SOME ECONOMIC ASPECTS OF SMALL-SCALE FARMING IN ZAMBIA
A CASE STUDY OF NGWEZI SETTLEMENT SCHEME IN MAZABUKA DISTRICT

by

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TABLE OF CONTENTS

	Page
ABSTRACT	iv
CHAPTER I - INTRODUCTION	1
The Study Area	6
The Problem	14
The Resource Situation . .	20
Land	22
Labour	23
Equipment	27
Livestock	30
Objectives Of The Study . .	32
CHAPTER II - METHODOLOGY	34
Literature Review . . .	35
Data Collection . . .	43
The Sample	44
Collection And Type of Data	45
Data Analysis	47
Sources And Levels of Farm Income	47
Net Farm Income and Farm Variables	49

Page

Definition Of The Variables 51

Net Farm Income . . . 51

Household Size . . . 51

Acreage 51

Permanent Labour. . . . 51

Casual Labour . . . 52

Tractor Hire . . . 53

Age 53

Education 53

Fertiliser 53

CHAPTER III - FARM INCOME ANALYSIS . . . 54

Sources and Levels Of Farm Income 54

Regression Analysis. . . . 66

Household Size . . . 70

Acreage 71

Fertiliser 73

Permanent Labour. . . 75

Casual Labour . . . 78

Tractor Hire . . . 80

Age 82

Education 83

CHAPTER IV - SUMMARY AND CONCLUSIONS . . 85

REFERENCES 95

Page

BIBLIOGRAPHY 99

ACKNOWLEDGEMENTS 104

APPENDICES 106

LIST OF TABLES 121

LIST OF FIGURES 123

ABSTRACT

The development of the agriculture industry in Zambia could contribute tremendously to the development of the country which at present is dependent on the copper industry. Over three-quarters of the population still lives in the rural areas making their living from self-employment in farming. However, the levels of production are still very low for the majority of these people resulting into their low level of development. The development of these people could be brought about through the development of their farming businesses. The methods to bring about this development are not readily available and discernible and this has at times resulted into resource mis-allocation into costly ventures which have not achieved the objective.

This study examines the economics of small-scale farming with a case study of Ngwezi Settlement Scheme in the Mazabuka District of Zambia. The objectives of the study are:

(1) To investigate the sources and levels of farm

incomes;

(2) To determine the effectiveness of certain farm variables on net farm incomes. The variables studied are household size, acreage, fertiliser cost, permanent labour, casual labour, tractor hire, age of farmer, and education.

The farm income under study is defined as the value of total farm produce. However, there were major problems in trying to get records of any other incomes from other farm produce except that for crops. Though this limitation seems to prejudice the first objective, the scope for crop diversification in the area is still very important. The study therefore tries to find out the contribution of each crop grown in the area. Enterprise diversification is not emphasised in this study as such emphasis would have been beyond the resources available for the study.

The analysis looks at both the farm and the national levels. At the farm level, concern is focused on the use of the available land, labour,

capital and management resources. At the national level, the study tries to examine government policy on this type of farm development. This latter analysis follows from the farm level analysis as most of the factors at the farm level are determined by national policies, for example, land.

It has been discovered that most of the farm income is derived from maize which is the staple food. Among the newly-introduced crops, only cotton seems to be significant while the rest are rarely allocated even half an acre of the land. The farmers are therefore exposed to a greater risk of loss of income should a bad year affect their only crop. However, livestock seems to be used as an insurance against such losses, and this is the reason for farmers' reluctance to sell their livestock during years of good harvests. This attitude is very rational although it is regarded as being a problem and causing a lot of concern. The small-scale farmer is prepared to sell his livestock when he needs extra cash. However, he is not prepared to invest capital

and management in his livestock because he regards them as savings and numbers are more important than the quality of any savings.

In the hope of changing the cropping patterns of these farmers, the extension service should work hand in hand with the credit agencies so that a discrimatory type of credit can be introduced. Since farmers are more willing to adopt innovations with less risks, credit can be used to reduce the risks of certain innovations in both crops and methods. It is in the interests of both the farmer and the nation that different crops be grown as an insurance against loss of income from one crop. The persuasive method being used by the government to farmers to grow a variety of crops will not work easily as persuasion needs the existence of a mutual interest.

On the association of farm income and certain farm variables, it has been found that only few variables have any significant association. Acreage and casual labour have the most significant relationship with farm income. The farmers still

believe that they can only increase production by increasing the acreage planted. While the increased use of fertiliser and improved seed shows an acceptance of the capability of these inputs increasing yields, their application is most times far below the recommended level. The fertiliser is usually applied on a far larger acreage, thus reducing its productive power and lowering the yields. The formal education of the farmer does not contribute towards the farmer's understanding of such recommendations and has no significant relationship to farm incomes. The availability of tractors for hire has increased the farmer's capacity to increase his cultivated acreage. This interest in tractor ploughing which eases the work has sometimes delayed the farmer and even resulted in a loss of income.

While the small-scale farmer has access to the necessary inputs for his business, it seems the important problem is lack of management. The farmer is still operating at very low management level. Technical, efficiency, and intensity decisions are

made without regard to the important issue of marginal productivity. Production has increased because of the availability of land and not through improved methods and increased yields.

Many schemes have been tried in an effort towards the development of the rural areas, for example, co-operatives. Some of these schemes failed because of lack of proper initial planning. Settlement schemes seem to be succeeding, but because of their limitations in size, they cannot bring about the development of the rural people as soon as possible. In fact, these schemes, because of their selective nature do encourage the widening of the disparity between the successful and not very good or rich farmers. These schemes are supposed to have a demonstration effect on the subsistence producers on the reserve land. However, this effect is not being transmitted because the reserve farmers regard themselves as poorly situated in terms of land and extension services. The government should turn its efforts to the farmers on the reserve land, changing

the present land ownership system to one assuring permanency of land use and occupation. Such a system could provide some form of security for much-needed loans for investments. Agricultural development could be increased on land already being used in the rural areas by structural changes of the existing system. Selected projects, for example, settlement schemes have a role to play in development, but most times they benefit only a small section of the community.

CHAPTER I

INTRODUCTION

This study examines the major factors that do contribute towards the development of low producing subsistence farmers into more economic producers. The study tries to isolate those factors in relation to their effects on farm incomes. Net farm income which is the best measure of farm development has been taken as the basis for this study. The study has been confined to the easily measured sources of income and these are crop sales for this area.

The development of agriculture in Zambia has very much depended upon the transformation of the farming methods practiced by the subsistence producers scattered throughout the country. Through this process these low producers are developed into middle-class producers lying between the pure subsistence producer whose only concern is his family's food requirements and the commercial farmer producing for the market. Small-scale farming which is the term used for these

middle producers has been advocated as a more acceptable method of agricultural development in the country. This has been the general government policy because the large-scale commercial farmers who contribute over two-thirds of the total maize marketed comprise such a small number and most of them are foreigners and "cannot by definition provide the nucleus for expanding the productivity of the mass of the rural population."[1] The small-scale farmer has proved to be successful wherever he has accepted the innovation; for example, cotton growing. Because of their limited and less specialised capital, the small-scale producers may easily change their pattern of production without much risk or disruption.

In Zambia, the small-scale farmers are playing a very important role in the nation's efforts towards self-sufficiency in agricultural products. Table I shows the contribution of small-scale farmers of marketed maize in the country over the last ten years. While the small-scale farmers contribute

TABLE I

MAIZE INTAKE BY THE NATIONAL AGRICULTURAL MARKETING BOARD OF ZAMBIA (NAMB) 1963 TO 1972

Harvest Year	Sales('000 bags) Large-scale	Small-scale	Percentage of Small-scale to Total
1963	655	354	35.1
1964	1,342	797	37.2
1965	2,129	675	24.1
1966	2,582	1,581	37.9
1967	2,552	1,579	38.2
1968	1,724	1,024	37.3
1969	1,541	1,250	44.7
1970	1,100	271	19.7
1971	2,511	1,639	39.4
1972	3,629	1,712	32.1

Source: National Agricultural Marketing Board of Zambia.

only about one third of total marketed maize, their total contribution to the nation must include the produce which is retained for home-consumption. Any evaluation of the productivity of the rural population must take into account this aspect of self-sufficiency in their food production as this relieves the national economy of its obligations towards this section of the community.

Many agricultural projects have been initiated in the rural areas of Zambia with the basic aim of developing the rural people. However, these subsistence producers are spread throughout the country and any wholesome development efforts would mean spreading the little resources available so thinly as to be of any benefit at all. Recent agricultural development efforts have been on a concentration basis on "the people who are more receptive, on areas that have the greatest potential and on types of innovations that may win relatively easy acceptance."[2] It is in these areas that the government has spent

money on resettling small-scale farmers. These settlements were planned to improve the productivity and economic welfare of the rural people and also to improve the farming methods of those left on the reserve land through the demonstration effect.

This study looks at the objective of increasing the productive capacity of the small-scale farmer who has been resettled on good fertile land. The measure of success is taken to be net farm income and this is looked at in terms of the inputs and methods used on the farms and also the type of farmer that has been involved. The study therefore analyses the impacts of inputs, methods, and some characteristics of the farm operators on income.

THE STUDY AREA

This section presents some background information on the area under study in as far as agricultural development has been affected by some external events. This section also gives the origins of the settlement idea, the location of the area, its climate and the objectives of the scheme.

In 1960, a land utilisation survey to determine the population density and farming methods and patterns of the area was carried out by the government.[3] The survey showed a serious problem of over-crowding and over-grazing in the area. As this situation hampered agricultural development, it was decided to resettle some of the people where improved farming methods could be introduced and the Ngwezi area was chosen for this purpose. The Ngwezi lowlands had been reserved for settler farmers during the colonial rule and in fact this had contributed to over-crowding in the surrounding reserve lands.

