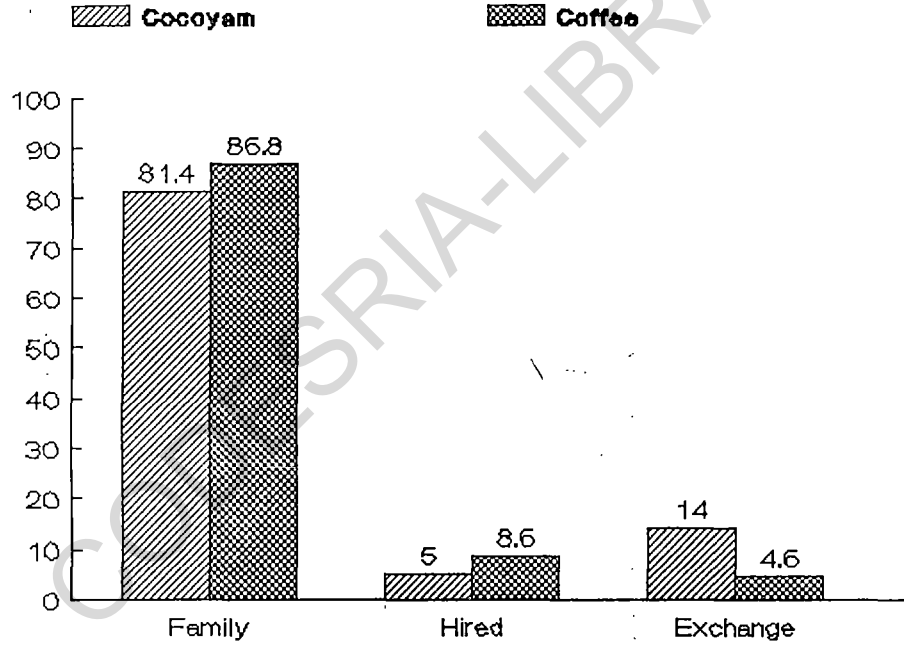

Figure 4.2: Percentage Distribution of labour used on cocoyam and coffee farms according to source (Family, Hired, exchange/communal) in all farm operations.

land clearing required the least mandays. All the operations carried out on the cocoyam farms were done manually.

Table 4.13 shows that harvesting was the most important farm operation in coffee production in terms of labour requirement (52.9%). This supports the findings of Wellman (1961). Weeding was next in importance with a labour allocation of 29.4 per cent, followed by pruning (10.3%).

Table 4.12: Labour Allocation (Mandays) Per Hectare for Different Farm Operations in a Cocoyam Based Crop Enterprise

Farm operation	Mandays	Percentage
Land clearing	14	13.7
Ridge making	22	21.6
Planting	14	13.7
Weeding	32	31.4
Harvesting	20	19.6
Total	102	100.0

Source: Field Survey Data, 1997

4.3.4 Determinants of size of labour force

The factors that determined the size of the labour force on cocoyam and coffee farms are family size, availability of hired labour, type of farming operation, wage rate, farm size and lack of money (Table 4.14).

Table 4.13: Labour Allocation (Mandays) per Hectare for Different Farm Operations in a Coffee Based Crop Enterprise.

Farm operation	Mandays	Percentage
Weeding	20	29.4
Pruning	7	10.3
Planting	1	1.5
Weeding	4	5.9
Harvesting	36	52.9
Total	68	100.0

Source: Field Survey Data, 1997

Table 4.14: Distribution of Respondents According to What Determines the Size of the Labour Force on their Cocoyam and Coffee Farms.

Factors	Respondents			
	Number		Percentage*	
	Cocoyam	Coffee	Cocoyam	Coffee
Family size	114	110	98.3	94.8
Availability of hired labour	15	31	12.9	26.7
Type of farming operation	41	71	35.4	61.2
Wage rate	7	12	6	10.4
Farm size	88	82	75.9	70.7
Lack of money	5	3	4.3	2.6

*: Multiple responses were recorded
Source: Field Survey Data, 1997

In cocoyam and coffee production family size ranked first as the most important factor that determined the size of the labour force. The frequency of family size was 98.3 per cent for cocoyam and 94.8 per cent for coffee. This shows that farming in the study area is subsistent and most operations were manual, using simple tools. The farm size came second in the determination of the size of the labour force for cocoyam and coffee production. This was reported by 75.9 per cent (cocoyam producers) and 70.7 per cent for coffee producers.

The factors that determined the size of labour force for both cocoyam and coffee production were the same, however, their relative importance varied.

4.4 Capital

In a production process, there are usually inputs in the form of land, labour and capital of which managerial skill is added to give the expected result. In the study area, cocoyam and coffee production are considered to be processes whereby inputs like land, labour and capital are combined by the farmers in the best way they can to produce cocoyams and coffee beans. Capital includes cash and farm tools/equipment and structures. Farm structures were virtually absent and such physical structures like buildings in which farmers keep their farm tools/equipment and production outputs were ignored. This is because they are primarily used for residence.

The farm tools/equipment used by farmers in the study area included, hoe, cutlass, knife, axe, basin and basket for cocoyam production, and cutlass, pruning

scissor, sprayer, basket, jute bag, tarpaulin and file for coffee. Tables 4.15 and 4.16 show the farm tools/equipment used by the farmers on cocoyam and coffee farms and their annual values.

Table 4.15: Farm Tool/Equipment Used on Cocoyam Farms and Their Annual Values:

Tool/equipment	Average cost (FCFA)	Total life span (years)	Annual value (FCFA)
Hoe	1345	3	448.3
Cutlass	2404	3	801.3
Knife	221.5	1	221.5
Axe	3317	5	663.4
Basin	2395.5	5	479.2
Basket	600	5	300.0
Total	-	-	2913.7

Note: FCFA-Francs Communaute Francaise Africaine
1000frs (cfa) = ₦44.7 in the fourth quarter of 1995
Source: Field Survey Data, 1997

An average cocoyam farmer has four tools viz hoe, cutlass, knife and basket while an average coffee farmer has five tools, namely, hoe, cutlass, basket, jute bag and file. However, it is rare to find a cocoyam or coffee farmer in possession of all the mentioned farm tools/equipment outlined in Tables 4.15 and 4.16. A total annual value of 2913.7frs CFA and 5466.7frs CFA could be obtained for any cocoyam or coffee farmer in possession of all the farm tools/equipment listed and a lesser amount otherwise. These total annual values for cocoyam and coffee signifies the low scale of operation and dominance of traditional technology.

