# MODAL FARM PLANS FOR TOBACCO FARMERS IN EJURA AND WENCHI AREAS OF GHANA

A Thesis

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by

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# CHAPTER ONE

# INTRODUCTION

The first section of this chapter states the objectives and the procedure adopted for the study and gives reasons for choosing the Ejura and Wenchi areas for the study and centering it around tobacco. This is followed by brief discussions of the geography of the two areas and the characteristics of the tobacco farmers. Agriculture in the two areas is then discussed and some of the bottlenecks to increased agricultural production highlighted. The final sections of the chapter trace briefly the history of the development of tobacco industry in Ghana as a whole and in the Wenchi and Ejura areas in particular stressing the role of the Ghana Tobacco Company.

## The Objectives and Procedure of the Study:

A knowledge of the opportunities open to farmers and an understanding of the constraints facing them is needed to devise an appropriate agricultural policy. This information can be presented in a summary form in a modal farm plan. The plan can be revised to show the effects of removing or altering some of the constraints and, hence, serve as a guide to policy formulation. It might also serve to assist extension workers in giving advice to farmers and possibly to help the farmers themselves. The objective of this study, therefore, is to formulate a modal farm plan for tobacco farmers in the Wenchi and Ejura areas of Ghana. The plan will indicate the various (existing) farm enterprises and the levels at which

they should be combined within the existing constraints to give 'optimum' returns to the farmers. Aspects of the study include the following:-

1. A listing of the alternative enterprises open to tobacco farmers in the Wenchi and Ejura areas.
2. Current cropping patterns.
3. Estimation of the various inputs, production costs and the relative returns from different existing farm enterprises.
4. Recent changes in cropping patterns and an appraisal of factors contributing to increased and/or decreased tobacco production and the production of other crops in the Wenchi and Ejura areas.

The study is centred around tobacco production. Although it has a relatively recent history, tobacco is the most commercialized crop in the two areas (the degree of commercialization being defined here as percentage of marketed surplus to total output). The production of tobacco is still flourishing and it is said to be the crop which gives the greatest returns to farmers in both areas. Hence, the hypothesis is made that any farming programme designed for the two areas, which has in view increased incomes and a better standard of living for the farmers, should be designed or built around tobacco production. The study is facilitated by the fact that tobacco is the only important cash crop in the two areas whose production is organised and controlled by an established agency and for which records could be easily obtained.

The Ejura and Wenchi areas were chosen for the study firstly because the two areas have been the largest producers of leaf tobacco in the country since the Pioneer Tobacco Company (PTC) started operations in 1953.

Secondly, Ejura seems to be one of the areas in Ghana where considerable change in agricultural techniques has occurred in recent years, particularly with reference to mechanization, whereas in the Wenchi area much less change has occurred. A contrast between the two areas should reveal the importance of different constraints on farming patterns. Thirdly, the two areas are in the same ecological zone in which a wide range of crops can be grown. Thus an opportunity is provided to study the relationship between tobacco and other crops. Finally, the writer had worked on tobacco production in the Ejura area; was familiar with the two areas and could speak the language of the farmers.

The study is based primarily on the analysis of returns to questionnaires given by tobacco farmers selected at random in the Wenchi and Ejura areas. The first set of interviewing was conducted from July to September 1969 in the Ejura tobacco area in connection with a dissertation presented for the B.Sc degree. At that time a list of all tobacco farmers during the 1968 tobacco season was obtained from the State Tobacco Products Corporation (STPC) now Ghana Tobacco Company (GTC). Numbers were assigned to the farmers and 122 (about a third of them) were selected for interviewing using a table of random numbers. Of these, 111 farmers answered the questionnaires completely and 11 answered in part. Using the same procedure and a revised questionnaire, 42 tobacco farmers were selected and interviewed in the Wenchi area from September 20th to October 8th, 1970. Again, to follow up events in the Ejura area, 15 tobacco farmers were randomly selected from the original list and interviewed using the revised questionnaire from November 11th to November 19th, 1970.

The writer undertook all the interviews and recorded the results on

prepared questionnaire forms. No major problems were encountered in obtaining information from the farmers. This was largely because the assistance of a GTC personnel was obtained everywhere the writer went in both of the areas. Farmers' suspicions were, therefore, not aroused. It should be emphasised however, that apart from the introduction of the writer to the farmers, the interviews with them were conducted independently of the GTC personnel. The farmers were able to answer in confidence and in some cases even to criticize the GTC.

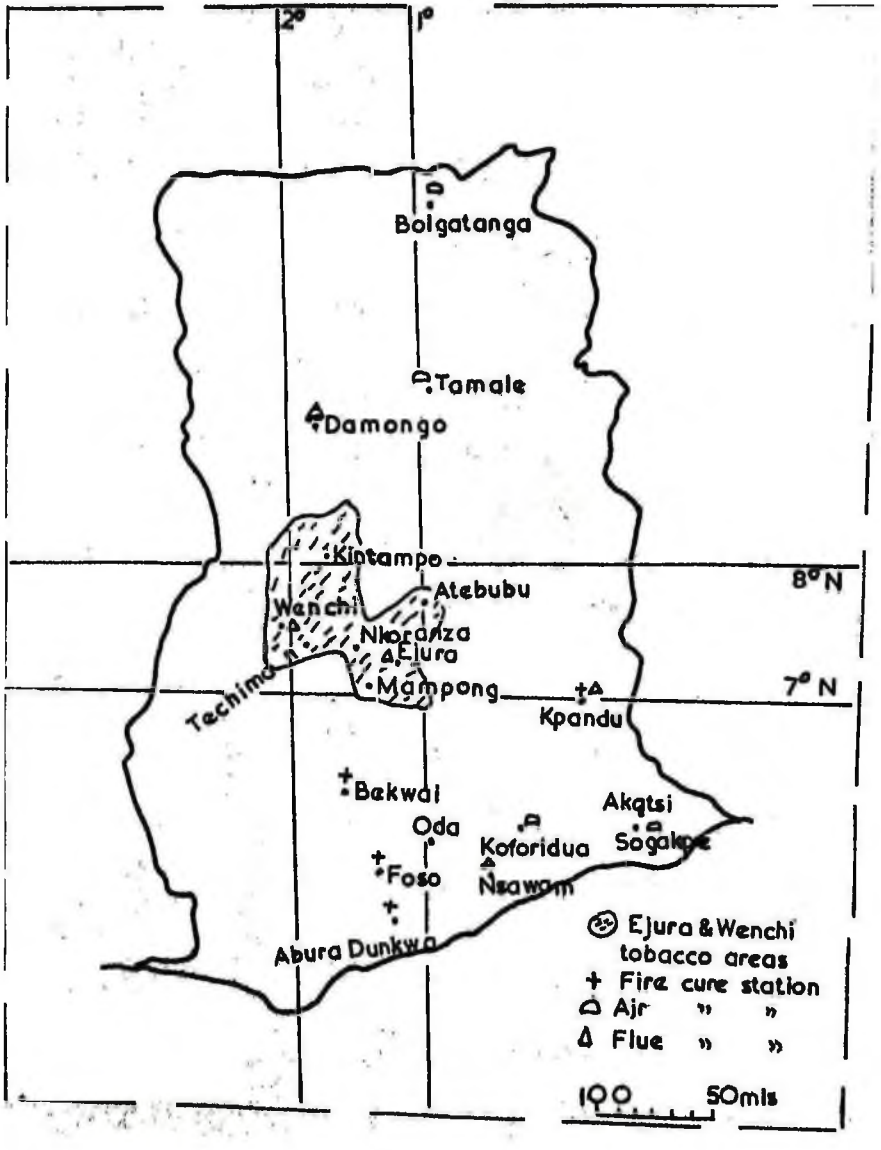
In addition to using questionnaires, the writer held a number of discussions with the Agricultural Officers and the Technical Agricultural Officers in charge of the two areas. He also had talks with the Deputy Managing Director (who is also the Production Manager) of the GTC and the Leaf Adviser of PTC, both of whom are directly involved in the formulation of tobacco production policies in the country. Discussions were also held with Area Tobacco Managers, the Tobacco Superintendents, and the Area Tobacco Officers of the GTC at Wenchi and Ejura. The writer also had talks with a number of field staff of the GTC in the two areas.

## The Geography of the Ejura and Wenchi Tobacco Areas

### 1. Location and Size.

The Ejura and Wenchi Tobacco areas are situated between latitudes $7^{\circ}$N and $8^{\circ}15'$N and between longitudes $1^{\circ}$ and $2^{\circ}15'$ West of the Greenwich Meridian (Map 1). Together, the two areas cover an area of about 1,700 square miles and occupy parts of the Kintampo, Wenchi, Attebubu and Mampong Agricultural districts. The Ejura Tobacco area stretches from Kumawu, through Mampong, Bosomkekye along the main Kumasi-Tamale trunk road to

# MAP I TOBACCO STATIONS IN GHANA



Attebubu in the Brong Ahafo Region (a distance of about 90 miles by road). It also covers several villages east and west off this main road. The most important of these villages include, Sekyereodumasi, Ahyiaemu, Mem and Babaso.

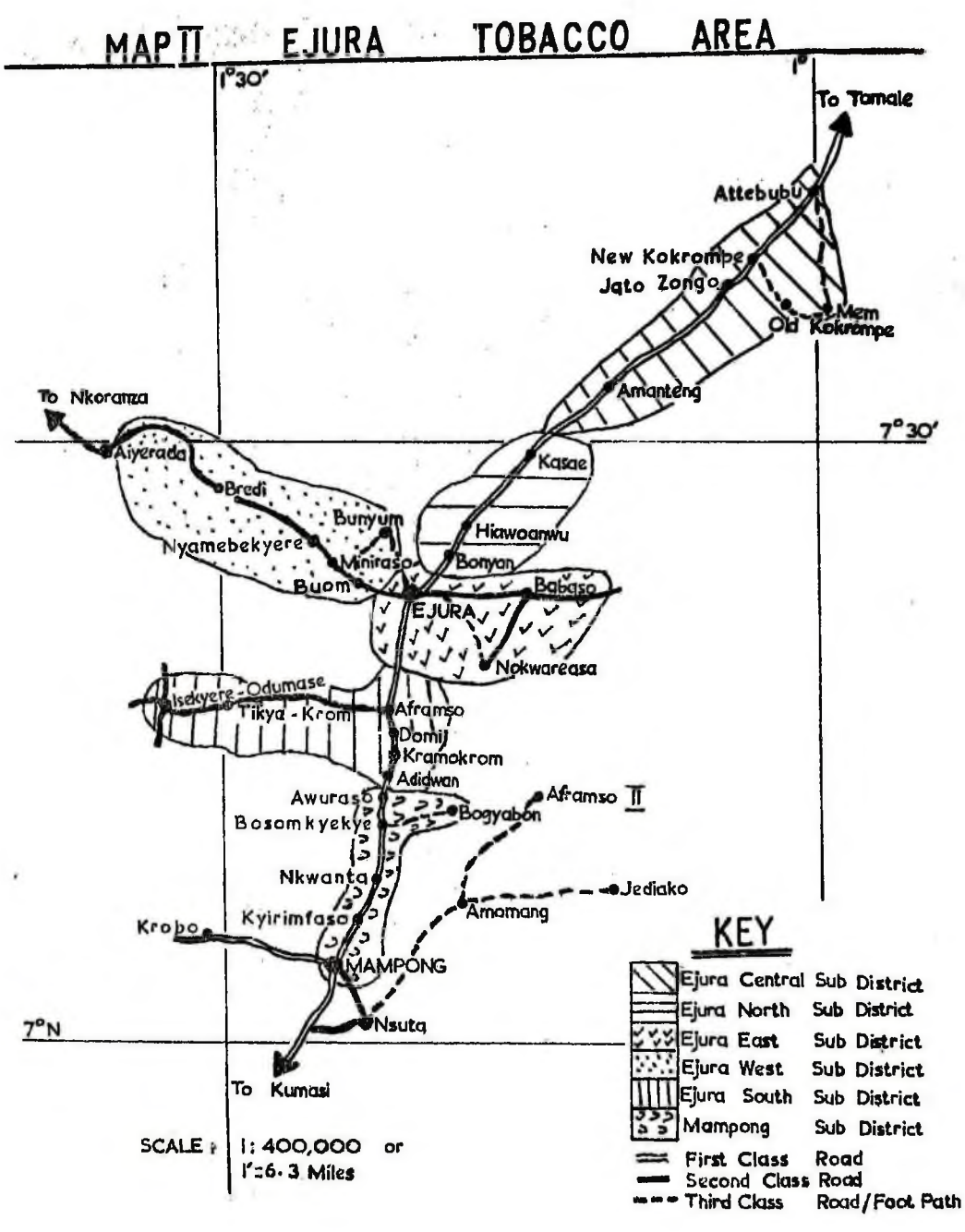
To facilitate administration, the Ejura area has been divided into six sub-districts viz: Ejura North, South, East, West, Central and the Mampong sub-districts (Map II). But these are all currently administered from the Ejura Tobacco Station.

Compared to the Ejura Tobacco area, the Wenchi Tobacco area is much larger. On the Kumasi-Wa truck road, it extends from about five miles south of Techniman to Subinso about 50 miles northwards. It stretches to such distant places as Tromeso and Offuman (Map III). It also includes the whole of the Nkoranza local council area. Also for the purposes of efficient administration, the Wenchi Tobacco area has been divided into two main tobacco districts - the Wenchi and the Kintampo districts. These are further divided into sub-districts. Thus, the Wenchi district comprises th Wenchi and Techiman sub-districts, while the Kintampo tobacco district comprises the Kintampo and Nkoranza sub-districts.

2. Climate, Vegetation and Relief:

The two tobacco areas occupy the same ecological or geographical zone. Rainfall in the two areas is seasonal and variable from year to year. There are two rainfall regimes. The major rainfall season starts in early March, reaches its peak in June and tapers off through July. The mean annual rainfall during this season is 36.9 inches in the Wenchi tobacco districts, 40 inches in the Kintampo district and 40 inches in the Ejura tobacco area.

There is a fairly well distributed rainfall throughout the growing



period for tobacco from April to July. The minor rainfall season begins in September, reaches its peak in October and lasts into November. The mean rainfall for this season is 13 inches for Ejura Central sub-districts, 16 inches for the rest of Ejura area, 15 inches for Wenchi tobacco district and 13 inches for the Kintampo district.

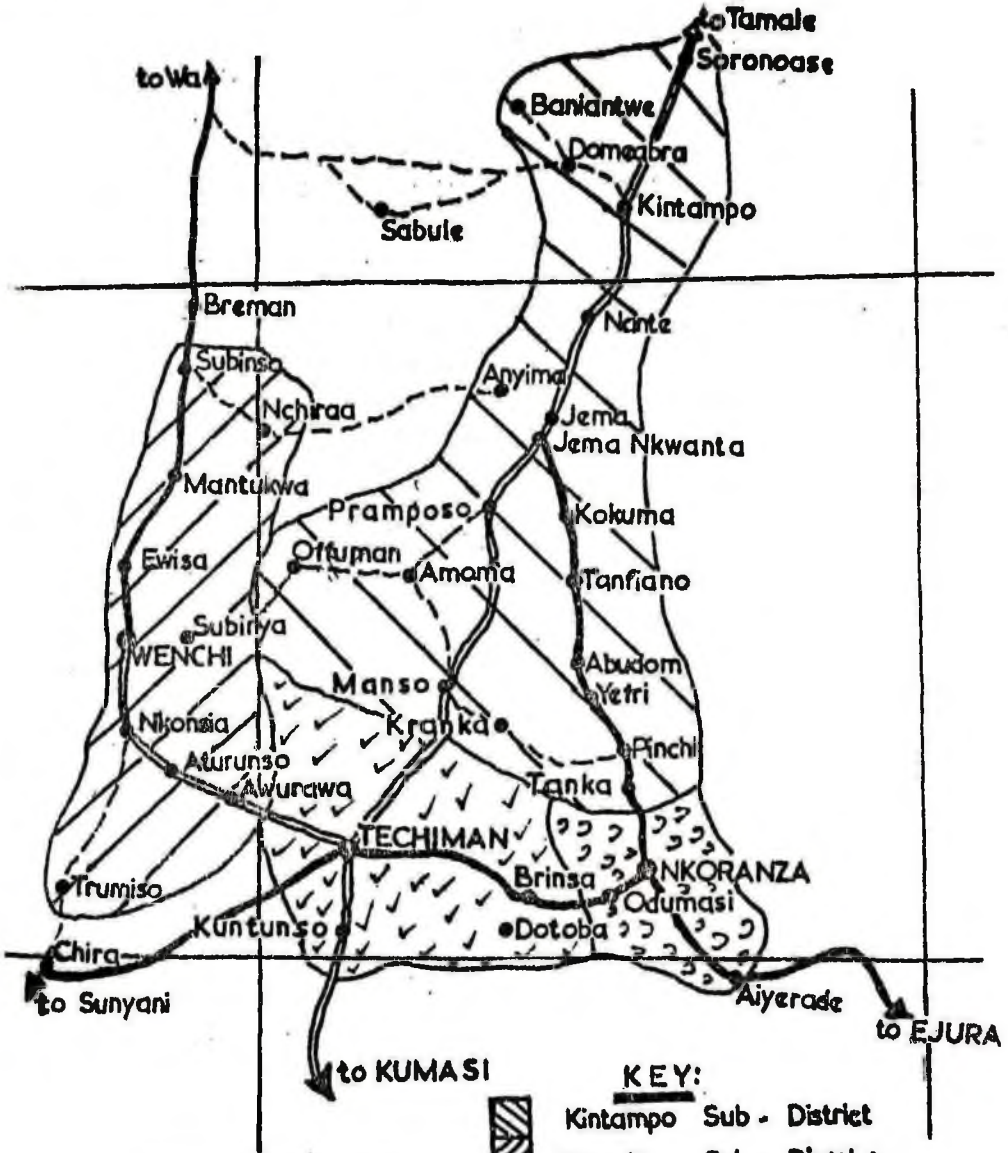
The mean total annual rainfall for the Ejura area is 56.8 inches, Wenchi district 51.6 inches and 53.3 inches for Kintampo district.

The vegetation in the southern parts of both areas (most parts of the Mampong, Ejura south sub-districts and the Techiman and Nkoranza sub-districts) is typical deciduous forest. In both areas this is followed northwards by a transitional zone and then by Guinea Savanna.

Most parts of the Wenchi tobacco area have a topography which is moderately undulating. In the Ejura area, however, the topography is gentle over the whole area except in the southern parts (around Sekyereodumasi and Mampong) where it is moderately undulating. The gentle topography has enabled a greater degree of development of mechanization in the Ejura area than in common in other parts of the country.

The predominant soil types in both tobacco areas are the Savanna ochrosols. These soils are well developed; they are sandy-loam, free-draining and quite

MAP III. WENCHI TOBACCO AREA.



high in mineral content. They are therefore the types most suitable for tobacco production.

Land Tenure and The Land Used For Tobacco Production:

The same land tenure system operates in both the Ejura and Wenchi areas as in most other parts of the country. No land is unowned. Individuals possess usufruct rights to land and they cannot dispose of it. Ownership of land is vested in the Stools or the chiefs who hold the lands in trust. An individual establishes his right over the use of land by being the first to bring that piece of land under cultivation. As long as he continues to use the land or he is able to show evidence of his previous occupation no one can deprive him of the use of that tract of land.

Immigrants may obtain farm lands either through free grants by Chiefs or family heads, through the offering of 'drinks' or through a system of share cropping. In the Ejura area where there is a great demand for agricultural land, land is no longer given freely to strangers. Strangers have to pay first a consideration fee (aseda) of between N¢2.10 and N¢8.40 to the chiefs depending upon the size of land they wish to cultivate. They then pay annual rents of N¢4.70 and 50np per acre of land acquired to the chief and the Local Council respectively (6, p.5). Under the share cropping system, a tenant grows maize, yams, tobacco or any annual crop (not a tree crop) and shares the harvest equally with the landowner. Under this system which is referred to commonly as abunu, the landowner contributes his land while the tenant incurs all the production costs.

It was found from the surveys that land tenure arrangement does not

impose very serious restriction to tobacco and other annual crop farming in the two areas. For example, 71% and 79% of the farmers interviewed in the Ejura and Wenchi areas respectively, said they had no problems in getting lands for tobacco and other agricultural purposes. These farmers were using 'free-hold' ancestral land and according to them what prevent them from operating more acreages of the crops they produce are capital, labour and in the case of tobacco, the acreage quota of not more than two acres imposed by the GTC. The GTC imposes this quota in the hope that farmers will improve their yields (per acre). The implications of this policy are discussed in this paper (Pages 72-73).

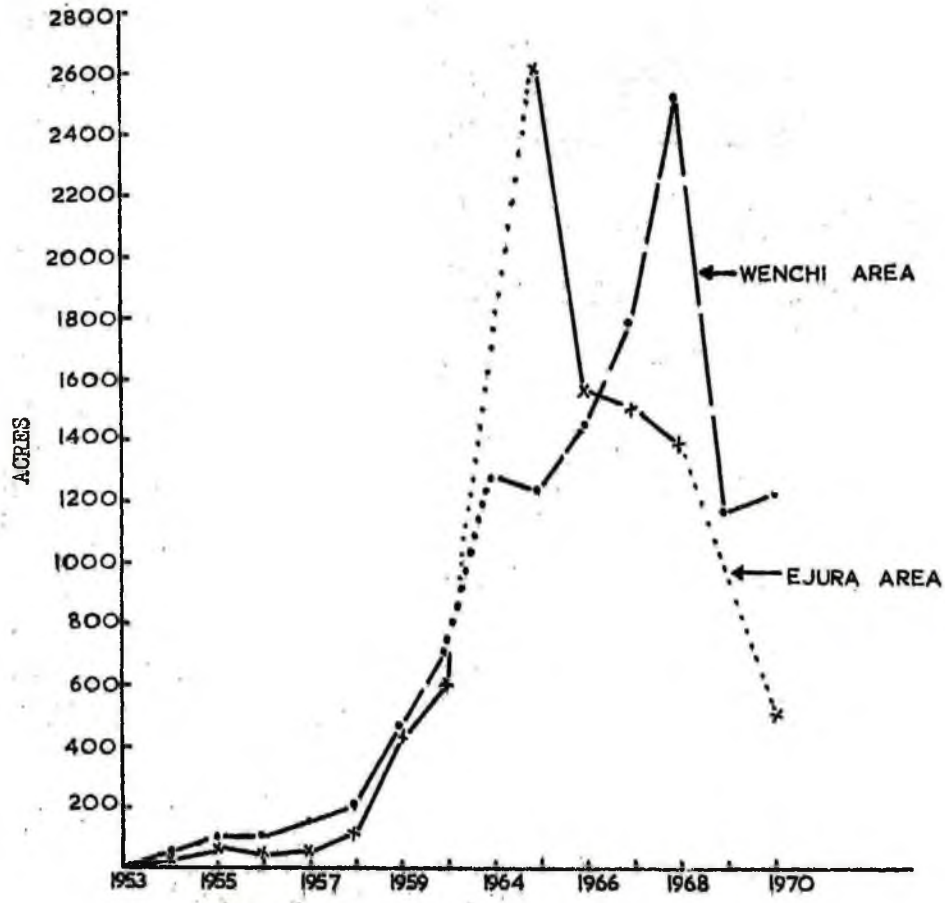
A fair percentage of the farmers covered by the surveys (22% in the Ejura area and 5% in the Wenchi area) were operating on rental lands.

The surveys revealed that lands which are very near to the villages are preferred by the farmers. Thus, the average distance from a tobacco farm to the villages was found to be only half a mile in the Wenchi area - the range being from one-quarter of a mile to one and half miles. In the Ejura area the average distance was one mile and the range was from a little less than one-tenth of a mile to four and half miles. The farmers claimed that the nearness of their tobacco farms to their villages eases the problem of conveying the green leaves

from the farms to the curing barns which are usually sited at the outskirts of the villages. Tobacco farmers in the Ejura area seem to be siting their tobacco farms farther away from the villages because of soil suitability and intense competition between tobacco and the other crops for land.

The total land area utilized for tobacco production in both areas is very small relative to the area occupied by the other crops and the area of unfarmed land. Figure 1 gives the acreages of land which have been cropped with tobacco in the two areas from 1953 to 1960 and from 1965 to 1970. The table shows that tobacco as a farm enterprise has grown remarkably in size over the years in the two areas. It shows, however, that in recent years the size of the enterprise (as measured in terms of acreage) is on the decline. The marked drop in the acreages produced from 1968 crop year is explained by the restriction imposed by the STPC/GTC on the number of acres produced per farmer and by the large numbers of farmers who dropped tobacco production when the GTC stopped buying green leaf tobacco.

FIG I ACREAGES OF TOBACCO PRODUCED IN EJURA & WENCHI AREAS 1953/60 & 1964/70*




SOURCE: APPENDIX TABLE 3.

## The Characteristics of Tobacco Farmers in the Ejura and Wenchi Areas

### 1. Farmers' Origin, Age and Educational Background

Tobacco farmers in both Ejura and Wenchi areas operate their own farms. No absentee farmer was encountered. Most of the tobacco farmers in both areas are indigenous but a greater proportion of immigrant farmers were found in the Ejura area than in the Wenchi area. These facts are presented in Table 1. The large number of immigrant farmers in the Ejura area can probably be explained by the enormous agricultural potential of the area.

TABLE 1. ORIGIN OF TOBACCO FARMERS IN EJURA AND WENCHI AREAS

| | Ejura Area (1969) | | Wenchi Area ('70) | |
|---|---|---|---|---|
| | No. | % | No. | % |
| Indigenous Farmers .... .... .... | 79 | 71 | 37 | 88 |
| Immigrants .... .... .... | 32 | 29 | 5 | 12 |
| Origin of Immigrant Farmers | | | | |
| Aliens .... .... .... | 10 | - | 0 | - |
| Other parts of Ghana .... .... | 22 | - | 5 | - |
| Years of Settlement of Immigrant Farmers | | | | |
| Less than 5 years .... .... | 16 | - | 2 | - |
| 5 years and over .... .... | 16 | - | 3 | - |
| Total Number of Farmers .... .... | 111 | 100% | 42 | 100% |

It was observed from the surveys that tobacco farming in both areas has attracted young farmers and that many of the farmers are literates as shown in Tables 2 and 3 respectively. Most of the farmers interviewed in both areas

were around forty years old (Table 2). The age distribution given in Table 3 suggests that tobacco farmers in both areas are relatively young compared to farmers in some other agricultural enterprises. For example, a study by Rourke (15) showed that cocoa farmers in the Tepa district (Ashanti Region) and Suhum-Mangoase district (Eastern Region) were considerably older on the average than the tobacco farmers in the Wenchi and Ejura areas.

TABLE 2. AGE DISTRIBUTION OF TOBACCO FARMERS IN EJURA AND WENCHI AREAS

| Age | Ejura Area No. | Ejura Area % (of Farmers) | Wenchi Area No. | Wenchi Area % (of Farmers) |
|---|---|---|---|---|
| 15 - 24 years .... | 9 | 8 | 1 | 2 |
| 25 - 34 years .... | 22 | 20 | 10 | 24 |
| 35 - 44 years .... | 38 | 34 | 13 | 31 |
| 45 - 54 years .... | 26 | 23 | 11 | 26 |
| 55 - 64 years .... | 13 | 12 | 5 | 12 |
| 65 years and over .... | 3 | 3 | 2 | 5 |
| Total number of Farmers | 111 | 100% | 42 | 100% |

Table 3 gives the educational background of the farmers interviewed in both areas and shows that 29% of them (in the Ejura area) and 26% in the Wenchi area were literates. Almost all of these were middle school leavers. The table shows, however, that the core of the farmers in the two areas is made up of illiterates.

TABLE 3. EDUCATIONAL BACKGROUND OF TOBACCO FARMERS IN EJURA AND WENCHI AREAS

| | Ejura Area | | Wenchi Area | |
|---|---|---|---|---|
| | No. | % | No. | % |
| Illiterates .... .... .... | 79 | 71 | 31 | 74 |
| Literates[1] .... .... .... | | | | |
| Middle School .... .... | 31 | 28 | 10 | 24 |
| Higher than Middle School | 1 | 1 | 1 | 2 |
| Total Number of Farmers .... | 111 | 100% | 42 | 100% |

2. Farmers' Alternative Engagement.

The background of tobacco farmers was also investigated in the two surveys. A list of previous engagements is given in Table 4. Most of the farmers in both areas lived solely by agriculture, however, the percentage of farmers who had non-farm engagements was higher in the Ejura area than in the Wenchi area (Table 4). In the Ejura area 16% of those interviewed were government employees, 20% were artisans (tailors, masons, carpenters, and shoemakers), 5% were traders, 5% were in school, 3% madâ gari while 2% were employees of the STPC. The same kind of pattern of previous employment was observed in the Wenchi area.

1. Farmers who know how to read and write.

TABLE 4. FARMERS' OCCUPATION BEFORE TAKING UP TOBACCO FARMING

| Engagements | Ejura Area | | Wenchi Area | |
|---|---|---|---|---|
| | No. | % | No. | %(of Farmers) |
| Farming .... .... | 55 | 50 | 25 | 60 |
| Government Employees .... | 17 | 16 | 4 | 9 |
| Artisans .... .... | 21 | 20 | 6 | 15 |
| In School .... .... | 5 | 4 | 2 | 5 |
| Traders .... .... | 6 | 5 | 4 | 9 |
| Gari-Makers .... | 4 | 3 | 0 | 0 |
| STPC Employees .... | 3 | 2 | 1 | 2 |

It was observed from the surveys that no farmers in the two areas depends solely on tobacco production for his livelihood. All the farmers encountered had other jobs - either farming or non-farming. However, most of the farmers interviewed farmed other enterprises besides tobacco. Table 5 gives the distribution of tobacco farmers by the type of alternative non-farm enterprise. Those who took the non-farm jobs reported that their jobs fetched them incomes which ranged from N¢100.00 to over N¢500.00 per annum.

TABLE 5. DISTRIBUTION OF TOBACCO FARMERS BY ALTERNATIVE NON-FARM ENTERPRISE

| Enterprises | Ejura Area No. | Ejura Area % (of Farmers) | Wenchi Area No. | Wenchi Area %(of Farmers |
|---|---|---|---|---|
| Other Farm Enterprises Only | 76 | 68.4 | 34 | 81.0 |
| Government Employees | 11 | 10.0 | 1 | 2.0 |
| Artisans (self employed) | 8 | 7.2 | 4 | 2.0 |
| Traders .... .... | 8 | 7.2 | 2 | 5.0 |
| Fetish Priest .... | 1 | 1.0 | 0 | 0.0 |
| Gari-Makers .... | 5 | 5.0 | 0 | 0.0 |
| Akpeteshie Distillers .... | 2 | 2.0 | 0 | 0.0 |
| Baker .... | 0 | 0.0 | 1 | 2.2 |
| Total Number of Farmers | 111 | 100% | 42 | 100% |

3. Farmers' Experience in Tobacco Production.

In a specialized farm enterprise like tobacco production, experience is a great asset. It was found that on the average, farmers in the Ejura area have a greater number of years of experience than those in the Wenchi area. This is shown by Table 6. 64% of the farmers interviewed in the Wenchi area had produced tobacco for between three and five years and only 7% had produced it for two years or less. In the Ejura area 42% had produced the crop for over five years and 22% for only two years or less. This shows that in the Ejura area tobacco is continually being adopted by new farmers. It should be noted however that experience with the crop

varied widely from one farmer to another even within the various producing villages.

TABLE 6: FARMERS' EXPERIENCE IN TOBACCO PRODUCTION BY YEARS

| Years | Ejura Area | | Wenchi Area | |
|---|---|---|---|---|
| | No. | % (of farmers) | No. | % (of farmers) |
| 2 years or less | 25 | 22 | 3 | 7 |
| 3 to 5 years | 40 | 36 | 27 | 64 |
| Over 5 years | 46 | 42 | 12 | 29 |
| Total No. of Farmers | 111 | 100% | 42 | 100% |

New entrants into tobacco production (farmers with up to only 5 years' experience) formed 58 percent of tobacco farmers in the Ejura area (see Table 6). They had an average age of 43 years (the standard deviation being 1.7 years). Of the 65 new entrants covered by the survey in the area, 29 (44%) were literates, majority of the latter having been government employees before embarking upon farming. Only 9 percent of them became farmers immediately after completing their elementary school education (see Table 7). Thirty-three (90%) of the 36 illiterate new entrants covered were already farmers before taking to tobacco production (see Table 7).

In the Wenchi area, 30 (71%) of the 42 tobacco farmers covered by the survey were new entrants. Their average age was 39 years (with 5.8 years standard deviation). Twenty-two (nearly 74%) of them illiterate once lived by agriculture before taking up tobacco production. Of the literate

new entrants, 4 had been government employees before taking to farming while 3 started farming immediately after completing elementary school (see Table 7).

TABLE 7: DISTRIBUTION OF NEW TOBACCO FARMERS BY EDUCATIONAL AND OCCUPATIONAL BACKGROUND

| | | New Entrants | Government Employees | Attending School | Farming | Privately Engaged Outside Farming |
|---|---|---|---|---|---|---|
| Ejura Area | Literates | 29 | 21 | 3 | 3 | 2 |
| | Illiterates | 36 | 0 | - | 33 | 3 |
| | Total | 65 | 21 | 3 | 36 | 5 |
| Wenchi Area | Literates | 8 | 4 | 3 | 1 | 0 |
| | Illiterates | 22 | 0 | - | 20 | 2 |
| | Total | 30 | 4 | 3 | 21 | 2 |

4. Family Labour Force Available to Tobacco Farmers:

The extended family system obtains in the Ejura and Wenchi areas (as in other Akan areas). A feature of this system is that the farmers tend to have a large number of dependants who help them with the farm work without requiring cash payment for their services. In the Ejura area the number of dependants of the farmersinterviewed ranged from one to twenty-five with a mean of ten. In the Wenchi area the range was from four to sixty-one with a mean of sixteen as shown in Table 8. It was observed in the Ejura area that the immigrant farmers (and they occurred largely in the Ejura Central sub-district) had fewer dependants than the indigeneous farmers.

The modal size of family labour force possessed by a tobacco farmer in the Ejura area was estimated at seven and half man-equivalent.[1] This comprised three women of over 15 years of age, three men of over 15 years of age and three children between the ages of 10 and 15 years old. In the Wenchi area a farmer was estimated to have a family labour force of ten and half man-equivalent[1] comprising 4 women, 4 men and 5 children (between the ages of 10 and 15 years old).

TABLE 8. AVERAGE NUMBER AND RANGE OF DEPENDANTS AND SIZE OF FAMILY LABOUR FORCE PER TOBACCO FARMER

| Composition | Ejura Area Dependants Average No. | Range | Wenchi Area Dependants Average No. | Range |
|---|---|---|---|---|
| Women over 15 years old | 3 | 0 - 8 | 4 | 0 - 17 |
| Children 10-15 years old (not at school) | 1 | 0 - 10 | 1 | 0 - 5 |
| Children 10-15 years old (at school) | 2 | 0 - 6 | 4 | 0 - 13 |
| Children under 10 years old | 2 | 0 - 11 | 4 | 0 - 13 |
| Men over 15 years old | 10 | 1 - 25 | 16 | 4 - 61 |
| The Mode of Family Labour Force available to a Tobacco Farmer | $7\frac{1}{2}$[1] | 2 - 16 | $10\frac{1}{2}$[1] | 5 - 32 |

[1] It is assumed that work done by 2 children between 10-15 years old is equivalent to work done by one mature person.

Agriculture in the Wenchi and Ejura Tobacco Area:

1. General.

Farming has been a way of life for the people of the Ejura and Wenchi Tobacco areas probably from a very ancient time. Farming has been practised on a small scale with the individual family farm or farm unit being very small and operated with the traditional farm implements - the hoe and cutlass. Recently, however, the proportion of agricultural production marketed has increased considerably. Certain special crops have been introduced into both areas which are produced solely for the market. In addition, a great many of the farmers in both areas produce most crops with the motive of selling them or they produce large surpluses over household consumption and market these surpluses.