The development of agriculture in this area could not be left in the hands of the foreign farmers alone who were few in number. This uneven distribution of land could perpetuate a situation of an uneven distribution of income. With the advent of political change, it was felt that this state of affairs had to change also. In 1963, the State started buying out some of the settler farmers so that these farms could be divided up and distributed to small-scale farmers from the surrounding areas.[4] In 1964, a group of thirty-two farmers from the reserve lands settled in the area and were followed by a further twenty-one in 1965 and yet another twenty-two in 1966. By 1966, about twelve thousand acres of good arable farmland had been bought and this came to be known as the Ngwezi Settlement Scheme. In 1970, another extension was opened up with seventeen farmers and the following year a few more thousand acres were added to the scheme.

The Ngwezi Settlement Scheme is located along the Ngwezi River plain which runs from the Magoye area eastwards for over thirty miles. The area is close to

the railway line running from Livingstone to the north with Magoye Siding less than two miles away from the western end of the scheme. The area is bounded by a district road on the southern end dividing it from the reserve and to the north, there are some large commercial farms and the Magoye Regional Research Station(see Fig.I).

The settlement lies between 3,300 and 3,500 feet above sea level and has a climate typical of the plateau area of Mazabuka District, with hot, wet summers and cool, dry winters. The annual mean temperature lies in the range of 70-73°F; the mean annual rainfall is about 33 inches with considerable variations from year to year(Table II).[5]

The land is developed on the Pre-Cambrian metamorphics(calc-silicate) granulites, schists, and marbles, karroo sandstones and grits supporting a natural vegetation of Acacia, Combretum(mixed woodlands), Albizzia spp. with Hyparrhenia spp. of grass in very sandy areas. The area is agriculturally

Figure I

LOCATION MAP
Mazabuka
GREAT NORTH ROAD
Kaleya
Chalimbana
Magoye Forest Reserve
Magoye
Ngwezi
Ngwezi River Settlement Scheme
Magoye South Forest Reserve
Kamuzya
MAGOYE ROAD
GREAT NORTH ROAD
Tambero
N
SCALE :- 1 : 250,000
Miles 5 4 3 2 1 0 5 10 15 Miles
Feet 10000 0 10000 20000 30000 40000 50000 Feet

TABLE II

MONTHLY AND ANNUAL RAINFALL(INCHES)
AT MAGOYE RESEARCH STATION

Month	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73
October	0.04	2.34	0	2.54	0.45	0.06	0.31
November	0.47	3.08	8.43	2.33	7.13	6.26	1.73
December	8.52	2.13	12.77	12.13	10.02	6.64	3.94
January	8.08	6.78	8.21	2.46	10.33	8.34	7.24
February	4.22	2.90	3.92	4.28	3.76	4.55	5.42
March	1.54	1.98	5.05	0.59	1.80	5.62	1.49
April	1.06	1.29	3.33	3.91	2.01	1.21	2.09
May	0.12	0.59	0	0	0	0	0
TOTAL	24.05	21.09	41.71	28.24	35.50	32.68	22.22

Source: Magoye Research Station Annual Reports

suitable for maize, cotton and groundnuts.[6]

The Ngwezi Settlement was an effort by the government to provide the peasant farmer with basic services and introduce him to commercial farming. The main objectives of the Scheme were:-

a) To reduce over-crowding in the surrounding districts;

b) To provide information on settlement for future agricultural planning;

c) To develop commercial farming on small farms;

d) To teach modern methods of farming which will increase the production of the small-scale farmer and thus raise the standard of living of the family.[7]

The farmers settled on the scheme were chosen from a long list of applicants drawn from the surrounding areas. The main qualities looked for were that the applicants have experience as farmers; own some farming equipment to enable them to use the land agriculturally. The farmer was allowed a limited herd

of cattle of eight so as to avoid over-grazing the communally-owned grazing land. The basic farm unit was made forty acres (sixteen hectares) although in some earlier plans, a one hundred and fifty acre unit had been suggested.[8] Lack of prior information as to the size of holding which a small-scale farmer could successfully manage led to the big difference between the originally-suggested size and the one ultimately given to each settler. The lease was to be for a period of fourteen years after which a farmer could renew it. In the conditions of lease, the settler was restricted to using the land for agricultural, pastoral, and residential purposes only. The farmers were also restricted to having not more than half of their arable land planted with maize. This restriction was an effort towards diversification in crops, but met with little success as soon, many farmers had nearly all their arable land under maize.

The scheme has been chosen for this study because of its objectives which, if fulfilled, would go

a long way towards the development of the small-scale farmer. The location of the scheme in the rich agricultural zone and the availability of some data were added advantages for a study of farm management of the small-scale farmer in Zambia.

THE PROBLEM

In this study there is no attempt to define the optimum farm income for a small-scale farm operator. The assumption is made that all the producers under study are small-scale farmers and therefore fall under the definition made earlier on in this chapter. The productive motive of a small-scale farmer is assumed to be that of producing enough agricultural produce so as to be able to satisfy his food requirements and also get some cash income. The aim of the subsistence producer is "to produce, if at all possible, somewhat more than is needed so that, taking the bad years with the good ones, basic food requirements can at all times be met."[9] In view of changing production practices and technology, prices of products, and the cost of inputs, as well as changes in the basic needs of the operator, small-scale farming implies that there is a positive though small margin for growth to facilitate capital accumulation and therefore development towards more commercialised production. The major impediments

towards this development of the subsistence producer are his limited scope of basic needs, lack of capital and savings for reinvestments. The small-scale farmer strives for some income from his farming operations and it is this motive which necessitates his saving, investing, acceptance of new ideas, accumulation of capital, and most of all the economic use of his land, labour and capital.

Numerous difficulties affect the income position of farmers. Many cannot earn an income sufficient to provide them with basic necessities of life. Variations in income from year to year can leave a farmer with big losses and therefore heavy financial obligations. Income problems may arise from different situations. Some are a result of situations far beyond the activities of the farmer on his farm, for example, the problems of inputs' supplies which may lead to their increased prices, and even problems resulting from decisions made on each individual farm. Government policies and programmes do affect farm incomes. With all these problems in mind, it is up to

the farmer to use his limited land, capital, and labour inputs in a well organised manner so as to meet his family's immediate needs and also to keep the business going.[10.]

Farmers may use different methods to attain their goals, and this means that under the same circumstances, farmers will react differently. One farmer may change his production through the adoption of a new technology while another changes his production by changing his input mix but keeping the existing technology. The economics of such farm decisions can only be known through the analysis of factor prices and marginal productivities. The risk element must be realised whenever such farm management decisions are analysed. As improvements in farming are achieved, differences in the degree of progress among the farmers become increasingly important. However, while extension efforts should be focussed on those who are more receptive, economists should focus their attention on the slow adaptors so that their problems are known and ways

of overcoming them are formulated.

The development of rural populations cannot be accelerated unless something is known of the problems of these people. In most developing economies, over three-quarters of the population is still engaged in agriculture and the development of mass agricultural production seems to provide a sure means of developing these people. There is need to introduce new and improved seeds, fertilisers, pesticides, and agricultural extension methods, There is the most important pre-requisite of changing the traditional attitudes of the peasant producers. "However, to attempt to persuade farmers to abandon traditional practices in favour of innovation without understanding fully the value and constraints of their existing practices is to invite rejection of our advice."[11] Indeed, McLoughlin says that we must know why farmers do as they do and what the economic, technical and social constraints to any expansion of output are. We must also know what methods, tools, systems,

services and institutions will break those particular bottlenecks.[12]

There are many theories that have been advanced for the slow development of the rural population. Among these are the low marginal productivity of subsistence labour; the non-responsiviness of peasant producers to any incentives; the inhibition of the customary land tenure system to any agricultural development. However, these terms have become questionable as studies have proved them to be untrue if not false. Dean, in his studies on the responsiviness of small-scale farmers in Malawi, found out that there was a marked response by these farmers to price changes.[13] For a farmer to consider adopting any innovation, there must be greater returns to off-set the additional cost of production which may not be in money terms but perhaps in terms of leisure time. On the theory of the zero marginal productivity of subsistence labour, Meier notes, "As far as agriculture is concerned, I find it impossible

to conceive of a farm of any kind on which, other factors of production being held constant in quantity, and even in form as well, it would not be possible by known methods to obtain some addition to the crop by using additional labour ....."[14]

In Zambia, there is an added problem of the uneven distribution of good agricultural land, most of which lies along the line of rail covering some thirty or more miles on each side. During the colonial era, most of the good fertile land was acquired or taken away from the indigenous people and given to settler farmers. In the Southern Province of Zambia where the Tonga were trying to improve their cultivation methods, many were driven into unproductive areas or were made to work on these settlers' farms. At Independence, the question of these farms, especially the abandoned ones, became a major issue and the government became involved in buying these undeveloped lands for redistribution. Under the new government policy of involving as many

producers as possible in the production of the country's food, the land productivity factor had to be considered as well. This newly acquired land could only be given to people who were capable of utilising it productively. The settlement approach was chosen as the most appropriate form of organisation by which some selection criteria could be applied. The success of such schemes does very much depend upon the overall mix of management, and farming methods. However, while there is a general belief by settlement organisers that the mere provision of services for settlers will increase productivity, there is a danger of neglecting the factors which may hinder individual farm development.

THE RESOURCE SITUATION

This section looks at the availability and type of resources at the beginning of the scheme. The resources dealt with are land, labour, equipment and livestock as a form of draught power. In the

selection process, emphasis was laid upon the capability of the settler to provide labour and implements so as to be able to use the land productively There is no doubt that the fertility of the land alone cannot lead to increased production. The type and availability of the other inputs are major factors and their inadequacy may lead to the failure of any agricultural project. Any development scheme must take into account the easy mobilisation of the required resources before project initiation can be done. Indeed there are many schemes that have been started in the developing countries which can easily fit with the views expressed on lack of data before implementation. Stolper, Lewis, McLoughlin, are but a few of the development scholars who have emphasised the importance of accurate pre-investment analysis.[15] McMeekan wrote, "throughout the underdeveloped world, inability of authority and individuals to mobilise all the various inputs necessary for production on an adequate scale is by far the major bottleneck to improved land use."[16]

Land

The land resource was not determined by the farmers but by the government which allocated the prepared plots of land to the settlers. Each farmer was allocated an average of forty acres of arable land while he had to share communal grazing land equivalent to one hundred acres per farmer. On settling, the farmers found at least half of their arable land already cleared by the government. However, they were expected to contribute towards the cost of clearing the land by paying an annual fee in addition to the rent. This fee was determined by the proportion of the area cleared, for example, a farmer who had all his forty acres cleared was expected to pay an annual fee of fifty kwacha (Appendix A). The type of soil available in the area has already been described in the section on the study area.