Table 4.16: Farm Tools/Equipment Used on Coffee Farms and Their Annual Values.

Tool/equipment	Average cost (FCFA)	Total life span (years)	Annual value (FCFA)
Hoe	1345	3	448.3
Cutlass	2404	3	801.3
Pruning scissor	2653	5	530.6
Sprayer	17090	10	1709.0
Basket	175	2	87.5
Jute bag	500	2	250.0
Tarpaulin	5200	5	1040.0
File	600	1	600.0
Total	-	-	5466.7

Note: FCFA - Francs Communaute Francaise Africaine 1000frs (cfa) = ₦44.7 in the fourth quarter of 1995.
Source: *Field Survey Data, 1997*

4.5 Cropping Systems in Cocoyam and Coffee Based Farming Systems

4.5.1 Cropping Systems in Cocoyam-Based Farming System.

Cropping systems in the study area consist of sole cropping and mixed cropping of a varying number of crops in mixtures. Mixed cropping is the commonest cropping system adopted by farmers in the study area. Various crop combinations referred to as crop mixtures are grown. Crop rotations vary as do the crop combinations which are adapted to changing soil and topographic conditions. Mixed cropping is a food security

crop diversification mechanism by which the farmer selects and grows those crops that symbiotically complement each other, make more efficient use of the environment, resist pests, diseases and weeds, and ensure that the soil is covered during most of the year. This is usually to enable the farmer to spread labour evenly throughout the year. According to Arze *et al* (1990) this practice is common in the tropics and appeals most to the small-scale farmers with limited resources. In mixed cropping, species with different periods of maturity, canopy types and rooting habits may be grown together or in overlapping sequence (Okigbo, 1995).

In the study area, cocoyam is either planted as a major crop together with beans, maize, huckleberry, pepper, pumpkin or okro, or as a minor crop. As a minor crop this means that it could be a yam based crop mixture where cocoyams are also planted. In the study area where cocoyam is cultivated as a major crop, sole cropping constituted 25.4 per cent, two crop mixtures constituted about 65 per cent while above seven crop mixtures constituted 6.1 per cent. Where cocoyam is cultivated as a minor crop three to four crop mixtures constituted a greater proportion of 69.5 per cent and seven and above crop mixtures constituted about 18 per cent.

Cocoyam is planted at distances of 0.5 metres apart in the systems where cocoyam is the major crop. Usually cocoyams are planted on ridges with systematic planting pattern. Other crops grown together with cocoyam on cocoyam-based farms include:-huckle berry, beans, maize, okro, pumpkin, pepper, garden egg, groundnut and

sweet potato. However, in some farms there may be some stands of plantain, banana, coffee, yam and even cassava, but in all cases cocoyam is regarded as the major crop.

Where cocoyam is grown as the minor crop they are usually spaced one to two metres apart depending on the density of the major crop grown. The cocoyam is planted on top of the ridges but not at the beginning or end of the ridge, and other crops like cassava, beans, maize, pepper, okro, sweet potato, irish potato, melon, cowpea, soyabeans and garden egg at the sides usually near to the furrow. The furrow widths ranged from one to two metres. The major crop which is usually yam, has traditional planting position on top of the ridge but it must also occupy the beginning and the end of the ridge. Again some stands of plantain, and banana could be found on such farms.

Farmers in the study area planted up to 10 crops on the same piece of land in a farming season. This is in line with what Besong *et al* (1993) found that is, that farmers would prefer the intercropping system to the sole crop because the total income from the intercropping crop mixture is higher than that from sole crop. They noted that though planting of many crops on the same piece of land resulted in very low densities of each crop and in comparable low yields, these yields were compensated by the high land and income equivalent ratio. This corroborates the observation made by Arze *et al* (1990) that intercropping in the tropics is the crop system that appeals the most to farmers with limited resources.

Farm operations performed in cocoyam based crop mixture include land clearing, ridging, planting, weeding and harvesting (figure 4.3). Land clearing for cocoyam production commences in December and lasts till January of the following year. Depending on the vegetation of the farm to be cultivated, land clearing is by slashing with cutlass and burning or if the volume of the debris is small, it is worked into the soil while making ridges.

Ridging, which follows land clearing commences in February and ends in March. Planting which is usually dependent on the rains, is carried out in February, March and April. An early incidence of rain was reported in 1996 giving reasons for the early February planting compared to other years of planting which is normally in March. The early maturing crops are always planted last but harvested early.

Weeding commences in May and lasts till September. The weeding operation is carried out manually (using hoes and cutlasses) by all the surveyed farmers. On the average there are two weedings. However, there could be a third weeding that is during the harvesting period. This is to help sustain the other crops that have long maturity periods like cassava. This last weeding which very few farmers do, is mainly by hand-pulling of the weeds. The farmers carry out the first weeding during the early stages of cocoyam growth and development as there is no full canopy cover and weeds always out-compete the cocoyam. Early weeding is even more important for suckering and a good yield as Gurnah (1986) and Chinaka *et al* (1987) noted.

Harvesting of cocoyams is done between the months of September and January. Harvesting is done as the need arises by handpulling or by using digging sticks and knives. The farmers indicated that cocoyams are either consumed immediately after harvest, stored for future consumption or as planting material, sold or given to friends and relatives. Results of this study indicate that while 52 per cent stored for future consumption and as planting material, while five per cent offered part of their harvest as gifts.