Farm sizes are increasing rapidly, especially in the Ejura Tobacco area where the use of tractor services for land preparation and for other agricultural purposes is very common.

It seems, however, that the methods of farming have on the whole not undergone much change over the years. Agriculture is still little capitalized, the same hoes and cutlasses are used, farmers continue to rely on poor planting materials (largely because of the lack of access to better quality materials) and except for the production of tobacco, cotton and to a little extent for cocoa, (where it is grown) very little or no fertilizers and pesticides are used.

Like most other parts of Ghana, crop production in the Wenchi and Ejura tobacco areas is based on the traditional land rotation system; that is farmers have permanent places of settlement from which they cultivate a

piece of land for two to four years and leave it to revert into natural vegetation (fallow) when the fertility of the soil has declined. The fallow period may last anything between two years to fifteen years (depending upon the availability of land to the farmer) after which time the farmer comes back to re-cultivate the land. The advantages of this system of farming to the farmers are that it minimizes the build up of pests, diseases and weeds in the soil and regenerates soil fertility automatically without any expense nor thought by the farmer.

Mixed cropping seems to be the rule rather than exception in the two tobacco areas. With the exception of tobacco, cotton and in some instances, rice, all other crops are normally planted in mixed-stands. The usefulness of mixed cropping to farmers appears to be that it saves labour and land, it limits soil erosion by keeping the ground covered and it also gives the farmer an insurance against total crop failure and disease outbreak. This system also fits very well into crop production for subsistence purposes.

2. Crops Grown and Rotation:

The Ejura and Wenchi tobacco areas fall within similar ecological zones, as such, similar crops are grown in both areas. The principal crops grown are maize, tobacco, yams, cassava, groundnuts and tomatoes. Other vegetables common to both areas are garden eggs, okro, 'neri' and cowpeas. Cocoa, cocoyams and plantain are grown mostly in the forest parts (i.e. the southern parts of the two areas) and on the fringes of the derived savanna zone.

Tobacco is particularly important in derived savanna areas. Rice is important in the northern parts of the Ejura area (Ejura Central Sub-district, i.e. Mem, Amanteng and Attebubu), elsewhere in the two areas, rice is not an important crop.

The production of citrus especially, mangoes and oranges is quite popular in the Wenchi tobacco area but not in the Ejura area. Commercial production of coffee (in the forest parts) and cotton has recently been introduced into the two areas but it seemed however that the two crops had gained only a little acceptance among the farmers at the time of the survey.

The chief cash crops (based upon the percentage of marketed surplus to total output) in the two areas are tobacco and maize. In the Ejura area, yams, groundnuts and tomatoes are also very important cash or market crops. Plantain, cocoyams, pepper, garden eggs (and in the Wenchi area) yams, are grown largely on a subsistence basis in both areas although some surpluses over household consumption are usually produced for sale.

The percentages of tobacco farmers interviewed in both the Ejura and Wenchi areas who produced the various other crops (than tobacco) are given in Table 9. The Table shows that the greatest percentage of tobacco farmers in both areas produce maize, and that in the Ejura area yam production ranks second to maize in popularity to tobacco farmers. The Table also shows that tobacco farmers in both areas have been getting increasingly interested in tomato production over the past three years. It can be noted from the Table, however, that whereas in the Wenchi area more and more tobacco farmers have been shifting from the production of groundnuts to the other crops, in the Ejura area and especially in the Ejura Central and Ejura North Sub-districts, more tobacco farmers are going into the production of groundnuts. The increasing shift towards groundnut production in the Ejura area might be explained at least partially by the recommencement of the operations of the Attebubu Vegetable Oil Mills.

TABLE 9. DISTRIBUTION OF TOBACCO FARMERS IN THE EJURA AND WENCHI AREAS - BY OTHER CROPS THEY PRODUCE - 1968-1970 (PERCENTAGE OF FARMERS INTERVIEWED)

| Crop | Ejura Area | | | Wenchi Area | | |
|---|---|---|---|---|---|---|
| | 1970 | 1969 | 1968 | 1970 | 1969 | 1968 |
| Maize | 82 | 66 | 73 | 78 | 69 | 67 |
| Tomato | 18 | 16 | 14 | 36 | 21 | 17 |
| Groundnuts | 63 | 41 | 33 | 9 | 14 | 21 |
| Cassava | 36 | 29 | 26 | 67 | 60 | 57 |
| Yam | 54 | 48 | 61 | 45 | 45 | 45 |
| Plantain cum Cocoyam | 36 | 37 | 45 | 52 | 62 | 57 |
| Cocoa | 5 | 5 | 7 | 28 | 28 | 28 |
| Other Vegetables | 12 | 12 | 14 | 4 | 4 | 6 |
| Cotton | 4 | 0 | 0 | 2 | 0 | 0 |
| Coffee | 0 | 0 | 0 | 2 | 2 | 2 |

Seasonality of farming activities is dictated by the seasonality of rainfall and the intrinsic requirements of the crops concerned. Generally however, in both areas, land preparation for the major cropping starts in late November, continues through January and February and ends in March. Planting or sowing is done in March and April with the coming of the early rains. The main harvesting season starts in June and ends in October.

Crop rotation on the same piece of land is widely practised and in fact the same rotations (crop sequence) occur in both areas. The crop which is planted first in a rotation depends upon the importance the farmer attaches to the crop but usually the market value of the crop is a major consideration.

Table 10 gives the various rotations which obtain in the two tobacco areas.

TABLE 10. COMMON CROP ROTATIONS IN THE EJURA AND WENCHI TOBACCO AREAS

| | 1st Crop | 2nd Crop | 3rd Crop | 4th Crop | 5th Crop |
|---|---|---|---|---|---|
| A.[6] | i Tobacco | Maize | Groundnuts | Tobacco | Fallow |
| | ii Tobacco | Groundnuts & Maize | Cassava | Fallow | - |
| | iii Tobacco | Tomatoes & Maize | Groundnuts | Tobacco | Fallow |
| | iv Tobacco | Tomatoes & Maize | Cassava | Fallow | - |
| B. | i Yams | Maize & Vegetables | Cassava | Fallow | - |
| C. | i Maize | Groundnuts or Cowpeas | Maize | Fallow | - |
| | ii Maize | Cocoyam & Plantain, Garden Eggs, Okro etc. | Cassava | Fallow | - |

It follows from Table 10 that rotations in the two areas could be classified into 3 according to the crop which is planted first in the rotation. Thus we have rotations in which tobacco, yam and then maize are the first crops.

Where tobacco is produced, it is almost invariably the first crop

planted when the land is freshly cleared and it is grown as pure stand. The Crops that are usually planted on the land after the tobacco are as given in Table 10 (Ai, Aii, Aiii and Aiv). Yams also occupy the first stage in the rotation but a month or so after the yams seeds are sown in the mounds, the intermound areas may be planted to maize and vegetables like okro, and neri. When the maize is harvested, cassava may be planted on the sides of the mounds so that the cassava crop becomes almost a pure stand after the yams are harvested. The rotation in which maize is followed with groundnuts and/or cowpeas and then finally with maize before fallow (Table 10 Ci) occurs frequently in Ejura Central and Ejura North sub-districts and in most parts of the Kintampo district. Rotation C.ii in Table 10 in which maize is interplanted with plantain, cocoyam, and vegetables followed by cassava before fallow occurs commonly in the southern parts of the two tobacco areas where the vegetation is almost forest and on the fringes of this vegetation.

It can be seen from the above account that arable farming predominates over tree crop farming in both tobacco areas. It was observed from the study that livestock farming has little commercial significance to tobacco farmers in the two areas. For example, 19 (i.e. 28%) of the tobacco farmers interviewed in the Wenchi area did not keep any livestock at all while 21 (i.e. 52%) of them reared chickens, turkeys and ducks and pigs. Most of these animals were being reared in only small numbers and for the purposes of household consumption. In the Ejura area 60 out of the 111 tobacco farmers interviewed kept some livestock while 57 did not keep any animals. Animals kept by the tobacco farmers in the Ejura area included all the above and also guinea pigs.

3. Some Problems of Agriculture Production in the Wenchi and Ejura Tobacco Areas:

The main bottlenecks to agricultural production in the two areas can be classified under two broad headings: poor yields and poor agricultural infrastructure.

The problem of poor crop yields in the two tobacco areas resides in the use by farmers of poor planting materials and of poor cultural practices. Farmers in both areas use the same planting materials (which are unimproved to start with) over and over again. As a result inherent genetic characters of these planting materials have undergone great changes (segregation). They, therefore, have poor performance. Yam, rice, groundnuts, plantain, cocoyam and to a large extent maize farmers in both areas experience this predicament. Another cause of low crop yields in the two areas is low quality farm management practices. Most farmers continue to stick to the old farm practices; little soil management and crop protection practices are adopted. It seems, especially in the Wenchi area, that the Extension Division of the Ministry of Agriculture has not made a very great impact with their extension work. The situation in the Ejura area is however better than that in the Wenchi area, for example, 5% of the farmers interviewed in the Ejura area applied fertilizers on their maize farms in addition to their tobacco farms, while 10% applied insecticides to their maize in storage. In the Wenchi area, however, although all the farmers interviewed used fertilizers on their tobacco farms none of them had ever used fertilizers for the production of any other crops and only 5% used insecticides to store their maize. This difference in the states of affairs could explain, at least partially, the difference in crop yields per unit of land

and/or per unit of labour obtaining in the two areas.

By agricultural infrastructure is meant all the physical facilities obtaining outside the farm gate which affect the activities going on inside the farm gates. The most important, but unfortunately the least developed of the physical facilities in the two tobacco areas include credit facilities, land tenure arrangement, marketing facilities, especially storage and transport facilities - and agricultural education.

One of the crucial factors which has made the Ejura area very prosperous agriculturally (far more prosperous than the Wenchi tobacco area) is its locational advantage. The greater part of the area lies on a main trunk road (Kumasi-Tamale road). It is not far from Kumasi which provides the largest market for crops (foodstuffs) produced in the area. Relatively good roads, most of them motorable throughout the year lead off from the trunk road to link the most important food producing villages in the area (including Sekyere-Odumasi; Babaso-Nkwareasa, Buoun and Bredi). More importantly, many 'mammy' trucks and trailored tractors ply on these roads on market as well as on other days.

The result is that a large number of middlemen, mostly women, from the Kumasi market come very frequently to the Ejura area to make contacts with the farmers. Thus, in the Ejura area farmers have ready markets for their agricultural products. They also encounter less difficulties in conveying their products to the market centres in the area and it would be seen later in the paper that they incur relatively low marketing costs. These give the farmers in the area incentives to produce more food than their subsistence needs.

The marketing infrastructure in the Wenchi area is much poorer than it is in the Ejura area. Roads to many very important food producing villages (e.g. Offuman, Nchirah, Sebie-Banda, Tromeso, Banantwe, and Asatekwaa) become unmotorable for most part of the year especially during the harvesting season. As such, very few trucks ply on these roads and their drivers do charge high fares. For example, the writer observed at the time of the survey, that it cost not less than 50 new pesewas to convey a bag of maize from Nchirah to Subinso, a distance of about 9 miles. Because of transportation difficulties, farmers incur high marketing costs and relatively few middlemen are attracted to operate in this area. In view of these problems, the production of tobacco has become more attractive to most farmers in the area. The reason being that tobacco farmers have guaranteed markets and prices and more importantly the Ghana Tobacco Company (GTC) makes sure to send trucks and where necessary trailored tractors to even the remotest villages to purchase farmers' tobacco leaves and convey them to the tobacco stations. It is, therefore less surprising that intense tobacco production has some to supercede intense production of food crops in the Wenchi tobacco area especially the Wenchi sub-district. This also explains why tobacco production in the Wenchi area is often associated with reports of very frequent scarcity of foodstuffs on the markets in the area.

One of the most serious and much talked-about problems with agricultural production in the country today is the land tenure system. It should be said, however, that it emerged from the survey that the land tenure arrangementiobtaining in the two tobacco areas does not seem to impose any serious limitation to the expansion of tobacco production although it poses great

problems with tree crop production and other long term agricultural activities and investments.

The Development of the Tobacco Industry in Ghana:

1. History

It is reported that tobacco (Nicotina tobaccum) was among the many crops introduced into the country from South America by the early Portugese traders (13, p.7 and 12, p.95). These traders grew the crop in their gardens to provide leaves to smoke, chew and snuff. These practices became increasingly popular among the indigeneous people who came in contact with these Europeans and as a result the cultivation of the tobacco spread to the interior of the country. The crop has since been grown in all the agricultural zones in Ghana at least on a very small horticultural scale for the purposes of local consumption (16, pp. 387-393).

It is reported that the First World War saw a decline in the local trade which was hitherto evolving around this crop and as such, farmers lost interest in the cultivation of the crop. Nevertheless, according to La-Anyane (13, p.140), farmers' interest in the crop seemed to have been restored by 1933 in the Eastern Region of what was then the Gold Coast, where many co-operative societies embarked upon the cultivation of the crop. In those days the local strain from Northern Ghana (Nicotina rustica) and the 'Bourbon', an imported strain from Mauritius were the most popular.

The trend continued with the Second World War offering additional stimulation to increased production of the crop. La-Anyane reports (13, pp.140-141) that the local cheroot industry prospered during the World War II with

the good makers of cheroot winning contracts to supply regularly to the forces in combat.

At the same time the demand for the locally prepared pipe tobacco also increased. Towards the end of the War, however, imports of tobacco increased, much to the detriment of local production as foreign tobacco was preferred to the locally produced tobacco. Thus, although the cultivation of tobacco persisted, local production became relatively less important vis-a-vis the ever increasing importation of tobacco (both manufactured and unmanufactured).

The production of tobacco for other than local village consumption purposes could be said to have actually been revived only after the establishment of the Pioneer Tobacco Company (PTC) in the country in 1952. In fact, La-Anyane and Afful consider that the establishment of this company marked the birth of an organised Tobacco Industry in this country (14, p.2). The PTC started operation as a vertically integrated tobacco agency, in the sense that it engaged in the production of raw tobacco leaves as well as in their processing into manufactured cigarettes. While it undertook to produce tobacco itself, the PTC also encouraged and stimulated local production by way of an extensive publicity programme aimed at inducing farmers to grow the crop, organizing tobacco farmers and giving them technical advice, seedlings and other necessary materials (farm requisites) and finally providing ready markets and guaranteed prices for the crop.

The number of acres of tobacco planted in the country since 1953 has increased many hundred fold although local production has not been sufficient to match domestic requirements. It should be noted, however, that although this country still imports considerable quantities of manufactured tobacco,

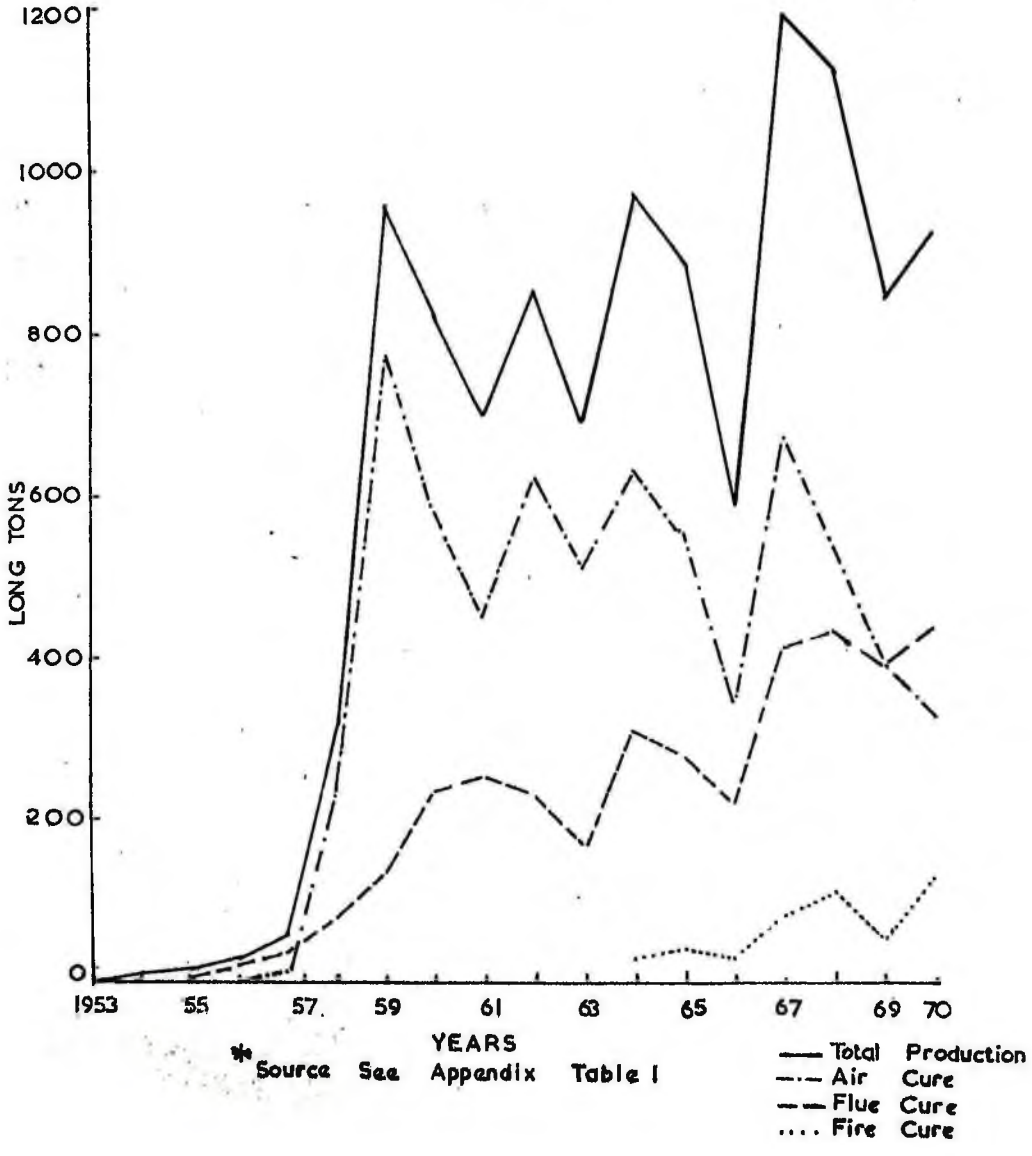
the improvement in domestic production over the years has resulted in a marked decrease in importation and has therefore saved the country a substantial amount of foreign exchange. Figure 2 shows the local production of leaf tobacco by methods of curing from 1953 to 1970. Figure 3 provides a comparison of domestic production of leaf tobacco with imports of leaf tobacco from 1953 to 1970, and shows the declining importance of imports of unmanufactured tobacco.

In addition to PTC, the Agricultural Development Corporation (ADC, now defunct) once participated in tobacco growing and after 1960 in tobacco manufacturing. But the ADC specialized in 'Black Strap' tobacco and the Wing of the ADC, which indulged in this, later became known as the Ghana Cigar Company. This company added to the 'Black Strap' tobacco (or Negrohead) the manufacture of cigars. Neither the ADC nor the Ghana Cigar Company is currently operating.

In the 1960's a number of changes were made in the organisation of tobacco marketing in Ghana. In December, 1962, the Foodstuffs Division of the Agricultural Produce Marketing Board (which was to become the Ghana Food Marketing Board in 1963) took over from the PTC the organisation of tobacco and marketing in this country. The PTC then became the sole or monopsonist of the crop. Because of allegations of mismanagement and maladministration on the part of the Ghana Food Marketing Board, the State Tobacco Products Corporation (STPC) was established in 1964 to be responsible for the production and the marketing of raw tobacco. The STPC inherited a large amount of liabilities from the previous organisation and as such it could not operate effectively. Thus, upon the recommendations made by Professor La-Anyane (University of Ghana) and E.N. Afful (now of the Agricultural

FIG.2 GHANA LEAF TOBACCO PRODUCTION 1953-70*
( long tons )




* Source See Appendix Table I

Development Bank) a new company, the Ghana Tobacco Company Limited (GTC) was formed in 1969 to be responsible for the direction and administration of the production and marketing of raw tobacco in the country.

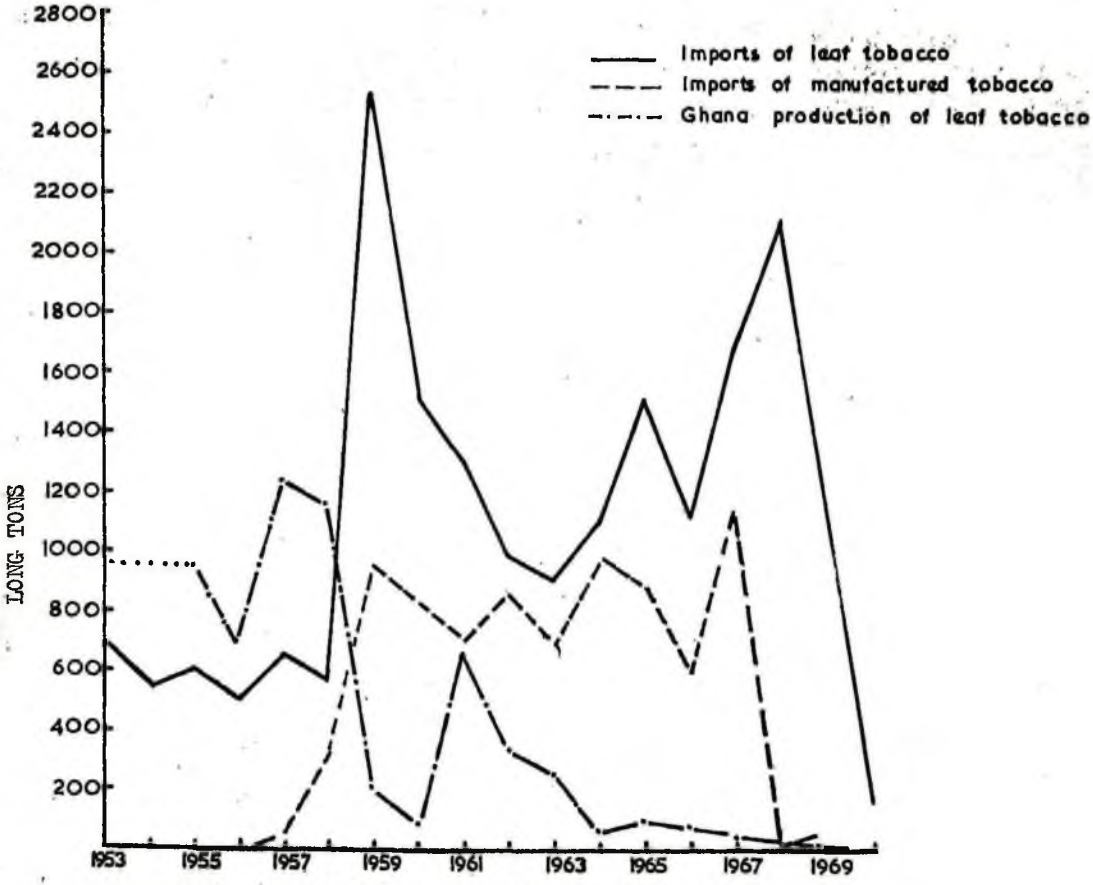
2. The Development of the Tobacco Industry in the Ejura and Wenchi Areas:

The Ejura and Wenchi areas were the first two areas selected by the PTC in 1953 to experiment on local leaf tobacco production. The PTC first tried to generate farmers' interest in the cultivation of the crop by a publicity programme. Attempts were made in both areas to develop a supervisory service for farmers interested in the cultivation of tobacco. The PTC itself operated some farms at Awisa and Wenchi (in the Wenchi area) and at Ejura, Bosomkyekye and Mem in the Ejura Tobacco area. These farms served as demonstration farms as well as good sources of leaves for the company. Initially, very few farmers enrolled to produce the crop in both areas and these were given free supply of seedlings, fertilizers and technical advice. The farmers sold their tobacco green (uncured) to the PTC which constructed central curing facilities to cure the leaves. With time, however, more and more farmers became interested in producing tobacco in both areas and substantial acreages, therefore, came to be planted with the crop. Meanwhile, the PTC extended its publicity programmes to cover more and more villages in the two areas and this made intense tobacco production spread to distant places.

Having sufficiently generated farmers' interest in tobacco production, the PTC and its successors' policy became one of encouraging the farmers to produce cured leaves with the minimum of direction and assistance as possible. In keeping with this policy, farmers who could afford to put up curing barns

FIG 3 COMPARISON OF GHANA LEAF TOBACCO PRODUCTION AND IMPORTS OF LEAF TOBACCO AND IMPORTS OF MANUFACTURED TOBACCO

(long tons)




SOURCE : APPENDIX TABLES 1 & 2

were encouraged to do so. In this regard, farmers who produced cured leaves were given a free supply of seedlings whilst their counterparts who produced and sold green leaves were made to pay N¢6.00 for an acre's consignment. Cured leaves were also purchased at much higher prices than the green leaves. Also in consonance with this long-term policy, the STPC (the immediate predecessor of the GTC) ceased to buy green leaf tobacco in the Ejura area as from the 1969 season. A year later (in 1970) the GTC carried this action to the Wenchi area. The action caused a lot of tobacco farmers who could not afford the financial investment or capital outlay involved in the construction of curing barns to stop tobacco production altogether. In fact, as many as about 60% of the tobacco farmers dropped out in the Ejura area. In the Wenchi area the figure was much less. It should be noted, however, that the cessation of green leaf purchases by the STPC in the Ejura area was timed to coincide with the introduction into both the Ejura and Wenchi areas of "Master Growers' Scheme". Under this scheme, a number of tobacco farmers are selected annually according to their past performance in tobacco production and are assisted by the GTC to construct their own curing barns through loans obtained for them from the Agricultural Development Bank.

It is worthy of notice that tobacco production has now become a very popular farm enterprise among farmers in the two areas. This might be attributed to the high gross margins per acre (see Chapter II, .61). The acceptance of the crop by the farmers in the two areas is reflected in the dominant positions the two areas occupy among other tobacco areas in the country. Currently, the Wenchi area produces the greatest quantity of tobacco in the country while the Ejura area is the second largest producer of the crop.

3. The Role of the Ghana Tobacco Company in the Tobacco Industry:

The GTC is a joint government-cum-private venture. The government contributed 30% in capital equipment and the PTC 30%, the National Investment Bank 20% and the National Cash Register Company (NCR) 20%; all the latters' contributions being in cash.

The PTC is currently the managing agent of this new company. Being responsible for the general direction and administration of the production and marketing of raw tobacco in the country, the GTC plays a very crucial role in the sustenance of the tobacco industry in the coun ry. The company engages in publicity campaigns throughout all the tobacco producing areas in the country aimed at inducing non-tobacco farmers in the areas to produce the crop and at sustaining the interest of tobacco farmers in tobacco farming. The personnel of the company register tobacco farmers and select suitable plots for them to cultivate the crop. The company arranges for the farmers to get tractor services on credit for ploughing, harrowing and ridging. It raises seedlings which were originally supplied, freely, to all the farmers. Now, however, the GTC sells its seedlings to flue-cured tobacco farmers. Fire-cured tobacco farmers still receive free seedlings while air-cured farmers raise their own seedlings with the assistance of the company. The company also subsidises and supplies fertilizers and other farm requisites to tobacco farmers on credit.

By special arrangements with the Agricultural Development Bank, the GTC acts as guarantor to individual tobacco farmers and thus obtains loans for the farmers to enable them to construct curing facilities. In fact, some few tobacco farmers from both the Ejura and Wenchi tobacco areas have been able to

procure tractors with trailer and implements through the help of the GTC. Apart from this, and credits given in the form of farm requisites, the GTC administers credits in the form of physical cash advances from its own resources to its farmers to help them meet part of their production expenses. The terms on which GTC gives credit to tobacco farmers could be said to be liberal - no interest rates are charged on the credits; the value of the credits being deducted at source from the farmers' proceeds.

One of the most important services the GTC performs to sustain tobacco production in this country is the provision of extension services to tobacco farmers. The company has a regiment of field staff who live with the tobacco farmers in the various villages. The sole duty of the staff is to teach the tobacco farmers all the desirable cultural practices and technicalities involved in tobacco production. They are supposed to supervise all the tobacco production operations the farmers perform from land clearing through harvesting to grading. Refresher courses are organised for the field staff of the company after every tobacco season to acquaint them with new practices and techniques that are periodically evolved. Another crucial function of the GTC is that it provides a ready market for all the new tobacco farmers' produce in this country. It is the monoposonist buyer of leaf tobacco from farmers. It purchases tobacco at guaranteed prices. The company saves tobacco farmers some trouble and perhaps marketing costs by arranging to go with trucks and tractors (where necessary) to purchase the crop from the villages. After purchasing the leaves, the company reconditions and bales them before selling them to the manufacturers. It should be said that the company is also the monopolist seller of all locally produced leaf tobacco to tobacco manufacturers in this country.

The GTC, therefore, occupies the place of a middleman being between the ultimate producer of the crop and the manufacturers in this country. In the discharge of its functions as a middleman here, the GTC adds place and time utilities to the leaf tobacco for the benefit of the manufacturers.

The FTC is the greatest customer of the GTC. In fact, it has until recently been the sole user of all the locally produced leaf tobacco. Currently, it purchases all the flue-cured and air-cured tobacco produced in the country for the manufacture of cigarettes while the National Tobacco Rehandling Company (NTRC) purchases and uses all the fire-cured tobacco produced locally for the manufacture of Black Fat Tobacco for the use of pipers, chewers and snuff makers.

4. Fire-cured and Air-cured Tobacco and Other Tobacco Areas:

It could be noted from the above that not only flue-cured tobacco is produced in this country. The other types of tobacco produced are fire-cured and air-cured tobacco - the names being indicative of how the green tobacco leaves are prepared before despatch to the manufacturers.

In fire-cured tobacco production, the harvested leaves are literally smoked in curing barns by means of smoke generated from smouldering materials usually corn-cobs or saw-dust. With the air-cured tobacco, the green leaves are hung in the air to dry.

Although some amounts of tobacco could be found in all the agricultural zones in Ghana, concentrated production of the crop occurs chiefly in the derived savanna areas of the northern Ashanti and Brong Ahafo, in Volta Region and the savanna areas of the Northern and Upper Regions and in the transitionary forest zones around Nsawam, Abura Dunkwa, Foso, Koforidua, Bekwai and

Agona Swedru. These areas are usually classified according to the curing procedure adopted. Thus, there are Air-cured areas (e.g. Bolgatanga and Tamale areas), Flue-cured areas (e.g. Wenchi, Ejura and Damongo areas), and Fire-cured areas (e.g. Akatsi, Koforidua, Bekwai areas). The major tobacco stations in the country are shown on Map I (page 5).

5. The Problems of the Tobacco Industry in Ghana:

One of the major problems facing the tobacco industry in the country today is the low domestic production of the crop and high rate of smuggling of tobacco products into the country. Low domestic production of tobacco emanates from poor yields obtained by farmers in the tobacco areas. Low domestic production of tobacco has made importation of unmanufactured tobacco by the PTC continually necessary. Although some amount of exotic strains would have to be imported in order to blend with locally produced leaves to obtain the desired flavour and quality of cigarettes, an increase in domestic production would save the country more foreign exchange and perhaps decrease the production costs of the manufacturers.

Another pressing problem facing the tobacco industry in Ghana today is the high rate at which foreign brands of tobacco products, particularly, cigarettes, are smuggled into the country. It is estimated that as much as about 30% (Personal communication with an official of PTC, Accra) of the cigarettes currently on the market are contraband or smuggled cigarettes. To be able to compete with the smugglers, therefore, the PTC is forced to import more of the foreign strains of tobacco to enable them to manufacture cigarettes whose flavour and other qualities compare favourably and can compete with the smuggled ones on the market.

The solutions to these problems, therefore, lie firstly in checking the rate at which tobacco products are smuggled into the country, (this responsibility falls on the Government), and secondly in increased domestic production of leaf tobacco. The potentialities for increased tobacco production do exist in Ghana. For instance, the current yield per acre (average for the whole country) is around 450lbs whereas the potential yield per acre is estimated at 2,000lbs, (personal communication with Leaf Adviser, PTC, and Production Manager, GTC). Considering the present yield situation, the large imports of tobacco leaves, the probability of an export market, the ready availability of suitable land and the resources which are already committed but which could be more efficiently employed to produce a greater quantities of tobacco, one may argue that there is still much scope for further development and prosperity for the tobacco industry in Ghana. In this regard, it can be said that the Ghana Tobacco Company still has much work to do.

Some measures which could be adopted to increase domestic tobacco production are suggested later in Chapter II.

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# CHAPTER II

## THE ECONOMICS OF TOBACCO PRODUCTION IN THE EJURA AND WENCHI AREAS OF GHANA

This Chapter presents a brief discussion of the type of labour used in tobacco production and of the yields and returns obtained from the enterprise. A description is also given of the production costs and the capital requirements of the enterprise. The investment in tobacco production is also appraised and is followed by a brief account of how tobacco production in the two areas is financed. Finally an examination is made of the bottlenecks which are preventing an expansion in tobacco production and some suggestions are put forward.

### The Types of Labour Used In Tobacco Production:

Flue-cured tobacco production is a highly labour intensive enterprise. As such, the type and the amounts of labour used in the various operations (these are discussed in Appendix II) have a great influence on production cost. The labour used in tobacco production in the Ejura and Wenchi areas could be classified under two main headings: family labour and hired labour. The categories of hired labour used are (i) 'by-day' or daily-rated labour, (ii) piece-rated or contract labour, (iii) monthly-rated labour and (iv) yearly-rated labour.

Daily-rated labour is by far the most widely used type of hired labour in both areas for tobacco production. Except in very isolated cases (villages such as Mem and Kokrompe in the Ejura area) the general situation with regard to this type of labour is that it is available, provided the farmer has money for payment. The rate is charged on a manday basis and it varies

slightly from village to village. The range encountered throughout the two areas was from 55np to 75np (including meals) per manday - the mean being 65np per manday (standard deviation being 0.3np).

The yearly-rated labourers enjoy certain other prerequisites apart from their fixed annual salaries. For example, their employers provide them with free food, accommodation, clothing, medical care and all other basic necessities. All the yearly-ratad labourers encountered in both areas came from the Northern and Upper Regions of Ghana and their salaries ranged from N¢24.00 to N¢120.00 per annum. It was observed that yearly-rated labourers are made to work on other farms. They are employed by the relatively prosperous farmers in the areas. Farmers complained that yearly-rated labourers are currently very difficult to get. In some cases farmers have to travel to the Northern and Upper Regions to make arrangements to get the labourers. It was revealed that many of them often leave the farmers unceremoniously never to return.

Table 11 gives the number and percentage of the farmers interviewed, who depended upon the various types of labour for tobacco production. It can be seen from the table that few farmers in both areas rely solely on hired labour for tobacco production. Those who rely only on family labour are also few. However, more people in Ejura depend solely on hired labour than in the Wenchi area. Most of the farmers in both areas depend upon both hired and family labour.

TABLE 11. PERCENTAGE DISTRIBUTION OF TOBACCO FARMERS BY TYPE OF LABOUR USED FOR TOBACCO PRODUCTION

| | Ejura Area | | Wenchi Area | |
|---|---|---|---|---|
| Type of Labour | No. | % | No. | % |
| Family Labour Only | 17 | 15 | 2 | 5 |
| Hired " " | 27 | 24 | 2 | 5 |
| Both Family & Hired Labour | 68 | 61 | 38 | 90 |
| Total Percentage | 112 | 100 | 42 | 100 |

It was found that farmers in both areas prefer to use hired labour for operations like land preparation and cultivation which need great physical exertion.

Yields and Gross Returns to Tobacco Production.