The government provided fencing, roads and water facilities and also subsidies for carrying out

certain development works. Though the costs of all these services were supposed to be recoverable, the mechanics of the whole process of determining the amounts due was not clear and no clear policy on their recovery. However, rents for the land continued to be collected although there was no effective machinery for dealing with rent defaulters. By the time of this study, many farmers were in arrears and although warning letters had been sent to these farmers, not a single one had been evicted.

Labour[17]

This subsection deals with the labour situation when the farmers were just settling. The most important and most reliable form of labour available to the small-scale commercial farmers is their own family labour. The conditions for acceptance on the scheme were that a settler should have enough labour and many farmers had quite large families. Table III shows the number of family residents on the farms in 1966. More than fifty percent of the farms

had between five and fourteen persons residing on the farms throughout the year. Two farms had over twenty family members resident on them. Another condition of settlement was that only one dwelling house could be built on each plot. However, because of the large families, this condition was flouted from the beginning and in 1967, Hailey found that there were an average of 2.2 houses per farm.

TABLE III

FREQUENCY DISTRIBUTION OF ALL YEAR FAMILY RESIDENTS

No. of Persons	No. of Farms	% of All Farms
1 - 4	16	22
5 - 9	36	49
10- 14	15	20
15- 19	4	6
20- 24	2	3
Total	73	100

Source: Hailey, S. et al., "Investigations into Small-scale Farming Systems" No. 1, 1967.

The labour available to the farmer may be divided into two categories, namely, family labour and hired labour which may further be divided into permanent and casual. Table IV shows the amount of non-family labour used in one month in 1966, divided as per section of the settlement. On the Ngwezi Block which is the oldest section of the settlement, 1.1 and 1.4 regular and casual labourers respectively were hired per farm while the other section showed lower numbers. The higher casual labour figure for both sections of the settlement illustrates the seasonality of farm labour requirements.

Table V gives a summary of the total labour force available in the year. The table shows that of all labour used on the farm, nearly three-quarters of that is from the family. This shows the importance the farmer attaches to having a large family and that is the reason for many of these farmers tending to be polygamists with two or more wives. The family

labour only partly available in the year would include school children who spend most of their time at school. There was some hired labour during the year amounting to only ten percent of all the labour force. On the whole, there was a labour force of about six persons per farm.

TABLE IV

NON-FAMILY LABOUR EMPLOYED DURING OCTOBER 1966

Type of Labour	Ngwezi Block	Extension 'A'	Total
Regular Labourers			
Number	39	9	48
Average per Farm	1.1	0.25	0.7
Casual Labourers			
Number	51	12	63
Average per Farm	1.4	0.3	0.9

Source: Hailey, S. op. cit.

TABLE V

TOTAL LABOUR FORCE.

Type of Labour	Number	Average Per Farm	Percentage of All Labour
Family All Year	348	4.8	72
Family Part Year	171	2.3	18
Permanent	48	0.7	10
Total Labour Force*	481.5	6.6	100

* Total Labour Force = Family All Year plus Permanent Labour minus ½ Family Part Year.

Source: Hailey, S. op. cit.

Equipment

This subsection describes the types of farming implements the farmers brought with them onto the scheme. Though at the time of the implementation of this scheme there was a lot of excitement about tractors, the settlers for this settlement were advised to bring their ox-drawn implements with them.

Table VI shows the types and numbers of all the oxen equipment declared by the farmers on settling on Ngwezi Block and Extension 'A'. In all, the farmers owned equipment worth six thousand six hundred and ten kwacha at 1967 depreciated value. This amounted to nearly one hundred Kwacha worth of oxen equipment per farmer. The most prevalent piece of equipment was the plough of which there were an average of two per farm. However, there were less and less of the more sophisticated types of implements, for example, there were only two knapsack sprayers and only one two-row planter. While there seemed to have been enough oxen implements, soon the government Tractor Hire Scheme was attracting many farmers. As early as 1967, the first tractor on the scheme had been bought by a farmer with only a small acreage of arable land and by 1973, there were nineteen privately-owned tractors on the scheme.

TABLE VI

OXEN EQUIPMENT

Type of Equipment	Total for 73 Farms	Average Per Farm
Ploughs	150	2.1
Cultivators	104	1.4
Harrow Sections	89	1.2
Scotch Carts	37	0.5
One-Row Planters	22	0.3
Two-Row Planters	1	-
Ridgers	10	0.1
Maize Shellers	9	0.1
Knapsack Sprayers	2	-
Total New Value	K10,626	K146
Total 1967 Value	K6,610	K 90

Source: Hailey, S. op.cit.

Livestock

There is a large cattle population in the Southern Province of Zambia and this has been one of the contributory factors towards the deterioration of the land in the Reserve areas. The Tonga who live in this area are a cattle keeping tribe, but there is no commercial or economic attitude attached to their large herds of livestock. Realising the dangers of overstocking the limited grazing land, the settlement planners limited the size of herd a farmer could bring onto the scheme to only eight. However, the farmers could not leave some of their cattle on the reserve land to be looked after by their relatives. Soon there were large herds on the comunally-owned grazing land. Attempts to conduct a census of the cattle met with problems as ownership of the cattle could not be clearly defined due to the "extended family ownership". There was therefore no planned programme for dealing with cattle improvement on the settlement scheme. However, farmers were encouraged to bring with them some cattle for

cultivation. The livestock on the scheme and indeed that on the reserves can only be treated as a resource in its provision of draught power. The traditional attitudes prohibit sales except in difficult circumstances.

OBJECTIVES OF THE STUDY

The study looks at farm development in relation to the factors that contribute to this development. Farm development may be caused by decisions made on the farm by the operator or even by factors far removed from the day-to-day farm activities. The qualities of the farm operator determine the degree to which he makes good farm management decisions which in turn do influence the success of the farm business. In this study, there is an analysis of the decisions made by the farmer on farm enterprises and then there is a study of the qualities of the farmers and their effects on farm success. The objectives may be stated as follows:-

1. To investigate the levels and sources of farm incomes;

2. To determine the degree of association between certain farm variables, for example, age, family and hired labour and the net farm incomes.

By achieving the above objectives, the study will reveal the major sources of the incomes of the small-scale farmers; indicate the major influences on farm output and the need for supplementary policies to help the farmer. The study will expose some factors which are essential for farm success in such an environment as the one offered by the settlement scheme. Settler qualities on this type of development areas should be identified and also ways of augmenting them planned for successful settlement farming and small-scale farming as a whole.

CHAPTER II

METHODOLOGY

This chapter is divided into three sections of literature review, data collection, and data analysis. The first section presents thinking on small-scale farming in general and settlement development in particular. In this section, there is a presentation of the results of past studies on settlement schemes and the observations that have been made from these studies. Though this section might not present an exhaustive literature on settlement schemes, much of the most important studies are included. The section on data collection explains the methods used to collect data for the study. The section describes the sample, data collected, period of collection and data preparation. The third section presents the regression methods used and the statistical methods applied in the attempt to achieve the objectives of the study. The section also

defines the variables used and the assumptions made on them. The problems encountered in the process of collecting data are also mentioned so as to give a background to the accuracy and reliability of the data used in the study.

LITERATURE REVIEW

Settlement schemes have been thought out as another alternative towards changing the production environment of peasants in the developing countries. The major emphasis is on the transformation of the production methods of the peasants in a controlled and organised manner. However, the success of this method depends upon the planners having a clear understanding of the needs of the farmers in their present environment. This method must prove to create the opportunity to satisfy these needs more efficiently in order to attract the farmers.[18] The aims and organisation of settlement schemes are the major factors that determine the success of these schemes. In East and Central Africa, settlement

schemes have been started for different and sometimes unclear reasons. Richard Chambers gives a long catalogue of settlement schemes, ranging from soil conservation types to the political and ideological ones.[19] The organisation that is carried out on these schemes is therefore also very different. In his case study of the Mwea Scheme in Kenya, Chambers found out that there was a conflict between political and technical policies. This was because there was no clear policy on the establishment of the scheme. This point is also emphasised by Cosnow in his study of the Bandek Settlement Scheme also in Kenya.[20] Cosnow writes, "Whatever may have been and still are the motivating forces for the creation and maintenance of land schemes in Kenya, they require radical shifts from traditional behaviour."[21] The Western Nigeria case study of settlements by Roider once more exposed this lack of a clear definition of the purpose for their establishment.[22] In his cost-benefit analysis, Roider says that these schemes cannot stand such a test because they are not primarily established for

economic reasons. In this case, the schemes were for resettling school-leavers who had only a limited and theoretical knowledge of agriculture; in Kenya there were both political and population pressures for their establishment; while in Uganda they were for the eradication of the tsetse fly; and in Tanzania there were attractions of the equipment left behind after the failure of the groundnut scheme; in Zambia, they are for making the rural areas more attractive and profitable.[23] In all the areas cited above, one objective which was always included was that of changing the production patterns of the rural population. It can be seen that some of the objectives above could not be well matched with this general objective of improving the rural areas.

Another factor in the success of settlement schemes is the selection of the settlers. As far back as 1954, this point had been realised and even emphasised by Lewis.[24] He pointed out

that it is very important to choose the right place and people when establishing a settlement scheme and this in fact determines the development of the scheme. However, in spite of this early recognition of this factor, "it is embarrassing now to read Arthur Lewis' comments ....., and to discover that most, if not all, his guidelines were blithely ignored....."[25] The selection criteria used have differed from country to country. In Kenya, the difficult criteria of 'landlessness' was considered as an important criterion for allocation of a plot on the schemes that were being organised. Lewis pointed out that it is a must that settlers have their own capital and should include a sizeable family to provide the labour. However, in many settlements, settlers have had access to government organised services that they have become less self-sufficient and always looked upon the government for any services. Indeed Illingworth[26] emphasised the point that there must be a desire by the farmers to develop themselves before being resettled and this means that

the selection agent must be able to identify the peasants who have this desire to develop.