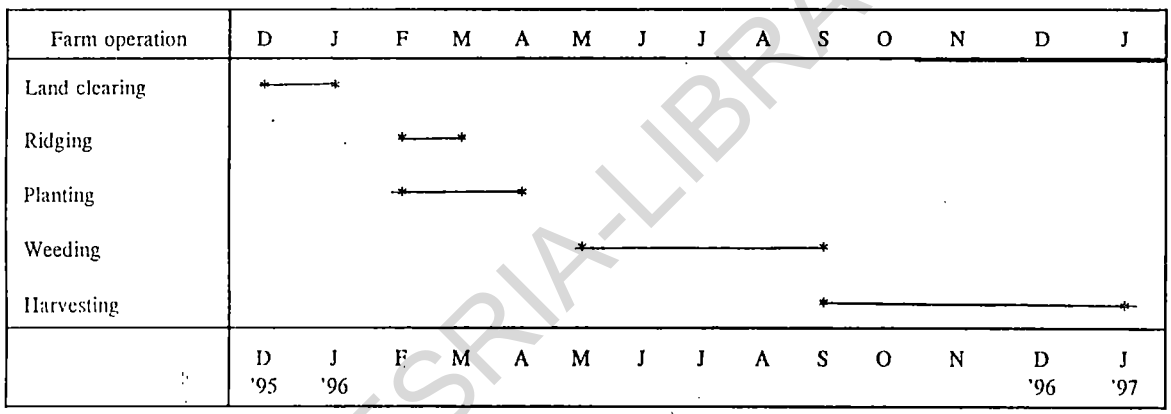

Figure 4.3: Calendar of Farm Operation on Cocoyam Based Enterprises
Source: *Field Survey Data, 1997.*

4.5.2 Cropping System in Coffee Based Farming System

In the study area, coffee is also grown in mixed culture or under the intercropping system. Rarely is coffee grown in pure stands as is the case in Latin American and African smallholdings (Hans, 1976). Coffee (arabica and robusta) are grown together with other plantation crops like plantain, banana, mango, avocado pear, kola nut, oil palm, raffia palms, "fichia", pineapple, sugar cane, plums, bitter kola, papaya and

guava. It should be noted that not all these crops are grown in the same coffee farm however, 65.5 percent of the farmers indicated a five to nine crop combination or mixture (coffee, plantain, banana, avocado pear, mango, plums, oil palm, sugar cane and raffia palms). However on coffee farms cocoyam, pepper, soyabeans and/or cowpea beans could be seen planted. The coffee stems are planted 2m to 2.5m apart for robusta and 3m to 3.5m apart for arabica. the planting positions of the crops varied but usually the raffia palms are mostly planted in the valleys or near swampy areas because of its high water requirement. The coffee intercrops had no definite planting arrangement which of course resulted in irregular and unsystematic planting distances of some of the older coffee plants.

Planting sequence depended upon which crop was available and the need for the planting. Though coffee, oil palms and kola nuts are always planted first in fields where they are planted, they are among the last to be harvested. Since all the coffee farmers interviewed had already planted coffee stems which were old (more than 20 years) and majority of the present farmers never took part in the planting, information was sought for only weeding, pruning, fertilizer application, spraying of chemicals and harvesting. However, according to INADES (1986), land clearing, pegging and digging of planting holes, and the establishment of shade trees occur in March, while trans-planting from the nursery into the new farm, early weeding and fertilizer application in April, May, June, July and August, late weeding in September.

Weeding of arabica coffee farms takes place in the months of December and January for hoe weeding, while cutlass is used in the months of July, August and September. The calender of the farm operations in coffee based enterprise is shown in figure 4.4. Weeding of robusta (April till September for two weedings) is mostly done by slashing with cutlass. Weeding is generally carried out manually either using hoe and /or cutlass and it is normally three times for arabica and two times for robusta coffee.

Pruning of the coffee stems is done to control the spread of diseases, remove dead stems or branches or to avoid uneconomic growth of the coffee stems. Pruning is usually carried out twice, during December, January and March, and June and August. However, very few farmers do really prune their coffee. Fertilizer application is carried out on coffee farms during the months of March and April. However, only a handful of the farmers applied fertilizer to their coffee farms. Spraying of chemicals which very few farmers did, was done on an adhoc basis either to control pests, and diseases or to supplement the plant with elements which are lacking or insufficient for good growth. It is usually done in March, May, June or October.

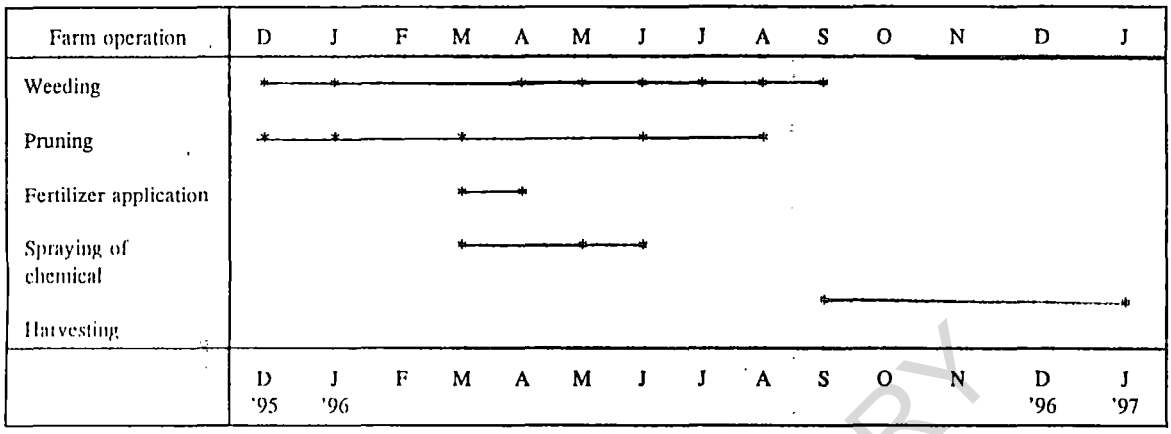

Figure 4.4: Calendar of Farm Operation on Mature Coffee Based Enterprise

Source: *Field Survey Data, 1997.*

Harvesting, which is the most important aspect of coffee and has been where the best folk skills in coffee production are developed (Wellman, 1961), commences in September with arabica coffee and ends in January with robusta coffee. The farmers indicated that the exocarp including the mucilage of the arabica type coffee product were removed, dried and sold while the robusta product was only dried and sold. However, in both cases, weeks or months of storage may be necessary before sale.

4.6 The Effects of Socio-economic Variables, on Cocoyam and Coffee output

4.6.1 The Effects of Socio-economic variables, on cocoyam output.

The effects of socio-economic variables, on the output of cocoyam was investigated using a production function model. The correlation matrix showed that none of the independent variables was statistically linearly correlated, that is, there was no multicollinearity problem.