Yields are obviously a very important determinant of profits. In flue-cured production yields depend amont other things upon the efficiency of leaf handling and the efficiency with which topping and suckering is done. It is believed that up to 10% of leaves are lost through handling (4). Experiments in Rhodesia have revealed that yields of flue-cured tobacco can be increased by about 30% if topping and suckering are properly done (5). Penny (Leaf Adviser, PTC, Accra) and Kwasi Appiah (Production Manager, GTC, Accra) estimate the potential average yields of flue-cured tobacco in the Wenchi and Ejura areas to be about 2,000 lbs per acre[1]. This means that

1. By personal communication with the writer.

although the situation seems to improve every year, the yields obtained so far are very low (Table 12). Yields vary considerably from one tobacco plot to another. Available records, however, suggest that on the average yields are higher in the Wenchi area than in the Ejura area (Table 12). In the Wenchi area itself, in the 1970 season, the average yields were higher in the Wenchi district (666 lbs per acre) than in the Kintampo district (413 lbs per acre). In Ejura yields were highest in Ejura East and Ejura North sub-districts and lowest in the Mampong and Ejura West sub-districts in 1969 and 1970.

Table 12. YIELDS AND RETURNS PER ACRE OF FLUE-CURED TOBACCO IN EJURA AND WENCHI AREAS - 1965 to 1970*

| | EJURA AREA | | | | WENCHI AREA | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Acreage per farmer | Yield lbs per acre | Price per lb | Gross Returns per acre | Acreage per farmer | Yield per acre | Price per lb | Gross Returns per acre |
| 1965 | 4.5 | 86 | 27.2p | ₵25.70 | 3.7 | 74 | 22.4p | ₵18.00 |
| 1966 | 5.2 | 49 | 24.2p | 14.58 | 1.3 | 79 | 29.7p | 23.44 |
| 1967 | 6.3 | 159 | 30.6p | 50.05 | 1.1 | 247 | 33.4p | 83.00 |
| 1968 | 2.0 | 309 | 29.6p | N₵92.19 | 1.6 | 248 | 31.9np | N₵78.80 |
| 1969 | 1.8 | 392 | 41.9np | 130.60 | 1.3 | 496 | 39.5np | 199.40 |
| 1970 | - | 428 | 44.3np | 189.64 | - | 540 | - | 213.81 |

* Source: Compiled from Ejura and Wenchi Areas Annual Crop Reports (STPC/GTC).

The gross returns that a farmer receives from a given yield of flue-cured tobacco is determined by the price per pound-weight which in turn is influenced by the quality of the leaves. It can be seen from the prices in Table 12 that although yields have been higher in the Wenchi area over the years, leaf quality has not been as good as that in Ejura. This difference might be explained by the greater experience of tobacco farmers in the Ejura area as shown in Table 5. Nevertheless, the yield differentials have always seemed stronger than the price differentials. The result is that on the average the levels of gross returns per acre have been higher in the Wenchi area than in the Ejura area (Table 12). It should be noted, however, that gross returns per acre vary considerably from one plot to another throughout the two areas in proportion to the yields.

The Costs of Producing an Acre of Flue-cured Tobacco

The level of returns to an enterprise is a function of the output (yield times price) and the cost of production. Tobacco production gives high returns but it also costs a lot to produce.

The questionnaires used in the surveys included a number of questions specifically framed to obtain estimates for the costs of executing the various operations involved in tobacco production. The questionnaires used are given in Appendix I. The succession of operations involved in tobacco production are discussed in Appendix II. The detailed assessment of the cost of individual operations include valuation of family labour based on the average prevailing wage rate of 65np per manday. It should be noted, however, that in the computation of variable costs for purposes of estimating gross margins, family labour is treated as a fixed cost and is therefore

  

ignored. Nevertheless, that part of the cost of operation performed by family labour is also shown separately. Labour costs and requirements are shown in Tables 13 and 14 for the various operations involved in flue-cured tobacco production.

Analysis of labour inputs showed that on the average, farmers in the Wenchi area use greater amounts of labour to produce an acre of tobacco than those in the Ejura area. The average total amount of labour used in the Wenchi area was estimated at 145 mandays per acre whereas in the Ejura area, 118 mandays were required per acre (standard deviations being 14 and 10 mandays respectively). Thus, if family labour is included as a cost, the cost of producing an acre of tobacco in the Wenchi area was N¢152.28[1] which is much higher than the total cost of N¢126.40[1] in the Ejura area (standard deviations being N¢16.10 and N¢13.60 respectively) - see Tables 13 and 14.

Although the average amounts of hired labour used in both areas are almost equal, a greater amount of family labour is used in the Wenchi area than in the Ejura area. The average total variable cost of production (family labour cost ignored) was also found to be higher in the Wenchi area (N¢95.48 per acre) than in the Ejura area (N¢88.50 per acre). One of the explanations for high labour requirements in the Wenchi area is the higher yields obtained. This makes it necessary to employ more hands at harvesting and for other leaf handling operations (see Table 15).

Labour requirements were found to vary with the type of operations depending upon the difficulty of the operation and the promptness with which the operation needs to be executed. Different farmers used different amounts of labour for the same operations. The range of labour requirements used in the various operations are also shown in Tables 13 and 14. Where the ranges

1. This also represents the cost of production by a farmer who uses the average amounts of inputs and relies only on

TABLE 13. COST OF TOBACCO PRODUCTION PER ACRE AND LABOUR IMPUTS - EJURA AREA - 1970 SEASON

| Operation | Average Total Labour (m/d) | Range of Total Labour (m/d) | Average Cost per Unit Imput | Total Average Cost per acre (N¢) | Range of Total Cost (N¢) | Average Total Family Labour (m/d) | Range of Total Family Labour (m/d) | Average Total Cost of Family Labour | Range of Total Family Labour Cost | Total Average Hired Labour (m/d) | Average Cost of Hired Labour & Other Variable Costs (N¢) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Clearing & Stumping | 18 | 2-40 | @ 065 per m/d | 11.70 | 1.30-26.00 | 2 | 0-9 | 1.30 | 0.00 - 5.85 | 16 | 10.40 |
| Tractor Services | - | - | | 10.00 | 10.00 | - | - | - | - | - | 10.00 |
| Seedlings | - | - | @ 6.00 per 6,200 | 6.00 | 6.00 | - | - | - | - | - | 6.00 |
| Transplanting | 5 | - | @ 65np per m/d | 3.25 | 1.30-6.50 | 4 | 2-9 | 2.60 | 1.30 5.85 | 1 | 0.65 |
| Fertilizers | 2 bags | - | @ 4.00 per bag | 8.00 | - | - | - | - | - | - | 8.00 |
| Fertilizer Application | 4 | 2-10 | @ 0.65 per m/d | 2.60 | 1.30-6.50 | 2 | 0-10 | 1.30 | 0.00 - 6.50 | 2 | 1.30 |
| Weeding (Cultivation) 2 times | 12 | 5-40 | " | 7.80 | 3.25-26.00 | 4 | 0-24 | 2.60 | 0.00 - 15.60 | 8 | 5.20 |

TABLE 13 (Contd.).

| Operation | Average Total Labour (m/d) | Range of Total Labour (m/d) | Average Cost per Unit Imput (N¢) | Total Average Cost per Acre (N¢) | Range of Total Cost (N¢) | Average Total Family Labour (m/d) | Range of Total Family Labour (m/d) | Average Total Family Labour Costs (N¢) | Range of Total Family Labour Costs (N¢) | Total Average Hired Labour (m/d) | Average Cost of Hired Labour & Other Variable Costs N¢) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Topping & Suckering | 3 | 1-10 | @ 0.65 | 1.95 | 0.65 - 5.85 | 2 | 0-9 | 1.30 | 0.00-5.85 | 1 | 0.65 |
| Harvesting | 14 | 9-33 | " | 9.10 | 5.85 - 21.45 | 7 | 0-26 | 4.45 | 0.00-16.90 | 7 | 4.65 |
| Stringing | 12 | 9-32 | " | 7.80 | 5.85 - 20.80 | 6 | 0.20 | 3.90 | 0.00-3.10 | 6 | 3.90 |
| Loading of Barn | (included in the cost of stringing) | | | | | | | | | | |
| Woodfuel | 6 cords | 2⅔-13 | @ 3.00 per cord | 18.00 | 7.90 - 40.30 | - | - | - | - | - | 18.00 |
| Fireman Service | 15 | 4-42 | @ 0.85 per m/d | 12.75 | 3.40 - 35.70 | 7 | 0-25 | 5.95 | 0.00-21.25 | 8 | 6.80 |
| Kerosine | - | | | 0.70 | 0.15 - 1.30 | - | - | - | - | - | 0.70 |
| Unloading of barn | (included in the cost of unstringing) | | | | | | | | | | |
| Unstringing | 13 | 3-38 | @ 0.65 per m/d | 8.45 | 1.95 - 24.70 | 7 | 0-38 | 4.55 | 0.00-24.70 | 6 | 3.90 |

TABLE 13 (Contd.)

| Operation | Average Total Labour (m/d) | Range of Total Labour (m/d) | Average Cost per Unit (N¢) | Total Average Cost per acre (N¢) | Range of Total Cost (N¢) | Average Total Family Labour (m/d) | Range of Total Family Labour (m/d) | Average Total Cost of Family Labour (N¢) | Range of Total Family Labour Cost | Total Average Hired Labour (m/d) | Average Cost of Hired & Other Variable Costs (N¢) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Grading | 22 | 8-54 | @ 0.65 | 14.30 | 5.20-35.10 | 13 | 0-42 | 8-45 | 0.00 - 27.30 | 9 | 5.85 |
| Transportation[1] | - | - | - | 2.80 | 0.00-9.00 | - | - | 0.30 | 0.00 - 3.00 | - | 2.50 |
| Water for Quenching Fire (done with family labour) | 4 drums | - | 30np per drum | 1.20 | - | - | - | 1.20 | - | - | - |
| T o t a l | 118 m/ds | 90-159 | - | q118.40 | 72.40-186.30 | 54 m/ds | 0-132 | 37.90 | 1.30 - 90.00 | 64 m/ds | 88.50 |

Note: (m/d) indicates 'mandays'.

Part of transportation is done by headloading using family labour.

TABLE 14. COST OF TOBACCO PRODUCTION PER ACRE & LABOUR IMPUTS - WENCHI AREA - 1970 SEASON

| Operation | Average Total Labour (m/d) | Range of Total Labour (m/d) | Total Average Cost per Unit of Input (NȻ) | Total Average Cost of Input per acre (NȻ) | Range of Total Cost of Input per acre (NȻ) | Average Total Family Labour (m/d) | Range of Total Family Labour (m/d) | Average Total Cost of Family Labour (m/d) | Range of Total Family Labour Cost (NȻ) | Total Average Hired Labour (m/d) | Total Average Cost of Hired Labour & Other Variable Costs (NȻ) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Clearing & Stumping | 24 | 13-42 | @ 0.65 per m/d | 15.60 | 8.45 - 27.30 | 6 | 0-15 | 3.90 | 0.00 - 9.75 | 18 | 11.70 |
| Tractor Services | - | - | - | 10.00 | - | - | - | - | - | - | 10.00 |
| Seedlings | - | - | - | 7.77 | 4.15 - 11.40 | - | - | - | - | - | 7.77 |
| Transplanting | 6 | 3-11 | @ 0.65 per m/d | 3.90 | 1.95 - 7.15 | 4 | 0-8 | 2.60 | 0.00 - 5.20 | 2 | 1.30 |
| Fertilizer | - | - | @ 4.00 per 112 lbs | 8.00 | - | - | - | - | - | - | 8.00 |
| Fertilizer Application | 6 | 4-9 | @ 0.65 per m/d | 3.90 | 2.60 - 5.85 | 3 | 0-9 | 1.95 | 0.00 - 5.85 | 3 | 1.95 |
| Weeding (Cultivation) 2 times | 14 | 9-20 | " | 9.10 | 5.85 - 13.00 | 5 | 0-15 | 3.25 | 0.00 - 9.75 | 9 | 5.85 |
| Topping & Suckering | 6 | 1-12 | " | 3.90 | 0.65 - 7.80 | 5 | 0-12 | 3.25 | 0.00 - 7.80 | 1 | 0.65 |
| Harvesting | 18 | 8-29 | " | 11.70 | 5.20 - 18.85 | 10 | 2-29 | 6.50 | 1.30 - 18.85 | 8 | 5.20 |

TABLE 14 (Contd.)

| Operation | Average Total Labour (m/d) | Range of Total Labour (m/d) | Total Average Cost per Unit of Imput (N¢) | Total Average Cost of Imput per acre (N¢) | Range of Total Cost of Imput per acre (N¢) | Average Total Family Labour (m/d) | Range of Total Family Labour (m/d) | Average Total Cost of Family Labour (N¢) | Range of Total Family Labour Cost (N¢) | Total Average Hired Labour (m/d) | Average Cost of Hired Labour & Other Variable Cost (N¢) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Stringing | 16 | 8-29 | @ 0.65 per m/d | 10.40 | 5.20 - 18.85 | 13 | 0-29 | 8.45 | 0.00 - 18.85 | 3 | 1.95 |
| Loading of Barn | 4 | 2-5 | " | 2.60 | 1.30 - 5.85 | 4 | 0-9 | 2.60 | 0.00 - 5.85 | 0 | 0.00 |
| Woodfuel | 10½ cords | 5-21 | @ 2.60 a cord | 27.30 | 13.00 - 54.60 | 0 | - | - | - | - | 27.30 |
| Firemen Services (Curing) | 15 | 4-29 | @ 0.85 per m/d | 12.75 | 3.40 - 24.65 | 10 | 0.29 | 8.50 | 0.00 - 24.65 | 5 | 4.25 |
| Kerosine | - | - | - | 0.64 | 0.10 - 1.38 | - | - | - | - | - | 0.64 |
| Unloading of Barn | 3 | 1-5 | @ 0.65 per m/d | 1.95 | 0.65 - 3.25 | 3 | 0.5 | 1.95 | 0.00 - 3.25 | 0 | 0.00 |
| Unstringing | 10 | 5-15 | " | 6.50 | 3.25 - 9.75 | 7 | 0.15 | 4.55 | 6.00 - 9.75 | 3 | 1.95 |
| Grading | 23 | 14-46 | " | 14.95 | 9.10 - 29.90 | 14 | 0.15 | 9.10 | 0.00 - 19.50 | 9 | 5.85 |
| Transportation | - | - | - | 1.12 | 0.15 - 2.40 | - | - | - | - | - | 1.12 |
| Water for Quenching Fire | 4 drums | 1-9 | @ 30np a drum | 1.20 | 0.30 2.70 | 4 drums | 1.5 | 1.20 | 0.30- 2.70 | 0 | 0.00 |
| T o t a l | 145 m/d | 117-165 | - | 152.28 | 92.50 - 168.98 | 84 m/ds | 38-152 | 56.80 | 42.90 - 132.60 | 61 m/ds | 95.48 |

were very wide, modes were taken instead of arithmetic averages. The operations which used the greatest amounts of labour in both areas were land clearing, cultivation, and the leaf handling operations (particularly harvesting, stringing, curing, unstringing, and grading).

Labour used for land clearing (including stumping) ranged from 2 to 42 mandays per acre, the mode being 18 mandays per acre in the Ejura area. In the Wenchi area, the mode was 24 mandays and the range from 13 to 42 mandays per acre. Correspondingly, the modal cost of this operation was estimated to be N¢11.70 per acre in the Ejura area and N¢15.60 in the Wenchi area. Very little family labour is used for land clearing in both areas (Tables 13 and 14). The labour used for land clearing was found to increase with the thickness of the vegetation and the number and sizes of trees on the plot. Thus in the Ejura area, the cost incurred for the operation varied from N¢1.30 per acre at Amanteng (in the Savanna zone) to N¢26.00 at Kyirinfaso, a forest area. Similarly, in the Wenchi area, the cost of land clearing was found to decline as one travelled northwards from Techiman.

Most farmers cultivate their tobacco plots twice before harvesting is completed. The average total amount of labour used for each cultivation was estimated to be 6 mandays per acre in the Ejura area and 7 mandays in the Wenchi area.

The leaf handling operations - harvesting, stringing, loading and unloading the barns, curing, unstringing and grading together require the greatest amount of labour in both areas. As shown in Table 15, leaf handling alone takes a total of 76 (64%) of the 118 mandays required to produce an acre of flue-cured tobacco in the Ejura area, and 89 (61%) of the 145 mandays

required in the Wenchi area. The greatest proportion of family labour used in tobacco production is used in the leaf handling operations as shown below in Table 15.

TABLE 15. LABOUR IMPUTS IN LEAF HANDLING OPERATIONS

| | EJURA AREA | | | WENCHI AREA | | |
|---|---|---|---|---|---|---|
| | Average Total Labour Used (m/d) | Family Labour Content (m/d) | Hired Labour Content (m/d) | Average Total Labour Used (m/d) | Family Labour Content (m/d) | Hired Labour Content (m/d) |
| Harvesting | 14 | 7 | 7 | 18 | 10 | 8 |
| Stringing | 12 | 6 | 6 | 16 | 13 | 3 |
| Loading & Unloading of barn | Included in Stringing and Unstringing | | | | | |
| Curing (Fireman) | 15 | 7 | 8 | 15 | 10 | 5 |
| Unstringing | 13 | 7 | 6 | 10 | 7 | 3 |
| Grading | 22 | 13 | 9 | 23 | 14 | 9 |
| T o t a l | 76 | 40 | 36 | 89 | 61 | 28 |

It was found that on the average the same amount of labour (15 mandays) is used in curing in both areas. Because of the difficulties involved and the skill needed in this operation, firemen who do the curing charge an average of 85np per manday. Farmers, however, cut down their curing costs by teaming up in threes and sometimes in fours to employ one fireman at the same time. Such firemen watch curing in three or four barns simultaneously.

  

This is facilitated by the fact that farmers group their barns together. Table 16 gives the list and the cost of the other variable inputs (apart from labour) used in tobacco production in both areas for which payment is made in cash. The items include wood-fuel, tractor services, fertilizers, seedlings, kerosine and transport charges; the total cost in Ejura being N¢45.20 and Wenchi N¢54.83 per acre.

TABLE 16. AVERAGE COSTS OF VARIABLE IMPUTS (APART FROM LABOUR) USED IN TOBACCO PRODUCTION

| | EJURA AREA | WENCHI AREA |
|---|---|---|
| | Average cost per acre | Average cost per acre |
| Tractor Services | 10.00 | 10.00 |
| Seedlings | 6.00 | 7.77 |
| Fertilizers | 8.00 | 8.00 |
| Wood-fuel | 18.00 | 27.30 |
| Kerosine | 0.70 | 0.64 |
| Transportation | 2.50 | 1.12 |
| Total | 45.20 | 54.83 |

Tobacco farmers receive tractor services for ploughing, harrowing and ridging at N¢4.00, N¢2.00 and N¢4.00 per acre respectively from the Ministry of Agriculture. The GTC started to operate tractor services for the farmers in 1970. However, because the Company charges higher rates (N¢6.00, N¢4.00 and N¢6.00 per acre for ploughing, harrowing and ridging respectively) farmers in both areas prefer to obtain tractor services from

the Ministry of Agriculture.

Flue-cured tobacco farmers in both areas were made to buy seedlings for the first time in the 1970 season. The official price for the seedlings was N¢6.00 for an acre's consignment of 6,200 seedlings. In the Wenchi area, however, seedlings from the GTC sources were in short supply at the appropriate times for many farmers. As such, private farmers who used their own seedlings took advantage of the shortages and sold their surpluses to other farmers at prices higher than the official rate.

Farmers in both areas paid a flat rate of N¢4.00 per one hundred-weight bag of fertilizers in 1970 season. They were paying N¢3.36 per bag in the 1969 season. Two bags were applied per acre, thus farmers paid a total of N¢8.00 for fertilizers per acre.

Woodfuel for curing the leaves is a very expensive variable cost item. The costs of woodfuel delivered at the barn sites was N¢3.00 and N¢2.60 per cord of 128 cubic feet in the Ejura and Wenchi areas respectively. On the average, farmers in the Wenchi area use more weedfuel to an acrea of tobacco than their counterparts in the Ejura area. Tables 13 and 14 show that on average 6 and 10½ cords of woodfuel are used to cure an acre of tobacco in the Ejura and Wenchi areas respectively, which corresponds to an average cost per acre of N¢18.00 and N¢27.30. The difference in the average amounts of woodfuel used in the two areas can be explained in terms of the difference in average yields and the sizes of barns in the two areas. Large barns require a greater stock of woodfuel than smaller ones in order to maintain the temperatures. An experiment conducted by some GTC field staff during a refresher course at Kintampo in 1969, indicated that the type of furnace used also affects the level of woodfuel consumption. The construction of

  

some furnaces are such that they allow much of the heat generated to be dissipated outside the barn. It was found from the experiment that the 'Darlington Mark 2' furnace recently introduced into the Wenchi area consumed about 30% less woodfuel than the type which previously existed. With a given size of barn, (say, Pioneer Duplex Barn) the amount of woodfuel used increases with the size of the farm but at a diminishing rate.

It was also observed that in the Wenchi area illiterate farmers incur higher costs per acre. This is because they tend to use a greater amount of labour (both family and hired) per operation than their literate counterparts.

Gross Margin of Tobacco Production:

The gross margin of an enterprise is expressed as the value of total output (product of the yield and price) less the variable costs. The level of gross margin of an enterprise has a great influence on farmers' production and investment decisions. Table 17 gives the gross output and gross margin of tobacco in the Wenchi and Ejura areas. It can be seen from the Table that on the average the crop gives a higher gross margin (N¢118.33) per acre in the Wenchi area than in the Ejura area (N¢101.14). However, if it is assumed that the farmer hires all his labour (i.e. family labour is costed) then a higher gross margin (N¢63.24) per acre is obtained in the Ejura area than in the Wenchi area (N¢61.53 per acre).

TABLE 17. GROSS OUTPUT AND GROSS MARGINS OF TOBACCO PER ACRE (1970)

| | EJURA AREA | | | WENCHI AREA | | |
|---|---|---|---|---|---|---|
| | Gross Output (N¢) | Variable Costs (N¢) | Gross Margin (N¢) | Gross Output (N¢) | Variable Costs (N¢) | Gross Margin (N¢) |
| Farmers with Family & Hired Labour | 189.64 | 88.50 | 101.14 | 213.81 | 95.48 | 118.33 |
| Farmers with Hired Labour Only | 189.64 | 126.40 | 63.24 | 213.64 | 152.28 | 61.53 |

Investment in Curing Barns:

In flue-cured tobacco production, the investment which requires the greatest capital outlay is the construction of curing barns. It is also the longest-term investment that is made in the enterprise. When the GTC (then STPC) was buying green leaf tobacco in the two areas, the only incentives farmers had for constructing curing facilities were a free supply of seedlings, higher prices for cured leaves (than the green leaves) and free services of a fireman during curing. Raising money for the construction of the barn was entirely the responsibility of the farmers themselves. Further, increase in the gross margins obtained from flue-cured tobacco production relative to those obtained from the production of green leaf tobacco were not substantial enough to provide an adequate incentive for the farmers to invest in barn construction (3). Accordingly, not many barns were constructed until 1969 in the Ejura area and 1970 in the Wenchi area when the GTC ceased to purchase green leaf tobacco altogether. Because

  

of the Company's decision not to buy any more green leaves, farmers who wanted to produce tobacco did not have any alternative than to construct tobacco barns to cure their leaves.

Flue-cured tobacco barns may be constructed of landcrete, mud or mud and thatch. Basically, they are rectangular buildings with 'lean-to' type roofing and equipped with a door and a number of vents. The vents occur at the bottom and at the top of the building and may be opened or closed as it becomes necessary. There is on the floor of the interior a connection of tubes (flue-pipes) which run the length and breadth of the room and which lead into a low-fire furnace constructed of baked bricks outside the barn. The other end of the flue-pipes opens out at the top of the building into a chimney which usually has a hat-like cover called a 'crowel'. Also, inside the barn are poles, tier poles, which stand vertically and which are connected to each other horizontally and in tiers by batterns. It is on these batterns that the tying sticks or piers bearing the green tobacco leaves are hung to cure.

The types of tobacco barns found in the two areas were: Standard barns, Pioneer Duplex barns, Miniature barns and Bush barns. The standard barns are the biggest of the four types. They are 16' x 20'x 30' and four to six of them may be built together to form a massive block of barns (see plate 1). The existing Standard barns were constructed by the Food Marketing Board for curing leaves bought from farmers and also leaves produced by farms operated by the Board. Currently, the GTC rents some of them out to tobacco farmers and uses some, especially those sited at the tobacco stations, for conditioning cured leaves prior to baling. Each Standard barn can contain

Plate I. Standard Barns

Plate II. Pioneer Duplex Barn

up to 880 tying sticks each bearing 96 leaves (i.e. a total of 44,880 leaves) per cure. This means that one Standard barn can cater for 4.7 acres of tobacco at one cure. Records on the costs of constructing those barns were not available at the time of study.

Both the Pioneer Duplex and the Miniature barns are 4-tiered. However, the Pioneer Duplex is bigger (16'x 16'x 16') than the Miniature barn which measures 12'x 12'x 16'. Photographs of Pioneer Duplex and Miniature barns are shown in Plates II and III respectively. The Miniature barn is capable of carrying 19,200 leaves at a time and, therefore can cater for 1.7 acres of tobacco while the Pioneer Duplex barn can cater for 3 acres of tobacco.

'Bush' barns (so called by the tobacco authorities) differ from the other types of barns mainly because they are constructed with local materials although some have iron roofing. They are not of a standard size. Those encountered during the surveys had sizes varying from about 8'x 12'x 12' to 18'x 25'x 20'. They have similar interior arrangements as the Standard, Pioneer Duplex and Miniature barns. Bush barns were the most common type found in the Ejura area before 1969. Recently, however, the policy of the GTC of restricting farmers' tobacco acreage to 1 or 2 acres has increased the popularity of the Miniature barns. Authorities in the Wenchi area, however encourage the putting up of Pioneer Duplex barns instead of Miniature barns because it is hoped that farmers will expand their tobacco acreages in future.

Table 18 gives the numbers and the types of barns which were present in the two areas in 1969 and 1970. The Table shows that more tobacco barns have been built in both areas since 1968 than in the previous years. It can be

Plate III. 12' x 12' x 16' Miniature Barn

Plate IV. 12' x 12' x 16' 'Bush' Barn

seen from Table 18 that the Pioneer Duplex barn is more popular in the Wenchi area and the Miniature barn is most common in the Ejura area.

TABLE 18: NUMBER AND TYPES OF TOBACCO BARNS IN THE EJURA AND WENCHI AREAS AT THE END OF 1968 SEASON AND THOSE BUILT IN 1969 AND 1970*

| Type of Barn[1] | Built before End of 1968 | | Built 1969 | | Built 1970 | | Total at end of 1970 Season | |
|---|---|---|---|---|---|---|---|---|
| | Ejura | Wenchi | Ejura | Wenchi | Ejura | Wenchi | Ejura | Wenchi |
| Standard Barn | 45 | 23 | 0 | 0 | 0 | 0 | 45 | 23 |
| Pioneer Duplex | 35 | 83 | 10 | 127 | 14 | 336 | 59 | 546 |
| Miniature | 70 | 3 | 74 | 0 | 80 | 0 | 224 | 3 |
| T o t a l | 150 | 109 | 84 | 127 | 94 | 336 | 328 | 572 |

It was observed from the surveys that all the types of barns mentioned are capable of producing good quality cured leaves provided the appropriate temperature and humidities are maintained during the curing process. However it was also observed that it is not economical to cure the produce from a small acreage in large barns especially when yields are low.

'Bush' barns are more susceptible to fire and storm risks than other barns, especially if they are constructed of wooden frames and thatch roofing. In fact incidents were recorded in both areas during the survey where Bush barns caught fire and burnt during curing. The landcrete barns are more durable and may have a useful life of some thirty years and have low maintenance costs. Their disadvantage is that they require a fairly

*Source: GTC Records Wenchi, Ejura and Kintampo

1. 'Bush' barns have been classified into Standard, Pioneer and Miniature barns according to their approximate sizes.

large capital outlay (see Table 19). By contrast, the Bush barns may only last about 12 years and cost more to maintain since cracks in the walls occur frequently and the thatch may need to be replaced. Bush barns, however, have low initial costs and some farmers claimed that when well maintained and given a cement coating a Bush barn can last as long as a landcrete one.

Tables 19, 20 and 21 give the details of the relative construction costs involved for three different types of barns: Pioneer Duplex barn in the Wenchi area, a Miniature barn in the Ejura area and a 12'x 12'x 16' Bush barn also in the Ejura area.

TABLE 19. COST OF CONSTRUCTING A 16'x 16'x 16' PIONEER DUPLEX BARN IN WENCHI - 1970*

| Item | Quantity | Price per Unit (N¢) | Total Cost(N¢) |
|---|---|---|---|
| Cement | 50 bags | 1.80 | 90.00 |
| Labour (for landcrete) | 2,500 blocks | 12.00/100 | 30.00 |
| Water | 40 drums | 0.22 | 8.80 |
| Labour (Mason for Construction) | piece-rate | - | 32.00 |
| Stones | 1 truck load | 10.00 | 10.00 |
| Iron Rods | 30 feet | 1.40 | 1.40 |
| Labour (to help Mason) | 14 mandays | 0.60 per manday | 8.40 |
| Wooden plants 2'x4' | 8 | 0.75 each | 6.00 |
| Wooden " 1'x3' | 8 | 0.55 " | 4.40 |
| Iron Sheet[1] | 2 pkts. | 34.00 " | 68.00 |
| Labour (Carpenter - Roofing) | piece-rate | - | 8.00 |
| Boards for Furnace 2'x 4' | 4 | 0.75 each | 3.00 |
| Boards for Furnane 1'x 3' | 4 | 0.55 " | 2.20 |

| | | | |
|---|---|---|---|
| Mails for Roofing | 41 lbs | 0.30 per lb | 1.20 |
| Doors | 2 | 5.50 each | 11.00 |
| Top Vents | 6 | 0.60 " | 3.60 |
| Bottom Vents | 8 | 0.40 " | 3.20 |
| Baked Bricks (for Furnace) | 150 | 0.10 " | 15.00 |
| Teak Poles | 10 | 0.65 " | 6.50 |
| 'Ofram' Poles | 40 | 0.13½ " | 5.40 |
| Nails (for fixing Tiers) | 4 lbs | 0.50 per lb | 2.00 |
| Cement (for spraying wall) | 2 bags | 1.80 each | 3.60 |
| Labour (for spraying Wall) | 2 mandays | 0.75 per manday | 1.50 |
| Flue-Pipes | Full complement | - | 91.00 |
| Total (Cost of Construction) | .... | .... | N¢416.20 |

*Source: GTC Records Kintampo.

1. The cost of Iron Sheets was found to fluctuate considerably.

TABLE 20. COST OF CONSTRUCTING A 12'x 12'x 16' MINIATURE BARN IN EJURA - 1970*

| Item | Quantity | Price per item (N¢) | Total(N¢) |
|---|---|---|---|
| Cement | 43 bags | 1.80 | 77.40 |
| Labour (for making landcrete) | 14 mandays | 0.75 per manday | 10.50 |
| Sand and Stones | 1 truck load | 10.00 | 10.00 |
| Mason (for construction) | piece-rate | - | 26.00 |
| Labour (to help Mason) | 2 mandays | 0.75 per manday | 1.50 |
| Boards & Tier Poles | 38 | 0.80 each | 30.40 |
| Iron Sheets | 1½ pkts. | 34.00 " | 51.00 |
| Mails | 9 lbs | 0.50 | 4.50 |

| | | | |
|---|---|---|---|
| Carpenter (for Roofing) | 3 mandays | 1.05 per manday | 3.15 |
| Doors and Hinges | 1 | - | 6.70 |
| Iron Rods | 26 feet | 0.30 | 1.20 |
| Top and Bottom Vents | 10 | 0.50 | 5.00 |
| Baked Bricks[1] (for furnace) | 700 | 0.04 | 28.00 |
| Mason (for constructing furnace) | 2 mandays | 1.05 | 2.10 |
| Water | 25 drums | 0.22 | 5.50 |
| Flue-Pipes | Full complement | - | 66.00 |
| Total Cost of Construction | ..... | ..... | N¢328.95 |

* Source: GTC Records Ejura.

1. Furnaces in the Ejura area have different shapes from 'Darlington Mark 2' in the Wenchi area.

TABLE 21. COST OF CONSTRUCTING A 12'x 12'x 16' 'BUSH' BARN WITH IRON ROOFING IN THE EJURA AREA - 1970*

| Item | | Total Cost (N¢) |
|---|---|---|
| Wooden Frames ... | .... | 42.00 |
| Carpenter (for erecting the frame and roofing) | | 30.00 |
| Application of Mud to the Wooden Frame | 10 mandays | 7.50 |
| Mails 8 lbs @ 0.50 per lb | .... | 4.00 |
| Iron Sheets 1½ pkts. @ 34.00 | .... | 51.00 |
| Door and Vents with Hinges | .... | 11.70 |
| Flue-Pipes - Full complement | .... | 66.00 |
| Total cost of construction | .... | N¢212.20[2] |

* Source: Interview with farmers.

2. A similar barn with thatch roofing is estimated to cost N¢163.50 to build instead of N¢212.20 since the thatch and the labour for roofing together cost only N¢2.00.

Appraisal of The Investments In Tobacco Barns:

The following assumptions are made for the appraisal of the investment in a tobacco barn:-

1. That the economic life of the landcrete (Pioneer Duplex and Miniature) barn is 15 years and that these barns have no scrap value.
2. That each farmer is allowed to produce only one acre of tobacco - (due to acreage restrictions).
3. That the yields the producer prices and the cost of production of tobacco will not change in the next 15 years. Admittedly this is a pessimistic assumption especially if it is considered that yields have been increasing in recent years.

(a) Appraisal of Investment in Miniature Barn in Ejura Area

(i) Using Discounted Cash Flow - Net Present Value Method.

| | |
|---|---|
| Cost of Investment .... .... .... | N¢328.95 |
| Annual Cash Flow (Gross Margin) .... .... | 101.14 |
| Rate of Interest - 9% .... .... .... | - |

Annuity Factor - 8.06

Net Present Value = Present Value - Cost of Investment

= (N¢101.14 x 8.06) - N¢328.95

= N¢486.24

(ii) Using the Yield Method:

| | | |
|---|---|---|
| Cost of Investment .... | .... | N¢328.95 |
| Annual Cash Flow .... | .... | 101.14 |
| Annuity Factor $\frac{328.95}{101.14}$ | .... | 3.25 |

3.25 corresponds to a yield of 30%

(b) Appraisal of Investment in Pioneer Duplex Barn in Wenchi Area:

(i) Net Present Value Method

| | | |
|---|---|---|
| Cost of Investment | .... .... | N¢416.20 |
| Annual Cash Flow (Gross Margin) | .... | 118.33 |
| Rate of Interest | = | 9% |
| Annuity Factor | = | 8.06 |
| N.P.V. | = | P.V - C |
| | = | (N¢118.33 x 8.06) - N¢416.20 |
| | = | N¢537.54 |

(ii) Yields Method.

| | | |
|---|---|---|
| Cost of Investment | = | N¢416.20 |
| Annual Cash Flow | = | 118.33 |
| Annuity Factor | = | $\frac{416.20}{118.33}$ = 3.51 |

3.51 corresponds to a yield of 28%

These calculations show that it is very profitable to invest in tobacco barns in both areas - the yields of the investment being 30% and 28% in the Ejura and Wenchi areas respectively.

Credit Facilities Available to Tobacco Farmers.

Flue-cured tobacco production involves relatively high direct and indirect costs as discussed in the earlier sections. Some farmers pay for these costs directly from their own resources but many of them depend, either entirely or in part, on credits obtained from the following sources:-

(i) Friends, relatives and private money lenders. Credit from such sources

is almost invariably in cash and given on a short-term basis (usually one farming season). Such credit also attracts very high interest rates. Some farmers interviewed were paying interest rates of 50% to 100%.

(ii) The GTC extends credit to the farmers in the form of farm requisites such as seedlings, fertilizers, fertilizer measures (cups), piers, jute twines and flue-pipes. The Company also gives a cash advance of N¢10.00 per acre to cover partially the cost of woodfuel. The value of credit extended by the Company is deducted at source from the farmers' proceeds.