In terms of the achievements of settlement development policy in Africa, there are various views that have been expressed by many scholars. However, most of them point to the failure of this policy because of the lax attitudes that have been adopted either during the planning stages or later in the organisation and running of the schemes set up. Chambers[27] says that the past record of settlement schemes in Africa is discouraging and even the studies that have been done on these schemes have neglected some of the major issues, for example, the strain of trained manpower in terms of extension staff. He advocates an economic analysis involving the opportunity costs of land, settlers and staff. In his article on land settlement schemes, Bridger writes that there have been some successes with a few schemes, but this has been at such a high cost which could have been incurred elsewhere with better

results.[28] He continues to say that movement of people from one area to another must take place only under great pressure. The schemes in many parts of Africa are overplanned in that the settlers are expected to do too much on settling. There must be a lot of thought given to the types of people to be involved before putting so much hope on settlers whose qualities are not even known. The schemes therefore end up being asked to do things which are far beyond the abilities of the settlers within a short period as noted by both Moris and Illingworth on the Kenyan and Ugandan schemes respectively. Moris puts the blame for schemes' failures on the agencies and organisations that do plan and run them. He then gives a near-exhaustive checklist of guidelines to assist in the planning and implementation and also evaluation of settlement schemes.[29] However, Collinson criticises the whole transformation approach as being "too selective to offer an equitable general strategy for agricultural development."[30] On the other hand he realises the problems that may result

from population pressures which will militate against the improvement strategy.

The Kenya Government carried out an economic appraisal of its settlement schemes in 1971.[31] Output on most of the schemes increased due to increased capital investments and labour inputs and also due to higher yields from the major enterprises. Capital is realised as a major limiting factor for subsistence producers and therefore it is expected that its availability would increase productivity. However, labour is thought to have a very low marginal productivity in the peasant economies. Its increased productivity on the settlement schemes could only be a result of a desire by the settlers to develop and therefore a commitment to the cash economy as discovered by Cosnow in his study of the Bandek Scheme. In his preliminary investigations of the Ngwezi Scheme, Hailey found out that though the farmers had large families who could provide the required labour, they still found it necessary to employ labour.[32]

It is the management of this readily available labour which was lacking. On the Kenya Settlements, net cash surplus rose from minus three hundred and thirty-two shillings in 1965 to two hundred and eighty shillings in 1967. However, most farms did not reach the target income; the original budgets were too inflexible to allow for changed circumstances. The study also revealed that there was a strong relationship between inputs of capital and growth of output and between farm size and levels of profitability. Farmers sold less than half of their gross output and many could not meet both their food needs and loan repayments. Cosnow also observed that sales and maize production on the Bandek Scheme had increased as compared to the reserves though it was still far below the potential yield.

Most of the available literature on land settlement schemes concentrates on policy and whole scheme organisation. The few case studies that have been undertaken have tried to reveal some important

social and economic aspects of these schemes. In Zambia, the major emphasis for land settlement schemes wa and still is the attempt at increased agricultural production through the development of the small-scale farmers. It is hoped that this study will contribute to the growing knowledge on land settlement and the development of the backward rural areas of developing countries.

DATA COLLECTION

This section presents the methods and period of data collection. The sample used in described and its characteristics presented so as to justify the application of the findings of the study to the general agricultural systems found in the country. While there were numerous problems during data collection, for example, political suspicion, many of these have been left out as they were considered normal especially when dealing with such a community. However, the major ones are mentioned because this might help in the future designs of such research.

The Sample

Using a list of farmers prepared by the extension staff, a random sample of twenty-eight farmers was obtained. There are four sections making up the whole settlement scheme, namely Ngwezi Block, Extensions A, B, and C, with a total of over one hundred farmers. However, Extensions B and C were opened recently and have been excluded from this study. The sample is from Ngwezi Block and Extension A so that the farmers have approximately the same acreages of arable land; entered the scheme at the same time; have the same background of having been peasant farmers; have communal grazing and any income from livestock is incidental as there is nobody practising improved feeding methods; and all of them have access to government extension services. These farmers have a basic farm unit of forty acres of arable land while they share the grazing land. However, many of them have never cultivated the whole of this acreage in any one season.

Collection and Type of Data

Data was collected between the months of June and October 1973, which was part of a six-month research period granted by Makerere University, Kampala. Some valuable information on the history of the scheme and the settlers was available from already recorded data. Farm surveys had been conducted on the scheme between 1966 and 1969 by the Magoye Research Station. These farm survey records had never been analysed in any form, and therefore some time was spent on extracting what valuable data could be got from them. As for data on recent seasons, a simple interview schedule was prepared and used in getting the required information from the farmers. This rather simple method of data collection was resorted to because of lack of time and funds. The interviews were conducted in August and September when farmers had completed their harvesting. This period had been chosen because it was thought that it was the farmers' slack period and they would therefore be available at their homes.

However, problems arose as many farmers went away as they had nothing to do at home. The situation became worse in September after the farmers had received the proceeds from their crop sales and went away in search of spare parts or new equipment. This is also the time when there are so many ceremonies going on in the villages and some of the farmers spend some days away from their homes. This therefore delayed the process of data collection. It is therefore advisable that any such kind of research be conducted when the farmers are busy in their fields as they will be readily available.

Information collected during these visits included cropping patterns, crop output and sales, family and hired labour, farmers' attitudes towards the scheme, loans or credit obtained and how it was used, cost of fertiliser, seed, insecticides, and tractor hire, methods of cultivation whether using oxen or/and tractor. Information relating to crop sales, credit, fertiliser, seed, tractor hire was also

obtained from the Agricultural Finance Company (AFC) and the National Agricultural Marketing Board (NAMB) of Zambia so as to counter-check with that from the farmers. All data were coded and transferred onto computer sheets and then to punched cards for collation and analysis.

DATA ANALYSIS

This section describes the statistical methods used to analyse data in order to achieve the objectives of the study. There are two objectives of the study and this section is divided into two sections according to these objectives.

Sources and Levels of Farm Income

The farming business offers a wide range of sources of income due to the many enterprises a farmer can carry out on his farm. The major categories of these enterprises are crop and livestock production. However, within these two broad categories, there are many crop and livestock types that one may choose from. The choice of enterprises depends on numerous

reasons. Some are chosen for their attractive prices; easy and cheap methods of production; quick returns on investment. Others are favoured because they contribute to the family's food requirements. It is therefore most important to know the contribution made by different crops towards the economic and social satisfaction of the farmer.

The major crops grown by the small-scale farmers in Zambia are maize, which is also the country's staple food, groundnuts, and cotton. In the study area these three crops have dominated the farming business. However, some other minor crops, for example, sunflower, velvet beans, sunhemp, soya beans are grown on a smaller scale. There is also a large cattle head in the area, but this rarely contributes to the family's income. Using frequency distributions, the study shows the relative importance of the three major crops to gross farm income. The analysis also shows the production and prices of these crops. The data used for this analysis is at Appendix B.

Net Farm Income and Farm Variables

The second objective of the study is to determine the degree of effectiveness of some farm variables on net farm incomes. A multiple regression equation has been used to relate Net Farm Income to these variables. The eight variables used are household size, acreage, fertilizer, permanent labour, casual labour, tractor hire, age, and education. The objective hopes to reveal the degree of association between each of these variables and net farm income. Gross Farm Income from which Net Farm Income is derived is defined as the total income from maize, cotton and groundnut production. The Gross Farm Income may be expressed as follows:-

Gross Farm Income = Crop Sales + Home Consumption. The dependent variable under study is Net Farm Income which is defined as the residual of gross farm income after taking away the variable costs of fertiliser, seed, tractor hire, marketing charges, hired labour where possible. This gives the equation

as:-

Net Farm Income = Total Farm Income - Variable Costs.

The most important econometric tool is the general linear model, but it can only be applicable under certain conditions. The two major assumptions that are made in any application of this model are the linearity of the production functions and infinite divisibility of all factors of production and the goods produced. In agriculture, these assumptions are not very often fulfilled and this presents serious problems and limitations in the application of this model in this sector. In this study, a linear multiple equation is used taking Net Farm Income as dependent variable Y. The equation of the above relationship may be expressed as follows:-

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + U.$$

In the above equation, the B's are the regression.

coefficients which also give the marginal value productivities of the variables in the equation, and U is the residual matrix. The variables are: household size(X_1), acreage(X_2), fertiliser(X_3), permanent labour(X_4), casual labour(X_5), tractor hire (X_6), age(X_7), and education(X_8).

Definitions of the Variables

Net Farm Income. The dependent variable net farm income has been defined as the residual of total actual and imputed income from maize, groundnuts, and cotton after deducting the costs of variable costs such as fertiliser, seed and hired labour.

Household Size. This variable is the total number of people residing on the farm regardless of their ages or relationship with the farmer.

Acreage. The land factor is in acres of cultivated land in a season. This assumes that the land in the whole settlement is of equal productive potential.

Permanent Labour. The labour factor might be

the most difficult to define because of the different sources, types and even demand periods. In this study the number of people actually doing work during the year is used and this is different from the usual method of using man-hours. There is even no attempt to correct the labour for quality or sex differences except using a minimum age of six years. It is felt that the use of man-hours is more applicable to an industry where there are stipulated working hours and the worker is paid per hour of work done. To tell a farmer that he needs a certain number of man-hours rather than a certain number of people is very confusing to him as he has no idea as to what a man-hour is or should be.

Casual Labour. This variable is defined as the number of people who helped the farmer with some work for sometime during the year. This then takes care of school children who are resident on the farms for only a part of the year and also the farmer's relatives who are summoned to help him during peak

periods.

Tractor Hire. This is the cost of hiring a tractor for some farming operation and includes all hiring whether from government or private owner.