Table 4.17: Correlation Matrix of the Socio-economic Variables of Cocoyam.

	X_1	X_2	X_3	X_4	X_5	X_6	X_7
X_1	1.000						
X_2	0.458	1.000					
X_3	0.397	0.234	1.000				
X_4	0.474	0.360	0.289	1.000			
X_5	0.021	0.562	0.233	0.184	1.000		
X_6	-0.025	0.346	0.092	0.129	0.620	1.000	
X_7	0.439	0.505	0.114	0.100	0.237	0.134	1.000

All the explanatory variables except age and capital, had positive relationships with the output of cocoyam (Appendix).

The production funciton model is implicitly expressed as

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7) + U$$

where Y = output of cocoyam (small basis)

X_1 = age of farmer (years)

X_2 = family size (number of persons)

X_3 = level of education (years)

X_4 = farming experience (years)

X_5 = farm size (has)

X_6 = labour used on the cocoyam farm (mandays)

X_7 = capital

U = error term.

Note: a small basin = 12Kg.

On the basis of the selection criteria such as the overall F-ratio, coefficient of multiple determination (R^2), the statistical significance of the regression coefficients and the signs on the regression coefficients, the double-log form was selected for further analysis. Details of the estimed models along with the computed statistics ar present ed in Table 4.18.

Result of the multiple regression shows that age, educational level of the farmer, farming experience, labour used on the cocoyam farms and capital had significant effects on output, while family size and farm size did not.

The significant negative relaitonship between the age of the farmer and the output of cocoyam could be due to the fact that as the farmers grow older, though with farming experience, they become weaker in carrying out the necessary farm operaitons such as land clearing, planting, weeding and harvesting. All these will invariably lead to lower productivity.

The level of education had a significant positive relationship with the output of cocoyam. Education enables individuals to gain knowledge and skills and thus increases their power of understanding. Knowledge and skill acquired through education help individuals to take decisions and act according to situations. Also, Halim (1976) reported that increase in the number of years spent in formal educaiotn enhances the rate of technological adoption.

Table 4.18: Summary of Multiple Regression Analysis for Cocoyam Production.

Variable	Linear	Semi-log	Double-log
Age (X_1)	-207.79**	-799.85	-1.83*
	(125.74)	(548.64)	(0.54)
Family size (X_2)	105.12*	366.90	0.34
	(33.60)	(244.99)	(22)
Educational level (X_3)	70.46	140.96	0.35*
	(66.55)	(149.77)	(0.15)
Farming experience (X_4)	10.41	180.26	0.96*
	(109.42)	(416.62)	(0.41)
Farm size (X_5)	-171.22	-120.98	0.077
	(148.42)	(164.49)	(0.16)
Labour (X_6)	9.94*	1065.92*	0.84*
	(3.13)	(401.13)	(0.40)
Capital (X_7)	-0.098	-62.26	0.98*
	(0.07)	(202.45)	(0.20)
Constant (b_0)	-560.38	-4151.70	-6.67
R-square (R^2)	0.232	0.135	0.423
Overall F	4.65	2.41	11.32

$\alpha = 5\%$: $t_{.025, 30} = 1.96$

$\alpha = 10\%$: $t_{.05, 30} = 1.645$

* statistically significant at 5% level

** statistically significant at 10% level

All others: insignificant at 10% level.

Values in parantheses represent standard errors.

The significant positive relaitonship between farming experience and the output of cocoyam could be as a result of the acquisition of farming skills and managerial expertise over the years.

The positive relaitonship of family size with the output though not significant is consistent with the *a priori* expectation because increase in family size would probably mean availability of more hands to carry out the necessary farming operations for cocoyam production. This is particularly true as most of the rural farmers are resource poor and thus find it difficult to hire labour. Indeed, they have continued to use family and exchange/communal labour which involve little or no out of pocket expenses (Haswell, 1953).

The result of the regression analysis also shows that there was a non-significant positive relationship between farm size and the output of cocoyam. This is not consistent with the *a priori* expectation and could probably be due to infertile soil, scarcity of good farm land for cocoyam production and the endemic nature of pests and diseases. In addition, eventhough farmers with larger farms cvould get more returns from their farms and become economically solvent, their problems increased with increase in farm size with respect to planting, weeding and harvesting. Also, the ridges which could be as far apart as two metres may also account for the non-significance especially here that cocoyam is intercropped. The intercropping of cocoyam results in low plant density which could explain why the size of the cocoyam farms could not be significant.

Only 42 per cent of the variation in yield could be explained by the explanatory variables. This is low and it can be said that some variables which could significantly affect the output of cocoyam were left out in the model. However, the overall regression equation was significant at the five per cent level of probability. The F-calculated from the data (11.32) is greater than the F-tab. (2.15). It is on this basis that it is being accepted that socio-economic variables, affect the level of cocoyam output.

4.6.2 The effects of Socio-economic variables, labour availability and use on coffee output.

Factors that are believed to influence the output of coffee include, family size, educational level of the farmer, farming experience, and age of the farmer. The correlation matrix of variables showed that none of the independent variables were statistically linearly correlated, that is, there was no multicollinearity problem (Table 4.19).

Table 4.19: Correlation Matrix of the Socio-economic Variables of Coffee.

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
X_1	1.000							
X_2	0.458	1.000						
X_3	0.397	0.234	1.000					
X_4	0.473	0.360	0.289	1.000				
X_5	0.057	0.415	0.165	0.317	1.000			
X_6	0.580	0.379	0.172	0.297	0.454	1.000		
X_7	0.174	0.197	0.063	0.106	0.477	0.378	1.000	
X_8	0.255	0.171	0.083	0.058	-0.088	-0.097	-0.039	1.000

All the explanatory variables had positive relationships with the output of coffee (Appendix).

The production funciton model is implicitly expressed as

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8) + U$$

where Y = output of coffee (bags)

X_1 = age of farmer (years)

X_2 = family size (number of persons)

X_3 = level of education (years)

X_4 = farming experience (years)

X_5 = farm size (ha)

X_6 = labour used on the coffee farm (mandays)

X_7 = capital

X_8 = Dummy variable for coffee

U = error term.

Note: 1 bag = 66Kg.

Of the three functional forms tried, the double-log form gave the best fit in terms of the overall F-ratio, coefficient of multiple determination (R^2), the statistical significance of the regression coefficients and the signs on the regression coefficients. Details of the estimated models along with the computed statistics are presented in Table 4.20.