(iii) Tobacco farmers in both areas receive tractor services (ploughing, harrowing, and ridging) on credit from the Ministry of Agriculture by special arrangement with the GTC.

(iv) The most recent source of credit to tobacco farmers in both areas is the Agricultural Development Bank (ADB). Under the Master Growers' Scheme (discussed in Chapter 1) the Bank gives loans to farmers to cover the costs of constructing curing barns. The loans are repayable in three years and interest is charged at 9%.

Some Bottlenecks to Increased Tobacco Production and Suggestions for Their Remedy.

The various functions performed by the Ghana Tobacco Company in the organisation of raw tobacco production and marketing in the country have been discussed in Chapter 1 of this paper.

One of the policies of the Company about which many farmers interviewed, especially in Ejura East, complained was the restriction on the acreage of

tobacco a farmer can plant. Tobacco yields throughout Ghana have been low. One of the reasons put forward to explain this is that tobacco farmers have been operating larger acreages of tobacco farms than they can conveniently cope with. Thus, it has been a long-standing policy by the tobacco authorities to restrict the acreages allocated to the farmers. This policy had been carried out through limiting the number of tobacco seedlings supplied to the farmers. It may be interesting to note whether the size of tobacco holding per farmer has any significant relationship with the yield per acre and whether the yield situation has improved since the authorities started to carry out this policy.

The situation is that tobacco yields in the Ejura and Wenchi areas have shown a continued improvement over the years (Table 12). However, a regression analysis done in this study (see Appendix III) shows that there is no statistically significant correlation (relationship) between the size of holding held by a farmer and his yield per acre. This suggests that there is little justification in restricting the acreages of tobacco farms It was observed during the survey, especially in the Ejura East district, that farmers were giving tobacco less attention in favour of competing crops because of the acreage restriction on tobacco. The apparent reason for this is that farmers are more interested in their total annual returns over a period than the returns they receive per acre of a particular crop. In view of this, it is suggested that farmers who have adequate curing facilities, enough labout (or money for the purpose) and good past performances should be less restricted. Such a measure would encourage increased domestic output.

Formerly, when the tobacco Company (or STPC) supplied all the farmers' requirements of seedlings farmers often complained that there were not enough

seedlings at the appropriate times for planting. They also complained that the Company's field staff who distributed the seedlings indulged in favouritism and nepotism. It was found from the surveys, especially in the Wenchi area, that many of the field workers illegally indulged in tobacco farming under fictitious and/or other names. These workers used the seedlings intended for the farmers to plant their own farms and in some cases madd farmers pay for them. It is hoped that when farmers are able to raise all the seedlings they require, these problems will no longer arise.

A number of farmers interviewed in both areas complained that they were unable to get tractor services to prepare their land at the right times. It was alleged that the delays encountered were sometimes so long that farmers were forced to give up the year's tobacco cropping altogether. It was learnt that in the Wenchi district last year, there were many cases where field workers of the GTC collaborated with tractor operators of the Ministry of Agriculture to impose extra charges before giving farmers good quality services. As a remedy for the delays encountered by farmers and for fraudulent practices, it is suggested that the GTC endeavour to increase its fleet of tractors in both areas.

The suggestion is also made that the GTC try to extend its woodfuel advances to cover all the farmers in both areas. The amounts involved should also be increased to about N₵18.00 per acre in the Ejura area and N₵28.00 in the Wenchi area to cover all the costs incurred on woodfuel. This is because most of the farmers interviewed complained of difficulties in financing their tobacco operations. Thus, apart from the woodfuel advances, many farmers would need further advances during the tobacco season to enable them to finance

  

their labour requirements. Perhaps a total cash advance of about N¢45.00 per acre per season would alleviate the farmers' financial problems. Such loans would not be difficult to retrieve since the GTC is the only buyer of farmers' tobacco. It is suggested, therefore, that the GTC explore the possibility of working out a scheme with the Agricultural Development Bank whereby such loans could be granted to the tobacco farmers in both areas.

Controversy often arises over the present grading system introduced in 1969. Under this new system, the Company's field workers are supposed to visit farms frequently to observe the stage of harvesting reached and to mark farmers' marketing cards accordingly. This enables the buying team to decide whether leaves should be bought as 'Bottom' or 'Top' leaves. The method is adopted because it is often difficult to tell just from visual inspection whether a leaf comes from the bottom of the plant or from the top of it. It could be effective if only field workers would inspect the farms before marking the cards and if farmers could plant their plots at the same time so that the plants would grow uniformly. Unfortunately, however, this does not happen and as a result farmers' cards frequently get wrongly marked. Consequently their leaves are boght at the wrong prices. Perhaps a more trained and hard-working field personnel of the tobacco Company might eliminate this problem.

Some farmers complained during the surveys, that some officials of the buying teams indulge in corrupt practices. It was alleged that the officials collude with farmers so that much higher weights are recorded in the buying books than their tobacco leaves actually weigh. The excess returns thus obtained are shared between the farmers and the officials concerned. It was

learnt that losses emanating from such practices are suffered by the GTC or more frequently by other farmers - especially the illiterates who cannot read the scales and the receipts given them. Lower weights are recorded for their leaves. Reports of these corrupt practices were heard from many farmers in the Wenchi area especially in the Wenchi district. These allegations can be investigated and the culprits, if any, brought to book.

At the time of the STPC, payments for farmers' tobacco were made at very long and often irregular intervals. As a result of bitter complaints by the farmers, the GTC promised to make payments every month during the 1969 season. This promise could not be fulfilled throughout the season. The GTC would do well to consider devising a procedure whereby prompt payment is made for tobacco received.

The writer witnessed occasions during the surveys, when misunderstanding and even quarrels ddveloped between GTC officials and farmers over deductions made from farmers' payments with respect to farm requisites supplied on credit and other debts. It was observed that many farmers, literates and illiterates alike, usually leave the tobacco stations after payment with the impression that they have been cheated by the officials - account clerks. This is because the pay slips given to the farmers do not indicate how much the farmers owe, the items for which deductions are being made nor their prices. New pay slips which would supply all the above information may solve the problem. Such slips would make the farmers understand the deductions made and would go a long wwy to restore and maintain the farmers' confidence in the tobacco officials.

In spite of the fact that annual production targets are usually unattained

and the fact that the general price levels have risen, producer prices of flue-cured tobacco have not shown much increase since 1962 - as shown in Table 22.

TABLE 22. PRODUCER PRICES PER 'LB' OF FLUE-CURED TOBACCO, 1962-1970*

| Grade | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | Grade | 1969 | 1970 |
|---|---|---|---|---|---|---|---|---|---|---|
| I | 5/- | 5/3 | 5/3 | 63p | 63np | 63p | 53np | Bottom Mature | 55np | 55np |
| II | 4/- | 4/3 | 4/3 | 4/3 | 51p | 51p | 43np | Top " | 50np | 50np |
| III | 3/- | 3/3 | 3/3 | 3/3 | 39p | 39p | 32np | Bottom Bright | 40np | 40np |
| IV | 2/- | 2/- | 2/- | 2/- | 24p | 24p | 20np | Top " | 35np | 35np |
| V | 1/3 | 1/6 | 1/6 | 1/6 | 18p | 18p | 15np | Bottom Dark | 30np | 30np |
| VI | 6d | 9d | 9d | 9d | 9p | 9p | 7np | " Green | 25np | 25np |
| - | - | - | - | - | - | - | - | Top Dark | 20np | 20np |
| - | - | - | - | - | - | - | - | Top Green | 10np | 10np |
| - | - | - | - | - | - | - | - | Scrap | 15np | 15np |

* Source: Compiled from STPC/GTC Records.[1]

In keeping with the Company's policy to make the farmers produce flue-cured tobacco independently, the Company no longer provides firemen services during curing. It has also reduced its fertilizer subsidy to farmers and made them raise their own seedlings or pay for them. The result of this policy is that farmers' production costs have increased in recent times. It would, therefore, seem less surprising to note that 72% and 84% of the farmers

1. Data received from Mr. Kwasi Appiah, GTC, Accra.

interviewed in the Ejura and Wenchi areas respectively complained about low producer prices. It is believed that low producer prices was one of the reasons why 'green' leaf farmers were disinclined to change over to become 'dry' leaf farmers. It was also one of the reasons why many farmers stopped producing tobacco altogether when the STPC ceased to buy green leaves. In view of these facts, the GTC should endeavour to look into the possibility of increasing the present producer prices. Such a gesture would go a long way to attract more farmers to tobacco production and to sustain the interest of those already producing the crop.

It has been stated earlier on that the Agricultural Development Bank (ADB) gives loans to tobacco farmers to construct curing barns. The loans attract 9% interest rates and are supposed to be repaid in three years. The relevant question to ask is whether the farmers can conveniently repay the loans within the stipulated time, in view of the high costs of the barns and the current low yields of tobacco. To investigate this, the method of Cash Budget analysis is used under the following assumptions.

1. That the present gross margins obtained by farmers are going to remain unchanged in the next six years.
2. That the farmers use only the cash (gross margins) generated from tobacco to pay for their barns.

The results of the analyses are presented in Tables 23, 24, 25, and 26.

TABLE 23. CASH BUDGET FOR CONSTRUCTING DUPLEX BARN - (WITH 1 ACRE OF TOBACCO) - WENCHI AREA

| Year | Capital Outstanding at the beginning of year (N¢) | Interest charges - 9% on Outstanding Capital (N¢) | Capital Outstanding at the end of the year (N¢) | Net Cash Flows (N¢) | Final Balance (N¢) |
|---|---|---|---|---|---|
| 1st | 416.20 | 37.46 | 453.66 | 118.33 | -335.33 |
| 2nd | 335.33 | 30.18 | 365.51 | 118.33 | -247.18 |
| 3rd | 247.18 | 22.25 | 269.43 | 118.33 | -151.10 |
| 4th | 151.10 | 13.60 | 164.70 | 118.33 | - 36.37 |
| 5th | 36.37 | 3.27 | 39.64 | 118.33 | + 78.69 |

Table 23 shows that under the assumptions made, if a farmer in the Wenchi area takes a loan of N¢416.20 from the Bank to construct a Pioneer Duplex Barn he will not be able to repay the loan in the third year if he produces only one acre of tobacco. In fact, he will be N¢151.10 in arrears at the end of the third year. He can, however, finish repayment at the end of the fifth year when his budgetary balance becomes positive.

TABLE 24. CASH BUDGET FOR CONSTRUCTING DUPLEX BARN (WITH 2 ACRES OF TOBACCO) - WENCHI AREA

| Year | Capital Outstanding at beginning of year (N¢) | Interest Charges - 9% on Outstanding Capital (N¢) | Capital Outstanding at the end of the year (N¢) | Net Cash Flows (N¢) | Final Balance (N¢) |
|---|---|---|---|---|---|
| 1st | 416.20 | 37.46 | 453.66 | 236.66 | -217.00 |
| 2nd | 217.00 | 19.53 | 236.53 | 236.66 | + 0.13 |

The same farmer will however be able to break even at the end of the second year if he operates two acres of tobacco instead of one acre - as shown in Table 24.

Similar analyses indicate that if a farmer takes a loan of N¢328.95 to construct a Miniature barn in the Ejura area, and he is made to grow only one acre of tobacco, repayment will take slightly more than four years. On the other hand, if the farmer is allowed to produce 2 acres of the crop, he will finish repayment of the loan at the end of the second year - as shown in Tables 25 and 26.

TABLE 25. CASH BUDGET FOR CONSTRUCTING A MINIATURE BARN (WITH 1 ACRE OF TOBACCO) - EJURA AREA

| Year | Capital Outstanding at the beginning of the year (N¢) | Interest Charges - 9% on Outstanding Capital (N¢) | Capital Outstanding at the end of the year (N¢) | Net Cash Flows (N¢) | Final Balance (N¢) |
|---|---|---|---|---|---|
| 1st | 328.95 | 29.61 | 358.56 | 101.14 | -257.42 |
| 2nd | 257.42 | 23.17 | 280.59 | 101.14 | -179.45 |
| 3rd | 179.45 | 16.15 | 195.60 | 101.14 | - 94.46 |
| 4th | 94.46 | 8.50 | 102.96 | 101.14 | - 1.82 |
| 5th | 1.82 | 0.16 | 1.98 | 101.14 | + 99.16 |

TABLE 26. CASH BUDGET FOR CONSTRUCTING A MINIATURE BARN (WITH 2 ACRES OF TOBACCO) - EJURA AREA

| Year | Capital Outstanding at the beginning of the year (N¢) | Interest Charges - 9% on Outstanding Capital (N¢) | Capital Outstanding at the end of the year (N¢) | Net Cash Flows (N¢) | Final Balance (N¢) |
|---|---|---|---|---|---|
| 1st | 328.95 | 29.61 | 358.61 | 202.28 | -156.28 |
| 2nd | 156.28 | 14.07 | 170.35 | 202.28 | + 31.93 |
| 3rd | 31.93 | 2.87 | 34.80 | 202.28 | +237.08 |

The above analyses justify, to some extent, the complaints many farmers made that the repayment period given them under the Master Growers' Scheme is too short and causes them considerable hardship. In the light of the above analyses the GTC should arrange to get the repayment period extended to six years for all farmers made to operate only one acre of tobacco. Alternatively, all farmers under the scheme could be allowed to operate two or more acres of the crop.

It was observed during the surveys that in many villages - especially in the Wenchi area - the personal relations between farmers and field staff were strained. Obviously, under such circumstances good extension work cannot be carried out. The writer encountered two ex-tobacco farmers in the Wenchi district and one in the Ejura area, who alleged that they stopped tobacco farming because they were insulted by some STPC/GTC officials. The Company's officers in both areas should continue to make conscious efforts to ensure good relations between their personnel and the farmers.

One important area in tobacco production where emphasis has been lacking is research. In a bid to increase domestic production of the crop, research should be made to find varieties which perform better under our conditions than the present N.C.95 and Harrison Special. The use of one fertilizer recommendation for all soil situations has been known to produce disastrous results. In the 1969 season, the writer witnessed cases at Bredi, Bosomkyekye and Ejura (all in the Ejura area) where several barns-fulls of tobacco did not cure because of an incorrect fertilizer application.

Despite these problems, it may be noted that as an interprise, tobacco production has become widely accepted in both areas. It is a very lucrative crop and there seems to be fuller scope for expansion.

  

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# CHAPTER III

## THE ECONOMICS OF THE PRODUCTION OF SOME IMPORTANT FOOD CROPS IN THE EJURA AND WENCHI TOBACCO AREAS

This chapter discusses briefly the yields, labour imputs, production cost and the returns to yam, maize, groundnut and tomato enterprises in the two tobacco areas.

Since the Ejura and Wenchi tobacco areas are in the same ecological zone, one finds similar crops growing in both places. Maize, yams, cassava, groundnuts, plantain, cocoyams and tomatoes are the major food crops while garden eggs, cowpeas, 'neri', okro and rice are produced to a very limited extent. The rotations in which these crops occur were discussed in Chapter One and summarized in Table 10. In the present Chapter, however, only yams, maize, groundnuts and tomatoes have been selected for the purposes of detailed study. These crops were selected because, first, they give high gross margins, second, they were produced by most of the farmers covered under the surveys as seen in Table 9 and third, reliable data were obtained about them. For the computation of gross output and gross margins the modes of the prices for the past three years quoted by the farmers are used.

### Resources Used In Agricultural Activities Other Than Tobacco Farming

The same resources of land, labour and (a little) capital are used in the production of maize, yams, groundnuts and tomatoes as are used in tobacco production. Data on the extent of land which has been under these crops were not available. They could not be obtained from the offices of the Ministry

of Agriculture in the two areas. Farmers rely on the same types of labour for these crops as they do for tobacco.

Capital items used are hoes, cutlasses and axes as in the case of tobacco. However, unlike tobacco no fertilizers are used in the production of yams, groundnuts and tomatoes and only few farmers fertilize maize. Farmers in Ejura depend largely on tractor services for land preparation for maize, whereas in the Wenchi area land preparation for these crops is done largely with manpower. Other capital items used in the production of these crops are baskets, raphia mats and storage barns constructed of raphia and/or wood. As a rule these barns are not costly. The costs given by the farmers ranged from N¢3.00 to N¢10.00 depending upon the size and the materials used in their construction. They last between one and three years. It can be seen, therefore, that farmers do not make as great a capital investment in these crops as they do in flue-cured tobacco production.

Some of the farmers finance the production of these crops through credit. Credit is obtained from friends, relatives, private money-lenders and middlemen who deal in these crops. The Agricultural Development Bank (ADB) also extends credit amounting to fifteen New Cedis per acre for maize production. However, only one of the farmers interviewed in the Wenchi area had a loan from the Bank for maize production and in the Ejura area only three farmers had obtained a maize loan. At the time of the surveys the Bank had not started administering loans to yam farmers. Farmers who take loans from middlemen usually encounter difficulties. They can sell to only the middlemen concerned and at prices often determined at the time of the loans are administered. Frequently the farmers involved are therefore unable to get good prices for their produce.

Maize (Zea mays)

Maize is said to be the country's most important staple cereal (8, p.372). It was observed from the surveys that it is the most popular crop apart from tobacco. 82 and 78 percent of the farmers interviewed in Ejura and Wenchi areas respectively grew maize in 1970 (Table 9). Farmers in both areas indicated that they produced this crop for consumption as well as for the market.

Maize is usually the first crop in a number of rotations. This in a way shows the importance farmers attach to the crop. Unlike tobacco and yams, one crop of maize is grown in the major and another in the minor season. However, in this paper an account is given only of the major season maize. This is because in the minor season, the acreages cultivated are very small due to the uncertainty of the weather and the crop is largely intended for consumption purposes.

1. Yields.

Available records show that maize yields are variable. The late maturing variety is said to yield twice as much as the early-maturing variety which is said to yield between 350 lbs to 800 lbs of shelled maize per acre (8, p.372). A report from the Ministry of Agriculture (Crop Production Division), Brong Ahafo Region indicates that maize yields 600 lbs (shelled) per acre in the region. Records from the same Division's Offices at Mampong and Attebubu indicate, however, that in the Ejura area maize yields between 800 and 1,000 lbs (shelled) per acre. In the Ejura and Wenchi areas, maize isuusually sold in cocoa bags which hold 220 lbs. Farmers interviewed in

the Wenchi area reported that they sold between 2 and 5 bags (440 lbs to 1,100 lbs) of shelled maize per acre. From the figures they quoted, it was estimated that an average of three bags or 660 lbs of shelled maize is sold per acre per farmer in the area. This figure allows for household usage and reserves for planting in the next season. Similarly, it was found that farmers in the Ejura area sold between 2 and 7 bags (440 lbs to 1,540 lbs) of shelled maize per acre, the average being 4 bags or 880 lbs per acre. This indicates that maize yields are higher in the Ejura area than in the Wenchi area. The difference might be explained by the fact that 5% of the farmers interviewed in the Ejura area said they applied some fertilizers on their maize farms. In the Wenchi area none of the farmers interviewed applied fertilizers to their maize farms.

Data[1] on maize prices collected from the major market centres in the two areas (Wenchi, Techiman, Kintampo, Ejura and Mampong) indicate that prices of maize vary considerably in both areas according to the time of the year. They are very low during the harvesting period of July-August. They then rise steadily and reach their peak in March-April. Prices quoted by the farmers interviewed in the Wenchi area ranged from N¢3.00 to N¢10.00 per bag. In the Ejura area they ranged from N¢3.00 to N¢12.00 per bag. The mode of the prices quoted was found to be N¢6.00 per bag for both areas. This price is the same as that at which the Ghana Food Marketing Corporation purchases maize throughout the year in both areas. Assuming this price the average gross returns to maize were estimated at N¢18.00 per acre in the Wenchi area and N¢24.00 in the Ejura area.

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1. Obtained from Offices of the Ministry of Agriculture, Crop Production Division at Wenchi, Kintampo, Attebubu and Mampong.

2. Labour Inputs and Production Costs:

Tables 27 and 28 give the amounts of labour input and the costs of the various operations in maize production in the two areas. The various operations are discussed in Appendix IV The tables show that farmers in the Wenchi area use greater amounts of labour to produce an acre of maize than their counterparts in the Ejura area. It was estimated that on the average 17 and 25 mandays of labour are used to produce one acre of maize in the Ejura and Wenchi areas respectively. The disparity is explained by the fact that almost all the farmers interviewed in the Ejura area relied on tractor services for land preparation whereas those interviewed in the Wenchi area depended on manpower (Tables 27 and 28). In the Wenchi area the operation which demands the greatest amount of labour was found to be land clearing. It was estimated to take an average of 12 mandays per acre out of the total of 25 mandays used by the enterprise. Land cultivation also demands quite a high amount of labour while harvesting and sowing use very little labour in both areas - as shown in Tables 27 and 28. Nearly half of the total labour used on maize farms in both areas is family labour. However, as in the case of yam and tobacco production, land clearing and cultivation for maize are done with hired labour (see Tables 27 and 28).

The only capital items used in maize production in the two areas are tractor services (in the Ejura area) and seeds. In the Ejura area farmers plough the fields twice before sowing and this costs them N¢8.00 per acre. The value of seeds used was estimated to be 55 np and 75 np per acre in the Ejura and Wenchi areas respectively. However, the farmers interviewed in the Wenchi area provided their own seeds while their counterparts in the Ejura area preferred to buy an average of 25 np worth of improved seeds from

TABLE 27: LABOUR IMPUTS AND COST OF PRODUCING AN ACRE OF MAIZE - EJURA AREA - 1970

| Operation | Total Average Labour (m/d) | Range of Total Labour (m/d) | Average Wage Rate per m/d | Total Average Labour & Other Costs (N¢) | Range of Total Labour & Other Costs (N¢) | Average Total Family Labour Involved (m/d) | Range of Family Labour Involved (m/d) | Average Total Cost of Family Labour & Other items provided by household (N¢) | Range of Family Labour Costs & Other items provided by household (N¢) | Total Average of Hired Labour Involved (m/d) | Total Average Variable Costs (N¢) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Clearing | 2 | 1-4 | @ 0.65 | 1.30 | 0.65-2.60 | 1 | 0-4 | 0.65 | 0.00-2.60 | 1 | 0.65 |
| Tractor Services | - | - | - | 8.00 | 4.00-12.00 | 0 | 0-0 | 0.00 | - | - | 8.00 |
| Seeds | - | - | -- | 0.55 | 0.20-0.80 | - | - | 0.20 | 0.00-0.45 | - | 0.25 |
| Sowing | 3 | 1-5 | @ 0.65 | 1.95 | 0.65-3.25 | 2 | 0-5 | 1.30 | 0.00-3.25 | 1 | 0.65 |
| Cultivation | 8 | 4-12 | " | 5.20 | 2.60-7.80 | 3 | 0-12 | 1.95 | 0.00-7.80 | 5 | 3.25 |
| Harvesting | 4 | 2.11 | " | 2.60 | 1.30-7.15 | 24 | 0-11 | 1.30 | 0.00-7.11 | 2 | 1.30 |
| - dehusking & shelling- | | 0.35 to 0.55 per bag - Average = 45np per bag | | | | | | | | | |
| T o t a l | 17 | 9.21 | - | 19.60 | 12.70-22.00 | 8 | 5-21 | 5.50 | 3.00-12.00 | 9 | 14.10 |

TABLE 28. LABOUR IMPUTS AND COST OF PRODUCING AN ACRE OF MAIZE - WENCHI AREA - 1970

| Operation | Total Average Labour (m/d) | Range of Total Labour (m/d) | Average Wage Rate per (m/d) | Total Average Labour & Other Costs (N¢) | Range of Total Labour & Other Costs (m/d) | Average Total Family Labour Involved (m/d) | Range of Family Labour Involved (m/d) | Average Total Cost of Family Labour & Other Items provided by household (N¢) | Range of Family Labour Cost & Other Items provided by household (N¢) | Total Average of Hired Labour Involved (m/d) | Total Average Variable Costs (N¢) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Clearing | 12 | 6-15 | @ 0.65 | 7.80 | 3.90-9.75 | 3 | 0-9 | 1.95 | 0.00-5.85 | 9 | 5.85 |
| Seeds | - | - | - | 0.75 | 0.55-1.50 | - | - | 0.75[1] | 0.55-1.50 | - | 0.00 |
| Sowing | 3 | 2-6 | @ 0.65 | 1.95 | 1.30-3.90 | 3 | 2-6 | 1.95 | 1.30-3.90 | 0 | 0.00 |
| Cultivation (Once) | 6 | 3-10 | " | 3.90 | 1.95-6.50 | 2 | 0-10 | 1.30 | 0.00-6.50 | 4 | 2.60 |
| Harvesting | 4 | 2-12 | " | 2.60 | 1.30-7.80 | 4 | 2-12 | 2.60 | 2.30-7.80 | 0 | 0.00 |
| T o t a l | 25 | 23-48 | - | 17.00 | 14.10-28.50 | 12 | 12-43 | 8.55 | 8.20-18.00 | 13 | 8.45 |

1. All the farmers interviewed provided their own seeds.

Note: (m/d) indicates 'mandays'

the Ministry of Agriculture.

2. Assuming an average wage rate of 65 np per manday, it was estimated that the farmers interviewed produced maize at an average variable cost of N¢8.45 per acre in the Wenchi area and N¢14.10 in the Ejura area (see Tables 27 and 28 and 29). These do not include marketing costs. Mechanized land preparation increased variable costs in the Ejura area. It was estimated that if a farmer uses the same average amounts of inputs as his colleagues but relies on only hired labour his total variable costs would be N¢17.00 and N¢19.60 per acre for maize in the Wenchi and Ejura areas respectively. This also represents the cost of production if family labour is costed (see Tables 27, 28 and 29).

The average marketing costs incurred by farmers in the two areas are given as follows:-

| | Ejura area | Wenchi area |
|---|---|---|
| i. Husking and Shelling @ 45np per bag | N¢1.80 | N¢1.20 |
| ii. Transportation @ 25np per bag | 1.00 | 1.50 |
| iii. Insecticides .... .... .... | 0.60 | 0.60 |
| T o t a l .... .... | N¢3.40[1] | N¢3.30[1] |

3. Returns:

Table 29 gives the average total variable cost of producing one acre of maize and the gross margins in the Wenchi and Ejura areas. The Table shows that on the average, farmers in the Ejura area get only slightly higher gross margins from maize than those in the Wenchi area in spite of the higher yields of the crop. This is because of the higher production costs in the Ejura area (see Table 29). It was estimated that the farmers interviewed

1. The storage barns (cribs) cost about N¢3.60 to build. They serve for 2 to 3 years. They are usually constructed with family labour and have therefore been considered as a fixed cost.

  

obtained average gross margins of N¢9.55 and N¢9.90 per acre in the Wenchi and Ejura areas respectively if they incurred no marketing costs (see Table 29). Those who incurred marketing costs received gross margins of N¢6.25 and N¢6.50 per acre in the Wenchi and Ejura areas respectively.

TABLE 29. AVERAGE VARIABLE COSTS PER ACRE OF PRODUCTION AND GROSS MARGINS OF MAIZE IN THE WENCHI AND EJURA AREAS

| | Wenchi | | | Ejura | | |
|---|---|---|---|---|---|---|
| | Gross Output (N¢) | Variable Production Cost (N¢) | Gross Margins (N¢) | Gross Output (N¢) | Variable Production Cost (N¢) | Gross Margins (N¢) |
| Farmers Using hired & family labour but incurring no marketing costs | 24.00 | 14.10[1] | 9.90 | 18.00 | 8.45[2] | 9.55 |
| Farmers using hired & family labour & incurring marketing costs | 24.00 | 17.50 | 6.50 | 18.00 | 11.75 | 6.25 |
| Farmers using only hired labour but incurring no marketing costs | 24.00 | 19.60 | 4.40 | 18.00 | 17.00 | 1.00 |
| Farmers using only hired labour and incurring marketing costs | 24.00 | 23.00 | 1.00 | 18.00 | 20.30 | -2.30 |

Yams (Dioscorea spp):

The Ejura and Wenchi tobacco areas form part of the North Ashanti/Brong Ahafo yam belt which is one of the two major yam producing belts in the country (7, p.22). Dioscorea rotudanta is the chief variety grown in the two areas but D. cayenensis and D. alata also occur to a limited extent. It was

1. Standard Deviation being N¢1.97
2. " " " N¢2.23

observed in the surveys that more people grow yams in Ejura area than in Wenchi area. For example, 54 percent of the farmers interviewed in Ejura area produced the crop in 1970 as against 45 percent in the Wenchi area (Table 9). This is explained, at least, partially, by the fact that apart from maize, yams feature most prominently in the diet of the greatest proportion of the people in the Ejura area. In the Wenchi area however, great quantities of plantain, cocoyam and cassava are also eaten - plantain and cocoyams in particular being major staples for the people. Another explanation might be that there are more Konkombas (the chief yam producers in the country) in the Ejura area than in the Wenchi area. The ready availability of a market for the crop may also account for Ejura being a greater yam area than Wenchi. The survey showed that on the average yam farms are larger in the Ejura area than in the Wenchi area. The average yam farm per farmer interviewed was found to be three acres[1] in the Ejura area and two[2] in the Wenchi area. The ranges were from $\frac{1}{2}$ acre to 10 acres in the Ejura area and $\frac{1}{2}$ to 6 acres in the Wenchi area. It should be noted however, that yam holdings for farmers who do not produce tobacco may be much larger.

1. Labour Inputs and Production Costs:

Tables 30 and 31 give estimates of labour imputs and the costs of producing an acre of yams (operation by operation) in the Ejura and Wenchi tobacco areas respectively. As in the case of tobacco, the figures were arrived at after analysis of the returns to questions specifically framed for the purpose (see questionnaire - Appendix I). The operations involved in yam production are also discussed in Appendix IV. The operations which

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1. Standard Deviation being 0.30 Acres
2. " " " 0.16 "

TABLE 30. LABOUR IMPUTS AND COST OF PRODUCING AN ACRE OF YAMS - EJURA AREA - 1970

| Operation | Total Average Labour (m/d) | Range of Total Labour (m/d) | Average Wage Rate per m/d (N¢) | Total Average Labour Cost & Other Costs (N¢) | Range of Total Labour & Other Costs (N¢) | Average Total Family Labour Involved (m/d) | Range of Family Labour Involved (m/d) | Average Total Cost of Family Labour Involved & Other Items Provided by household (N¢) | Range of Family Labour Costs & Other Items Provided by household N¢) | Total Average Hired Labour (m/d) | Total Variable Costs (N¢) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Clearing | 6 | 3-10 | @ 0.65 | 3.90 | 1.95-6.50 | 2 | 3-5 | 1.30 | 1.95-3.25 | 4 | 2.60 |
| Mounding | 9 | 4-10 | " | 5.85 | 2.60-10.40 | 3 | 0-0 | 1.95 | 0.00-5.85 | 6 | 3.90 |
| Seed Yams | - | - | - | 28.00 | 12.00-50.00 | - | - | 18.00 | 0.00-50.00 | - | 10.00 |
| Sowing | 3 | 1-5 | @ 0.65 | 1.95 | 0.65-3.25 | 2 | 1-5 | 1.30 | 0.65-3.25 | 2 | 0.65 |
| Staking | 6 | 2-8 | " | 3.90 | 1.30-5.20 | 4 | 2-7 | 2.60 | 1.30-4.55 | 2 | 1.30 |
| Cultivation (2 x) | 12 | 8-18 | " | 7.80 | 5.20-11.70 | 4 | 0-10 | 2.60 | 0.00-6.50 | 8 | 5.20 |
| Harvesting | 7 | 3-10 | " | 4.55 | 1.95-6.50 | 6 | 3-8 | 3.90 | 1.95-5.20 | 1 | 0.65 |
| Total | 43 | 36-60 | " | 55.95 | 35.20-82.82 | 21 | 8-56 | 31.65 | 19.35-62.10 | 22 | 24.30 |

Note: m/d indicates 'mandays'

TABLE 31. LABOUR IMPUTS AND COST OF PRODUCING AN ACRE OF YAMS - WENCHI AREA - 1970

| Operation | Total Average Labour (m/d) | Range of Total Labour (m/d) | Average Wage Rate per m/d (N¢) | Total Average Labour Cost & Other Costs (N¢) | Range of Total Labour & Other Costs (N¢) | Average Total Family Labour Involved (m/d) | Range of Cost of Labour Involved (m/d) | Average Total Labour Family Labour Involved & Other Items Provided by household (N¢) | Range of Family Labour Costs & Other Items Provided by household (N¢) | Total Average Hired Labour (m/d) | Total Variable Costs (N¢) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Clearing | 8 | 6-12 | @ 0.65 | 5.20 | 3.90-7.80 | 3 | 6-8 | 1.95 | 0.00-5.20 | 5 | 3.25 |
| Mounding | 10 | 7-17 | " | 6.50 | 4.55-11.05 | 4 | 0-7 | 2.60 | 0.00-4.55 | 6 | 3.90 |
| Seed Yams | - | - | - | 20.00 | 8.00-50.00 | - | - | 20.00 | 8.00-50.00 | - | - |
| Sowing | 3 | 2-6 | @ 0.65 | 1.95 | 1.30-3.90 | 2 | 1-6 | 1.30 | 0.00-3.90 | 1 | 0.65 |
| Staking | 6 | 4-8 | " | 3.90 | 2.60-5.40 | 3 | 1-8 | 1.95 | 0.00-5.20 | 3 | 1.95 |
| Harvesting | 6 | 4-10 | " | 3.90 | 2.10-6.50 | 4 | 0.10 | 2.60 | 0.00-6.50 | 2 | 1.30 |
| T o t a l | 43 | 33-56 | - | 47.95 | 32.35-85.50 | 19 | 14-41 | 32.35 | 18.00-85.50 | 24 | 15.60 |

demand the greatest amounts of labour are mounding, harvesting, staking and land cultivation (Tables 30 and 31). The amount of labour used in an operation was found to vary from one farmer to another in both areas. Nevertheless it was found that on the average the same total amount of 43 mandays of labour was used to produce an acre of yams in the two areas. Hired labour was estimated to comprise 51% of the total amount of labour used in the Ejura area. This contrasts with Bray's (1958) estimate that about 80% of the labour on yam farms in the Ejura area was hired. The hired labour is used largely for the relatively difficult operation, for example, mounding, land clearing and land cultivation. This can be seen from the information presented in Tables 30 and 31. On the other hand, harvesting is almost entirely done with family labour. This is because harvesting requires a lot of care and patience to avoid bruises and breakages of the tubers and it is presumed that the farmer and the members of his household would exercise more patience than hired labourers. Bray has estimated that about 5% of yam output is lost in harvesting (1, p.31). A comparison of Tables 30 and 31 with Tables 13 and 14 shows that in the Ejura area a greater proportion of family labour is used in yam production than in tobacco production, while the opposite is true in the Wenchi area.

It costs more to produce an acre of yams in the Ejura area than in the Wenchi area. The average total production costs were estimated at N¢47.95 per acre in the Wenchi area and N¢55.95 in the Ejura area if family labour and the planting materials used are costed.[1] In addition, the average variable cost (family labour considered as fixed cost) were also

1. They also represent the average variable costs that could be incurred by farmers in the two areas who rely solely on hired labour and pay for their planting materials.

  

found to be higher in the Ejura area (N¢24.30 per acre) than in the Wenchi area (N¢15.60). The average cost of producing one acre of yams was estimated to be higher in the Ejura area because yam setts (planting materials) were found to be more expensive in that area than in the Wenchi area. For instance, while planting materials on an acre cost an average of N¢20.00 in the Wenchi area it costs N¢28.00 in the Ejura area. Furthermore, all the farmers interviewed in the Wenchi area provided their own planting materials so that in their case planting materials were not considered as a variable cost. On the other hand, each farmer interviewed in the Ejura area bought an average of N¢10.00 worth of planting materials per acre (Tables 30 and 31). Thus it can be seen from Tables 30 and 31 that in the Wenchi area the total variable cost per acre of N¢15.60 is for the hired labour only. In the Ejura area, however, the total variable cost of N¢24.30 per acre comprised N¢14.30 per hired labour and N¢10.00 for planting materials. The two tables also show that the average amounts of hired labour (and also family labour) used by the farmers in both areas did not differ substantially.