Age. The age of the farmer is the number of years the farmer has lived since birth as given by himself.

Education. The education factor is the academic level of formal education attained. It is assumed that education does not appreciate or depreciate with age.

Fertiliser Cost. The total cost of all chemical inputs used by the farmer whether bought with cash or credit facilities.

CHAPTER III

FARM INCOME ANALYSIS

This chapter presents the results of data analysis in the persuance of the objectives of the study stated in Chapter One. The Chapter is divided into two sections according to the two objectives. The first section presents the results on sources and levels of farm incomes and the second section shows the relationships between net farm income and the variables of the regression analysis.

Sources and Levels of Farm Incomes.

The major sources of income for the small-scale farmers in the study area are crop sales as stated in chapter two. Maize and groundnuts are grown as food crops as well, while cotton is a pure commercial crop. Livestock and poultry are sometimes sold in order to meet urgent needs. In Table VII is shown the contributions of each crop towards gross farm income. Maize is the most important source of income contributing over seventy percent of farm income. In

both 1971 and 1972, cotton contributed more than groundnuts to total farm income although it is a relatively new crop. The Table shows a declining contribution by maize the traditional crop with a drop of over twenty per cent since 1966 when there were no cotton sales. The actual contribution of groundnuts is very difficult to determine because some farmers regard the groundnuts income as belonging to the wife alone.

TABLE VII

ANALYSIS OF GROSS FARM INCOME ACCORDING TO CROPS

Crop	Percentages				
	1966	1968	1971	1972	1973
Maize	95.2	85.9	85.7	79.4	71.4
Groundnuts	4.8	14.1	4.9	8.1	23.0
Cotton	0	0	9.4	12.5	5.6
Total	100.0	100.0	100.0	100.0	100.0

Source: Farm Survey, Ngwezi Settlement Scheme, Zambia, 1973.

The production of individual crops depends on the acreage given to each crop. Maize is usually given the largest acreage because some of it has to be reserved for the family's food. Table VIII shows that maize takes up as much as four times the acreage planted with both cotton and groundnuts. The cotton acreage doubled in 1972 which was a good season and the following year which was a dry year had the effect of cutting it to less than half. The average maize acreage works out at over twenty acres per farmer, that of cotton at two and a half acres and groundnuts at about four acres. This means that each farmer had about thirty-one acres planted with the three major crops. The acreage variations shown in the table between 1972 and 1973 must be due to the bad season in 1972/73 with very little rain. The acreage a farmer cultivates depends upon the weather conditions, availability of traction power. However, the production a farmer attains depends upon the availability of chemical inputs, weeding labour. Many farmers sometimes get poor yields because as much as

they are able to plant large acreages by hired tractors, they fail to get the labour for weeding. Indeed many farmers lose valuable income by waiting for the unreliable tractors instead of using their own oxen to plant the most manageable acreage.

TABLE VIII

ACREAGE DATA OF SAMPLE FARMERS

Crop	Acreage 1966	1968	1971	1972	1973
Maize	319	693	721	1137	924
Groundnuts	17	51	81	137	133
Cotton	N/A	N/A	95	212	70

N/A: Not available

Source: Farm Survey, Ngwezi Settlement Scheme, Zambia 1973

Another indicator of the productivity of the land and subsequently that of the farmer is the yield per unit of land. Table IX shows the yields of the major crops. The yields of maize have decreased over

the years from 14.1 bags per acre in 1966 to only 5.8 bags per acre in 1973. Groundnut yields were very low in 1971 but are going up again. Cotton yields went down in 1973 after having risen in 1972. The table shows that while the acreages have been increasing as shown in Table VIII, output per unit of land used has not been increasing at the same time.

TABLE IX

YIELDS PER ACRE: MAIN CROPS

Crop	1966	1968	1971	1972	1973
Maize[a]	14.1	10.2	12.6	11.8	5.8
Groundnuts[a]	4.8	7.1	2.2.	4.2	5.4
Cotton[b]	0	0	613	735	425

Notes: a; yields in bags per acre
b; yields in pounds(lbs) per acre

Source: Farm Survey, Ngwezi Settlement Scheme, Zambia, 1973

The levels of farm incomes for the sample have risen very high over the years. Table X shows frequency distributions of incomes for three years.

In 1971, three farmers had incomes of less than five hundred Kwacha while in 1972, only two farmers had such low incomes. In 1973 which was a bad season, six farmers had gross incomes of less than five hundred kwacha. In 1972, seven farmers attained gross farm incomes of more than three thousand Kwacha while in both 1971 and 1973 only one farmer had that much income. Table XI shows that in 1971 over half of the farmers had gross farm incomes exceeding one

TABLE X

FREQUENCY DISTRIBUTION OF GROSS FARM INCOME 1971 TO 1973

Level of Income (Kwacha)	Number of Farmers 1971	1972	1973
Below 501	3	2	6
501 - 1000	3	2	9
1001 - 1500	9	5	5
1501 - 2000	7	4	5
2001 - 2500	3	5	2
2501 - 3000	2	3	0
Above 3000	1	7	1
Total	28	28	28

Source: Farm Survey, Ngwezi Settlement Scheme, Zambia 197

thousand Kwacha while in 1972, the same proportion had gross farm incomes of over two thousand Kwacha. In 1973, over half of the farmers had gross farm incomes of less than one thousand Kwacha.

TABLE XI

RELATIVE FREQUENCY DISTRIBUTION OF GROSS FARM INCOME.

Level of Income (Kwacha)	Percentage 1971	1972	1973
Below 501	10.7	7.1	21.4
501 - 1000	10.7	7.1	32.2
1001 - 1500	32.2	17.9	17.9
1501 - 2000	25.0	14.3	17.9
2001 - 2500	10.7	17.9	7.1
2501 - 3000	7.2	10.7	0
Above 3000	3.5	25.0	3.5
Total	100	100	100

Source: Farm Survey, Ngwezi Settlement Scheme, Zambia, 1973.

Table XII shows the variations in net farm incomes for the five seasons. The lowest net income over the five seasons was - K274.50 attained in 1968,

while the highest was K9758.00 achieved in 1971. The range between the lowest and the highest net income in all years is very high. The levels of net farm income are spread over a long range and the causes of these variations are the concern of this study. While all the farmers are subject to the same weather conditions, they do apply the other factors that do influence production in differing quantities and levels of quality. The highest net incomes had risen from the 1965/66 season to the 1971/72 season while the lowest net farm incomes had varied so much over the same period. For all the five seasons, net farm incomes were over K500.00 with the highest average incomes being attained in 1972.

While the following table shows the range of net farm incomes, in Table XIII, the frequency distribution of this income is shown. The table shows that in 1968 when the lowest net income was attained, there was the largest number of farmers with no net incomes. The interpretation of this situation is that these farmers could not even produce enough for their

TABLE XII

COMPARISON OF LOWEST AND HIGHEST NET FARM INCOMES

Level	Net Farm Income (Kwacha)				
	1966	1968	1971	1972	1973
Lowest	+13.80	-274.50	+244.00	-186.00	+185.00
Average	+614.10	+594.50	+1235.95	+2353.30	+763.50
Highest	+1655.24	+2328.10	+2975.00	+9758.00	+3197.00

Source: Farm Survey, Ngwezi Settlement Scheme, Zambia, 1973.

food requirements. However, the reality was that these farmers were unable to settle their loans and therefore they kept the little produce they had for consumption. The table also shows the effect of stability and long establishment as the incomes of farmers rise with the passing of time. In 1966, no farmer had a net farm income of over K2000.00 but by 1971, the limit was at a high level of K3000.00 and another year made a difference of over one thousand Kwacha. In 1966 half of the farmers had net farm incomes of less than one thousand Kwacha while in 1972

over half of the farmers attained net incomes of over one thousand five hundred kwacha.

TABLE XIII

FREQUENCY DISTRIBUTION OF NET FARM INCOME

Level of Income (kwacha)	1966	1968	1971	1972	1973
	Number of Farmers				
Negative	0	4	0	1	0
1 - 500	13	10	5	1	13
501 - 1000	4	9	3	4	7
1001 - 1500	3	2	12	7	6
1501 - 2000	3	2	5	4	1
2001 - 2500		1	1	4	0
2501 - 3000			2	1	0
Above 3000				6	1
Total	23	28	28	28	28

Source: Farm Survey, Ngwezi Settlement Scheme, Zambia, 1973

One important factor which could distort the income picture of the farmer is the price he is paid for his farm produce. In Zambia, there have been frequent shortages of maize and edible oils to which

the government has reacted by increasing the prices every so often. While this was done in order to stabilise the national supplies of agricultural products, it had a tendency of distabilising the incomes of farmers from year to year. Such price variations may not actually affect the amount of farm produce the farmer produces especially if the crop is also a food crop like maize. It requires a very elastic differential prices policy to make the farmer respond to price changes otherwise he continues to produce the easy to grow crop which still allows him a lot of free time for leisure.

Table XIV shows the producer prices for the major crops in Zambia. The price of maize had fallen between 1966 and 1969 when it reached its lowest mark of K2.98 per 90 kilogram bag. From 1970, the price of maize started rising until it reached K4.30 per bag in 1972 and this price has been maintained up to the present time. The price of groundnuts has been on the increase although it remained constant for five years

between 1968 and 1972 at K10.20 per 80 kilogram bag. The price of cotton had attracted a lot of growers in the late sixties, but somehow this production has not been maintained although the price is still very attractive.

TABLE XIV

PRODUCER PRICES FOR SELECTED CROPS
1965 - 1973

YEAR	Maize[a]	Groundnuts[b]	Cotton[c]
1965	3.45	8.73	N/A
1966	3.45	9.33	"
1967	3.32	9.90	"
1968	3.10	9.90	"
1969	2.98	10.20	"
1970	3.20	10.20	5.5
1971	3.50	10.20	6.0
1972	4.30	10.20	6.0
1973	4.30	10.20	6.0

Notes: a - price in kwacha per 90 kilogram bag.
b - price in kwacha per 80 kilogram bag.
c - price in ngwee per pound(lb) weight.