Table 4.20: Summary of Multiple Regression Analysis for Coffee Production.

Variable	Linear	Semi-log	Double-log
Age (X_1)	-0.083 (0.48)	-3.81** (2.33)	0.12 (0.27)
Family size (X_2)	0.14* (0.11)	1.09 (0.98)	0.24* (0.11)
Educational level (X_3)	0.17 (0.26)	0.83 (0.64)	-0.0032 (0.074)
Farming experience (X_4)	0.51 (0.45)	2.42 (1.99)	0.38** (0.23)
Farm size (X_5)	2.53* (0.46)	1.63* (0.57)	0.47* (0.07)
Labour (X_6)	0.021 (0.017)	0.55 (0.81)	0.065 (0.095)
Capital (X_7)	0.00018* (0.0001)	2.54* (0.48)	0.26* (0.07)
Dummy Variable (X_8)	2.38* (0.49)	2.05 (0.567)	0.19* (0.06)
Constant (b_0)	-5.13	-18.79	-2.30
R-square (R^2)	0.657	0.548	0.742
Overall F	25.57	16.21	38.50

$\alpha = 5\%$: $t_{.025, 30} = 1.96$

$\alpha = 10\%$: $t_{.05, 30} = 1.645$

* statistically significant at 5% level

** statistically significant at 10% level

All others: insignificant at 10% level.

Values in parantheses represent standard errors.

Result of the multiple regression shows that family size, farming experience, farm size, capital and the type of coffee had significant effects on the output of coffee, while age of the farmer, his educational level and labour used on the coffee farm did not.

Farm size had a significant effect on the output. This could probably be due to better management, crop combination and greater efficiency in the use of productive resources. The effect of farming experience was significant and this could be related to the acquisition of farming skills and managerial expertise over the years.

Level of education, which had a non significant positive relationship with the output of coffee, could probably be due to the absence of modern inputs and technology. An increase in educational level will increase the farmer's ability to use modern farm inputs such as fertilizers and hybrid seeds and adopt available technologies. The subsistence level of farming, which is purely traditional, may be an explanatio for the non-significant nature of the effect. However, the overall regression equation was significant at five per cent level. This is because the F-cal (38.50) was greater than the F-tab (2.15) at that level.

4.7 Effect of Labour and Capital on the Output of Cocoyam and Coffee.

Capital influences the sources, types and amount of labour used on cocoyam and coffee farms. Capital here includes cash and farm tools/equipment which might determine the amount of labour that could be hired. Okpukpara (1996) noted that a meaningful agricultural production could only be achieved if enough labour is available

at the right time. He opined that because family labour is mostly in short supply during the work peak periods of agricultural production, farmers always hire labour to make up for the shortages during the peak periods in farming. However, in this case, the farmers hardly hire labour, rather, exchange/communal labour was used. Moreover, the simple correlation coefficients between labour and capital were relatively low (0.134) and (0.377) compared with the overall degree of multiple correlation coefficient (0.42) and (0.74) for cocoyam and coffee respectively.

In order to analyse the effects of labour and capital on the output of cocoyam and coffee, the mean values of the variables, except that for labour and capital, are substituted in the production function model and then evaluated. Hence the marginal products for labour and capital can be computed. The mean value of the variables are presented in Table 4.21.

Table 4.21: Mean Values of Variables.

Variable	Mean Value
Age (X_1)	4.43
Family size (X_2)	8.64
Educational level (X_3)	2.76
Farming experience (X_4)	4.32
Farm size (X_5)	1.24* 1.55**
Labour (X_6)	102.05* 67.34**
Capital (X_7)	2761.09* 5812.96**
Output (Y)	200.50* 6.56**
Dummy variable	0.767

* cocoyam : ** coffee

4.7.1 Effects of Labour and Capital on Cocoyam Output

The model expressing the economic relationships among the variables is represented by the production function model in its double-log form.

$$Log\ Y = b_0 - 1.83 \log \bar{X}_1 + 0.34 \log \bar{X}_2 + 0.35 \log \bar{X}_3 + 0.96 \log \bar{X}_4 + 0.077 \log \bar{X}_5 + 0.84 \log X_6 + 0.98 \log X_7 \quad \text{Eqn.1}$$

where $\bar{X}_i$ = mean values and i = 1 - 7.

Substituting the mean values of the X_is except labour and capital into the estimated production function, equation (2) is obtained.

$$\begin{aligned} Log\ Y &= -6.97 - 1.83(\log 4.43) + 0.34(\log 8.64) \\ &\quad + 0.35(\log 2.76) + 0.96(\log 4.32) + 0.077(\log 1.24) \\ &\quad + 0.84 \log X_6 + 0.98 \log X_7 \\ &= -7.063 + 0.84 \log X_6 + 0.98 \log X_7 \end{aligned} \quad \text{Eqn. 2}$$

Equation (3) is obtained from equation (2) by using the respective antilogs. Hence

$$Y = 0.000000087\ X^{0.84}\ X^{0.98} \quad \text{Eqn. 3}$$

The result shows that the output of cocoyam is depended on labour and capital. Since the F-calculated from data (11.32) is greater than the critical -F from table (3.06), it signifies that the overall regression equation was statistically significant at the five per cent level.

The factor intensity ratio (b_7/b_6) is given by 0.98/0.84 i.e. 1.2 that is the intensity of use of capital and labour in cocoyam production is not significantly different, since the intensity ratio is close to 1. The efficiency factor b_0 measures the managerial

the intensity ratio is close to 1. The efficiency factor b_0 measures the managerial efficiency. It has a value of 0.000000087 which is low. The parameter estimates, $b_6 = 0.84$ and $b_7 = 0.98$, give the elasticities of output with respect to labour and capital respectively. The marginal products obtained by partial differentiations are;

$$\frac{dy}{dX_6} = MP_{X_6} = 0.84\frac{Y}{X_6} > 0$$

$$\frac{dy}{dX_7} = MP_{X_7} = 0.98\frac{Y}{X_7} > 0$$

and the second derivatives are

$$\frac{d^2y}{dX_6^2} = 0.84(0.84 - 1)\frac{Y}{X_6^2}$$

$$= -0.134\frac{Y}{X_6^2} < 0$$

$$\frac{d^2y}{dX_7^2} = 0.98(0.98 - 1)\frac{Y}{X_7^2}$$

$$= -0.020\frac{Y}{X_7^2} < 0$$

The marginal products of both labour and capital are positive indicating that increases in labour and/or capital will yield positive marginal products.