2. Yields and Returns to Yam Production:

Normally, one tuber of yam develops per mound but two, three or more tubers per mound are not uncommon. It is said, however, that single tubers are much larger and weigh as much as all the two or more tubers developed per mound put together (4, p.219). The Agricultural Officers and their Assistants contacted in the two areas estimated the average yields of yams to be two tons per acre. Another estimate puts the average yields at between 4 to 5 tons per acre (8, p.378). Nevertheless, farmers interviewed in both areas indicated that they sold from 200 to 1,200 tubers of yams

  

per acre per season. It is estimated from the figures they quoted that an average of 500[1] tubers per farmer were sold per acre. This figure allows for household consumption and for tubers reserved for planting in the next season.

Yam prices vary considerably in time and in space and according to tuber size. All the farmers interviewe sold their yams immediately after harvesting. The prices quoted by the farmers ranged from N¢7.00 to N¢40.00[2] per 100 tubers throughout the harvesting period. It was estimated, from the prices given, that a 100 normal-sized tubers sold at modal prices of N¢15.00 in the Ejura area and N¢13.00 in the Wenchi area. That is on the average farmers in the Wenchi area get lower prices for their yams than their counterparts in the Ejura area. Thus assuming that 500[1] tubers are sold per acre the average gross returns to yam production is N¢75.00 per acre in the Ejura area and N¢65.00 per acre in the Wenchi area.

All the farmers interviewed in the Ejura area sold their yams on the farms. Yam dealers (mainly women from the Kumasi market) brought trucks and/or trailered tractors along with them to convey the yams away after bargaining. The farmers, therefore, incurred no marketing costs. In the Wenchi area, however, the farmers indicated that they were usually responsible for conveying their yams to the villages or to the markets where they met the yam dealers. Conveying the yams from the farms to the villages is usually done by headloading usually with family labour. Occasionally, however, trailered tractors are also used and when they are used farmers pay

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1. This is the mode of the figures quoted by farmers in both areas.

2. These are prices the farmers said they have been receiving for the past three years.

  

from N¢1.00 to N¢3.00 for every 100 tubers depending upon the sizes of the tubers, the distances involved and the condition of the roads. None of the farmers interviewed paid local council tax before selling their yams.

It was found that yam production gives a slightly higher average gross margin to farmers in the Ejura area, where, although production costs are higher, yam prices are higher than in the Wenchi area. The average gross margins were estimated to be N¢50.70 per acre, (N¢75.00 minus N¢24.30), for the Ejura area and N¢49.40, (N¢65.00 minus N¢15.60), for the Wenchi area. For a farmer using the same amount of inputs and relying only on hired labour the gross margins would be N¢19.05, (N¢75.00 minus N¢55.95), per acre in the Ejura area and N¢17.05, (N¢65.00 minus N¢47.95), in the Wenchi area.

The problems with yam production in the two areas are poor yields and underdeveloped marketing facilities. Low yam yields are caused by the use of unimproved planting materials, although the situation in Ejura area is relatively better. Also, none of the farmers interviewed in both areas use fertilizers for the crop although fertilizers have been claimed to increase yam yields by up to 80% (6, p.230). Perhaps farmers could be encouraged to use fertilizers. The lack of storage facilities for yams and the lack of an adequate pricing system contribute to the great fluctuation in the yam prices even during the harvesting season. Another problem with the marketing of yams, particularly in the Wenchi area, is the lack of good motorable roads and trucks to convey the yams from the farms to the markets.

Groundnuts (Arachis hypogoea)

Groundnuts have never been a staple crop in any zone in Ghana although it is widely cultivated in many parts of the country (8, p.379). Concentrated

production of the crop, however, occurs in the interior savanna areas and it is believed custom has made it a woman's crop (8, p.379). It was found from the survey that this belief is a little misleading as far as Ejura and Wenchi areas are concerned. This is because of the groundnut producers interviewed in the Ejura and Wenchi areas, only 25% and 29% respectively were women. It was observed however, that female and child labour are often used for harvesting.

Sixty-three and nine percent of the farmers interviewed in the Ejura and Wenchi areas respectively grew groundnuts in 1970. It was also observed in the survey that whereas in the Ejura area the number of tobacco farmers who produce groundnuts has been increasing steadily for the past three years, the opposite has been happening in the Wenchi area (see Table 9). In the Wenchi area, the average size of a groundnut holding per farmer was estimated to be two acres (for those who produced the crop), the range being from half an acre to three acres. In the Ejura area, the sizes of groundnut farms were larger. They ranged from one acre to six acres per farmer and the average size (for those who sowed the crop) was three acres.

The postrate or 'Kumawu' type is the most common variety grown in both areas. It is sometimes intercropped with maize and/or tomatoes, which are planted in the inter-ridge areas. Groundnuts have two growing seasons in a y ar and these coincides with the two seasons for maize. The physical operations involved in groundnut production are discussed in Appendix IV.

1. Yields:

The yields of groundnuts are said to vary according to district, variety

and the method of cultivation (8, p.380). It is reported that yields obtained in the country vary from 400 lbs to 500 lbs per acre of shelled nuts (8,p.380). Another report, however, has it that a yield of about 1,500 lbs of shelled nuts could be obtained per acre if the following practices were adopted:- spacing at 6" by 3", seed dressing with combined fungicides and fertilizer (super phosphate) applied at the rate of 1 cwt per acre (8, p.380). Records from the Crop Production Division's Offices at Kintampo and Wenchi indicate that average yields of 650 lbs per acre are obtained in the Wenchi area. Similar records were not available at the Division's Offices at Mampong and Attebubu for the yields in the Ejura area. However, answers given by farmers interviewed in both areas, indicated that yields do not differe in both areas. Farmers sold an average of 3 bags (i.e. 540 lbs) of shelled nuts per acre - the range being 2 bags (360 lbs) to 4 bags (720 lbs) per acre.

The prices farmers said they received for their groundnuts ranged from N¢13.00 to N¢26.00 per bag of 180 lbs shelled nuts. The modes of these prices were N¢17.80 per bag in the Wenchi area and N¢19.00 in the Ejura area. Thus assuming that an average of three bags of shelled groundnuts are sold per acre then the enterprise gives average gross outputs of N¢53.40 and N¢55.95 per acre in the Wenchi and Ejura areas respectively.



2. Labour Inputs and Production Costs:

The amounts of labour used and the costs of the various operations involved in groundnut production in the two areas are given in Tables 32 and 33. The amounts of labour used differed with the operations involved and from one farmer to another. The farmers interviewed in the Wenchi area used an average of 39[1] mandays with a range from 32 to 46 mandays of labour

1. Standard deviation being 1.6 mandays.

TABLE 32. LABOUR IMPUTS AND PRODUCTION COSTS OF GROUNDNUTS (PER ACRE) - EJURA AREA - 1970

| Operation | Total Average Labour (m/d) | Range of Total Labour (m/d) | Average Wage Rate per m/d (N¢) | Total Average Labour & Other Costs (N¢) | Range of Total Labour & Other Costs (N¢) | Average Total Family Labour Involved | Range of Family Labour Involved (m/d) | Average Total Cost of Family Labour & Other Items Provided by household (N¢) | Range of Family Labour Costs & Other Items Provided by household (N¢) | Total Average Hired Labour (m/d) | Total Variable Costs (N¢) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Clearing | Tractor Services | | 4.00 | 4.00 | - | 0 | - | - | - | - | 4.00 |
| Ridging | | | 4.00 | 4.00 | - | 0 | - | - | - | - | 4.00 |
| Planting Material | - | - | - | 3.15 | 1.70 5.00 | - | - | 2.35 | 0.00-5.00 | - | 0.80 |
| Sowing | 4 | 2-9 | @ 0.65 | 2.60 | 1.30-5.85 | 2 | 0-4 | 1.30 | 0.00-2.60 | 2 | 1.30 |
| Cultivation (2 times) | 10 | 5-15 | " | 6.50 | 3.25-9.75 | 3 | 0-12 | 1.95 | 1.00-7.80 | 7 | 4.55 |
| Harvesting | 10 | 7-15 | " | 6.50 | 4.55 13.50 | 6 | 3-10 | 3.90 | 1.90-6.80 | 4 | 2.60 |
| T o t a l | 24 | 18-32 | - | 26.75 | 19.90-34.10 | 11 | 7.29 | 9.50 | 4.20-11.90 | 13 | 17.25 |

TABLE 33. LABOUR IMPUTS AND PRODUCTION COSTS OF GROUNDNUTS (PER ACRE) - WENCHI AREA - 1970

| Operation | Total Average Labour (m/d) | Range of Total Labour (m/d) | Average Wage Rate per m/d (N¢) | Total Average Labour & Other Costs (N¢) | Range of Total Labour & Other Costs (N¢) | Average Total Family Labour Involved (m/d) | Range of Family Labour Involved (m/d) | Average Total Cost of Family Labour & Other Items Provided by household (N¢) | Range of Family Labour Costs & Other Items Provided by household (N¢) | Total Average Hired Labour (m/d) | Total Average Variable Costs (N¢) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Clearing | 6 | 4-9 | @ 0.65 | 3.90 | 2.60-5.85 | 2 | 0-7 | 1.30 | 0.00- | 4 | 2.60 |
| Ridging | 8 | 5-12 | " | 5.20 | 3.25-7.80 | 3 | 0-9 | 1.95 | 0.00 | 5 | 3.25 |
| Planting Material | 3 tins of unshelled seeds @ N¢1.00 a tin | | | 3.00 | 3.00 | - | - | 3.00[1] | 3.00 | - | 0.00 |
| Sowing | 3 | 2-5 | @ 0.65 | 1.95 | 1.30-3.25 | 3 | 2-5 | 1.95 | 1.30-3.25 | 0 | 0.00 |
| Cultivation (2 times) | 14 | 8-20 | " | 9.10 | 5.20-13.00 | 5 | 0-20 | 3.25 | 0.00-13.00 | 9 | 5.85 |
| Harvesting | 8 | 5-15 | " | 5.20 | 3.25-9.75 | 6 | 0-10 | 3.90 | 0.00-6.50 | 2 | 1.30 |
| T o t a l | 39 | 32-46 | - | 28.35 | 22.00-35.25 | 19 | 10-41 | 15.35 | 8.50-25.35 | 20 | 13.00 |

1. All the farmers interviewed provided their own planting materials

to produce an acre of the crop. In the Ejura area the average number of mandays was 24[1] with a range of 18 to 32 per acre as shown in Tables 32 and 33. The difference in labour imput between the two areas is primarily due to the fact that farmers in the Ejura area rely on tractor services for land preparation. The operations which demand most labour in the enterprise are land preparation, harvesting and land cultivation. The latter is done twice before harvesting. About 51% and 54% of the labour used on groundnut farms in the Wenchi and Ejura areas respectively is hired labour.

It was found that farmers in the Ejura area, on the average, incur higher variable costs (family labour excluded) per acre of groundnuts than their counterparts in the Wenchi area. It was estimated that it costs about N¢17.25[2] and N¢13.00[3] respectively in the Ejura and Wenchi areas to produce one acre of the crop (see Tables 32 and 33). The difference is explained by the use of tractors. The average total variable cost in the area comprised N¢8.00 for tractor services, 80np for seeds and N¢8.45 for hired labour. In the Wenchi area, however, all the N¢13.00 was hired labour cost, since farmers provided their own seeds and did not hire tractor (see Tables 32 and 33). It was estimated that it would cost N¢26.75 for a farmer who depends only upon hired labour but uses the same average amounts of imputs (see Tables 32 and 33) to produce an acre of groundnuts in the Ejura area. In the Wenchi area it would cost the same farmer N¢28.35. The costs also represent the average production costs in the two areas if family labour is costed.

Average marketing costs incurred by groundnut farmers in the two areas

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1. Standard deviation being 2.2 mandays
2. " " " N¢2.76
3. " " " N¢2.10

were estimated as follows:-

(a) Ejura Area

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Shelling[1] 80np per bag | =N¢2.40 | per | acre | of | which | hired | labour | = | 0.60 |
| 2. | Transportation 30np per bag | = 0.90 | " | " | " | " | amount | paid | = | 0.90 |
| 3. | 2 Storage baskets @ 1.50 per basket | = 0.75[2] | " | " | " | " | " | " | = | 0.75 |
| | T o t a l | N¢4.05 | " | " | " | " | " | " | = | 2.25 |

(b) Wenchi Area

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Shelling 50np per bag | = N¢1.50 | per | acre | of | which | hired | labour | = | 0.00 |
| 2. | Transportation 40np per bag | = 1.20 | " | " | " | " | amount | paid | = | 1.20 |
| 3. | 2 Storage baskets @ 1.50 per basket | = 0.75 | " | " | " | " | " | " | = | 0.75 |
| | T o t a l | N¢3.45 | " | " | " | " | " | " | = | 1.95 |

3. Returns:

Table 34 presents the variable costs and the returns to groundnut production in the two areas. It can be seen from the table that in spite of the higher prices for the crop, farmers in the Ejura area receive lower gross margins than their counterparts in the Wenchi area. It was estimated that

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1. It was found from the surveys that in the Ejura area only one-fourth (¼) of the shelling was done by hired labour. In the Wenchi area almost all the shelling was done with family labour.

2. Straight line depreciation method was used. The baskets have an average useful life of three years and no scrap value.

farmers in the Wenchi area get an average gross margin of N¢40.40 per acre while those in the Ejura area get N¢38.70 (if marketing costs are excluded) - see Table 34. It was found, however, that under the assumed prices and yields, farmers in the Ejura area who rely only on hired labour[1] receive higher gross margins of about N¢29.20 per acre than their counterparts in the Wenchi area who receive an average of N¢25.05 per acre if marketing costs are ignored. Almost the same level of gross margin is however re-received in both areas if the costs of marketing are taken into consideration.

TABLE 34. VARIABLE COSTS AND RETURNS OF GROUNDNUT PRODUCTION IN THE EJURA AND WENCHI AREAS (PER ACRE IN N¢)

| | Ejura Area | | | Wenchi Area | | |
|---|---|---|---|---|---|---|
| | Gross output | Variable cost | Gross margin | Gross output | Variable cost | Gross margin |
| Farmers using hired & family labour but incurring no marketing costs | 55.95 | 17.25 | 38.70 | 53.40 | 13.00 | 40.40 |
| Farmers using hired & family labour & incurring marketing costs | 55.95 | 19.50 | 36.45 | 53.40 | 14.95 | 40.45 |
| Farmers using only hired labour but incurring no marketing costs | 55.95 | 26.75 | 29.20 | 53.40 | 28.35 | 25.05 |
| Farmers using only hired labour and incurring marketing costs | 55.95 | 30.80 | 25.15 | 53.40 | 31.80 | 21.60 |

1. This is equivalent to costing family labour.

Tomatoes (Lycopersicon esculentus)

Tomato was one of the crops introduced into the country by the early Portuguese (4,p.95). It has since been grown on a small scale as an inter-crop largely for subsistence purposes. Recently, however, the crop has gained popularity and become highly commercialized in Wenchi and Ejura areas. The reasons for this can be found in the great influx of middlemen from many parts of the country (including Kumasi, Koforidua and Accra) into the two areas during the harvesting period and the establishment of the Tomato Factory at Wenchi. Many of the farmers in the Wenchi area sold to the factory when it was in operation.

Inspite of the high gross margins given by the crop only small acreages are produced by the farmers and relatively few farmers produce the crop especially in the Ejura area. 18 and 36 percent of the farmers interviewed in the Ejura and Wenchi areas respectively grew the crop in 1970 (Table 9). The size of holdings was found to vary from about one-third of an acre to five acres in both areas. This is because the tomato enterprise has a very high risk. The farmers have no storage facilities and the crop is highly perishable. This places the farmer in a very weak bargaining position as compared with the visiting wholesale buyers. Nevertheless, Table 9 shows that the crop is still gaining popularity among tobacco farmers in both areas.

1. Yields.

Available records indicate that the yields of tomatoes vary considerably in this country. Yields of up to 20 tons per acre have been recorded

(8, p.388), although average yields are said to be between 4 to 5 tons per acre (8, p.388). However, records from the Crop Production Division Offices at Wenchi and Kintampo indicate that average yields of about $1\frac{1}{2}$ tons are obtained in the Wenchi tobacco area. Farmers' own reports during the survey indicated that they sold from 5 to 21 crates per acre (i.e. 650 lbs to 2,352 lbs) - the mode being 14 beer crates or 1,568 lbs per acre in both areas. The farmers also stated that they received prices ranging from N¢1.00 to N¢10.00 per crate of 112 lbs. The modes of the prices quoted were N¢4.00 and N¢5.00 per crate in the Wenchi and Ejura areas respectively.

Using these figures, the average gross returns to tomatoes were estimated to be N¢70.00 per acre in the Ejura area where higher prices can be obtained and N¢56.00 in the Wenchi area.

2. Labour Inputs and Production Costs:

Labour imputs and their costs are given according to operations in Tables 35 and 36 for the Ejura and Wenchi areas respectively. Again, the physical operations involved in tomato production are discussed in Appendix IV. As in the cases of maize and groundnuts, the average amount of labour used to produce one acre of tomatoes is higher in the Wenchi area than in the Ejura area. This is because mechanized land preparation reducex labour requirements in the Ejura area. Farmers interviewed in the Wenchi area utilized a range of 27 to 49 mandays of labour to grow an acre of tomatoes, the average being 36[1] mandays. In the Ejura area the average was 22[2] mandays with a range from 15 to 32 mandays per acre.

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1. Standard deviation being 2.30 mandays
2. " " " 1.6 "

TABLE 35. LABOUR IMPUTS AND PRODUCTION COSTS OF TOMATOES (PER ACRE) - EJURA AREA - 1970

| Operation | Total Average Labour (m/d) | Range of Total Labour (m/d) | Average Wage Rate per m/d (N¢) | Average Labour & Other Costs (N¢) | Range of Total Labour & Other Costs (N¢) | Average Family Labour Involved (m/d) | Range of Family Labour Involved (m/d) | Average Total Cost of Family Labour & Other Items Provided by household (N¢) | Range of Family Labour Costs & Other Items Provided by household (N¢) | Total Average Hired Labour Used (m/d) | Total Average Variable Costs (N¢) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Preparation: Tractor Services) | - | - | - | 8.00 (flat) | 0 | 0 | 0-0 | 0.00- | 0.00-0.00 | - | 8.00 |
| Manpower | 1 | 1-2 | @ 0.65 | 0.65- | 0.65-1.30 | 1 | 1-2 | 0.65 | 0.65-1.30 | 0 | 0.00 |
| Seedlings: Seeds | - | - | - | 1.50 | 1.00-2.20 | - | - | 1.50 | 1.00-2.20 | - | 0.00 |
| Nursery | 2 | 1-3 | @ 0.65 | 1.30 | 0.65-1.95 | 2 | 1-3 | 1.30 | 1.65-1.95 | 0 | 0.00 |
| Trans-planting | 2 | 1-4 | " | 1.30 | 0.65-2.60 | 2 | 1-4 | 1.30 | 0.65-2.60 | 0 | 0.00 |
| Cultivation (Once) | 7 | 4-14 | " | 4.55 | 2.60-9.10 | 2 | 0-8 | 1.30 | 0.00-5.20 | 5 | 3.25 |
| Harvesting | 10 | 6-20 | " | 6.50 | 3.90 13.00 | 10 | 6-20 | 6.50 | 2.60-13.00 | 0 | 0.00 |
| T o t a l | 22 | 15-32 | - | 23.80 | 11.10-33.10 | 17 | 10-24 | 12.55 | 7.65-30.00 | 5 | 11.25 |

TABLE 36. LABOUR INPUTS AND PRODUCTION COSTS OF TOMATOES (PER ACRE) - WENCHI AREA - 1970

| Operation | Total Average Labour (m/d) | Range of Total Labour (m/d) | Average Wage Rate per m/d (N¢) | Average Labour & Other Costs (N¢) | Range of Total Labour & Other Costs (N¢) | Average Family Labour Involved (m/d) | Range of Family Labour Involved (m/d) | Average Total Cost of Family Labour & Other Items Provided by household (N¢) | Range of Family Labour Costs & Other Items Provided by Household (N¢) | Total Average Hired Labour Used (m/d) | Total Average Variable Costs (N¢) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Clearing | 6 | 6-12 | @ 0.65 | 3.90 | 3.90-7.80 | 2 | 0-8 | 1.30 | 0.00-5.20 | 4 | 2.60 |
| Ridging | 8 | 6-10 | " | 5.20 | 3.90-6.50 | 2 | 0-10 | 1.30 | 0.00-6.50 | 6 | 3.90 |
| Seedling: | | | | | | | | | | | |
| Seeds | - | - | - | 1.50 | 1.00-2.20 | - | - | 1.50 | 1.00-2.20 | - | 0.00 |
| Nursery | 2 | 1-3 | @ 0.65 | 1.30 | 0.65-1.95 | 2 | 1-3 | 1.30 | 0.65-1.95 | 0 | 0.00 |
| Transportation | 3 | 1-5 | " | 1.95 | 0.65-3.25 | 3 | 1-5 | 1.95 | 0.65-3.25 | 0 | 0.00 |
| Cultivation (Once) | 6 | 4-8 | " | 3.90 | 2.60-5.20 | 3 | 2-8 | 1.95 | 1.30-5.20 | 3 | 1.95 |
| Harvesting | 11 | 9-16 | " | 7.15 | 5.85-10.40 | 11 | 10-16 | 7.15 | 6.50-10.40 | 0 | 0.00 |
| T o t a l | 36 | 27-49 | - | 24.90 | 18.65-29.05 | 23 | 17.40 | 16.45 | 12.05-22.00 | 13 | 8.45 |

  

Land preparation and harvesting were found to be the operations which demand most labour in the Wenchi area (see Table 36). In the Ejura area, however, harvesting and land cultivation used the greatest amount of labour (see Table 35). It was found that most of the labour used on tomato farms in both areas was family labour. For example, it was estimated that 64% and 74% of the total labour used comprised family labour. All harvesting labour done with family labour in both areas (see Tables 35 and 36).

The average variable costs of production were estimated to be N¢11.25[1] per acre in the Ejura area and N¢8.45[2] in the Wenchi area. It was estimated, however, that a farmer who uses the same average amounts of inputs but relies solely on hired labour would incur a total variable cost of N¢23.80 per acre of tomatoes in the Ejura area. In the Wenchi area the same farmer would incur N¢24.90 per acre excluding marketing costs (see Tables 35 and 36 and 37).

The only marketing cost farmers incur is that of transport, but this was found not to be very substantial in both areas. In fact, some of the farmers whose villages were situated along the main roads (especially in the Ejura area and to some extent even in the Wenchi area) reported that in many cases middlemen (buyers) chased them to their farms and actually assisted in the harvesting. It was estimated that those farmers who took their produce to large markets in the two areas incurred an average cost of 25np per crate (i.e. N¢3.50 per acre) in the Wenchi area and 20np per crate (i.e. N¢2.80 per acre) in the Ejura area.

3. Returns:

Table 37 gives the average variable costs of production and returns to

1. Standard deviation being N¢0.95
2. " " " N¢0.56

the enterprise in the Ejura and Wenchi areas. The table shows that because of the higher prices in the Ejura area farmers receive higher gross margins from tomato farming than their counterparts in the Wenchi area.

TABLE 37. AVERAGE VARIABLE COSTS AND RETURNS TO TOMATO PRODUCTION IN THE WENCHI AND EJURA AREAS (PER ACRE IN NȻ)

| | Ejura Area | | | Wenchi Area | | |
|---|---|---|---|---|---|---|
| | Gross Output | Variable cost | Gross margin | Gross Output | Variable cost | Gross margin |
| Farmers with Family & hired labour & incurring no marketing costs | 70.00 | 11.25 | 59.70 | 56.00 | 8.45 | 47.55 |
| Farmers with family & hired labour & incurring marketing costs | 70.00 | 14.05 | 55.95 | 56.00 | 11.95 | 44.05 |
| Farmers with only hired labour and incurring no marketing costs | 70.00 | 25.80 | 46.20 | 56.00 | 24.90 | 31.10 |
| Farmers using only hired labour and incurring marketing costs | 70.00 | 26.60 | 44.40 | 56.00 | 28.40 | 27.60 |

Other Crops:

1. Cassava (Manihot utilisima):

Cassava is grown by a greater proportion of tobacco farmers in Wenchi than in the Ejura area. This is shown by Table 9, Chapter One. The Table indicates, however, that the crop is still growing in popularity among

  

tobacco farmers in both areas. The size of cassava holdings are relatively small in both areas. In the Wenchi area they varied from half an acre to five acres with the average size being one acre per farmer. In the Ejura area the average size was also one acre but the range was from a quarter of an acre to three acres. The crop is essentially produced for subsistence purposes although in many cases surpluses are obtained for the market. It was observed, however, that it is fast becoming a market crop in the Ejura area where gari and konkonte makers occur in relatively large numbers.

The yields of cassava can be high but are very variable. Records from the offices of the Crop Production Division at Wenchi and Kintampo indicate that the average yield is about 2 tons per acre in the Wenchi tobacco area.

Reliable estimates of production costs could not be obtained for either area. This was because, according to the farmers, they spread the harvesting of the crop over a long period. Most harvested only when the need arose. As such they could not remember the amounts of labour they used. For the same reasons, they could not estimate their yields or returns from the crop.

2. Plantain (Musa Paradisiaca) and Cocoyam Xanthosoma sagittifoliun):

Plantain and cocoyam are very important food crops in the forest parts of the two areas and to some extent in the derived savanna areas. They are largely planted for household consumption but large surpluses often become an important source of revenue for the farmers. They are grown in the southern parts of the Ejura area and in many parts of the Wenchi area, especially in the south. Where plantain and cocoyam are grown, maize is

almost invariably the first crop planted. The cocoyams usually sprout out *in situ*, when the bush is burnt, from dormant bulbs buried in the ground. Additional ones are, however, planted in the inter-maize areas when the maize is 2 to 4 weeks old. Both cocoyams and plantain take about 10 to 14 months to mature. All the plantains on a plot do not mature at the same time. Accordingly, harvesting of the crop may be spread over some four to six months. With cocoyams, the harvesting period may even be stretched longer than six months. For the same reasons as assigned for cassava, reliable estimates of labour inputs and returns could not be obtained for plantain and cocoyam.

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# CHAPTER IV

## FORMULATION OF MODAL FARM PLANS

The data generated in previous chapters are used here to build modal farm plans for crop production in the two areas using the linear programming method. The optimum crop combinations so derived under different conditions are compared with the existing farming situation.

### Enterprise Interaction in the Ejura and Wenchi Areas.

An important factor influencing the farmers' choice of enterprises is the marked seasonality of rainfall in the two areas which produces situations where different enterprises compete for labour at particular times of the year. At other times, crops such as yams provide employment in what would otherwise be slack periods. In Table 38 a farming calendar is depicted for each of the operations in connection with the main crops grown in the two areas. The various activities are performed simultaneously in both areas. Several farm activities clash during the course of the year, for example, land preparation for tobacco done from December to April coincides with land preparation for maize, groundnut and rice and with the harvesting of cassava, cocoyam and plantain. Transplanting of tobacco seedlings from the second week of April to the end of May coincides with the sowing of maize, rice, yam and groundnuts and with the planting and weeding of cassava. The harvesting and curing of tobacco covering the period from late June to the end of September, competes for labour required for preparing land and the sowing of second (minor) season

TABLE 38. TIME-TABLE (PROGRAM) OF FARMING ACTIVITIES IN EJURA AND WENCHI TOBACCO AREAS

| ENTERPRISE | JANUARY | FEBRUARY | MARCH | APRIL | MAY | JUNE | JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAIZE | LAND PREPARATION | | PLANTING | | CULTIVATION | | LAND PREPARATION (2ND CROP) HARVESTING | | PLANTING | | CULTIVATION HARVESTING | |
| YAM | LAND PREPARATION | | PLANTING STAKING & CULTIVATION | | | | HARVESTING | | | | LAND PREPARATION & PLANTING (Early Yam) | |
| GROUNDNUT | LAND PREPARATION | | | | HARVESTING PLANTING | CULTIVATION | | LAND PREPARATION (2ND CROP) | SOWING | CULTIVATION | | HARVESTING |
| TOMATO & CASSAVA | LAND PREPARATION | | | | PLANTING | CULTIVATION | HARVESTING | LAND PREPARATION | PLANTING (2ND CROP) | | CULTIVATION HARVESTING | |
| | HARVESTING | | LAND PREPARATION | | PLANTING | | CULTIVATION | | HARVESTING | | | HARVESTING |
| COCOYAM & PLANTAIN | HARVESTING | | PLANTING | | | HARVESTING | | | | | HARVESTING CULTIVATING | CULTIVATING |
| TOBACCO | LAND PREPARATION | | LAND PREPARATION | | TRANS PLANT. | | FERTILIZATION CULTIVATION TOPPING & SUCKERING | | | | | |
| | | | | | | | HARVESTING CURING & MARKETING | | | | | |
| RICE | | LAND PREPARATION | | | PLANTING (White Rice) | | CULTIVATION | | | | HARVESTING | |
| | | | | | PLANTING (Brown Rice) | | | | | | | |

maize and groundnut crops and for the harvesting of yams, cocoyams, plantain, cassava and maize in the major season.

The crops also compete with each other for land, tractor services, farmers' management attention and, more importantly, working capital. The competition among crops for tractor services is more pronounced in the Ejura area where most farmers depend upon tractor services for land preparation. In both areas, the competition for the above factors of production is particularly strong between tobacco and maize since they are the two major crops in which farmers are most interested. 82 and 78 percent of the farmers interviewed produced maize in 1970 in the Ejura and Wenchi areas respectively (see Table 9). Further evidence of this can be seen in Table 41 in terms of the acreages of the two crops. In Wenchi area, in 1969 the average size of tobacco holding was 1.8 acres while the average size of maize was 4.6 acres. In 1970 when the average size of tobacco holdings increased to 2.0 acres the size of maize farms decreased to an average of 3.5 acres (see Table 41).

In spite of the competitive relationship between enterprises, most farmers in the two areas combine a number of enterprises during the year. Tables 39 and 40 give the various combinations encountered in the Ejura and Wenchi areas respectively. The numbers and percentage of farmers interviewed who adopted the combinations are also given. As many as 33 and 22 different crop combinations were found in the Ejura and Wenchi areas respectively. It can be seen from the two tables, however, that no single combination predominates overwhelmingly over the others. Tobacco-maize; Tobacco-maize-yam-groundnut-plantain cum cocoyam; and Tobacco-maize-yam-plantain cum cocoyam were the three

TABLE 39. CROP (ENTERPRISE) COMBINATION ENCOUNTERED IN THE EJURA AREA

| | Tobacco | Maize | Yam | Tomato | Groundnut | Cassava | Other Crops | No. of Farmers | Percentage of Farmers Interviewed |
|---|---|---|---|---|---|---|---|---|---|
| 1. | Tobacco | Maize | Yam | - | - | Cassava | Rice | 4 | 3.6 |
| 2. | Tobacco | Maize | Yam | - | - | Cassava | - | 3 | 2.7 |
| 3. | Tobacco | Maize | Yam | - | - | - | Cocoyam & Plantain | 9 | 8.1 |
| 4. | Tobacco | - | - | - | Groundnut | - | Cocoyam & Plantain | 1 | 0.9 |
| 5. | Tobacco | - | - | - | - | - | - | 12 | 10.8 |
| 6. | Tobacco | Maize | - | - | Groundnut | - | - | 5 | 4.5 |
| 7. | Tobacco | Maize | - | - | - | - | Cocoyam & Plantain | 4 | 3.6 |
| 8. | Tobacco | Maize | Yam | - | - | - | - | 4 | 3.6 |
| 9. | Tobacco | Maize | - | Tomato | - | - | - | 3 | 2.7 |
| 10. | Tobacco | - | - | - | Groundnut | - | - | 2 | 1.8 |
| 11. | Tobacco | Maize | - | - | - | - | Rice, Cocoyam & Plantain | 2 | 1.8 |
| 12. | Tobacco | Maize | Yam | - | - | Cassava | | 3 | 2.7 |
| 13. | Tobacco | Maize | - | - | - | - | - | 10 | 9.0 |
| 14. | Tobacco | - | - | - | - | Cassava | - | 4 | 3.6 |
| 15. | Tobacco | - | - | Tomato | - | - | - | 2 | 1.6 |
| 16. | Tobacco | Maize | Yam | - | Groundnut | - | Cocoyam & Plantain | 9 | 8.1 |
| 17. | Tobacco | - | - | - | Groundnut | Cassava | Guinea Corn, Cocoyam & Plantain | 1 | 0.9 |
| 18. | Tobacco | Maize | - | - | - | Cassava | Cocoyam & Plantain | 1 | 0.9 |
| 19. | Tobacco | Maize | - | - | Groundnut | - | Cocoyam & Plantain | 2 | 1.8 |
| 20. | Tobacco | Maize | Yam | Tomato | Groundnut | - | Cocoyam & Plantain | 2 | 1.8 |
| 21. | Tobacco | - | Yam | - | - | Cassava | Cocoyam & Plantain | 2 | 1.8 |
| 22. | Tobacco | - | Yam | - | Groundnut | Cassava | Cocoyam & Plantain | 5 | 4.5 |

| | Tobacco | Maize | Yam | Tomato | Groundnut | Cassava | Other Crops | No. of Farmers | Percentage of Farmers Interviewed |
|---|---|---|---|---|---|---|---|---|---|
| 23. | Tobacco | Maize | Yam | - | Groundnut | - | - | 5 | 4.5 |
| 24. | Tobacco | Maize | - | - | Groundnut | - | Cowpeas | 1 | 0.9 |
| 25. | Tobacco | Maize | - | Tomato | Groundnut | - | - | 3 | 2.7 |
| 26. | Tobacco | - | Yam | - | - | - | Cocoyam & Plantain | 2 | 1.8 |
| 27. | Tobacco | Maize | Yam | - | - | - | Rice | 3 | 2.7 |
| 28. | Tobacco | Maize | - | Tomato | Groundnut | Cassava | - | 1 | 0.9 |
| 29. | Tobacco | Maize | - | Tomato | - | Cassava | Cocoyam, Plantain & Cowpeas | 1 | 0.9 |
| 30. | Tobacco | - | - | Tomato | - | - | Garden Eggs & Cowpeas | 1 | 0.9 |
| 31. | Tobacco | Maize | Yam | Tomato | Groundnut | - | Cocoyam & Plantain | 1 | 0.9 |
| 32. | Tobacco | Maize | Yam | - | Groundnut | - | Rice | 2 | 1.8 |
| 33. | Tobacco | Maize | - | - | - | Cassava | - | 1 | 0.9 |

TABLE 40. CROP (ENTERPRISE) COMBINATIONS ENCOUNTERED IN WENCHI AREA - 1970

| | Tobacco | Maize | Yam | Tomato | Groundnut | Cassava | Other Crops | No. of Farmers | Percentage of Farmers Interviewed |
|---|---|---|---|---|---|---|---|---|---|
| 1. | Tobacco | Maize | - | - | - | - | Plantain & Cocoyam | 1 | 2.4 |
| 2. | Tobacco | Maize | - | - | - | Cassava | Garden Eggs, Plantain & Cocoyam | 1 | 2.4 |
| 3. | Tobacco | Maize | Yam | - | - | Cassava | Plantain & Cocoyam | 3 | 7.1 |
| 4. | Tobacco | Maize | - | - | - | - | Plantain, Cocoyam & Pepper | 2 | 4.8 |
| 5. | Tobacco | Maize | Yam | Tomato | - | - | Plantain & Cocoyam | 2 | 4.8 |
| 6. | Tobacco | Maize | Yam | Tomato | - | Cassava | Plantain & Cocoyam | 3 | 7.1 |
| 7. | Tobacco | Maize | Yam | Tomato | - | - | Plantain, Cocoyam & Cocoa | 1 | 2.4 |
| 8. | Tobacco | Maize | Yam | Tomato | - | Cassava | Plantain & Cocoyam | 4 | 9.4 |
| 9. | Tobacco | Maize | Yam | Tomato | Groundnut | Cassavae | Plantain & Cocoyam | 3 | 7.1 |
| 10. | Tobacco | Maize | Yam | Tomato | - | Cassava | Plantain, Cocoyam & Cocoa | 1 | 2.4 |
| 11. | Tobacco | Maize | Yam | Tomato | - | - | Plantain & Cocoyam | 2 | 4.8 |
| 12. | Tobacco | Maize | Yam | Tomato | - | Cassava | Plantain, Cocoyam & Pepper | 2 | 4.8 |
| 13. | Tobacco | Maize | Yam | Tomato | - | - | Garden Eggs, Plantain, Cocoyam & Cocoa | 1 | 2.4 |
| 14. | Tobacco | Maize | Yam | Tomato | - | Cassava | Plantain & Cocoyam | 3 | 9.4 |
| 15. | Tobacco | Maize | Yam | Tomato | - | Cassava | Plantain, Cocoyam, Cocoa & Coffee | 1 | 2.4 |
| 16. | Tobacco | Maize | Yam | Tomato | - | Cassava | Plantain, Cocoyam & Cocoa | 3 | 7.1 |
| 17. | Tobacco | - | - | - | - | - | - | 1 | 2.4 |
| 18. | Tobacco | Maize | Yam | Tomato | - | - | Plantain, Cocoyam, Cocoa & Pepper | 1 | 2.4 |
| 19. | Tobacco | Maize | Yam | - | Groundnut | Cassava | - | 3 | 7.1 |
| 20. | Tobacco | Maize | Yam | - | - | Cassava | Plantain, Cocoyam & Cocoa | 1. | 2.4 |
| 21. | Tobacco | Maize | Yam | - | - | Cassava | Pepper | 1 | 2.4 |
| 22. | Tobacco | Maize | - | - | Groundnut | Cassava | - | 1 | 2.4 |

combinations found to be adopted by the greatest number of farmers (being adopted respectively by 8.7, 9.0 and 8.0% of farmers interviewed - see Table 39). The two combinations which were adopted by the greatest number of farmers in the Wenchi area were tobacco-maize-yam-tomato-cassava-plantain cum cocoyam; and tobacco-maize-cassava. They were adopted respectively by 9.5 and 7 percent of the farmers interviewed.