Source: National Agricultural Marketing Board(NAMB)

Regression Analysis

This section presents the results of the multiple regression analysis done on net farm income as the dependent variable and the eight independent variables. Using a linear equation, the regression coefficients between the dependent variable Y and the independent variables have been estimated. From these coefficients, it is hoped that the physical relationships between the variables can be derived. This presentation will reveal the effects of the variables on net farm income at different quantities and in time.

In Table XV are presented the estimated regression coefficients, the intercepts, and the adjusted multiple correlation coefficients(r^2). There are negative intercepts over three seasons while the other two seasons show small positive intercepts. The three seasons with negative intercepts also show large adjusted multiple correlations. In 1966, 67 per cent of the variation in net farm income is explained by the factors included in the analysis, while in 1968

and 1973 the association was 66 percent and 59 percent respectively. In 1972, 85 percent of the variations in net farm income were associated with the variables in the analysis. The negative intercepts show that without these variables, farmers could actually obtain no incomes. Four of the multiple correlation coefficients over the period are statistically significant beyond the five percent level. This indicates that there is less than a five-to-a-hundred chance that such a relationship as this could arise in a population where there is no relationship at all.

The coefficients shown in Table XV are the marginal values of the relationship between the variables under study. These values indicate the additional value of product that would be produced if any particular factor is increased by one. For example, in 1966, if acreage (X_2) was increased by one acre, net farm income would have increased by K45.04± 15. However, mention here must be made of the weakness of the linear equation and that is its failure to

TABLE XV

ESTIMATES OF REGRESSION COEFFICIENTS FOR THE SURVEY DATA NGWEZI SETTLEMENT SCHEME, ZAMBIA.

Year	Intercept	Regression Coefficients								R^2
		X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	
1966	-183.33	-16.99 (33.46)	45.04** (14.85)	-4.44 (2.19)	-37.22 (48.84)	63.89 (62.09)	2.51 (2.61)	10.06 (16.11)	2.86 (3.97)	0.67*
1968	-663.75	-7.02 (25.72)	82.06** (18.78)	-3.02** (0.77)	5.58 (28.38)	25.61 (42.26)	-0.18 (1.32)	a	a	0.66**
1971	43.89	a	48.30 (28.06)	-1.01 (1.75)	45.21 (63.44)	2.62 (15.44)	-2.66 (3.40)	a	a	0.15
1972	-842.97	a	71.93** (14.73)	2.74 (2.62)	-110.86 (79.14)	27.31 (15.38)	4.24 (5.13)	a	a	0.85**
1973	285.61	-2.27 (18.35)	20.05* (7.61)	0 (0)	-48.95 (50.93)	14.65 (14.71)	1.88 (1.71)	0.83 (16.81)	0 0	0.59*

Notes: Figures in brackets are the standard errors.
a; variables not included in the regression analysis
**; indicates significance at 1% level.
*; indicates significance at 5% level.

diminishing marginal returns, as the returns are shown as constant for all unitary changes in factors.

In the above table, acreage and casual labour show large and positive marginal value productivities while household size and fertiliser show negative returns. However, only the marginal productivities of the land factor show any significance. In 1973, both fertiliser and education show a zero marginal value productivity. The education factor could actually have no effect on net farm income especially that many farmers had taken other courses since their settling on the settlement.

In the following analysis, the study looks at the individual variables and their relationship with net farm income. In the tables, the average net farm incomes for groups of farmers in the same range of variable quantities are presented. The correlation coefficients between net farm income and the variables are also shown.

Household Size. There does not seem to exist a strong relationship between net farm income and household size. Table XVI shows that there was a moderate degree of correlation between net farm income and household size in 1968 while in both 1966 and 1973, there was a negligible negative association. This seems to indicate that farmers in fact aspire for incomes far larger than their household requirements. The table also shows the amount of net farm income attained by farmers with different sizes of households. The variations in average net farm incomes for even the same range of household size from year to year are so big.

TABLE XVI

ANALYSIS OF NET FARM INCOME ACCORDING TO HOUSEHOLD SIZE

Year	Average Income Per household Range					r
	Below 5:	5 - 10:	11-15 :	16-20 :	Over 20:	
1966	13.80 (1)	886.24 (6)	562.80 (13)	456.76 (2)	563.21 (1)	-0.19
1968	0	385.22 (9)	549.60 (11)	230.98 (4)	552.67 (4)	0.44
1973	0	903.25 (8)	788.28 (7)	690.75 (8)	621.60 (5)	-0.07

Note: Figures in brackets are the number of farmers.

Source: Farm Survey, Ngwezi Settlement Scheme, Zambia, 1973

Acreage. The acreage cultivated does determine the amount of income a farmer gets and this has been observed in the subsistence sector. In this sector, acreage and not necessarily improved methods is relied upon for increasing production. Table XVII shows that there is an upward progression of net farm income as cultivated acreage does increase in favourable seasons. The acreages cultivated have been increasing over the years. In 1966, no farmer had cultivated over thirty-five acres but in 1972, five farmers cultivated over forty acres, and these had been given more land elsewhere.

In all the seasons, there is a marked degree of correlation between net farm income and acreage. The highest correlation coefficient ($r = 0.89$) being in 1972 which was a good farming season. While many small farmers could easily increase their production and incomes by increasing their acreages, this will not be possible on special development areas where the land is

TABLE XVII

ANALYSIS OF NET FARM INCOME

ACCORDING TO ACREAGE

Year	Average Income Per Acreage Range						r
	Below 20:	20-25	26-30	31-35	36-40	Over 40	
1966	322.15 (12)	929.02 (10)	0	968.50 (1)	0	0	0.67
1968	155.52 (4)	304.60 (12)	864.59 (8)	1290.83 (3)	1900.70 (1)	0	0.57
1971	604.60 (2)	1367.80 (10)	966.67 (11)	1961.25 (4)	1242.00 (1)	0	0.26
1972	-186.00 (1)	909.67 (3)	1860.00 (6)	1318.78 (9)	2059.75 (4)	3416.40 (5)	0.89
1973	369.60 (5)	405.50 (6)	857.75 (4)	872.78 (9)	0	1452.25 (4)	0.70

Notes: As for Table XVI.

Source: Farm Survey, Ngwezi Settlement Scheme, Zambia, 1973.

limited. The extension methods must therefore concentrate on increasing yields per unit of land. Indeed if comparison is made with the marginal value productivities of land in Table XV on page 68 and the yields in Table IX on page 58, converting the former into quantities of maize, groundnuts or cotton, one finds that the yields attained per acre are far below the marginal productivity of land. Changes in cultivated area do not usually result in the most economical production of farm products as far as the factors of production are concerned. Most often, the farmers cannot afford to get the other inputs required and this results into their applying of some of these inputs, for example, fertilisers wrongly, and therefore getting low yields per acre although achieving more total production.

Fertiliser. The use of fertilisers is often neglected by subsistence farmers because of acreage effects described in the above section. In

the 1965/66 year very few farmers used any fertiliser in their fields. However, the use of fertiliser has become easily accepted and only one or two farmers do not use fertiliser in any one season, as shown by Table XVIII. There was no significant association between net farm income and fertiliser cost until 1972($r = 0.80$). In all the seasons, more than fifty percent of the farmers buy fertiliser worth more than three hundred kwacha and these are the farmers with a substantial income.

One noteable aspect of fertiliser costs is that many farmers do not regard them as their personal variable costs as most of them are covered by seasonal loans. Many farmers do not even keep accurate records on these costs. Sometimes the fertiliser is applied without regard to agronomic recommendations and some farmers even sell the fertiliser to other people. The offering of fertiliser credit must involve an elaborate education on the uses and management of credit facilities.

TABLE XVIII

ANALYSIS OF NET FARM INCOME ACCORDING TO FERTILISER COST

Year	Average Net Farm Income 0	1-100	101-200	201-300	Over 300	r
1966	545.05 (13)	444.50 (1)	732.70 (9)	0	0	0.16
1968	827.75 (5)	0	255.70 (1)	517.30 (11)	616.73 (11)	-0.34
1971	356.00 (1)	557.00 (2)	982.67 (3)	1257.70 (21)	855.00 (1)	-0.08
1972	845.00 (2)	0	553.00 (4)	1911.78 (18)	6897.25 (4)	0.80
1973	221.50 (2)	318.67 (3)	265.00 (1)	757.70 (14)	1138.25 (8)	0.57

Notes: As for Table XVI.

Source: Farm Survey, Ngwezi Settlement Scheme, Zambia, 1973.

Permanent Labour. The productivity of labour in the subsistence sector has become a popular subject for development scholars. The concern is that the labour has an extremely low or even zero marginal productivity and that some of

this labour could be removed without causing any reduction in total production. However, the major problem seems to be lack of organisational ability by the heads of the families. While many farmers may have very large families, these are not regarded as sources of farm labour.

Table XIX shows that in 1966 when the farmers had just settled and perhaps very few people were hired, the higher the labour, the lower the net income. However, in later years the trend was that the more the labour force, the higher the net income. This increase could be a result of improved labour management which with small-scale farmers could be achieved when non-relatives are employed. From a personal knowledge of the study area and other rural areas as well, it has been observed that many small-scale and subsistence farmers will go to the extent of hiring labour even when they have large family labour available. These farmers fail to give instructions to relatives living with them who

might spend most of their time drinking beer. There is very little association between net farm income and permanent labour as shown in the table. It seems the economic problem of low labour productivity still remains as many members of farm families continue to be a pool of undisciplined labour contributing only towards consumption.

TABLE XIX

ANALYSIS OF NET FARM INCOME ACCORDING TO PERMANENT LABOUR

Year	Average Net Farm Income				r
	1 - 3	4 - 6	7 - 9	Over 9	
1966	898.92 (4)	619.08 (14)	461.10 (4)	17.25 (1)	-0.40
1968	351.62 (8)	757.00 (10)	796.30 (1)	607.55 (9)	0.15
1971	1094.50 (2)	1093.18 (11)	1345.36 (11)	1398.50 (4)	0.15
1972	518.00 (1)	1935.18 (11)	2490.00 (9)	3096.85 (7)	0.15
1973	0	692.81 (11)	832.00 (7)	793.30 (10)	0.11

Notes: As for Table XVI.