Considering the first and second derivative of the estimated production function one can observe that the production of cocoyam is in the economic region of production where the marginal products are positive and decreasing. Therefore from the results of the estimated model, $\hat{b}_6 + \hat{b}_7 = 0.84 + 0.98 = 1.82$ which is more than one, indicates the presence of increasing returns to scale.

The analytical result shows that not only were labour and capital positively related to the output of cocoyam, they were also statistically significant at the five per cent level. The coefficient of multiple determination

$$R^2_{Y.X_6X_7} = 0.42$$

means that 42 per cent is the proportion of variation in cocoyam output that is explained by the factor inputs (labour and capital). The adjusted coefficient of multiple determination

$$\overline{R}^2_{Y.X_6X_7} = 0.385$$

implies 38.5 per cent of the changes in cocoyam production is accounted for by variations in labour and capital inputs, after adjusting for the intercept term.

In other words it can be said that important variables which affects the output of cocoyam are left out in the model. That only 42 per cent of the variation in total yield could be explained by the farmer's level of labour and capital involvement could be explained on the basis of prevalence of pests and diseases, poor plantable setts, poor (infertile) soils and non application of agrochemicals. It would be on this premise that it is accepted that labour and capital influence the output of cocoyam in the area.

4.7.2 Effects of labour and capital on coffee output

The result of regression that measured the effect of labour and capital on the output of coffee is as shown.

$$\begin{aligned}\text{Log } Y &= -2.30 + 0.12(\log 4.43) + 0.24(\log 8.64) - 0.0003(\log 2.76) \\ &\quad + 0.38(\log 4.32) + 0.47(\log 1.55) + 0.19(0.767) \\ &\quad + 0.065 \log X_6 + 0.26 \log X_7 \\ &= -1.52 + 0.065\log X_6 + 0.26 \log X_7\end{aligned}$$

Taking the antilog

$$Y = 0.03\, X_6^{0.065}\, X_7^{0.26}$$

where the mean values of the variables were substituted except that for labour and capital.

The result shows that the output of coffee is depended on labour and capital. Since the F-calculated from data (38.50) is greater than the critical-F (3.06) from tables, it signifies that the overall equation is statistically significant at five percent level. The factor intensity ratio (b_7/b_6) for coffee production is high (4). This indicates the capital intensive nature of the farming operations involved in coffee production.

The parameter estimates, $\hat{b}_6 = 0.065$ and $\hat{b}_7 = 0.26$, give the elasticities of output with respect to labour and capital respectively. The marginal products obtained by partial differentiation are

$$\frac{dy}{dX_6} = MP_{X_6} = 0.065\frac{Y}{X_6} > 0$$

$$\frac{dy}{dX_7} = MP_{X_7} = 0.26\frac{Y}{X_7} > 0$$

and the second derivatives are

$$\frac{d^2y}{dX_6^2} = 0.065(0.065 - 1)\frac{Y}{X_6^2}$$

$$= -0.061\frac{Y}{X_6^2} < 0$$

$$\frac{d^2y}{dX_7^2} = 0.26(0.26 - 1)\frac{Y}{X_7^2}$$

$$= -0.192\frac{Y}{X_7^2} < 0$$

Thus the marginal products of both labour and capital are positive, indicating that an increase in labour and/or capital input will yield positive marginal products.

Considering the first and second derivatives of the estimated production function, one can observe that the production of coffee is economically efficient since production is carried out in the economic region of production where marginal products are positive and decreasing. This agrees with the view of Wallis (1979) who asserted that the Cobb-Douglas production function would indicate production in the economic region if $0 < b_6 < 1$ and $0 < b_7 < 1$. From the model, $\hat{b}_6 + \hat{b}_7 = 0.065 + 0.26 = 0.325$ which is

less than one, indicating the presence of decreasing returns to scale. Further application of input factors at this stage would lead to an increase in output. In the Production function model, the parameter b_0 is a measure of the managerial efficiency. It changes output for given input quantities. Here with a given combination of factors inputs, it measures the efficiency of the various farmers in production.

The coefficient of multiple determination,

$$R^2_{Y.X_6X_7} = 0.74,$$

measures the goodness of the fitted regression plane to the sample data. That is 74 per cent is the proportion of variation in coffee output that is explained by the factor inputs (labour and capital). The adjusted coefficient of multiple determination

$$\bar{R}^2_{Y.X_6X_7} = 0.723$$

implies that 72.3 per cent of the changes in coffee production is accounted for by variations in labour and capital alone.

From the results of the production model it shows that socio-economic variables, affect the output of cocoyam and coffee.

4.8 Constraints to Increased Cocoyam and Coffee Production

4.8.1 Constraints to Increased Cocoyam Production

The study revealed that several factors militated against increased cocoyam production in the study area (Table 4.21).

Table 4.22 shows that lack of finance is the most important constraint to increased cocoyam production in the area. This is true because most of the primary producers in Africa and Cameroon alike are resource poor (Swaminathan, 1987). Private savings are mainly used for investment. Since these are smallholder farmers this source of funding is insufficient to expand or increase their cocoyam production. This poor financial base may be attributed to low production and low saving ability of the farmers as well as their inability to secure loans from banks among others.

The second important constraint is that of pests and diseases attacking cultivated crops. Pests and disease are prevalent in the study area and have had adverse effects on cocoyam production. Pests, such as grass cutters, bush fowls and monkeys, and diseases, such as the 'panama', root rot, and leaf blight could reduce yield of cocoyam to an unbearable level (Hahn, 1987; IITA, 1986). Lyonga and Nzietchueng (1986) and Simarki *et al* (1992) reported that diseases of cocoyam can reduce the yield by up to 90 per cent.

The third important constraint to increased cocoyam production is poor (infertile) soil. This could be due to continuous cropping of the farm lands and the high nutrient requirement needed for cocoyam production. This could also be due to lack of fertilization because of the high cost of fertilizers.