The high gross margin and the guaranteed market at fixed prices contribute to farmers' choice of tobacco even though it requires a relatively high capital investment, labour input and great managerial skill.

The popularity of maize is hard to explain since it has a small gross margin per acre (see Table 31). Despite this, it is the second most important crop grown by the farmers in both areas with almost all tobacco farmers interviewed producing the crop (see Table 9). Among the reasons given by farmers for their interest in the crop were the following (i) food for the household; (ii) ease of storage and therefore affording a good hedge against famine (food shortage) and poor prices; (iii) ease of production (requiring little capital, labour and skill); (iv) credit facilities from wholesalers; (v) ease of intercropping with other crops such as plantain and cocoyam on which they also depend for consumption.

Yam is an important staple food for the people of both areas. It has also become an important source of income for the farmers giving them high gross margins of N¢50.70 and N¢49.40 per acre in Ejura and Wenchi areas respectively. Some yam farmers also indicated that they areceive credit from yam wholesalers to produce for them.

Groundnuts and tomatoes are produced purposely for the market although less attention is given to these crops than tobacco and yams. This is because tomato is extremely perishable and therefore risky to produce.

Plantain and cocoyam are interplanted between the maize but they later become the major crops on the land after the maize is harvested. The two crops are planted mainly for home consumption although large surpluses are usually obtained for the market.

It can be seen, therefore, that farmers adopt the above enterprise combinations with two motives. Production for household consumption as well as for the market (for cash).

Table 41 gives the average sizes of crop enterprises held by the farmers interviewed. The table indicates that apart from tobacco and plantain cum cocoyam, the sizes of holdings are, in general, larger in the Ejura area than in the Wenchi area even though the average size of family labour force available to the farmers in the Wenchi area is larger than that in the Ejura area (see Table 8). The average total size of holdings per farmer was found to be 16 acres in the Ejura area and 9.7 acres in the Wenchi area. The ranges were 3 to 28 and 1 to 33 acres in the Ejura and Wenchi areas respectively. Perhaps the reliance on mechanized services for land preparation enables farmers in Ejura to clear more land than their counterparts in the Wenchi area who rely on manpower. Another explanation might also be that farmers in the Ejura area have greater incentive to expand crop production due to easier access to markets.

TABLE 41. AVERAGE SIZES OF HOLDINGS PER FARMER - 1968-1970

| Crop | Ejura Area | | | Wenchi Area | | |
|---|---|---|---|---|---|---|
| | 1970 | 1969 | 1968 | 1970 | 1969 | 1968 |
| Tobacco | 1.8 | 1.8 | - | 2.0 | 1.8 | 1.9 |
| Maize | 8.0 | 4.0 | 4.0 | 3.5 | 4.6 | 3.0 |
| Tomato | 0.3 | 0.6 | - | 0.5 | 0.3 | 0.2 |
| Groundnut | 2.5 | 2.3 | - | 0.2 | 0.2 | 0.2 |
| Cassava | 0.7 | 0.7 | - | 1.0 | 1.3 | 1.0 |
| Yam | 3.0 | 3.0 | 3.0 | 1.0 | 1.0 | 1.0 |
| Plantain & Cocoyam | 1.0 | 0.3 | - | 1.5 | 3.0 | 2.0 |

The total gross margins for an average farm as calculated from the crop combinations for 1970 is presented in Table 42. The table indicates that tobacco farmers in both Ejura and Wenchi areas derive the major part of their annual incomes from tobacco and yam production. In spite of the large acreage of maize produced by farmers in both areas, incomes obtained from the crop rank fourth and third to other crops in Ejura and Wenchi areas respectively.

TABLE 42. GROSS MARGINS FOR AVERAGE FARM IN EJURA AND WENCHI AREAS - 1970

| Crop | Ejura Area | | | Wenchi Area | | |
|---|---|---|---|---|---|---|
| | Average Acreage | Gross Margin Per Acre (N¢) | Total Gross Margins (N¢) | Average Acreage | Gross Margin Per Acre (N¢) | Total Gross Margins (N¢) |
| Tobacco | 1.8 | 101.14 | 182.02 | 2.0 | 118.33 | 236.25 |
| Maize | 8.0 | 9.90 | 79.20 | 3.5 | 9.55 | 33.25 |
| Tomato | 0.0 | - | - | 0.5 | 47.55 | 23.77 |
| Groundnut | 2.5 | 38.70 | 96.75 | 0.0 | - | - |
| Cassava | 0.7 | - | - | 1.0 | - | - |
| Yam | 3.0 | 50.70 | 152.10 | 1.0 | 49.40 | 49.40 |
| Plantain & Cocoyam | 1.0 | - | - | 1.5 | - | - |
| T o t a l | 16.3 | - | 510.07 | 9.5 | - | 343.08 |

Returns to Labour:

Labour is the greatest single input used by most farmers in both areas. Table 43 gives the returns to this factor of production in the various enterprises. The gross margins would vary in direct proportion of the amount of hired labour. Return to labour is obtained by dividing total labour input into the result of gross output minus total non-labour cost of production. The returns to labour are higher for all the enterprises in the Ejura area than in the Wenchi area. The reasons for this are twofold:

(i) The tractor services used by farmers in Ejura area for land preparation reduces the amount of labour per enterprise; (ii) generally, farmers in the Ejura area receive higher prices, and therefore, higher gross margins for their crops than those in the Wenchi area. Table 43 indicates that tomato gives the highest returns of N¢2.75 and N¢1.51 per manday of labour in Ejura and Wenchi areas respectively. Groundnut gives the second highest return of N¢1.87 in Ejura area and N¢1.29 in Wenchi area. The third enterprise is tobacco. It gives N¢1.23 and N¢1.09 per manday of labour in Ejura and Wenchi areas respectively. Maize gives the least returns of N¢0.91 and N¢0.69 in Ejura and Wenchi areas respectively.

TABLE 43. RETURNS TO ONE MANDAY OF LABOUR - 1970

| Crop | Ejura Area | | | Wenchi Area | | |
|---|---|---|---|---|---|---|
| | Mandays Utilised Per Acre | Gross Output Minus Non-Labour Costs (N¢) | Return Per Manday of Labour (N¢) | Mandays Utilized Per Acre | Gross Output Minus Non-Labour Costs (N¢) | Return Per Manday of Labour (N¢) |
| Tobacco | 118 | 144.44 | 1.23 | 145 | 158.98 | 1.09 |
| Maize | 17 | 16.45 | 0.91 | 25 | 17.25 | 0.69 |
| Yam | 43 | 47.00 | 1.09 | 43 | 45.00 | 1.05 |
| Groundnut | 24 | 44.80 | 1.87 | 39 | 50.40 | 1.29 |
| Tomato | 22 | 60.50 | 2.75 | 36 | 54.50 | 1.51 |

The Farm Plans:

The need for plans in both areas which seek to optimize returns can not be over-emphasized. This is because economic and commercial motivation is very strong among the farmers: they depend upon a lot of consumer goods produced outside their farm gates. They also rely greatly on hired and/or purchased inputs (hired labour, fertilizers, improved seeds and in many cases even hired or purchased land). In such circumstances, it is important that the farmers retrieve their investment costs and generate a cash surplus. Farm plans which would enable the farmers to maximize their returns under their circumstances would attain such a goal. Such plans would also enable the farmers to make the best allocation of their resources and to avoid waste.

One technique used to select a combination of enterprise in a farm plan for the purpose of optimizing returns is Linear Programming. A description of the technique and the problems of its application are given in Appendix V.

In this exercise, the technique is used to investigate the optimum combination of farm enterprise with different amounts of available working capital and labour and at different agricultural wage rates. The use of fertilizers and Agricultural Development Bank's loans for maize production is also investigated along with the effects of using tractor services for land preparation. Different levels of working capital and labour are used in order to take account of any possible over-estimation or under-estimation of the amounts of these resources.

Technical Constraints and Coefficients Used in the Linear Programming

1. Gross Margins:

Tables 44 and 45 give the gross margins of the enterprises selected for the formulation of the farm plans. The gross margins were arrived at by using current yields, prices, and the mode of wage rates (N¢0.65 per manday prevailing in the survey areas).

TABLE 44. GROSS MARGINS (N¢) PER ACRE OF VARIOUS CROPS IN EJURA AREA

| Type of Labour | Tobacco | Maize | Yam | Groundnut | Tomato |
|---|---|---|---|---|---|
| Family Labour Only | 144.44 | 16.00 | 75.00 | 47.95 | 62.00 |
| Both Family & Hired Labour (in combination found) | 101.14 | 9.90 | 50.70 | 38.70 | 59.70 |
| Hired Labour Only | 63.24 | 1.00 | 19.05 | 29.20 | 46.20 |

TABLE 45. GROSS MARGINS (N¢) OF VARIOUS CROPS PER ACRE - WENCHI AREA

| Type of Labour | Tobacco | Maize | Yam | Groundnut | Tomato |
|---|---|---|---|---|---|
| Family Labour Only | 158.98 | 18.00 | 65.00 | 53.00 | 56.00 |
| Both Family & Hired Labour (in combination found) | 118.33 | 9.50 | 49.40 | 40.45 | 47.55 |
| Hired Labour | 61.53 | 4.04 | 17.05 | 25.05 | 31.10 |

2. Labour Constraints:

The monthly distribution of labour requirements for the various crops is presented in Tables 46 and 47 for Ejura and Wenchi areas respectively and in Figures 4 and 5. Both Tables and the figures show that labour is in most demand in July and August, the peak of the tobacco harvesting season. It can be noted, however, that the minor season plantings are done in September and October and harvesting is done in December and January. The minor season activities are relatively low because of the high risk of weather failure. For the purposes of the linear programme, February, March, May, June, July, August and September are chosen as the months in which labour is a constraint for expanded crop production. February and March are used to finish off land preparation. Sowing is also done in March, May and June are used for weeding while July to September inclusive is the major harvesting season ( see Table 38).

The modal size of family labour force available to a farmer in the Ejura area was found to be $7\frac{1}{2}$ man-equivalent, comprising 3 men, 3 women and 3 school children (2 males and a female). In the Wenchi area, the size was $10\frac{1}{2}$ and comprised 4 men, 4 women and 5 school children (2 boys and 3 girls between the ages of 10 and 15 years (see Table 8).

Farmers in the two areas normally work 6 days a week, resting either on Sundays or Fridays. Thus allowing 52 days in a year for rest and 13 days for indisposition, funerals and festivals; it can be assumed that farmers work 300 days in a year. Based upon 300 working days in a year, the numbers of mandays of family labour available to a farmer in the two areas are calculated under the following assumptions:-

TABLE 46. MONTHLY DISTRIBUTION OF PER ACRE MAJOR SEASON LABOUR REQUIREMENTS FOR TOBACCO. MAIZE. YAM, GROUNDNUT AND TOMATO - EJURA AREA

| ENTERPRISE | JAN. | FEB. | MARCH | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. | TOTAL MANDAYS PER ACRE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOBACCO | 5 | 4 | 5 | 3 | 9 | 9 | 23 | 34 | 32 | Nil | Nil | 4 | 118 |
| MAIZE | 0 | 2 | 3 | 0 | 4 | 4 | 1 | 3 | Nil | Nil | Nil | Nil | 17 |
| YAM | 4 | 4 | 6 | 4 | 6 | 6 | 2 | 2 | 3 | 2 | Nil | 4 | 43 |
| GROUNDNUT | 0 | 0 | 2 | 2 | 5 | Nil | 5 | 5 | 5 | Nil | Nil | Nil | 24 |
| TOMATO | 0 | 3 | 1 | 1 | 4 | 6 | 3 | 4 | 0 | Nil | Nil | Nil | 22 |

TABLE 47. MONTHLY DISTRIBUTION OF PER ACRE MAJOR SEASON LABOUR REQUIREMENTS FOR TOBACCO, MAIZE, YAM, GROUNDNUT AND TOMATO - WENCHI AREA

| ENTERPRISE | JAN. | FEB. | MARCH | APRIL | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. | TOTAL MANDAYS PER ACRE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOBACCO | 6 | 6 | 6 | 3 | 12 | 12 | 29 | 39 | 26 | Nil | Nil | Nil | 145 |
| MAIZE | 4 | 4 | 7 | 0 | 3 | 3 | 2 | 2 | 0 | Nil | Nil | Nil | 25 |
| YAM | 6 | 6 | 3 | 6 | 5 | 0 | 6 | 2 | 2 | 1 | Nil | 6 | 43 |
| GROUNDNUT | 5 | 5 | 5 | 2 | 7 | 3 | 7 | 3 | 2 | 0 | Nil | Nil | 39 |
| TOMATO | 5 | 5 | 6 | 3 | 6 | 1 | 4 | 5 | 1 | Nil | Nil | Nil | 36 |

FIG. 4 – MONTHLY DISTRIBUTION OF PER ACRE MAJOR SEASON LABOUR REQUIREMENTS FOR TOBACCO MAIZE YAM GROUNDNUT AND TOMATO — EJURA AREA

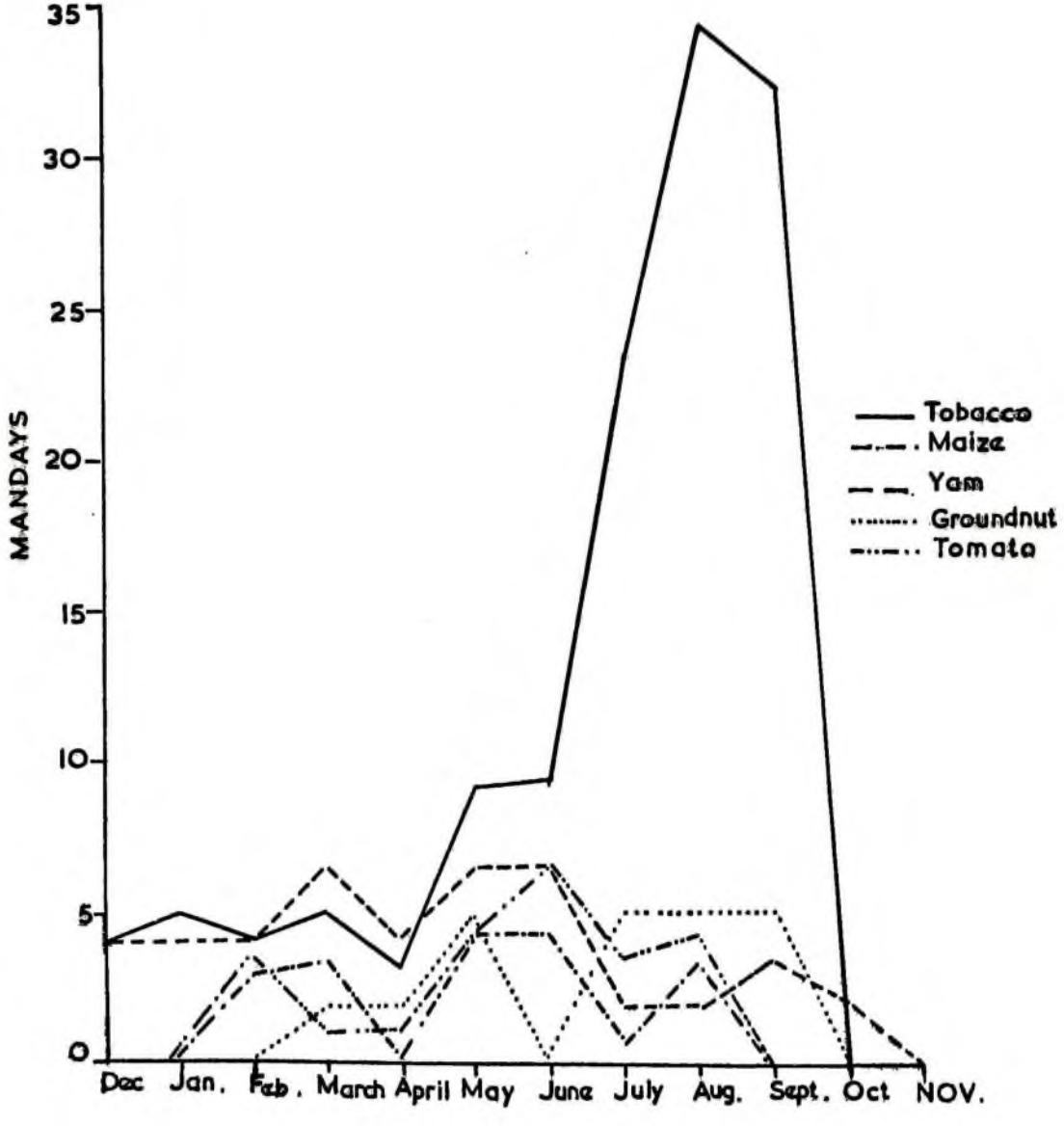
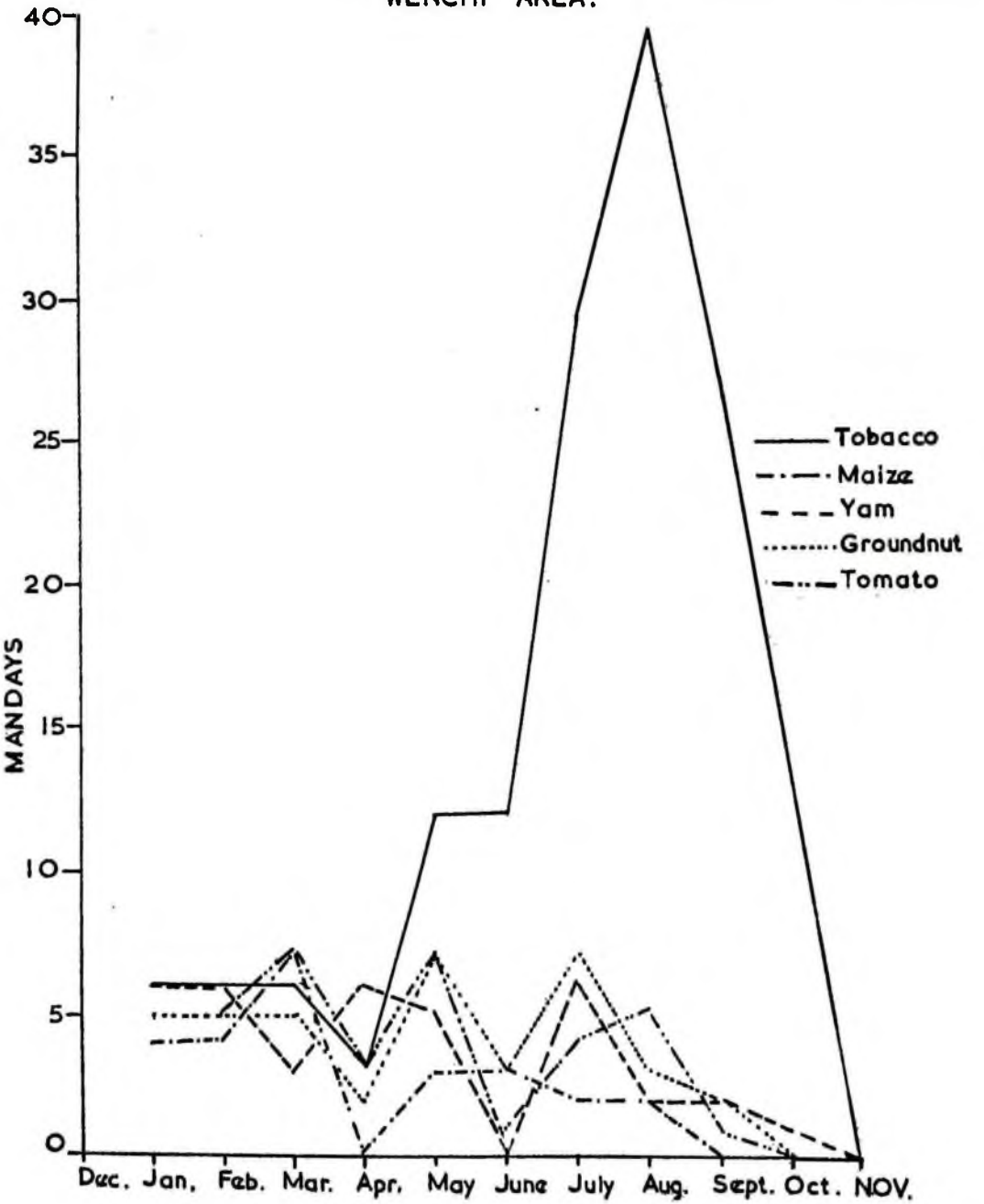


FIG.5-MONTHLY DISTRIBUTION OF PER ACRE MAJOR SEASON LABOUR REQUIREMENTS FOR TOBACCO, MAIZE, GROUNDNUT AND TOMATO WENCHI AREA.



(i) male adult farmers work full 5 hours a day while female farmers work for only 3 hours because they get tired earlier than the men and because they have to stop working to go and prepare food on the farm and/or at home;

(ii) the female farmers work as hard as the males in any given hour;

(iii) two child-hours are equivalent to one man (adult)-hour;

(iv) child-hour is available to the family only on Saturdays when the children do not go to school.

The mandays of labour per month are thus calculated as follows:-

(a) Ejura Area:

Male labour $\frac{300}{12} \times 3 = 75.0$ manday/month

Female labour $\frac{3}{5} \quad \frac{300}{12} \times 3 = 45.0$ manday/month

Child labour:

Boys $2 \times \frac{52}{2} \times \frac{1}{12} = 4.3$ mandays/month

Girls $\frac{3}{5} \times \frac{52}{2} \times \frac{1}{12} = 1.3$ mandays/month

T o t a l 125.6 mandays/month

(b) Wenchi Area:

Male labour $\frac{300 \times 4}{12} = 100.0$ mandays/month

Female labour $\frac{3}{5} \times \frac{300 \times 4}{12} = 60.0$ mandays/month

Child labour:

Boys $\frac{52 \times 2}{2 \times 12} = 4.3$ mandays/month

Girls $\frac{3}{5} \times \frac{52}{2} \times \frac{3}{12} = 3.9$ mandays/month

Total 168.2 mandays/month

3. The Working Capital Constraint:

Working capital seems to be the major constraint to the expansion of agricultural production in the two areas. As stated earlier, labour may be a constraint as far as the family is unable to pay its cost. However, apart from the payment for labour, physical cash is often needed especially in tobacco production to purchase other farm inputs (see Table 16), and to pay for tractor services in the Ejura area. It was difficult to get farmers to disclose the amount of working capital they require at the beginning of the year. Those who were willing to say something gave figures which were so low that they could be regarded as unreliable. To get around this, the total net returns from the existing farm plans adopted by the majority of the farmers were estimated (see Table 42). One-third (N¢170.00 and N¢114.36 in Ejura and Wenchi areas respectively) of these returns are taken as the base - allowing for expenditure on other items. Another approach is the use of working capitals of N¢388.13 and N¢251.37 for Ejura and Wenchi areas respectively. These are the working capitals required for the operation of the plans in practice in the two areas. However, working capital has been varied in subsequent plans to see its effects on the modal plan. It can be seen from Table 42 that all things being equal, the working capital requirement of the average farmer in the Ejura area would be higher than that of his counterpart in the Wenchi area. This is due to the greater scale of farming in the Ejura area.

Modal Farm Plans for Ejura Area:

Table 48 gives the original (problem) matrix for Plan 1 - Ejura Area. The assumption underlying the plan are as follows:-

(i) The average tobacco farmer in the area has available family labour of 125.6 mandays per month;

(ii) He can manage a maximum of 100 mandays of casual (hired) labour per month to supplement his family labour;

(iii) The farmer has working capital of N¢170.00 at the start of the season.

Activities $P_1 - P_{10}$ in the real enterprise columns in Table 48 indicate how much of the limiting resources are required by one acre of each enterprise. The activities $P_{11} - P_{25}$ in the disposal activity columns also indicate that it requires one unit of a resource to keep a unit of the same resource unemployed. The values in the 'C' column give the net returns to fixed capital, land and management for one acre of the enterprises. In the selection of the enterprises to enter the plan the principle of opportunity cost is used in the equation $Zi - C_{pi}$, where Zi denotes the opportunity cost of introducing one unit of the enterprise Pi and Cpi denotes the gross margin of Pi. In the iterations, the enterprise which is brought into the plan is the one which possesses the greatest negative Zi-Cpi value. The final, optimal, plan is obtained when all the values in the Z-C row become zero and or positive.

Optimal Solution to the LP (Modal Plan 1 - Ejura Area):

Table 49 gives the results of the LP, showing the optimal combination of enterprises to maximize total net returns in Table 48.

TABLE 43

ORIGINAL (PROBLEM) MATRIX FOR PLOT I - ZUGNA AREA

| Resource at Zero Level | Resource or Enterprise Level | | Disposal Activities | | | | | | | | | | | | | | Real Activities | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Feb. F/L+ $P_{11}$ | Feb. C/L* $P_{12}$ | Mar. F/L $P_{13}$ | Mar. C/L $P_{14}$ | May F/L $P_{15}$ | May C/L $P_{16}$ | June F/L $P_{17}$ | June C/L $P_{18}$ | July F/L $P_{19}$ | July C/L $P_{20}$ | Aug. F/L $P_{21}$ | Aug. C/L $P_{22}$ | Sept. F/L $P_{23}$ | Sept. C/L $P_{24}$ | Working Capital $P_{25}$ | Tob. F/L $P_1$ | Tob. C/L $P_2$ | Maize F/L $P_3$ | Maize FC/L $P_4$ | Yam F/L $P_5$ | Yam FC/L $P_6$ | G'nut F/L $P_7$ | G'nut FC/L $P_8$ | Tomato F/L $P_9$ | Tomato FC/L $P_{10}$ |
| | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -144.44 | -101.14 | -46.00 | -9.90 | -75.00 | -50.70 | -47.15 | -38.70 | -62.00 | -59.70 |
| Feb. F/L $P_{11}$ | 125.6 | MDS. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 2 | 1 | 4 | 2 | 0 | 0 | 3 | 3 |
| Feb. C/L $P_{12}$ | 100 | " | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 |
| Mar. F/L $P_{13}$ | 125.6 | " | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 3 | 2 | 6 | 3 | 2 | 1 | 1 | 1 |
| Mar. C/L $P_{14}$ | 100 | " | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 0 | 3 | 0 | 1 | 0 | 0 |
| May F/L $P_{15}$ | 125.6 | " | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 4 | 4 | 3 | 6 | 2 | 5 | 1 | 4 | 1 |
| May C/L $P_{16}$ | 100 | " | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 1 | 0 | 4 | 0 | 4 | 0 | 3 |
| June F/L $P_{17}$ | 125.6 | " | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 3 | 4 | 1 | 6 | 2 | 0 | 0 | 6 | 4 |
| June C/L $P_{18}$ | 100 | " | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 3 | 0 | 4 | 0 | 0 | 0 | 2 |
| July F/L $P_{19}$ | 125.6 | " | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 13 | 1 | 0 | 2 | 1 | 5 | 2 | 3 | 3 |
| July C/L $P_{20}$ | 100 | " | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 1 | 0 | 1 | 0 | 3 | 0 | 0 |
| Aug. F/L $P_{21}$ | 125.6 | " | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 34 | 19 | 3 | 1 | 2 | 2 | 5 | 3 | 4 | 4 |
| Aug. C/L $P_{22}$ | 100 | " | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 15 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 |
| Sept. F/L $P_{23}$ | 125.6 | " | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 22 | 11 | 0 | 0 | 3 | 3 | 5 | 3 | 0 | 0 |
| Sept. C/L $P_{24}$ | 100 | " | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| Working Capital $P_{25}$ | N170 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 45.20 | 38.50 | 8.00 | 14.10 | 0.00 | 24.10 | 8.00 | 17.25 | 8.00 | 11.25 |

+ F/L = Family Labour. *C/L = Casual Labour (Hired). F/CL = Family & Hired Casual Labour. MDS = Mandays. Tob. = Tobacco. G'nut = Groundnut

TABLE 49. OPTIMAL SOLUTION TO THE LP (FARM PLAN 1 - EJURA AREA)

| Productive Enterprise | | Acreage | Z-C (N¢) | Disposal Activities | | Mandays | Z-C (N¢) |
|---|---|---|---|---|---|---|---|
| $P_1$ Tobacco | F/L[1] | 0.0000 | 75.0474 | $P_{11}$ February | F/L | 38.3360 | 0.0000 |
| $P_2$ Tobacco | F/L[2] | 0.0000 | 151.4803 | $P_{12}$ February | C/L[3] | 100.0000 | 0.0000 |
| $P_3$ Maize | F/L | 0.0000 | 52.9358 | $P_{13}$ March | F/L | 19.0654 | 0.0000 |
| $P_4$ Maize | F/CL | 0.0000 | 47.2600 | $P_{14}$ March | C/L | 100.0000 | 0.0000 |
| $P_5$ Yam | F/L | 13.8720 | 0.0000 | $P_{15}$ May | F/L | 0.0000 | 5.6428 |
| $P_6$ Yam | F/CL | 0.0000 | 31.8175 | $P_{16}$ May | C/L | 68.2243 | 0.0000 |
| $P_7$ Groundnut | F/L | 6.3551 | 0.0000 | $P_{17}$ June | F/L | 0.0000 | 6.8571 |
| $P_8$ Groundnut | F/CL | 0.0000 | 7.7732 | $P_{18}$ June | C/L | 78.8162 | 0.0000 |
| $P_9$ Tomato | F/CL | 10.0000 | 20.6501 | $P_{19}$ July | F/L | 34.3044 | 0.0000 |
| $P_{10}$ Tomato | F/CL | 10.5919 | 0.0000 | $P_{20}$ July | C/L | 100.0000 | 0.0000 |
| | | | | $P_{21}$ August | F/L | 23.7125 | 0.0000 |
| | | | | $P_{22}$ August | C/L | 100.0000 | 0.0000 |
| | | | | $P_{23}$ Sept. | F/L | 52.2081 | 0.0000 |
| | | | | $P_{24}$ Sept. | C/L | 100.0000 | 0.0000 |
| | | | | $P_{25}$ Working Capital | | 0.0000 | 2.3669 |

Total Net Revenue = N¢1,972.3861

1. F/L = Family Labour; 2. F/CL = Family & Casual Labour;
3. C/L = Casual Labour.

June family labour would increase the total net revenue by N¢5.64 and N¢6.85 respectively. May and June family labour are therefore critical constraints to increased production. Another very important constraint in the plan is working capital. It is also exhausted in the plan (see Table 49) and an extra unit would increase the total revenue by N¢2.36.

Stability of the Plan (Table 49):

The modal farm plan can be said to be stable if the net revenue of each enterprise in the plan is not likely to change to an extent that it converts its marginal cost into marginal gain. To determine the stability of the plan (Plan 1 - Ejura Area), the critical ranges of the net revenue of the included enterprises are computed. These are given in Table 50.

TABLE 50. CRITICAL RANGES OF THE NET REVENUE OF THE INCLUDED REAL ENTERPRISES

| Included Enterprises | Least Positive $\frac{Zi - Ci}{rij}$ N¢ | Least Negative $\frac{Zi - Ci}{rij}$ N¢ |
|---|---|---|
| $P_5$ Yam F/L | 38.96 | 11.96 |
| $P_7$ Groundnut F/L | 9.90 | 0.00 |
| $P_{10}$ Tomato F/CL | 8.61 | 22.60 |

The smallest decrease in the net revenue that the included enterprise can sustain without being displaced from the plan is given by the least positive figure obtained by dividing each element of the included enterprise row in the final Tableau into the marginal cost (Z-C) of the excluded activity in which it is located. The least positive

figure thus obtained from Yam F/L is N¢38.96 (i.e. $\frac{20.6501}{0.5347}$) (see Table 50). This means that if the gross margin of Yam F/L falls by N¢38.96 a negative coefficient will appear in the Z-C row and give rise to a new set of substitute enterprise before the final plan would be reached. Similarly, if the gross margins of Groundnut F/L and Tomato F/CL fall by N¢9.90 and N¢8.61 respectively, the enterprises will be displaced from the plan. Considering the extent to which tomato prices fluctuate during the year, a situation where Tomato F/CL will be displaced from the plan can easily arise. Damoah reports that the prices of tomatoes fluctuate from 0.40np to N¢5.00 per basket during harvesting season in the Ejura area (6).

The least negative values in Table 50 indicate the greatest increase in the gross margins of the included enterprises that would leave the plan undisturbed. In the event of a greater rise in the net revenue an optimal plan would require the magnitude of operation of the specified included activity to rise. Thus an increase in the gross margins of Yam F/L and Tomato F/CL up to N¢11.96 and N¢22.60 respectively would leave the plan unchanged. It can be seen from Table 50 therefore, that Yam F/L is the most certain enterprise to remain in the modal plan. An optimum farm plan for the Ejura areaashould therefore contain this enterprise. On the whole, it can be said that although the plan (Plan 1 - Ejura Area) yields the highest net returns, it is not a very stable plan.

Comparison of Plan 1 with Plan Found in Practice:

Table 51 gives a comparison of the Modal Farm Plan 1 (Ejura Area) and the plan found in actual practice.

TABLE 51. COMPARISON OF MODAL FARM PLAN 1 (EJURA AREA) AND THE PLAN FOUND IN ACTUAL PRACTICE

| Modal Farm Plan 1 | | Plan in Actual Practice | |
|---|---|---|---|
| Enterprise | Acreage | Enterprise | Acreage |
| Yam F/L | 13.8 | Tobacco | 1.8 |
| Groundnut F/L | 6.3 | Maize | 8.0 |
| Tomato F/CL | 10.5 | Groundnut | 2.5 |
| | | Cassava | 0.7 |
| | | Yam | 3.0 |
| | | Plantain cum Cocoyam | 1.0 |
| Total Acreage | 30.6 | | 17.0 |
| Total Net Revenue | N¢1,972.38 | | N¢510.07* |

Maize which occupies 50 percent (8 acres) of the total acreage in the plan found in practice did not appear in the modal plan. Tobacco also did not appear. Instead of these two important crops, 10.5 acres of tomato appeared in the modal farm plan. Yam and Groundnut occur in both plans. However, the scales of yam and groundnut in the modal farm plan are much higher (13.8 and 6.3 acres respectively) than they are in the plan found in practice. Only 3.0 and 2.5 acres of yam and groundnut occur respectively in the actual plan. The modal farm plan involves a larger total acreage (30.6) than actual plan in practice. The latter involves 17.0 acres. However, it can be seen from Table 51 that the modal farm plan

* This excludes revenues from Cassava and Plantain cum Cocoyam.

yields a higher total net revenue of N¢1,972.38 than the plan in practice. The actual plan in practice yields N¢510.07 (excluding revenues, if any, from cassava and plantain cum cocoyam).