Source: Farm Survey, Ngwezi Settlement Scheme, Zambia, 1973.

Casual Labour. The variable of casual labour poses problems of definition as it includes part-time employees and relatives who are called upon to help during peak periods. Both of these types of labour are paid in kind in form of farm produce. The significant association between net farm income and casual labour as shown in Table XX indicates the importance of this type of labour. Over half of the farmers had between one and ten casual workers in all the seasons. The few farmers who had over twenty workers also had very high incomes. This labour was mostly used by farmers with tractors who were able to plough large acreages but had to use labour for weeding, harvesting and other manual operations.

The casual workers show positive marginal value productivities (Table XV, page 68) and also significant correlations with net farm income. However, this labour is somehow exploited as very

TABLE XX

ANALYSIS OF NET FARM INCOME ACCORDING TO CASUAL LABOUR

Year	Average Net Farm Income						r
	0	1-5	6-10	11-15	16-20	Over 20	
1966	92.29 (4)	521.82 (19)	0	0	0	-	0.42
1968	357.78 (13)	403.63 (12)	1939.32 (2)	843.40 (1)	-	-	0.46
1971	1172.25 (4)	1119.21 (14)	1600.14 (7)	1086.00 (1)	-	980.50	0.03
1972	447.25 (3)	1696.67 (15)	3256.12 (8)	-	-	6526.00 (2)	0.68
1973	332.00 (2)	546.53 (15)	885.28 (7)	1086.50 (2)	-	2073.00 (2)	0.64

Notes: As for Table XVI.

Source: Farm Survey, Ngwezi Settlement Scheme, Zambia, 1973.

the statutory minimum wage is not even paid. There is not much economic benefit in a system which attains high productivity but does not lead to a fair distribution of the income from this production. During bad seasons, most of these

people are given small amounts of food to supplement their own harvest. Employment in rural areas must mean self-employment or agro-industrial employment otherwise farm employment which is the only form of employment available is exploitive and leads to more uneven distribution of income and this is not rural development.

Tractor Hire. For many small-scale farmers, hiring a tractor is just a half way measure as they always aspire to own one. However, the costs of operating a tractor on such small fields are high. There are many tractors on the scheme, but those who do not possess any usually hire from the government owned tractor-hire scheme. The major reasons for hiring these tractors is that they make ploughing and planting much faster. Table XXI shows that in fact there is no difference between those who hired tractors and those who did not hire any. The table shows that there is no significant association between

TABLE XXI

ANALYSIS OF NET FARM INCOME
ACCORDING TO TRACTOR HIRE

Year	Average Net Farm Income					r
	0	1-50	51-100	101-150	Over 150	
1966	446.52 (13)	-	909.30 (8)	526.60 (2)	-	0.30
1968	479.08 (7)	711.75 (4)	856.12 (10)	100.78 (4)	500.83 (3)	0.07
1971	1371.22 (9)	1481.00 (1)	1172.36 (11)	1127.00 (7)	-	-0.13
1972	3533.72 (7)	1221.32 (8)	1919.32 (9)	3528.00 (4)	-	-0.01
1973	303.75 (12)	720.00 (4)	570.71 (7)	1031.00 (2)	932.00 (3)	0.05

Notes: As for Table XVI

Source: Farm Survey, Ngwezi Settlement Scheme, Zambia, 1973.

TABLE XXI

ANALYSIS OF NET FARM INCOME
ACCORDING TO TRACTOR HIRE

Year	Average Net Farm Income					r
	0	1-50	51-100	101-150	Over 150	
1966	446.52 (13)	-	909.30 (8)	526.60 (2)	-	0.30
1968	479.08 (7)	711.75 (4)	856.12 (10)	100.78 (4)	500.83 (3)	0.07
1971	1371.22 (9)	1481.00 (1)	1172.36 (11)	1127.00 (7)	-	-0.13
1972	3533.72 (7)	1221.32 (8)	1919.32 (9)	3528.00 (4)	-	-0.01
1973	803.75 (12)	720.00 (4)	570.71 (7)	1031.00 (2)	932.00 (3)	0.05

Notes: As for Table XVI

Source: Farm Survey, Ngwezi Settlement Scheme, Zambia, 1973.

net farm income and tractor hire.

The small-scale farmer has a choice between using oxen or mechanical power for his farm operations. While all the farmers on the scheme do possess some oxen, many of them prefer using tractors in their fields. Some even go to the extent of selling some of their oxen so as to hire a tractor. One of the bad effects of mechanical power is that of replacing labour which in most rural areas is very abundant. Indeed the use of oxen has proved very successful on the nearby Mbaya Settlement and perhaps encouragement should be towards the use of this readily and locally available resource.

Age. In Table XXII the relationships between net farm income and age are shown for 1966 and 1973. There is no significant association between net farm income and age. However, in both seasons, the oldest age group had the highest average net income. The only inference that can be

made from this occurence is that perhaps the older farmers have larger families and therefore a stable source of farm labour.

TABLE XXII

RELATIONSHIP BETWEEN AGE AND NET FARM INCOME

Year	Average Net Farm Income					r
	25-30	31-35	36-40	41-45	Over 45	
1966	555.30 (2)	528.09 (5)	585.83 (5)	635.57 (9)	844.06 (3)	0.15
1973	-	559.00 (2)	731.40 (5)	728.20 (5)	807.00 (16)	0.22

Notes: As for Table XVI

Source: Farm Survey, Ngwezi Settlement Scheme, Zambia, 1973.

Education. There is no direct relationship between net farm income and the number of years of formal education. The farmers received their formal education over twenty years ago and it is expected that such a long interval would reduce the effects

of the variable. However, the present education system cannot offer much in the form of giving encouragement to the educated rural people to remain there. It is rare to find young men with some years of formal education in the rural areas. This is because any formal education attained seems to imply that a job will be given to such a person and therefore many of the young men rush to towns once they drop out of school. The education system could play a role by emphasising the importance of the agricultural industry to the nation. The rural masses must be made to understand that their way of life, that is, farming, offers the same opportunities as urban employment.

CHAPTER IV

SUMMARY AND CONCLUSIONS

The study was concerned with the returns a small-scale farmer gets from his different enterprises and also the qualities and characteristics that make a successful farmer. The objectives of the study were; a) To investigate the sources and levels of farm incomes; b) To determine the factors which contribute towards higher net farm incomes. Frequency distributions and a multiple regression analysis were used for objectives (a) and (b) respectively.

The study looks at a purposeful sample drawn from a settlement scheme which is a special type of development area. The study tries to find out the effectiveness of this type of development especially with regard to the special attention given to these farmers. Are these 'favoured' farmers producing any more economically than the other farmers who

are out of settlements? Are there any other factors which should be combined with this government attention in order to develop the small-scale farmer? This study tries to find the answers to the above questions. However, it is not always easy to present farmers' answers on farming in statistical tables. The data for the study were obtained through personal interviews; from records kept by national organisations dealing with farming and from records kept by the farmers themselves. Some of the results and inferences made will be a result of the long personal interviews with the farmers much of which cannot be reproduced by way of tables.

The major problem which every development project tries to solve is that of low incomes and lack of material wealth. In developing countries, much effort is being directed towards the development of the rural areas where the larger section of the population lives. In an effort to direct attention to the rural areas, comparisons of

incomes have been made between rural and urban areas. In this study it was discovered that in good seasons the majority of small-scale farmers attain net incomes of over one thousand kwacha. Just as there exist income disparities between the highest and lowest paid wage-earners, this is true of the farming business and indeed there are farmers who get net incomes of over three thousand kwacha. The major determinant of farm incomes is the weather and its effects may only be reduced by certain measures, for example, crop diversification. However, in very bad seasons, even such measures are not effective and the farmer suffers.

The settlement farmers depend to a very large extent upon crop sales for their incomes. The degree to which livestock income contributes towards the social and economic well-being of the small-scale farmer has not been dealt with in this study. Maize which is the staple food realises the larger portion of the farmer's income. Many of the farmers

still grow only the staple crop on which sales are made after satisfying subsistence needs. Transformation of the production patterns should include changes in the degree of enterprise and crop diversification. Roberts[33] in his study of Mumbwa and Katete cultivators found out that many of the cultivators had more than four sources of income. However, a high percentage(58.2 percent) of total farm income was earned from crop sales of which maize was the major crop.

The availability of non-farm sources of income does hinder farm development. The farmers who are able to get outside financial help tend to neglect their farming businesses. These farmers may even show low farm incomes while having constant income from outside. Such income sources retard the development of the productive capability of the rural people. The pricing system especially that of farm products might be the best method to effect such income distribution.

Another important economic consideration is the responsiveness of farmers to price changes. This is very relevant because it directly affects the income the farmer gets from sales of his produce. However, the responses of farmers to price incentives is determined by some other factors. One of these factors is the labour demands of the crop with the most attractive price. For example, the farmers in the study area are not very interested in growing cotton because they feel that it is labour-demanding. Because of the use of family labour which is not paid, it is not very often that the farmer thinks of the labour in terms of the income it can generate. In other words, the small-scale farmer does not think of the marginal productivity of the labour he uses but always thinks of the whole family and size of the field they cultivate. The pricing system seems to have a very limited effect upon the small producer.

When talking about the levels of income, one should also get concerned with the needs and

aspirations of the people as this determines their spending capacity and the desire for more income. Any production incentive may fail to encourage production because of the limited spending capacity and the need for more income. The comparison of incomes between rural and urban people becomes meaningless if the motives and the levels of demand for accumulation of wealth in the two areas are very different. Although this study shows the levels of farm incomes of the small-scale farmer, it does not compare them with those of urban wages.

Investigations into the needs of the small-scale farmer could reveal an important economic aspect of rural life. This could also help with settlement policy in determining the sizes of farms which could assure the farmer of a minimum acceptable income. Although in many settlements the concept of a target income is introduced, it is not very clear as to the methods used in arriving at such a figure. The major concern of the extension staff should be the

achievement of the potential yields from the factors of production as there is no basis for determining the target income a farmer should get. The economic use of the factors of production can be better measured by factor productivity rather than total production.