Table 4.22: Distribution and Ranking of the Constraints to Increased Cocoyam Production in Momo Division:

Constraints	Frequency*	Percentage*	Rank
High cost of acquiring land	85	73.3	4th
High cost of farm inputs	85	73.3	4th
High cost of labour	30	29.9	8th
Lack of finance	111	95.7	1st
Scarcity of Labour	15	12.9	12th
Scarcity of farm inputs	52	44.8	6th
Problem of poor soil	104	89.7	3rd
Lack of rural (feeder) roads	20	17.2	10th
Problem of pest and diseases	107	92.2	2nd
Unreliable hired labour	5	4.3	14th
Theft in the field	38	32.8	7th
Lack of storage facility	20	17.2	10th
Spoilage during storage	23	19.8	9th
Lack of adequate market	12	10.4	13th
Poor yield	5	4.3	14th
n = 116			

Note* - Multiple responses were recorded.
Source: Field survey Data, 1997.

Another important constraint to increased cocoyam production is high cost of acquiring land. Since cocoyams are grown on fertile land, there is indication that these types of land on which cocoyam need to grow on are scarce and thus many people would have to struggle for the limited ones available. One could either buy the land or rent it for the farming season or for a period of time. In this line even if one has seen a piece of land for rentage his/her lack of finance would not allow him/her to get it for increased cocoyam production. However, after getting a piece of land for cocoyam cultivation, the high cost of farm inputs (planting material and agro chemical) again limits increased production.

Scarcity of farm inputs (planting material and agrochemicals) ranked sixth as a constraint to increased cocoyam production. This could probably be because the cocoyam corms and cormels, which are used for planting, are also used as food and animal feed. Onwueme (1978) reported that up to 10 per cent of the yield of corms is often reserved for subsequent use as planting material. Thus 10 per cent from a meagre harvest becomes insufficient to use for the next planting season if production is to be increased. In most cases, the farmer do not even reserve up to 10 per cent of their harvest, subsequently, the problem of high cost of farm inputs may arise as the little quantity supplied to the markets will have many buyers. Lyonga and Nzietchueng (1986) pointed out that when the farming season is at hand poor supply of plantable setts becomes one of the major constraints to increased cocoyam production. The cost

of purchasing additional plantable setts is too high for the smallholder farmer.

Theft in the field, high cost of labour, spoilage during storage, lack of storage facilities, lack of rural (feeder) roads, scarcity of labour, lack of adequate markets and poor yield were minor constraints to increased cocoyam production in th study area

4.8.2 Constraints to increased coffee production

The constraints to increased coffee production in Momo Division are summarized in Table 4.23. As in the case of cocoyam, although all the problems outlined in the table exist, they do not all affect a single farmer simultaneously. Most of these problems affect the farmer's ability to increase his coffee production in varying degrees. Outstanding among them is the lack of finance. Being smallholder resource poor farmers, their private savings are insufficient to fund an increase in coffee production.

The second important constraint is the problem of pests and diseases. This problem is compounded by the fact that most farmers are not able to identify the diseases attacking their crops such that most times the disease presence is unnoticed until it becomes too late. However, the farmers remarked that diseases like the coffee leaf disease and coffee berry disease can easily be observed, but they do not have solutions to them as the agrochemicals are scarce and when they are available they are very expensive. Also, pests like the black and red stinging ants, and stinging caterpillars make harvesting difficult.

Table 4.23: Distribution and Ranking of Constraints to Increased Coffee Production in Momo Division.

Constraints	Frequency*	Percentage*	Rank
High cost of acquiring land	76	65.5	5th
High cost of farm inputs	95	81.9	3rd
High cost of labour	42	36.2	7th
Lack of finance	112	96.6	1st
Scarcity of Labour	23	19.8	9th
Scarcity of farm inputs	78	67.2	4th
Problem of poor soil	75	64.7	6th
Lack of rural (feeder) roads	9	7.8	12th
Problem of pest and diseases	104	89.7	2nd
Unreliable hired labour	12	10.4	11th
Theft in the field	13	11.2	10th
Lack of storage facility	6	5.2	14th
Lack of adequate market	27	23.3	8th
Poor prices	7	6.0	13th
n = 116			

Note *-Multiple responses were recorded
Source: Field Survey Data, 1997.

The high cost of farm inputs also constrains the farmer's activities in terms of increasing coffee production. When the improved planting seedlings, fertilizer, pesticides, fungicides and herbicides are available, their prices are so exorbitant (eg an imperial gallon of Gammalin 20 was 5000frs cfa) that the smallholder farmers find it difficult to purchase.

Scarcity of farm inputs such as planting materials, fertilizer, fungicides, pesticides and herbicides also constraints increased coffee production. The farmers hardly have access to these improved planting materials and agrochemicals due to their lack of finance and small holding nature.

The fifth important constraint is the high cost of acquiring land. In the study area land is the most important factor in coffee production when all other things are held constant. This could be because of the wide planting distances of 2.5m by 2.5m or 3m by 3m required in coffee production. Even when one is highly interested in increasing his coffee production his lack of finance would increase his ineffectiveness in demand for land.

The problem of poor (infertile) soil militated against increased coffee production. Coffee, especially arabica, needs a good soil in order to give a good harvest. This may explain why most of the arabica coffee farmers keep livestock, like cattle and other ruminants. The dungs of these animals are used as manure in their coffee farms.

High cost of labour, lack of adequate market, scarcity of labour, theft in the field unreliable hired labour, lack of rural (feeder), roads, poor prices and lack of storage facility were minor constraints to increased coffee production in the study area.

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The overall purpose of this study was to investigate labour use on smallholder food and cash crop farms, particularly that on cocoyam and coffee farms in Momo Division, North-West Province, Cameroon. Multi-stage random sampling technique was adopted in the selection of the farmers/respondents. The results of this study are however based on information provided by 116 farmers who completed the questionnaires.

The results of the study showed that farmers are relatively older (81 per cent above 40 years) and not literate (58.6 per cent with no formal education). Farm sizes per family ranged from less than a hectare to approximately four hectares for cocoyam and from less than a hectare to seven hectares for coffee. The average farm size was 1.24 hectares for cocoyam which were mostly located farther away from the homestead and 1.54 hectares for coffee, which was mostly within the compound. Majority of the farmers (55.2 per cent) have been farming for over 20 years.