It has been estimated earlier in Chapter One that the average tobacco farmer in the Ejura area has an available family labour force of 7½ man-equivalent. This means that if the modal farm plan 1 is adopted, the ratio of farm size (in acres) to man-equivalent will be 4.1 to 1. A man-equivalent will then obtain N¢262.85 net revenue in the major farming season of ten months. The actual plan in practice gives only N¢68.00 net revenue per man-equivalent (excluding revenue, if any, from cassava and plantain cum cocoyam). These facts suggest that farmers in the Ejura area can increase their scale of agricultural production and their incomes if they make more efficient allocation of their resources between the different enterprises.

Effects of altering the levels of the limiting Resources:

1. Working Capital:

Working capital is an important resource in the farm plan. It is needed to purchase extra labour to supplement family labour and therefore to break the labour bottleneck. It is also needed for the purchase of other inputs. Table 52 gives the effects of varying the levels of this resource on total net returns and the marginal value products of working capital in modal farm Plan 1 (Table 49).

TABLE 52. VARIOUS LEVELS OF WORKING CAPITAL AND THEIR CORRESPONDING NET RETURNS AND MARGINAL PRODUCTS

| Working Capital (N¢) | Total Net Revenue (N¢) | Z - C (N¢) |
|---|---|---|
| 170.00 | 1,972.38 | 2.36 |
| 300.00 | 2,231.17 | 1.58 |
| 500.00 | 2,431.58 | 0.00 |
| 700.00 | 2,431.58 | 0.00 |
| 800.00 | 2,431.58 | 0.00 |
| 1,000.00 | 2,431.58 | 0.00 |

Table 52 shows that total net revenue increases from N¢1,972.38 to N¢2,431.58 as working capital available for production increases from N¢170.00 to N¢500.00 while other constraints (e.g. labour) remain unchanged. Increasing working capital beyond N¢500.00 does not, however, increase the total revenue. Similarily, the marginal value product of a unit (N¢1.00) of working capital decreases from N¢2.36 to zero as the level of working capital is increased from N¢170.00 to N¢500.00. The relationship between the various

levels of working capital and total net revenue is shown by the Sigmoid curve given in Figure 6. It can be seen from Table 52 and Figure 6 that working capital becomes less of a limiting factor to increased production when it is raised beyond N¢300.00. In fact, when the level of working capital is N¢500.00, N¢73.83 is left unutilized in the plan - labour becoming the main constraint at this stage. It should be mentioned that increasing the level of working capital is usually attended by alteration in the composition and the levels of enterprises appearing in the optimal plan. The optimal plan (Modal Farm Plan 2 - Ejura Area) obtained from the original matrix (Table 48) if the level of working capital is raised from N¢170.00 to N¢300.00 is given in Table 53. Plans obtained by further raising the levels of working capital are also compared in Table 54. Table 54 shows that an increase in the level of working capital (other factors remaining constant) is accompanied by an increase in total acreage produced and total net revenue. This trend continues until another factor (in this case, labour) becomes limiting. Total acreage produced increases from 30.6 to 45.4 acres and total net revenue from N¢1,972.38 to N¢2,431.58 when the level of working capital is raised from N¢170.00 to N¢500.00 (see Table 54). Table 54 also indicates that with increase in the level of working capital and therefore the ability to break the labour bottleneck, it becomes more profitable to invest in groundnut F/CL at the expense of groundnut F/L.

2. Labour:

When working capital is not a limiting factor, an increase in the amount of available labour brings about increase in the scale of production and total net returns. However, labour cannot be increased indefinitely even

FIG. 6 RELATIONSHIP BETWEEN VARIOUS LEVELS OF WORKING CAPITAL AND TOTAL NET REVENUE

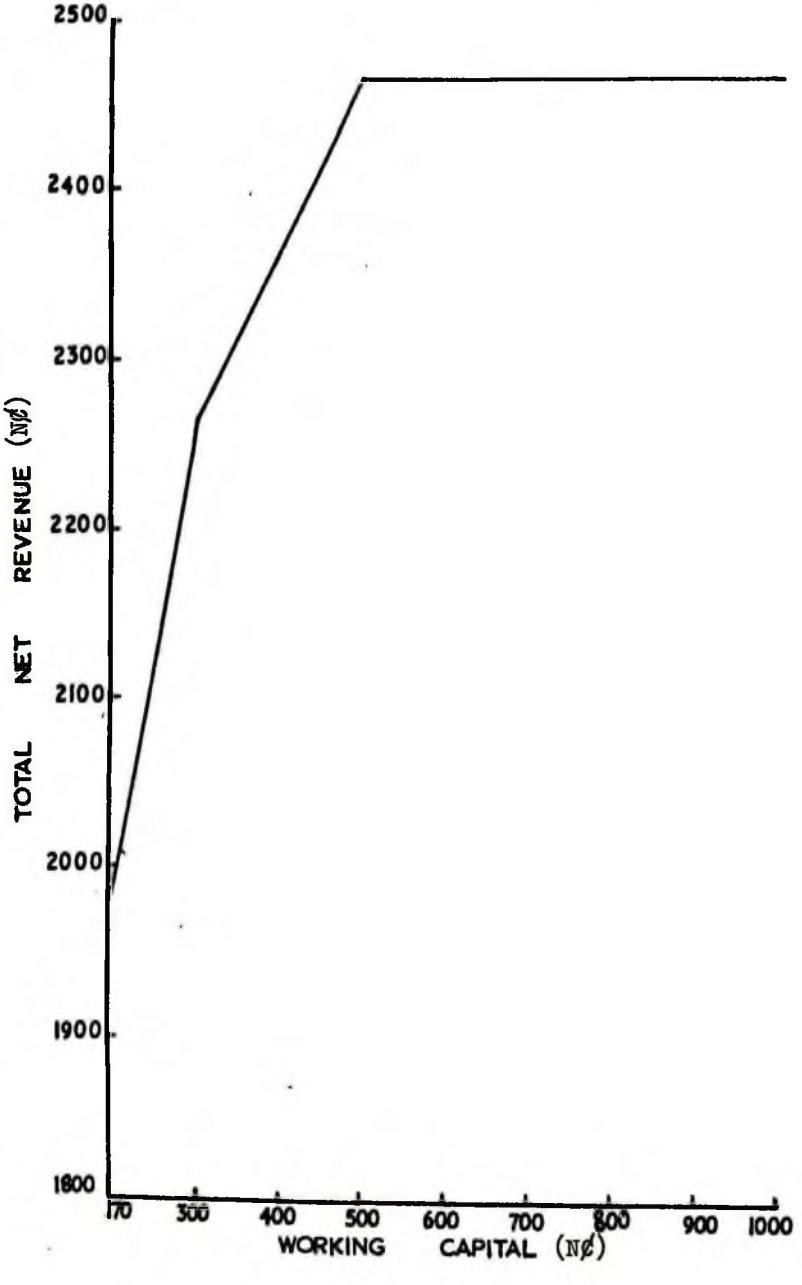


TABLE 53. OPTIMAL FARM PLAN 2 - EJURA AREA

| Productive Enterprise | Acreage | Z - C (N¢) | Disposal Activities | Unused Resources (Mandays) | Z - C (N¢) |
|---|---|---|---|---|---|
| $P_1$ Tobacco F/L | 0.0000 | 108.2123 | $P_{11}$ February F/L | 37.6815 | 0.0000 |
| $P_2$ Tobacco F/CL | 0.0000 | 121.3148 | $P_{12}$ February C/L | 100.0000 | 0.0000 |
| $P_3$ Maize F/L | 0.0000 | 50.3829 | $P_{13}$ March F/L | 18.8239 | 0.0000 |
| $P_4$ Maize F/CL | 0.0000 | 35.8349 | $P_{14}$ March C/L | 93.7069 | 0.0000 |
| $P_5$ Yam F/L | 12.5630 | 0.0000 | $P_{15}$ May F/L | 0.0000 | 4.6834 |
| $P_6$ Yam F/CL | 0.000 | 15.8407 | $P_{16}$ May C/L | 37.1617 | 0.0000 |
| $P_7$ Groundnut F/L | 6.2746 | 0.0000 | $P_{17}$ June F/L | 0.0000 | 7.0815 |
| $P_8$ Groundnut F/CL | 6.2930 | 0.0000 | $P_{18}$ June C/L | 74.8891 | 0.0000 |
| $P_9$ Tomato F/L | 0.0000 | 20.7508 | $P_{19}$ July F/L | 18.1209 | 0.0000 |
| $P_{10}$ Tomato F/CL | 12.5554 | 0.0000 | $P_{20}$ July C/L | 81.1209 | 0.0000 |
| | | | $P_{21}$ August F/L | 0.0000 | 2.2048 |
| | | | $P_{22}$ August C/L | 87.4139 | 0.0000 |
| | | | $P_{23}$ September F/L | 37.6585 | 0.0000 |
| | | | $P_{24}$ September C/L | 87.4139 | 0.0000 |
| | | | $P_{25}$ Working Capital | 0.0000 | 1.5885 |

Total Net Revenue = N¢2,231.1762

TABLE 54. COMPARISON OF OPTIMAL PLANS OBTAINED BY RAISING THE LEVELS OF WORKING CAPITAL

| Working Capital | Acreage of Enterprise | | | | | | Total Acreage | Total Net Revenue |
|---|---|---|---|---|---|---|---|---|
| | Yam F/L | Yam F/CL | G'nt F/L | G'nut F/CL | Tomato F/L | Tomato F/CL | | |
| N¢170 (Plan 1) | 13.8 | 0.0 | 6.3 | 0.0 | 0.0 | 10.5 | 30.6 | 1972.36 |
| N¢300 (Plan 2) | 12.5 | 0.0 | 6.2 | 6.2 | 0.0 | 12.5 | 37.4 | 2231.17 |
| N¢500 | 15.5 | 0.0 | 1.0 | 18.9 | 0.0 | 10.0 | 45.4 | 2431.58 |
| N¢700 | 15.5 | 0.0 | 1.0 | 18.9 | 0.0 | 10.0 | 45.4 | 2431.58 |

where the amount of working capital is unlimited. This is because up to a certain point the farmers' management ability and even land may become limiting factors.

3. Effect of Fertilizer and Agricultural Development Bank Loans for Maize on Plan 2.

The effects of fertilizer application on Plan 1 were investigated under the following assumptions: that maize yields 8 bags per acre when fertilizer is applied (11, p.19). The additional cost due to the application was taken account of in the gross margins of the resulting enterprises. The resultant plan was not different from Plan 1. This means that applying fertilizer does not make the enterprise profitable.

Getting the Agricultural Development Bank's loan facility of N¢15.00 per acre to produce maize does not make the enterprise appear in the optimal plan either.

4. Effects of Forcing Maize Enterprise into the Plan.

Maize appears to be relatively unprofitable. It does not appear in any of the above plans and has very little chances of entering the optimal plan. For reasons stated earlier in this chapter, however, maize gets the largest acreage in the farmers' plans in the Ejura area. To get nearer to common practice in the area, 8 acres of maize is forced into the farm Plan 1. The resultant plan is given as follows:-

| | | |
|---|---|---|
| Maize F/CL | = | 8.0 acres |
| Tomato F/CL | = | 8.1 acres |
| Yam F/L | = | 14.1 acres |
| Groundnut F/L | = | 2.5 acres |

The plan yields smaller total net revenue of N¢1,670.20 than Plan 1 although

it involves larger acreage (52.7). The marginal costs of bringing one acre of Tobacco F/L and Tobacco F/CL into the plan are higher (N¢75.04) and N¢151.48 respectively) than bringing the enterprises into Plan 1.

5. Effects of Forcing 2 Acres of Tomato into the Plan:

Earlier plans suggest the production of large acres of tomato. Tomato is highly perishable and as such very difficult to handle. Farmers therefore produce the crop on a small scale. In order to approach reality, 2 acres of Tomato F/CL is forced into Plan 1 with 8 acres of Maize F/CL to see the effect on the plan. The resultant plan is given as follows:-

| | | |
|---|---|---|
| Maize F/CL | = | 8.0 acres |
| Tomato F/CL | = | 2.0 acres |
| Yam F/L | = | 19.2 acres |
| Groundnut F/CL | = | 10.2 acres |

The plan involves a larger acreage of 39.4 but gives lower total net revenue of N¢1,018.37 than plan 1. Plan 1 involves 30.6 acres and yields N¢1,972.36 total net revenue.

6. Effects of Increase in Wage Rates on Farm Plan 1:

With the continuation of the rural-urban drift of labour and the increase in the cost of living in the country, it is likely that the prevailing average wage rate for farm labour will go up in the very near future. Thus the prevailing wage rate of 65np per manday was raised to 75np to see their effects on the farm plan. Increase in wage rates, with all other things being equal, will cause increase in food production cost and therefore decrease in gross margins of the enterprises. Table 55 gives the effects of variation in wage rates on total net revenue and enterprise combination.

TABLE 55. EFFECTS OF VARIATION IN WAGE RATES ON TOTAL NET REVENUE AND ENTERPRISE COMBINATION

| | Wage Rate at 65np | Wage Rate at 75np |
|---|---|---|
| Included Enterprise | Acreage | Acreage |
| Groundnut F/L | 6.3 | 5.8 |
| Groundnut F/CL | 0.0 | 0.0 |
| Yam F/L | 13.8 | 14.4 |
| Tomato F/L | 0.0 | 0.0 |
| Tomato F/CL | 10.5 | 9.6 |
| Total Acreage | 30.6 | 29.8 |
| Total Net Revenue | N¢1,972.38 | N¢1,958.75 |
| Marginal Product of Unit of Working Capital | N¢2.36 | 2.20 |
| Marginal Cost of Tobacco F/CL | N¢151.48 | 171.74 |
| Marginal Cost of Maize F/CL | N¢ 47.26 | 50.99 |

Table 55 shows that the chances of Tobacco F/CL enterprise entering the optimal plan become more remote with increases in wage rate because the marginal cost of bringing the enterprise into the plan increases. It increases from N¢151.48 when wage rate is 65np to N¢171.74 when it is 75np (see Table 55). The marginal cost of bringing one acre of maize F/CL into the plan also increases from N¢47.26 to N¢50.99 when wage rate increases from 65np to 75np. The total acreage involved in the optimal farm plan also decreases slightly from 30.6 to 29.8 when wage rate increases from 65np to 75np: the level of working capital remains unchanged.

Slight changes also occur in the levels of the enterprises involved in the optimal plan. The levels of groundnut F/L and Tomato F/CL decrease as wage rate is raised from 65NP to 75NP while the level of yam F/L increases (See table 55).

It can be noted from the above that under the conditions specified, none of the tobacco enterprises enters into the optimal plans. In all cases, the marginal cost of bringing one acre of tobacco enterprise into the plan is very high. This indicates that one unit of resource used in tobacco production has a higher opportunity cost when employed in the production of the other (the included) enterprises.

Modal Farm Plans for Wenchi Area:

Modal farm plans are derived for the Wenchi area using the same procedure as in the case of the Ejura area. Table 56 gives the original (problem) matrix for Plan 1 - Wenchi area - while Table 57 gives the optimal solution for Farm Plan 1. The plan was formulated under the following assumptions:-

(i) that the average tobacco farmer possesses 168.2 mandays of available family labour per month;

(ii) he can manage up to a maximum of 100 mandays, per month, of hired (casual) labour in addition to his family labour;

(iii) the farmer has NȻ114.34 working capital for production.

TABLE 56

ORIGINAL (PROBLEM) MATRIX FOR PLAN I – WENCHI AREA

| Resource at Zero Level | | | Resource or Enterprise Level | | Disposal Activities | | | | | | | | | | | | | | | Real Activities | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Feb. F/L | Feb. C/L | Mar. F/L | Mar. C/L | May F/L | May C/L | June F/L | June C/L | July F/L | July C/L | Aug. F/L | Aug. C/L | Sept. F/L | Sept. C/L | Working Capital | Tob. F/L | Tob. F/CL | Maize F/L | Maize F/CL | Yam F/L | Yam F/CL | G'nut F/L | G'nut F/CL | Tomato F/L | Tomato F/CL |
| | | | | | $P_{11}$ | $P_{12}$ | $P_{13}$ | $P_{14}$ | $P_{15}$ | $P_{16}$ | $P_{17}$ | $P_{18}$ | $P_{19}$ | $P_{20}$ | $P_{21}$ | $P_{22}$ | $P_{23}$ | $P_{24}$ | $P_{25}$ | $P_1$ | $P_2$ | $P_3$ | $P_4$ | $P_5$ | $P_6$ | $P_7$ | $P_8$ | $P_9$ | $P_{10}$ |
| | | | £ | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -158.98 | -112.35 | -18.00 | -9.50 | -65.00 | -48.40 | -53.40 | -40.45 | -56.00 | -47.55 |
| Feb. | F/L | $P_{11}$ | 168.2 | MDS | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 2 | 4 | 1 | 6 | 2 | 5 | 1 | 5 | 1 |
| Feb. | C/L | $P_{12}$ | 100.0 | " | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 3 | 0 | 4 | 0 | 4 | 0 | 4 |
| Mar. | F/L | $P_{13}$ | 168.2 | " | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 2 | 7 | 4 | 3 | 2 | 5 | 3 | 6 | 4 |
| Mar. | C/L | $P_{14}$ | 100.0 | " | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 3 | 0 | 1 | 0 | 2 | 0 | 2 |
| May | F/L | $P_{15}$ | 168.2 | " | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 5 | 3 | 1 | 3 | 1 | 7 | 3 | 6 | 3 |
| May | C/L | $P_{16}$ | 100.0 | " | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 2 | 0 | 4 | 0 | 4 | 0 | 3 |
| June | F/L | $P_{17}$ | 168.2 | " | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 8 | 3 | 1 | 0 | 0 | 3 | 1 | 1 | 1 |
| June | C/L | $P_{18}$ | 100.0 | " | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 |
| July | F/L | $P_{19}$ | 168.2 | " | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 28 | 20 | 2 | 2 | 6 | 2 | 7 | 3 | 4 | 4 |
| July | C/L | $P_{20}$ | 100.0 | " | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 0 |
| Aug. | F/L | $P_{21}$ | 168.2 | " | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 39 | 25 | 2 | 2 | 2 | 2 | 3 | 3 | 5 | 5 |
| Aug. | C/L | $P_{22}$ | 100.0 | " | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sept. | F/L | $P_{23}$ | 168.2 | " | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 26 | 17 | 0 | 0 | 2 | 2 | 2 | 2 | 1 | 1 |
| Sept. | C/L | $P_{24}$ | 100.0 | " | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Working Capital | | $P_{25}$ | N£114.34 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 54.83 | 95.48 | 0.00 | 8.45 | 0.00 | 15.60 | 0.00 | 13.00 | 0.00 | 8.45 |

Tob. = Tobacco. G'nut = Groundnut. MDS = Mandays.

TABLE 57. OPTIMAL SOLUTION FOR FARM PLAN 1 - WENCHI AREA

| Real Enterprise | Acreage Level | Z - C (N¢) | Disposal Activities | Unused Resources (Mandays) | Z - C(N¢) |
|---|---|---|---|---|---|
| $P_1$ Tobacco F/L | 0.0000 | 135.8675 | $P_{11}$ February F/L | 0.0000 | 3.8486 |
| $P_2$ Tobacco F/CL | 0.0000 | 181.0458 | $P_{12}$ February C/L | 62.3282 | 0.0000 |
| $P_3$ Maize F/L | 0.0000 | 15.7730 | $P_{13}$ March F/L | 21.1553 | 0.0000 |
| $P_4$ Maize F/CL | 0.0000 | 22.9784 | $P_{14}$ March C/L | 86.4646 | 0.0000 |
| $P_5$ Yam F/L | 15.2866 | 0.0000 | $P_{15}$ May F/L | 0.0000 | 3.3067 |
| $P_6$ Yam F/CL | 5.3005 | 0.000 | $P_{16}$ May C/L | 66.4456 | 0.0000 |
| $P_7$ Groundnut F/L | 0.0000 | 18.5938 | $P_{17}$ June F/L | 151.7302 | 0.0000 |
| $P_8$ Groundnut F/CL | 0.0000 | 11.9521 | $P_{18}$ June C/L | 100.0000 | 0.0000 |
| $P_9$ Tomato F/L | 12.3523 | 0.0000 | $P_{19}$ July F/L | 0.0000 | 4.2290 |
| $P_{10}$ Tomato F/CL | 4.1174 | 0.0000 | $P_{20}$ July C/L | 78.7979 | 0.0000 |
| | | | $P_{21}$ August F/L | 44.6769 | 0.0000 |
| | | | $P_{22}$ August C/L | 100.0000 | 0.0000 |
| | | | $P_{23}$ September F/L | 110.5559 | 0.0000 |
| | | | $P_{24}$ Sept. C/L | 100.0000 | 0.0000 |
| | | | $P_{25}$ Working Capital | 0.0000 | 1.9958 |



Total Net Revenue = N¢2,142.9916

The plan involves the following:-

| | | |
|---|---|---|
| Yam F/L | = | 15.2 acres |
| Yam F/CL | = | 5.3 acres |
| Tomato F/L | = | 12.3 acres |
| Tomato F/CL | = | 4.1 acres |

a total of 36.9 acres and yields N¢2,142.99 net revenue. The total acreage involved and the returns are both higher than they are in Plan 1 - Ejura area. The reason for this is that the amount of available family labour is greater (168.2) mandays/month) than in the Ejura area where it is 125.6 mandays per month. It is interesting to note that groundnut which is also less important in farmers' plans in the Wenchi area does not enter the optimal plan. It is also interesting to note that groundnut is important in farmers' plans in the Ejura area and the crop does appear in the (modal) optimal plans for that area. Tobacco and maize, the two important crops to the farmers also do not appear in Plan 1 - Wenchi area. In fact, the chances of the tobacco enterprises entering the plan are more remote in the Wenchi area than they are in the Ejura area (see Table 49). The marginal costs of a unit of Tobacco F/L and Tobacco F/CL in Plan 1 - Wenchi area - are N¢135.86 and N¢181.04 respectively. In Plan 1 Ejura area, the marginal costs of one acre each of Tobacco F/L and Tobacco F/CL are 75.04 and N¢151.48 respectively. On the other hand, total net revenue is reduced by only N¢15.77 if one unit of Maize F/L is introduced into the plan whereas in Plan 1 - Ejura area - total net revenue is reduced by N¢52.93. This means that maize is more likely to enter into optimal farm plan for Wenchi area than for Ejura area when conditions - say prices change a little. All of February and most of March, family labour is exhausted in the plan unlike in the Ejura area. This is explained by the fact that land preparation is done by manpower in the Wenchi

area and by tractor services in the Ejura area.

It has been estimated earlier that an average tobacco farmer in the Wenchi area possesses available family labour of 10½ man-equivalent. The adoption of farm Plan 1 - Wenchi area would mean therefore that each man-equivalent in the family would handle 3.5 acres and obtain N¢204.80 net returns in the major farming season of ten months. The acreage and net returns per man-equivalent (of family labour force) in the modal plan 1 - Wenchi area - are higher than they are in the plan in actual practice. In the plan in practice the ratio of farm-size (in acres) to man-equivalent of family labour was estimated at 0.9 to 1 net returns per man-equivalent of family labour was also estimated at N¢10.88 (excluding returns if any, from cassava and plantain cum cocoyam) in the major season of ten months. These suggest that the available family labour would be more efficiently utilized and farmers' incomes would also be greatly increased if plan 1 - Wenchi area - were adopted.

Stability of Farm Plan 1 - Wenchi Area:

The critical ranges of the revenues of the real activities included in Plan 1 - Wenchi area - are presented in Table 58.

TABLE 58. THE CRITICAL RANGES OF THE NET REVENUES OF THE INCLUDED REAL ENTERPRISES

| Included Enterprise | Least Positive $\left(\frac{Z_i - C_i}{r_{ij}}\right)$ N¢ | Least Negative $\left(\frac{Z_i - C_i}{r_{ij}}\right)$ N¢ |
|---|---|---|
| $P_5$ Yam F/L | 21.33 | 35.11 |
| $P_6$ Yam F/CL | 16.23 | 11.00 |
| $P_9$ Tomato F/L | 30.64 | 13.61 |
| $P_{10}$ Tomato F/CL | 15.13 | 11.64 |

Table 58 indicates that the net revenue from Yam F/L can drop by up to N¢21.33 per acre without the enterprise being displaced from the farm plan. Similarly, the revenues from Yam F/CL, Tomato F/L and Tomato F/CL can drop by as much as N¢16.23, N¢30.64 and N¢15.13 respectively without the enterprises being displaced from the plan. The table also indicates that the net revenues from Yam F/L, Yam F/CL, Tomato F/L and Tomato F/CL can increase by up to N¢35.11, N¢11.00, N¢13.61 and N¢11.64 per acre respectively without the plan being disturbed. This indicates that the plan 1 - Wenchi area - is a very stable plan with Tomato F/L and Yam F/L being the most certain enterprises to remain in the plan. Having much wider critical ranges of included enterprises, the plan is much more stable than Plan 1 - Ejura area.

Effects of Altering Limiting Resources:

1. Working Capital and Labour:

Similar effects were obtained on Plan 1 - Wenchi area - as were obtained on Plan 1 - Ejura area - when the levels of working capital and labour were varied. The optimal farm plan (Plan 2 - Wenchi area) obtained with a working capital of N¢300.00 is given as follows:

$P_9$ Tomato F/L = 14.3 acres

$P_{10}$ Tomato F/CL = 4.7 acres

$P_5$ Yam F/L = 9.5 acres

$P_6$ Yam F/CL = 17.3 acres

The plan which involves 45.8 acres and yields N¢2,503.69 is larger than Plan 1- Wenchi area and the corresponding (Plan 2) for Ejura area, (see Table 53). The latter plan involves 37.4 acres and yields N¢2,231.17 net revenue. The

difference in sizes of Plan 2 - Ejura area and Plan 2 - Wenchi area is explained by the larger amount of available family labour of 168.2 mandays per month in the Wenchi area. In the Ejura area the average available family labour per tobacco farmer is 125.6 mandays per month.

2. Effects of Forcing 3.5 acres of Maize F/L into Farm Plan 1 - Wenchi area:

Tobacco farmers in the Wenchi area produced an average of 3.5 acres of maize in 1970 season (see Table 41). The following optimal plan results when provision is made in Plan 1 - Wenchi area for 3.5 acres of Maize F/CL:-

| | | |
|---|---|---|
| Maize F/CL | = | 3.5 acres |
| Yam F/L | = | 15.3 acres |
| Yam F/CL | = | 5.1 acres |
| Tomato F/L | = | 12.3 acres |
| Tomato F/CL | = | 4.1 acres |

The plan yields N¢2,136.95 net revenue and involves 40.0 acres. The plan indicates that forcing maize into the optimal plan causes an increase in the size of the plan and a decrease in the total net revenue.

3. Effects of Fertilizing Maize on Plan 1 - Wenchi Area:

Neither Maize F/L nor Maize F/CL appeared in farm plan 1 - Wenchi area. The two enterprises did also not appear in plan 1 - Ejura area. However, the marginal costs of bringing them into plan 1 - Wenchi area were lower than in Plan 1 - Ejura area. Total net revenue would decrease by N¢15.77 and N¢22.97 respectively, if one acre each of Maize F/L and Maize F/CL were brought into Plan 1 - Wenchi area. In Plan 1 - Ejura area total net revenue would decrease by N¢52.93 and N¢47.26 respectively if one acre of Maize F/L and Maize F/CL were introduced into the plan. This indicates that a slight increase in the

gross margins of maize is likely to bring the crop especially maize F/L, into the optimal plan for Wenchi area. To test this, the effect of fertilizer application as a means of increasing the gross margin of maize, is investigated under the following assumptions: that maize yields 8 bags (of 220lbs/bag) per acre when fertilizer is applied (11, p.19). The additional cost due to the application was taken account of in the gross margins of the resulting enterprises. The resultant plan is given as follows:-

| | | |
|---|---|---|
| Maize F/L + Fe.[1] | = | 19.0 acres |
| Yam F/L | = | 17.1 acres |
| Tomato F/L | = | 6.7 acres |

The plan involves 42.8 acres and yields a total net revenue of N¢2,294.93. It also involves the use of only family labour and indicates that maize is a profitable crop in the Wenchi area when fertilizer is applied. It should be noted, however, that this plan is 5.9 acres larger than the original plan (Plan 1 - Wenchi) but yields only N¢151.94 more net revenue.

It has been stated earlier that except for tobacco production, land preparation in the Wenchi area is done by manpower. It is likely, however, that with time, farmers will resort to the use of tractor services for the other crops - tomato, maize and groundnut. Yam production does not require tractor services for land preparation because many trees are allowed to stand (in situ) to serve as stakes. Thus the effects of using tractor services for land preparation for maize, tomato, and groundnut on Plan 1 - Wenchi area were investigated. The resultant optimal plan is given as follows:-

| | | | |
|---|---|---|---|
| $P_5$ | Yam F/L | = | 25.5901 acres |
| $P_6$ | Yam F/CL | = | 7.3294 acres |

---

1. Fe. = Fertilizer

The plan yields N¢2,025.43 net revenue and involves only Yam. This plan therefore suggests that under the prevailing conditions (in the Wenchi area) it would be profitable to utilize available working capital to hire labour for yam production than to use it on tractor services to produce the other crops.

5. Optimal Rotation with Maize and Yam:

Yam usually occurs as the first crop in rotation in both Ejura and Wenchi areas. Maize can also occur as first crop. In some rotations, however, yam preceeds maize. When this happens, the cost of producing the maize is minimized because land clearing is less difficult. Using the assumptions underlying Plan 1 - Wenchi area, the possibility of an optimal rotation involving yam and maize was investigated. The rotation involves two growing seasons and draws on the fact that a one acre plot of yam for the first season gives an opportunity for one acre of maize in the second season. That is, maize would be planted in the place of yam during the second season. The following plan was obtained:-

| | | | |
|---|---|---|---|
| $P_9$ | Tomato F/L | = | 12.3523 acres |
| $P_{10}$ | Tomato F/CL | = | 4.1174 " |
| $P_5$ | Yam F/L | = | 14.982 " |
| $P_6$ | Yam F/CL | = | 5.2361 " |
| $P_4$ | Maize F/CL | = | 20.2436 " |

This means that optimal farm Plan 1 - Wenchi area, would remain almost unchanged in the first season. 20.2 acres of land used for yam in the first season would be available for maize in the second season. Plantings from the two seasons together would yield N¢2,334.99 total net revenue. The results also mean that in every one year one can have 20.2 acres of yam

and 20.2 acres of maize on the previous year's yam land.

It can be seen that the modal farm plans formulated involve larger scale of production than actually exist in the two areas. The reasons for this may be complex. It is likely that the assumptions used in the programming over simplified the situation in the two areas. However, the plans derived with working capital of one-third of farmers' total average annual income from farming (Plans 1 for both areas) may not be too far from normal as far as working capital goes. Farmers' management ability was difficult to define (or quantify) in the formulation of the plan. With regard to farmers' ability to handle labour, it was found from the surveys that a farmer can handle an average of eight man-equivalents a day (that is 200 mandays per month) depending upon availability of labour, working capital and the operation involved. Thus all things being equal, putting the maximum amount of labour a farmer can handle at the levels of 225.6 and 268.2 mandays per month in Ejura and Wenchi areas respectively was not overestimating the situation. In any case, in Plan 1 - Ejura area, the maximum amount of labour used per month was 156.8 mandays of May labour (see Table 49). In the Wenchi area, the maximum used in Plan 1 was 201.8 mandays also of May labour (see Table 57). Admittedly, however, some aspects of management problems may have been underestimated in the formulation of the plans.

The modal plans presented above do not take into account the risk of marketing the products. It was considered that all the produce emanating from the plans could be disposed of with at least the same facility as farmers dispose of their present low volume of production. In reality, however, poor marketing facilities are a major bottleneck to agricultural production in the two areas - especially in the Wenchi area. Since the farmer anticipates

the market before expanding the scale of his production, it can be said that the plans would be more feasible when marketing facilities become less constraining.

The survey should, therefore, have found the maximum quantities of the various produce the farmer is able to sell at his convenience during the season. This would have then been established in the programming as a constraint on the scale of production. Further work in this area must endeavour to take this up.

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# CHAPTER V

# C O N C L U S I O N

Linear Programming is an effective farm management tool which can be used to make optimal selection of enterprises within the existing constraints. It enables the best allocation of resources in the formulation and operation of a farm plan. It also enables management to identify various bottlenecks (or constraints) in production.

Linear Programming, as a technique is applicable to the agriculture in the Ejura and Wenchi areas. A lot of problems, however, arose in the use of the technique in this study. These included unavailability and/or quality of data. This and individual idiocyncracies made the formulation of modal plans for individual farmers impossible. The nature of farming practices (especially inter-cropping), and farmers objective function also presented problems. Some of the important constraints to production for example, marketing facilities, risks and farmers' management abilities were difficult to quantify and therefore to take account of in the modal Plans.

In spite of the above problems, it has been possible to use the technique of (LP) to indicate the following:-

(i) That yam, tomato and groundnut (in that order) are very profitable crops to produce in the Ejura and Wenchi areas.

(ii) That tobacco is a less profitable crop to produce in both areas.

(iii) That maize is generally also less profitable to produce but that it can be profitable in the Wenchi area when fertilizer is applied.

(iv) That it is possible through better selection and combination of

  

enterprises and improved marketing facilities for farmers to expand their present scale of production and increase considerably their incomes from farming.

It is understandable, therefore, that tobacco production has declined in the Ejura area in recent times. The following measures could, however, be adopted to raise the relative position of the tobacco enterprise in both Ejura and Wenchi areas. (The measures would increase the gross margin of the enterprise):-

(i) decreasing production costs through more efficient use of labour and other inputs;

(ii) increasing yields through better management practices and handling and through the use of higher yielding varieties. These call for more efficient extension and supervisory services and adaptive research;

(iii) increasing the current producer prices of leaf tobacco.

Unless efforts are made to increase the gross margins of tobacco it is likely the enterprise would continue to decline in both areas.

Further work should attempt to find why maize is still a popular crop (the two areas being surplus maize areas), in spite of its low profitability.

The costs and returns of cassava should also be studied so that further work would take account of the enterprise in formulation of the farm plan.

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## APPENDIX I

## A SURVEY OF TOBACCO FARMERS IN WENCHI & EJURA AREAS QUESTIONNAIRE 1970

A. G E N E R A L

1. Name.....Age.....Village.....

2. Are you from this district?.....

   If not how long have you been here?.....years

   From where did you come?.....

   Why did you move to this district?.....

3. Number of women and children living with you

   Women over 15.....

   Children 10 - 15 not attending school.....

   " 10 - 15 attending school .....

   " under 10 .....

4. Men over 15 living with you.....

5. What contribution do women, children and men living with you make to operations? Explain.....

6. What other kind of labour do you use? Specify casual labour/year round/abusua labour/

7. Do you have enough land for farming?.....
   If not, why?.....

8. For how long have you been a tobacco farmer?.....

9. What job were you doing before you started tobacco farming?.....

10. Do you do any work now apart from tobacco farming (e.g. carpentry, tailoring etc)? Specify.....
    If so, how many people do you employ?..... and how much do you pay them?..... How much did you earn in 1969 through this?.....
    Indicate: Under 240.00 / 240 - 360.00/360 - 500 Over 500.00

11. Were you a green leaf farmer?..... YES/NO. If yes, for how long..... years. Why did you not cure your leaves?.....

  

CROP COMBINATIONS

1. If you are a farmer, what crops did you produce this year? Give

| | Crop | Distance fro | Distance from Residence | Acreage | Production | Quantity sold | Price | Where sold |
|---|---|---|---|---|---|---|---|---|
| 1. | Tobacco | | | | | | | |
| 2. | | | | | | | | |
| 3. | | | | | | | | |

2. What prevented you from producing more of Crop

Crop 1 this year?.....

Crop 2 .....

Crop 3 .....

3. Do you intend to expand the production of Crop 1 (tobacco)/2/3/ next year?

.....

Why not the others?.....

If you want to expand tobacco production, what assistance do you think you will need in order to be able to do this.....

4. What crops did you produce last year? Give

| | Crop | Acreage | Production | Quantity | Prices | Where sold | | Quantity relative to sold |
|---|---|---|---|---|---|---|---|---|
| 1. | Tobacco | | | | | | | |
| 2. | | | | | | | | |
| 3. | | | | | | | | |

5. When did you sell these crops last year? Straight after harvesting/ long after harvesting. If long after harvesting give how long after harvesting..... and why.....

6. Did you incur any marketing costs? YES/NO.

If yes, specify - e.g. storage costs/transportation costs etc.....

and state how much.....

7. Do you find the marketing arrangements for these other crops more convenient than that of tobacco? YES/NO.

Explain.....

8. What crops did you produce in 1968? Give

| Crop | Acreage | Production | Quantity sold | Prices | Where sold |
|---|---|---|---|---|---|

9. In 1968 what prevented you from producing more of
Crop 1 (Tobacco).....
etc.

10. With Crop 1 (tobacco), explain the differences, if any, in
(a) Yields/acres.....
(b) Prices/lb.....

11. How long did you usually take to prepare the harvested tobacco leaves for curing? Give
1970.....days, 1969.....days, 1968..... days.

12. Do you keep livestock? YES/NO
If yes, specify - poultry/goats/sheep/pigs/cattle. Give

| Kind | No. owned | No. sold/year | Selling price |
|---|---|---|---|
| Poultry | _____ | _____ | _____ |
| etc. | | | |

13. Which of these animals do you intend to produce more?.....
Why.....

14. Why not the other.....

15. Given the resources, which enterprises would you most like to expand; tobacco production, other crops, livestock production or non-agricultural activities?
Explain.....
.....

## C. PRODUCTION COSTS

| OPERATION | TIME OF YEAR | FREQUENCY PER YEAR | AMOUNT OF PHYSICAL LABOUR | DATE CHARGED | TOTAL COST |
|---|---|---|---|---|---|
| 1. TOBACCO | | | | | |
| i. Land Clearing | | | Ploughing<br>Harvesting<br>Ridging | | |
| ii. Tractor Services | | | | | |
| iii. Seedlings | | No | | | |
| iv. Transportation | | | | | |
| v. Fertilizers | | No. of bags | | /bag | |
| vi. Fertilizer application | | | | | |
| vii. Weeding | | | | | |
| viii. Topping and suckering | | | | | |
| ix. Harvesting | | | | | |
| x. Stringing | | | | | |
| xi. Loading of barn | | | | | |
| xii. Woodfuel | | No. of cords | Where obtained | /cord | |
| xiii. Firemen services | | | | /night or month | |
| xiv. Kerosine | | No. of bottles | | | |
| xv. Unloading of barn | | | | | |
| xvi. Unstringing & erading | | | | | |
| xvii. Transportation to buying centre | | No. of trips | | /trip | |
| xviii. Others | | | | | |
| xix. | | | | | |

  

## D. INVESTMENT IN CURING BARN

1. When did you start curing your tobacco leaves?.....

2. Why did you start cuting your leaves when the company took green leaves.....

3. Do you have your own barn/s YES/NO. If yes, Gove: No.....year/s built.....and size/s.....

4. How far is your barn from tobacco farm..... and from your residence.....

5. What costs did you incur on the following items for the construction of the barn?

   (a) Building materials

   i. Cement.....
   ii. Blocks/mud.....
   iii. Iron sheets/straw.....
   iv. Flue pipes.....
   v. Others (specify).....

6. Did you have to borrow money to pay these costs? YES/NO.

   If yes, give source.....

   Principal.....

   Interest rate.....and repayment period.....

7. If you do not have your own barn, state how you get barns to cure your leaves.....

8. How do you think the organisation of tobacco production and marketing might be improved?.....

9. General Remarks.....

  

## APPENDIX II

## THE PHYSICAL OPERATIONS INVOLVED IN THE PRODUCTION OF FLUE-CURED TOBACCO*

The production of leaf tobacco involves a succession of operations spread over most of the year. In both the Ejura and Wenchi areas, seeds are sown on the seed beds in the period from March to early May. Land preparation begins earlier in January (in some cases even in December) and is usually completed by the end of March. Transplanting of seedlings from seed beds to the fields starts in Mid-April and continues through to early June. Fertilizers are applied and weeding carried out in the first few weeks after transplanting. About one month after transplanting, the tobacco plants are 'topped' (the terminal buds are broken off) and in the following weeks suckers (auxillary growths) are periodically removed. Harvesting starts in June - about 40 days after transplanting and lasts for three months. The leaves are cured after harvesting. Curing takes five days and after this the farmers grade the leaves which are then ready for sale.

Raising of Seedlings:

In the past, the entire job of raising seedlings was the responsibility of the tobacco Company, and seedlings were distributed free of charge to the farmers. However, when the Company was buying green leaf farmers at N¢6.00 for 6,200 seedlings, the recommended number of seedlings per acre, while 'dry' leaf farmers received their seedlings free. Currently, the Company encourages farmers in both areas to form groups on a village basis in order to raise their own seedlings. In addition to these private nurseries,

*The information contained in this section was obtained through discussions with tobacco farmers, field staff of GTC and the Area Managers and their staff in the two areas and through personal observations by the writer.

  

the Company also establishes some central nurseries to supplement those established by the farmers. The Company provides free of charge seeds, fertilizers (Ammonium Sulphate and Calcium Ammonium Nitrate), fungicides (Copper Oxychloride), insecticides (Aldrex 40% and Aldrine 40%) and technical advice for seedling production undertaken by farmers.

Nursery sites areusually selected in November on open-spaces where the soil is a light friable sandy-loam. The dimensions of the beds are usually 30 feet by 3 feet and three of such beds are required to obtain sufficient seedlings to plant one acre. When the beds are constructed, the soils in them is thoroughly stirred. They are covered with a six-inch layer of dried grass and leaves which is burnt. The fire kills off disease causing organisms and pests and destroys weed seeds while the ashes afford readily useable mineral nutrients for the young seedlings. The burning is usually repeated until the soil is burnt to the depth of about three inches.

The clearing of the nursery sites and the cutting of grass to be used for burning starts in December and ends in February. The seeds are sown immediately after the first rain in March and April and continue to be sown as late as the second week of May. This enables transplanting to be started about the middle of April. Because of the small size of tobacco seeds, sowing is done by mixing the seeds with wood ash in a watering can and spraying the mixture onto the seed beds. About ten spoonfuls - that is about one gram of seeds is sown in each bed. The seedlings are shaded against the sun by means of a mat of woven palm leaves supported on a wooden frame. The shade is removed on dull days and during the hardening-off stage when the seedlings are subjected to progressively.

increasing amounts of sunlight. During hardening-off, the seedlings are watered less frequently.

Seedlings are uprooted and distributed to farmers when they are six weeks old. Seedling distribution to farmers is done by the staff of the GTC to ensure that only strong and healthy seedlings are given to the farmers. Certain irregularities which sometimes occur during seedling distribution are discussed in Chapter II.

Land Preparation:

Land preparation for tobacco production consists of the following operations: land clearing, ploughing, harrowing and ridging. Land clearing may start as early as December and end in March. It is usually done by man-power using cutlasses, axes and pikes. It is necessary to cut down trees and destump the field because tobacco plants do not do well under shade; destumping is also necessary for mechanical ploughing and the construction of ridges.

All tobacco farmers in both areas use tractors for ploughing, harrowing and ridging. Tractor services are provided by the Mechanization Division of the Ministry of Agriculture and of late by the GTC itself. The problems farmers encounter with tractor services are discussed in Chapter II.

Harrowing the field after ploughing loosens the soil and brings the vegetation ploughed under the soil to the surface. Otherwise such vegetation would rot to provide more than the required amount of nitrogen to the plants. Over-abundant supplies of nitrogen from this source causes too much growth late in the growing season making the leaves excessively green and postponing ripening. Ridges are usually 12 inches high and this prevent water

logging. This is very important because tobacco is vefy sensitive to 'wet feet'. Ridges also help aeration and make available to the plant a greater volume of soil which is especially important where the soil is shallow. However, during the survey, some farmers were found who planted on the flat land.

Transplanting, Fertilization and Cultivation:

Seedlings are planted on the ridges with the soil pressed as firmly around the plants as possible to reduce the chances of wilting. The seedlings are planted preferably one day after rain when the ground is moist so that the operation is easily accomplished and the plant can get a good start. However, dry planting is being seriously considered in both areas. It is thought this will ensure good rooting and general plant development. The recommended planting distance is $2\frac{1}{2}$ feet by 3 feet making a total requirement of 6,000 seedlings per acre. The farmers are, however, supplied with 6,200 seedlings per acre in order to allow for damage during transplanting.

All the farmers in both areas use fertilizers on their tobacco farms. In the 1969 season, farmers were advised to apply 224 lbs of 5:20:15 NPK mixture per acre. In the 1970 season, this recommendation was changed to 224 lbs per acre of 3:25:15 N.P.K. mixture. The price of the fertilizers to the farmers in 1969 was N¢3.36 per hundred weight bag and in 1970 N¢4.00 per bag. In addition to the fertilizers the Company sells measuring cups with a capacity of five cubic centimeters, which is used in applying fertilizers to individual plants. Fertilizer is applied as soon as the tobacco plants are well established - that is about 2 to 3 weeks after transplanting.

  

To apply the fertilizer, the farmers make two holes - one on each side of the tobacco plant. The distance of the holes from the tobacco plant is determined by the extent of the canopy. The holes are about six inches deep and one cup of fertilizer is put in each hole so that each tobacco plant receives ten cubic centimeters of the fertilizer mixture. Farmers' complaints over the application of fertilizers are discussed in Chapter II.

Where a tobacco farm abounds with weeds, stunted growth of the plants results. Also, with time, the ridges on which the tobacco plants are standing break down under the rains. Thus land cultivation has a dual purpose; first to rid the plot of weeds which compete with the tobacco plants for food and strangle them for space, and second to maintain the ridges. The advice from the GTC is that farmers should cultivate the land at least twice before all harvesting is completed. Most farmers from both areas follow this advice; some cultivate more frequently while a few do it only once.

Topping and Suckering:

Topping and suckering is the process whereby the terminal buds of the tobacco plants are clipped off and the resultant growth of the axillary buds prevented. The process ensures that the nutrients are not diverted to flower and seed production or the production of small unsaleable leaves but to the saleable leaves making them thick and high in nicotine content. It is believed that, when properly done topping and suckering can increase the weight of the leaves by thirty percent. However, to ensure that the effects of this operation are achieved it is necessary that the topping is done at the correct time and desuckering done as frequently as suckers reappear on the plant. It was found in both areas that some farmers are very assiduous with this operation while others completely ignore it arguing that the operation involves

costs to them and also that it prevents the remaining leaves from ripening as early as they should.

Harvesting:

Harvesting starts when leaves turn from a dark to light green. Normally the lower leaves are ready for harvesting about 40-45 days from transplanting. To ensure a good cure, it is absolutely essential to harvest the leaves at the right time. It is bad practice to leave the leaves to yellow on the plant before harvesting for such leaves turn brown after curing. Dark green, unriped leaves should not be harvested because they turn greenish, especially at the veins, after curing. Usually two to four leaves are picked per plant at each harvest. Harvesting is done at intervals of about one week and on the average a tobacco farm is harvested 8 to 9 times a season.

Curing:

The arrangement of flue-pipes and the position of the furnace are such that air passing through the open-ended tubes heats the tubes which in turn radiate enough heat to cure the tobacco.

After harvesting, the leaves are tied on sticks, referred to in the trade as 'piers' with jute twine. The piers are about three feet long and each carries 96 leaves in 32 loops. They are hung in tiers in the barns and when this is done fire is set in the furnace. The actual curing process involves a series of chemical changes which take place in the leaves and gives rise to colour changes.

Three stages can be distinguished in the curing process: the yellowing stage, the colour fixing stage and the drying stage. The whole process of

  

curing takes five days.

In the yellowing stage, the leaves are subjected to a temperature of 90°F at a relative humidity of 90 to 100 percent. These conditions are maintained until the tips and edges of the leaves begin to curl inwards. By this time the leaves may have begun to yellow and the temperature is then raised to 95°F to make the yellow colour spread to the midribs. The temperature is raised further to 100°F to make the yellow colour predominant in the leaves.

Once the leaves are predominantly yellow, colour fixing is started. The humidity in the barn is lowered to about 70% and the temperature is raised to 120°F. These conditions are maintained for 24 hours and the humidity is lowered by progressively opening the eaves at the top of the barn.

After the fixation of the yellow colour, drying is started. The temperature in the barn is pushed up to 130°F for four hours to dry out the veins and the midribs of the leaves. At this stage the eaves are gradually closed until they are completely shut. The temperature is then raised to 160°F. This temperature is maintained until the midribs become brittle. When the leaf stalk breaks easily with a snap, the leaves are considered thoroughly dried and at this stage the source of heat is removed. The eaves are then opened slightly to allow the leaves to cool. Some moisture is gathered at this stage by the leaves. This makes them less brittle and therefore suitable for handling.

To assist the farmers to maintain the correct temperatures, especially designed thermometers are sold by the GTC to the farmers. These thermometers are designed in bright colours which make it easy for the farmers to

recognize what temperature and relative humidity they have in the barn. Originally the Company was hiring the services of experienced firemen to watch the curing for farmers during the night but this has been stopped.

Grading, Storage and Sales:

After curing the leaves are unloaded from the barn, unstrung from the piers and stretched one by one to be made ready for grading. Much of the stringing, unstringing and grading work is done by female labour. Grading is the responsibility of the individual farmers and the field staff of the GTC are supposed to be available to give advice when necessary.

Until 1969, the flue-cured tobacco was classed into six grades according to the specifications of the STPC. This system of grading depended primarily upon the leaf colour. Leaves with lemon or orange colour with few spots and no browning at all were put in Grade I. Grade II leaves were similar to Grade I leaves except that they had a little browning. In Grades III and IV more browning was present while Grades V and VI usually contained some green shades.

During the 1969 season, a new grading system was introduced. This is the internationally recognized system of grading. Under the system, leaves on the lower third of the plant are classified as 'Bottom' leaves and those from the upper two-thirds are considered as 'Top' leaves. This system takes into account the fact that the proportion of nicotine to sugar content of the leaves varies in accordance with the leaf position - 'Bottom' leaves being high in nicotine while 'Top' leaves have a higher proportion of sugar than nicotine. The 'Bottom' leaves, therefore, sell at a higher price than the 'Top' leaves under the new system of grading. 'Bottom' and 'Top' leaves are further graded into 'Mature', 'Bright', 'Dark' and 'Green' according to

how the Bottom or Top leaf turns out after curing. The 'Mature' leaves are lemon to light brown in colour, 'Bright' leaves are lemon in colour, 'Dark' leaves are a pale brown colour while 'Green' leaves tend to have some green colour still present. It was found during the surveys that a lot of irregularities occur in the application of this grading system. These irregularities are discussed in Chapter II.

It is advisable to sell the leaves as soon after grading as possible in order to prevent deterioration and the risk of fire. However, some farmers prefer to accumulate the leaves into substantial loads before selling them. Storing is usually done by the farmers who have to travel some distances to reach buying centres and also by farmers from villages where the Company's buying team makes its appearance once a week or less frequently. Where storage is done, the leaves are usually stuffed in water-proof polythene bags which are tightly tied. The bags are then stacked in the corner of a room or more recently in apartments or enclosures called 'Drying Cupboards' adjoining the barns. The flue pipes, from the curing barn pass through this drying cupboard which provides sufficient heat to keep the leaves dry. Some farmers also store their leaves in big packing cases. If the leaves are exposed to the atmosphere for too long during storage, they pick up moisture and go mouldy especially on the leaf stalks (petioles) at the point at which they are tied into bunches. Very mouldy leaves are not purchased.

Farmers quite frequently bring leaves to sell which have green colour reappearing. Such farmers are often advised to 'bulk' their leaves. 'Bulking' involves stuffing the leaves in large empty boxes and covering

them tightly for some days. Such cases result primarily from the harvesting of unripe leaves. They may also be caused by improper curing as an insufficient fixation of the yellow colour can give rise to this reappearance of the green colour after curing.

During the harvesting period, the GTC purchases leaves from 7.30 a.m. to 12 noon from Monday to Friday (inclusive) at Ejura, Mampong, Wenchi, Techiman, Nkoranza and Kintampo stations. The Company's buying teams comprise officers from the Produce Inspection Division of the Ministry of Agriculture and some personnel of the GTC. The Produce Officers and some of the Company's personnel examine every tied bunch of cured leaves brought by the farmers to make sure that the farmers' grading is correct and that the leaves are wholesome. Mouldy and other unwholesome leaves are separated from the rest and rejected.

If the examiners are satisfied with the leaves they are carried to the balance and weighed. A credit note is then given to the farmer which indicates the amount of cash he can collect at a later date. Formerly, the dates for payment were usually unspecified and had uncertain intervals. During the 1970 season, however, farmers in both areas were promised that they would be paid every month. In both the Wenchi and Ejura tobacco areas, the Company's buying teams travel to tobacco producing villages which are remote from the buying stations. For example, in the Ejura area the buying teams visit Attebubu, Bredi, Sekyere-Odumasi, Amoamang, Bogyabon, Afranso II etc.; in the Wenchi area, Tromeso, Amoma, Sabie-Banda, Offuman, Nchiraah and Tankar are among the remote places visited quite regularly. This has no doubt contributed great greatly to the extent to which tobacco production has spread in both areas of the country.

# APPENDIX III

## REGRESSION ANALYSIS

**Objective:** To find whether the size of a tobacco farm has a significant relationship with its yield (per acre).

**Procedure:** (i) Data on farm sizes and their yields were taken randomly in the Ejura area.

(ii) A simple linear regression model of the nature

$$Y = \alpha + \beta X + U$$ was used

where Y = yield of tobacco (lbs) per acre

X = the size (acreage) of the tobacco farm

U is assumed to have normal distribution.

**Data**

| Yield (lbs) | Acreage |
|---|---|
| $Y_i$ | $X_i$ |
| 717 | 2 |
| 316 | 2 |
| 60 | 2 |
| 180 | 1 |
| 462 | 1 |
| 431 | 1 |
| 640 | 2 |
| 438 | 1 |
| 558 | 4 |
| 611 | 1 |
| 57 | 2 |
| 520 | 2 |
| 227 | 1 |
| 209 | 1.5 |
| 234 | 3 |
| 175 | 2 |

$$\Sigma Y_i = 5660, \qquad \Sigma X_i = 28.5$$

$$\Sigma (Y_i - \bar{Y})^2 = 308926.37$$

$$\Sigma (X_i - \bar{X})^2 = 11.61$$

$$\Sigma (Y_i - \bar{Y})(X_i - \bar{X}) = 966.65$$

$$n = 15$$

**Method**

$$Y_i = \alpha + \hat{\beta} X_i$$

$$\hat{\beta} = \frac{\Sigma (Y_i - \bar{Y})(X_i - \bar{X})}{\Sigma (X_i - \bar{X})^2} = \frac{966.65}{11.61}$$

$$= 83.26$$

$$\left| \frac{\hat{\beta} - 0}{\frac{\sigma^2}{\Sigma (X_i - \bar{X})^2}} \right| > 1.95$$

$$\hat{\sigma}^2 = \frac{\Sigma (Y_i - \bar{Y})^2 - \hat{\beta} \Sigma (X_i - \bar{X})(Y_i - \bar{Y})}{n - 2}$$

$$= \frac{[308926.36 - (83.26)(966.65)]}{13}$$

$$= 17495.61$$

$$\left| \frac{83.26 - 0}{\frac{17495.61}{11.61}} \right| > 1.95$$

$$| 2.145 | > 1.95$$

The value in the significance table corresponding to 5% level is 0.4842. This is less than the calculated value of 2.145. Therefore we accept the Null Hypothesis that $\hat{\beta} = 0$. This means that the size of a tobacco farm has no significant relationship with its yield. Perhaps other factors such as the farmer's management competence, his handling ability and edaphic and climatic conditions have greater influence on yields.

## APPENDIX IV

## THE PHYSICAL OPERATIONS INVOLVED IN THE PRODUCTION OF YAMS, MAIZE, GROUNDNUTS AND TOMATOES

### Yam (Dioscorea spp):

Yam production involves the following sequence of operation:- land preparation, sowing, staking, land cultivation and harvesting.

Land preparation for yam production in the Ejura and Wenchi areas usually starts in October and may continue up to March. Sometimes, however, especially in the Ejura area, some farmers start preparing their lands as early as September. The operation consists of 'lifting' or cutting the grass and the undesirable trees on the plot, leaving them to dry before burning and finally making mounds. Suitable trees are usually left to stand to be used later as stakes. Mounds are made by amassing the top soil into little hills. They are usually constructed with hoes and may vary considerably in sizes. Mounding has the advantages of breaking up the soil to facilitate aeration. This is of particular importance with freshly cleared lands. Mounds also provide a sufficient volume of loose soil which enables good tuber development. The spacing of mounds may vary from 3' by 3' to 6' by 6' and there are usually not less than 1,200 mounds per acre.

Most farmers in the two areas plant yams early. Planting may start as early as October and end in March. This is done to allow the yam setts to undergo a period of dormancy. It is said that dormancy encourages tubers to sprout (6, p.4).

  

Planting materials are usually the small unsaleable tubers or "seed yams' specially produced for the purpose. Sometimes, however, large (saleable) yams may also be reserved for planting. In the latter case, the tubers are usually split longitudinally into sections such that each section includes a portion of the head where the vine was attached to the tuber. In sowing, the setts are placed face down about one-third of the depth of the mound and covered with soil. The mounds are then 'capped' with a mulch of dried leaves or grass on which is placed a layer of soil or clod to prevent them from being blown away by the wind. The 'cap' or mulch reduces the soil temperature within the mounds and prevents the dormant and later, the sprouting sett from being scorched by the sun. Being planted early, yams in both areas take advantage of the first rains. They are, therefore, usually ready for staking by the end of March.

Staking of yams consists of the provision of a solid upright pole along which the creeping vines of the yams can climb in order to expose the leaves to sunlight. Small trees are also left to support the yam vines and in many cases, strings are used to direct the vines to the stakes. Corn stems are occasionally used as stakes. Staking yams have been known to increase yields by up to 28% (4, p.18). It is said, however, that in order to achieve maximum results, the stakes must be at least six feet tall (8, p.377 and 4, p.18).

Land cultivation is usually done twice before harvesting is completed. The first is done in April or May and the second in August or September. Land cultivation has a dual purpose; it gets rid of the weeds which compete with the yams for nutrients and also it is carried out to repair the mounds.

Yams mature between six and nine months after sowing. Yam harvesting

  

starts in the North Ashanti/Brong Ahafo yam belt earlier than elsewhere in the country. This is because early yam are planted in this belt. Harvesting in the two areas starts in late June or early July but the operation is spread over a period of five to six months (4, p.219). Harvesting for the market is done only once in a year but two crops of yams might be taken. The first harvesting in the latter case, is called 'pricking' or 'milking'. This is done by carefully servering the connection between the vine of the yam and the tuber itself so that no damage is done to the roots of the vine, After the connection is servered, the tuber is removed from the mound and the vine replaced in the mound. The vine continues to grow and may produce after sometime, a cluster of small tubers or only one small tuber (as a second crop) which are used as seed yams. Some farmers exist in both areas who specialize in the production of seed yams for sale but none were interviewed during the surveys. All the farmers interviewed produced their own planting materials (setts).

Maize (Zea mays):

Land preparation, sowing, land cultivation and harvesting are the main operations involved in maize production. Land preparation for the major season starts in January and continues through February and ends in March. The operation is similar to the one for yam production except that only the very big trees which the farmers might find uneconomical to fell may be left. No mounds are constructed and in fact very few of the farmers encountered planted their maize on ridges. Ridging occurred on a few farms in the more northern parts of the two areas. Elsewhere, the crop was planted on the flat ground. In the savanna parts of the Ejura area (Ejura North, Central, East

and parts of Ejura West sub-districts) the farmers interviewed used tractor services for land preparation. Land preparation for the minor season cropping is done in July and August.

The major season sowing starts soon after the coming of the first rains in March and it is completed by the end of April. Sowing is usually done by piercing the soil to about three inches deep with a sharpened stick. This done, from one to four grains (seeds) of maize are put in the holes and covered. The second season planting is done in August.

Land cultivation is usually carried out in May or June and its purpose is to get rid of weeds. Where the maize is later intercropped with plantain, cocoyam and vegetables, a second cultivation is often done before the maize is harvested. Otherwise, a second cultivation is not usually done.

The maturity period for maize varies from 80 to 140 days according to the variety (8, p.372). The longer-maturing varieties often occur in the forest parts while the early maturing varieties are usually grown in the savanna zone (8, p.372). Harvesting of dry (mature) maize starts in July and ends in August. However, green or fresh maize may be harvested when preferred in June and July. Harvesting the matured maize consists of cutting the fruits (cobs with most of its husk intact) from the plant. The harvested maize may be husked and shelled immediately for sale or consumption. Most of the farmers interviewed preferred to store their maize in the husk in cribs (storage barns) for periods ranging from two months to nine months before sale.

Groundnut (Arachis hypogea):

The operations involved in groundnuts production are land preparation,

sowing, land cultivation and harvesting. These activities are performed simultaneously with the corresponding activities of maize. Land preparation for groundnuts almost invariably includes ridging. Among other things, ridges check erosion and facilitates good root development. The ridges are often 9 inches by 3 feet. In sowing, one or two beans may be placed in a hole of about 2 to 3 inches deep. The holes are usually spaced 6 to 10 inches apart on the ridges. Land cultivation is normally done twice before harvesting time to maintain the ridges and to uproot weeds.

Groundnuts mature in 4 to 6 months. The major season harvesting is done from July to September. Harvesting is the most tedious of the operations involved in groundnut production. It is done most often with female and child labour. In harvesting, the plants are uprooted, the pods are detached from the roots and the ground searched carefully to remove all the hidden pods. The harvested pods are then carried home where they are spread in open spaces either on raphia mats or on the bare floor to dry. When thoroughly dried, the groundnuts may be shelled straight for the market or for consumption or they may be stored in the pods. The storage facilities commonly used in the two areas for groundnuts are raphia baskets. These are usually three or four feet tall and flasked-shaped and they have lids made of the same material. These containers are usually made by the farmers themselves but a few of them specialize in making them for sale. The useful lives of these containers were said by the farmers to range from two to four years. Farmers said that they recovered almost all the groundnuts they stored in this manner. In fact this traditional method of storing groundnuts has been demonstrated to have a good scientific basis (8, p.397). Farmers apply no chemicals to the crop during the storage period.

Tomatoes (Lycopersicon esculentus):

The physical operations involved in tomato production are similar in all respects to those involved in groundnut production except in planting and the details of harvesting. In the case of tomatoes, seedlings are raised on separately prepared beds and are transplanted onto the field when two to three weeks old. Tomato harvesting consists simply of plucking or picking the riped fruits from the plants into boxes (usually beer crates) or baskets. After harvesting, the crop is usually sold immediately because it is highly perishable. Seedlings are transplanted at distances of 2 feet by 1 foot or 2 feet by 2 feet. In both areas planting is carried out in March and April and cultivation is done once. Fruiting begins in June and may last through to October. The bulk of the fruits are, however, harvested in July and August.

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# APPENDIX V

## THE TECHNIQUE OF LINEAR PROGRAMMING (LP)

**Definition:**

LP is a systematic method of determining mathematically, the most desirable combination of enterprises for the best (optimum) results. The technique is applicable to any problem which has an objective, alternative methods for achieving the objective and limited resources or restrictions. Thus as a tool, LP has a very wide application to both farm and non-farm problems. It was first applied to the problems of farm planning in U.S.A. in 1954 by E.O. Heady (5 pp.1035-1048). Since then, Eric Clayton has successfully applied the technique for selection of enterprises to maximize farmers' returns in Kenya (1 pp.337-347). Mcfarquar and Evans have also used it in a similar exercise in a tropical situation and have emphasized that the results of LP are practicable, if properly interpreted, even where the data used are crude (6, pp.474-497).

LP as a model for enterprise selection and combination may be formulated mathematically as follows:-

Where we want to select values of x that maximize $f(x) = cx$ subject to $Ax \leq b$ and $x \geq 0$.

Where c = a row vector of enterprise gross margin.

x = a column vector of activity levels in terms of acres devoted to different crops or units of production

A = a matrix of technical coefficients of enterprise requirements for specific constraints.

b = a column vector of resource and enterprise constraints.

ıade under LP:

gh it has very wide application, LP technique operates under the following assumptions:-

(i) Linearity of relationship between imput and output (i.e. constant imput-output ratio) irrespective of the scale of operation.

(ii) Factors of production and enterprises are infinitely divisible and additive (in order to achieve the goal of maximization or minimization).

(iii) Enterprises are independent of each other and the selection of one does not necessitate the selection of the other.

(iv) The number of enterprises or ingredients adoptable is finite and consequently choices and combination can be made only within this finite number of enterprises and ingredients.

Problems of LP Application to West African Agriculture:

The application of LP to agricultural problems is often criticized on the grounds that the linearity assumption precludes the concepts of economies of scale and more importantly diminishing returns. The latter is one of the characteristic features of agricultural production. This criticism is however underscored by the fact that a curvilinear function can always be broken up into its linear segments.

The special problems of the West African agriculture to the application of LP reside in data inavailability, farmers' cultural practices (especially intercropping), uncertainty of prices of farm imputs and produce and of yields. The relationship between the farm firm and the family also

presents problems to the application ofLP in West African agriculture.

The quality of the results obtained by using LP depends upon the quality of data used to formulate the model. In Ghana, and other West African countries, data on agricultural production, technical coefficients, constraints, yields, gross margins, inputs etc. are largely unavailable. Where they are available their reliability may be questionable. However, since errors in data are no justification for further errors in analysis, it can be argued that the fact that data is not available does not mean that the technique itself is not applicable. The solution to the problem lies in more surveys to collect data and to revise available ones. In any case, the data presented in this paper should be reliable enough to permit a successful use of the LP technique.

Most farmers in the Ejura and Wenchi areas, like those in other parts of West Africa, practise intercropping. Intercropping presents two major problems to the application of LP - viz; the difficulty of allocating the cost of operations like land clearing and cultivation between the individual crops and the difficulty of assuming that the individual crops do not influence the yields of each other. Work done by Norman indicates that the total output from a piece of an intercropped farm is normally higher than the output from a pure stand (8). To overcome the above problems of intercropping, it is convenient to consider all the farm (in ercrops) as one composite enterprise. This approach is adopted by Norman in his work on intercropping in the Zaria Province of Northern Nigeria (8).

Still another problem often closely associated with intercropping is farmers' objective functions. As stated earlier in Chapter Five, farmers may combine certain crops because they need them for consumption purposes and not necessarily for cash. In such cases the objective function of LP - to optimize - may not altogether hold. Further, to exclude such crops from the farm plan is to make the plan less realistic because the social integration of the farm firm and the the family may be very strong. This problem may be solved by making a provision in the plan for such crops (or staple) through a tie line activity in the LP (original matrix).

The general uncertainty surrounding agricultural production under the Ghanaian conditions makes the application of LP difficult. Farmers still rely heavily on nature (the climate) and use very few crop protection techniques, hence, crop yields are highly unpredictable. This is coupled with the often fairly high fluctuation of food prices and the prices of farm inputs. Wage rates may also not stay static. The net effect of all these factors is to make the estimation of gross margins for enterprises very difficult. This is very important since great variations of gross margins from those used in the plan may render the entire plan useless. One way to get around this problem is to vary the gross margins in the plans to take account of the above fact. A modification of LP called Maximin Programming has been developed by McInerney. It takes account of risk in LP. The technique is however beyond the scope of this paper.

It can be seen from the above account that the application of LP under the Ghanaian conditions presents some difficulties. However, these difficulties are not surmountable.

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## APPENDIX TABLE I

## GHANA LEAF TOBACCO PRODUCTION 1953-70*

(long tons).

| YEAR | FLUE CURED | AIR CURED | FIRE CURED | TOTAL |
|---|---|---|---|---|
| 1953 | 3 | - | - | 3 |
| 1954 | 12 | - | - | 12 |
| 1955 | 17 | - | - | 17 |
| 1956 | 23 | 4 | - | 27 |
| 1957 | 43 | 17 | - | 60 |
| 1958 | 86 | 239 | - | 325 |
| 1959 | 163 | 785 | - | 948 |
| 1960 | 247 | 580 | - | 827 |
| 1961 | 254 | 452 | - | 705 |
| 1962 | 229 | 620 | - | 849 |
| 1963 | 173 | 517 | - | 690 |
| 1964 | 313 | 625 | 37 | 975 |
| 1965 | 281 | 557 | 43 | 881 |
| 1966 | 219 | 338 | 37 | 594 |
| 1967 | 416 | 692 | 81 | 1,189 |
| 1968 | 434 | 535 | 114 | 1,078 |
| 1969 | 389 | 395 | 59 | 843 |
| 1970 | 438 | 333 | 138 | 922 |

*Source: Ghana Tobacco Company & S T P C "Annual Reports" Various years (Unpublished).

## APPENDIX TABLE II

## IMPORTS OF LEAF (UNMANUFACTURED) TOBACCO AND MANUFACTURED TOBACCO 1953-70*
(long tons)

| YEAR | LEAF (UNMANUFACTURED) TOBACCO | MANUFACTURED TOBACCO |
|---|---|---|
| 1953 | 699 | 961 |
| 1954 | 583 | ... |
| 1955 | 603 | 963 |
| 1956 | 527 | 681 |
| 1957 | 640 | 1,233 |
| 1958 | 579 | 1,162 |
| 1959 | 2,519 | 219 |
| 1960 | 1,507 | 93 |
| 1961 | 1,329 | 651 |
| 1962 | 944 | 334 |
| 1963 | 905 | 261 |
| 1964 | 1,099 | 79 |
| 1965 | 1,524 | 96 |
| 1966 | 1,101 | 83 |
| 1967 | 1,660 | 460 |
| 1968 | 1,893 | 34 |
| 1969 | 1,913 | 37.2 |
| 1970 | 8,210 | 13.3 |

* Source: Ghana Central Bureau of Statistics
Ghana External Trade Statistics
Various years

## APPENDIX TABLE III

## ACREAGE OF TOBACCO PRODUCED IN EJURA AND WENCHI AREAS 1953-60[a] AND 1964-70[b]

| YEAR | EJURA AREA | WENCHI AREA |
|---|---|---|
| 1953 | 5 | 16 |
| 1954 | 29 | 55 |
| 1955 | 50 | 101 |
| 1956 | 50 | 105 |
| 1957 | 50 | 150 |
| 1958 | 92 | 207 |
| 1959 | 444 | 454 |
| 1960 | 592 | 713 |
| . | . | . |
| . | . | . |
| . | . | . |
| . | . | . |
| 1964 | ... | 1,276 |
| 1965 | 2,615 | 1,239 |
| 1966 | 1,562 | 1,441 |
| 1967 | 1,488 | 1,795 |
| 1968 | 1,392 | 2,512 |
| 1969 | ... | 1,189 |
| 1970 | 520 | 1,200 |

Note: Figures include both Dry & Green Leaf Tobacco Production.

a Source: Ministry of Agriculture Division of General Agriculture Miscellaneous Information 1960-1962

b S T P C and P T C Records ("Annual Reports") Various years (Unpublished).