Land ownership was mostly through inheritance (53 per cent), direct purchase (20 per cent) and leasehold (14.8 per cent) for cocoyam. Sixty-eight per cent of the farmers indicated that the land for coffee production was acquired through inheritance and 27 per cent through purchase. The average number of farm fields was 3.4 for cocoyam and 1.6

for coffee. In addition to family labour, the farmers used hire labour and exchange/communal labour. On aggregate basis, family labour ranked first followed by exchange/communal labour, and finally, hired labour for the two crops.

Men, women and children served as sources of labour for the performance of the different operations on cocoyam and coffee farms. There was sex stereotyping of the farm operations for cocoyam production. However, most of the farming activities involved in coffee production, though which were not performed in the survey year, like pruning, spraying of chemicals and fertilizer application, were traditionally ascribed to men. On the average, men contributed 8.1 per cent of the total labour required for cocoyam production, women 70.6 per cent and children 21.3 per cent. For coffee production men ranked highest in their labour contribution with 58.5 per cent, followed by children 21.5 per cent and women 20 per cent of the total labour required.

Family labour was sourced for in all the farming operations in cocoyam production accounting for 81.4 per cent of the total labour. Hired and exchange/communal labour were used only during land clearing, ridge making and weeding and accounted for five and 14 per cent of the total labour, respectively. Family labour was also the major source of labour in coffee production accounting for 87 per cent of the total labour, followed by hired labour, 8.6 per cent, and exchange/communal labour, 4.6 per cent. The latter two were mostly used during weeding and harvesting of coffee.

Labour allocation pattern to the different farm operations (1996) showed that weeding took 31.4 per cent (highest) of the total labour required for cocoyam production, followed by ridge making (21.6 per cent) and harvesting (19.6 per cent). In coffee production, harvesting was the most important farm operation in terms of labour requirement (52.9 per cent), followed by weeding (29.4 per cent). The factors that determined the size of the labour force on cocoyam and coffee farms were the same, except that their contributing percentages varied, viz, family size, farm size, type of farming operation among others.

Hoes, cutlasses and baskets were the major farm tools used by both cocoyam and coffee farmers. There was no form of mechanization of any of the farm operations. Mixed cropping was the commonest cropping pattern adopted by farmers in the area. Cocoyams were planted at 0.5m to 2.0m apart depending on whether cocoyam was the major crop or minor crop. The coffee stems were planted at either 2.5m by 2.5m or 3m by 3m.

The effects of socio-economic variables, on the output of cocoyam were investigated using a production function model. The results of the regression showed that age, educational level, farming experience, capital and labour used on the cocoyam farms had significant effects on the output, while family and farm size did not. The positive relationship of output and the explanatory variables except age and capital (appendix) suggests that increases in any of the variables would increase the output of cocoyam.

The effects of socio-economic variables, on the output of coffee was also investigated using a production function model. The results of the regression showed that family size, farming experience, farm size, capital and the type of coffee had significant effects on the output of coffee, while age of the farmer, his educational level and labour used on the coffee farm did not. The positive relationship between the output of coffee and the explanatory variables suggest that increase in and family size for instance, would increase the output of coffee.

The effects of labour and capital on the output of cocoyam and coffee were investigated using the production function model. The result showed that the marginal products for labour and capital for both cocoyam and coffee were positive and decreasing. Thus production was in the economic region. The factor inputs had significant effects on the output of both crops. However, only 42 per cent of the total variation in yield of cocoyam could be explained by the factor inputs, labour and capital. this could be explained by the prevalence of pests and diseases, poor plantable setts, poor (infertile) soils and no application of agrochemicals, among other factors.

Lack of finance, pests and diseases, poor (infertile) soil, which ultimately resulted in low yields, scarcity of labour and high cost of acquiring land, coupled with the scarcity of farm land, among others, acted as constraints to increased cocoyam production in the area. Coffee is the major earner of income in the area and has its identified constraints to increased production as; lack of finance, high cost of acquiring

land for coffee production, scarcity of farm inputs (planting materials and agrochemicals), high cost of farm inputs when they are available, poor prices of produce, poor (infertile) soil, pests and diseases on cultivated stems and high cost of scarce labour.

5.2 Conclusion

Most farmers in Momo Division grow cocoyam primarily for food security and cash, and coffee strictly for cash. These reasons are important for increased production of these crops in the area as cocoyam is the staple food while coffee is the major source of income. A better living standard is expected of the farmers from these enterprises if the present constraints to increased production of the crops are removed by controlling pests and diseases on the cultivated crops, making available farm inputs that is, planting material and agro-chemicals at reasonable prices to improve on the soil fertility level which will consequently increase yield. These will act as incentives to the farmers to achieve increased production thus meeting the increasing demand for home consumption for the teeming population and gaining foreign exchange for the country's economic development.

5.3 Recommendations

Based on the findings of this research the following recommendations are made to encourage increased cocoyam and coffee production in the area.

(i) Introduction of credit schemes for the farmers (both cocoyam and coffee farmers) will help in alleviating their financial problems. This will enable the farmers to

purchase more good land and agricultural farm inputs (planting materials and agrochemicals) for increased cocoyam and coffee production.

(ii) Available research findings in the production and processing of coffee should be brought to the knowledge of farmers for their adoption.

(iii) Coffee farmers should be encouraged to form variable cooperatives to enable them benefit from the several government agencies like MIDENO in terms of input purchases at reduced costs.

(iv) Cocoyam farmers should be encouraged to form cooperative groups . This will enable them to better organise their purchasing and marketing activities as well as learn a handwork during their slack periods of work. They will also be able to get relief during peak periods of labour demands as cooperatives are usually larger than five members, therefore exchange/communal labour which is important in the area will further make the farm activities to be promptly carried out.

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APPENDIX

Correlation coefficients of socio-economic variables and labour with the output of cocoyam and coffee.

For Cocoyam		For Coffee	
I	Y	I	Y
Y	1.000	Y	1.000
X_1	-0.048	X_1	0.230
X_2	0.299	X_2	0.452
X_3	0.098	X_3	0.215
X_4	0.089	X_4	0.339
X_5	0.276	X_5	0.699
X_6	0.385	X_6	0.543
X_7	-0.005	X_7	0.512
		X_8	0.245