The study revealed the existence of a strong relationship between farm size, casual labour and the farm incomes. The rest of the factors in the study had negligible association with farm income. The importance of farm sizes should be realised when partitioning the land for settlement. However, the aims of settlements must be taken into consideration, as the need to provide large farms might conflict with some of these aims. The emphasis on the availability of family labour does not seem to be very important since many of the farmers depend upon casually hired labour. Indeed, many farmers with very large families and large farms resort to

mechanical ploughing while relying on employed labour for such manual operations as harvesting. Settlement as a means towards rural development will not be easily accepted if it results in the creation of a favoured small group of farmers exploiting other people's labour. Many settlements are being undertaken in Zambia with different farm sizes. However, unless a uniform farm size is applied in terms of productive land, then the development effort by the government will only benefit a small section of the rural population while the majority remain in their overcrowded environment. The development of the rural masses seems to lie on the development of small family farms on which family labour is organised and productive and also is assured of its food needs.

The development of small-scale farming is being achieved at a high cost in terms of the cost of land and the infrastructural developments. Although this increases crop production, farming is

still being carried out uneconomically resulting in low yields, low marginal productivities and very high seasonal costs. The small-scale farmer seems to be more concerned with his volume of output and not with his margin per unit of input. This is the most important issue that should concern management in any organisation. However, this study could not include management as one of the variables in the regression because of the problems in quantifying it. The other factors which are important but could not be included for lack of methodology are personal and family considerations of the farmer in his operations. All these factors do contribute towards decision-making on the farm. Economic theories can be applied in the hope that they will aid the farmer in his efforts to make good decisions. Improved management skills can lead to high productivity and a high level of living. The extension service has an important role to bring about this improvement in management. Changing

the farmer's environment without a related change in management will not improve productivity of the small-scale farmer.

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APPENDICES

APPENDIX A

NGWEZI BLOCK : COSTS PAYABLE

FARM NO.	TOTAL ACREAGE	ACREAGE CLEARED	YEARLY FEE (Kwacha)
1	40	40	50.00
2	43	40	50.00
3	42	35	45.00
4	42	20	32.00
5	40	20	32.00
6	40	20	32.00
7	40	20	32.00
8	40	20	32.00
9	40	20	32.00
10	40	20	32.00
11	40	20	32.00
12	40	20	32.00
13	40	20	32.00
14	39	20	32.00
15	39	20	32.00
16	40	20	32.00
17	40	20	32.00
18	40	20	32.00
19	40	20	32.00
20	44	41	51.00
21	43	43	52.00

FARM NO.	TOTAL ACREAGE	ACREAGE CLEARED	YEARLY FEE (Kwacha)
22	4040	4040	50.00
23	39	36	46.00
24	41	20	32.00
25	42	20	32.00
26	39	20	32.00
27	39	20	32.00
28	37	28	39.00
29	37	28	39.00
30	40	37	47.00
31	41	20	32.00
32	42	20	32.00
33	42	20	32.00
34	44	20	32.00
35	40	20	32.00
36	40	32	43.00
37	44	32	43.00
38	42	20	32.00
39	44	20	32.00

APPENDIX B

INPUT DATA USED IN

THE ANALYSIS

TABLE B-I

INPUT DATA : 1965/66 SEASON

FARM CODE No	NET FARM INCOME	VARIABLES X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
1	979.3	13	25	120.0	4	2	86.0	43	4
2	1,655.2	12	23	0	4	5	67.0	42	5
3	490.0	13	21	110.0	4	4	120.0	42	4
4	1,725.0	11	20	0	2	5	0	50	0
5	968.5	9	35	157.0	4	4	0	40	0
6	447.8	12	17	113.0	7	2	67.0	42	6
7	189.8	11	10	0	4	0	0	34	0
8	143.0	15	20	142.0	9	5	94.0	38	2
9	1,048.5	8	20	0	4	2	90.0	27	0
10	444.5	10	15	73.0	5	2	0	36	3
11	1,538.7	7	22	0	2	2	0	31	5
12	1,043.8	11	24	127.0	7	1	92.0	43	4
13	703.7	16	17	126.0	4	5	75.0	48	0
14	1,255.2	10	18	119.0	6	1	99.0	40	4
15	563.2	21	23	126.0	6	3	117.0	45	0
16	103.5	11	20	0	6	0	0	46	2
17	17.3	14	1	0	10	2	0	45	3
18	209.8	18	4	0	9	1	0	44	0
19	65.8	15	2	0	5	1	0	32	5
20	13.8	4	4	0	2	0	0	41	3
21	not yet settled								
22	138.0	14	4	0	5	4	0	38	4
23	not yet settled								
24	" " "								
25	62.1	7	3	0	5	0	0	228	3
26	not yet settled								
27	" " "								
28	318.2	12	5	0	2	2	0	32	4

TABLE B-II

INPUT DATA : 1967/68 SEASON

FARM CODE No.	NET FARM INCOME	X_1	X_2	X_3	X_4	X_5	X_6
1	639.4	13	24	273.0	3	1	0
2	843.4	29	23	0	14	11	0
3	1,103.4	13	32	342.0	3	0	100.0
4	2,328.1	8	26	0	6	2	40.0
5	1,900.7	24	39	365.0	6	10	74.0
6	-229.7	13	23	342.0	4	0	168.0
7	549.0	14	18	0	3	0	60.0
8	-72.4	9	18	317.0	4	0	0
9	171.0	8	24	252.0	3	5	136.0
10	16.2	16	27	275.0	3	2	40.0
11	420.0	9	7	0	4	0	0
12	791.2	13	34	280.0	12	1	0
13	1,488.6	25	28	0	10	0	360.0
14	588.5	14	23	268.0	11	3	88.0
15	703.5	16	27	258.0	5	1	60.0
16	360.4	8	27	224.0	3	0	60.0
17	155.0	18	21	268.0	11	0	128.0
18	223.6	15	25	378.0	10	0	160.0
19	648.5	14	28	378.0	11	3	80.0
20	-274.5	7	19	378.0	3	0	104.0
21	680.0	14	24	322.0	12	0	60.0
22	796.3	15	26	329.0	9	4	0
23	351.6	8	22	252.0	5	1	140.0
24	-64.8	9	21	252.0	5	2	0
25	247.6	7	22	315.0	3	0	48.0
26	1,977.9	21	34	283.0	9	7	56.0
27	255.1	11	26	180.0	6	2	32.0
28	49.2	17	24	398.0	12	1	52.0

TABLE B -III

INPUT DATA : 1970/71 SEASON

FARM CODE No.	NET FARM INCOME	VARIABLES X_2	X_3	X_4	X_5	Y_6
1	1,855.0	34	259.0	4	8	120.0
2	1,166.0	34	259.0	10	4	0
3	1,849.0	34	259.0	5	3	0
4	855.0	26	450.0	8	30	120.0
5	1,242.0	37	259.0	8	4	120.0
6	356.0	21	0	5	0	0
7	1,580.0	26	259.0	6	3	80.0
8	342.0	27	129.0	6	0	0
9	244.0	28	259.0	6	2	120.0
10	1,107.0	28	259.0	8	4	80.0
11	1,086.0	26	259.0	2	14	80.0
12	2,975.0	34	219.0	7	7	120.0
13	1,105.0	26	220.0	7	6	100.0
14	2,633.0	25	0	10	0	0
15	1,143.0	23	219.0	7	6	60.0
16	1,377.0	22	259.0	6	0	0
17	2,456.0	20	129.0	9	5	0
18	412.0	19	276.0	10	3	60.0
19	1,612.0	26	259.0	6	2	80.0
20	1,103.0	22	39.0	3	1	80.0
21	1,578.0	20	268.0	8	6	80.0
22	168.0	24	140.0	8	5	120.0
23	1,064.0	27	219.0	7	6	60.0
24	550.0	26	259.0	5	2	120.0
25	797.0	14	242.0	5	4	0
26	1,106.0	26	259.0	8	46	60.0
27	1,481.0	24	230.0	6	6	40.0
28	1,383.0	22	259.0	13	1	0

TABLE B-IV

INPUT DATA : 1971/72 SEASON

FARM CODE No.	NET FARM INCOME	VARIABLES X_2	X_3	X_4	X_5	X
1	2,451.0	40	259.0	4	8	120.0
2	6,596.0	116	459.0	10	4	0
3	2,367.0	31	259.0	5	3	0
4	9,758.0	50	620.0	12	40	120.0
5	1,024.0	32	259.0	10	5	120.0
6	-186.0	15	130.0	6	0	48.0
7	2,047.0	29	259.0	6	2	60.0
8	297.0	25	0	6	0	16.0
9	1,126.0	32	214.0	6	2	56.0
10	1,798.0	38	259.0	8	4	80.0
11	7,941.0	78	520.0	4	10	0
12	2,962.0	40	280.0	7	6	52.0
13	4,493.0	57	259.0	7	6	48.0
14	1,914.0	25	259.0	10	2	0
15	1,499.0	34	259.0	7	6	52.0
16	1,231.0	34	259.0	5	0	0
17	1,304.0	28	175.0	9	5	40.0
18	782.0	33	201.0	10	3	80.0
19	2,098.0	29	260.0	7	2	100.0
20	518.0	24	130.0	3	1	44.0
21	3,091.0	29	226.0	8	6	100.0
22	576.0	34	130.0	10	5	48.0
23	1,871.0	34	259.0	7	6	52.0
24	879.0	27	259.0	5	2	120.0
25	1,393.0	34	0	6	5	0
26	3,294.0	70	600.0	8	30	0
27	1,741.0	30	210.0	6	6	32.0
28	1,028.0	37	259.0	15	1	40.0

TABLE B-V

INPUT DATA : 1972/73 SEASON

FARM CODE No.	NET FARM INCOME	VARIABLES X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
1	1,210.0	11	31	282.0	4	8	0	50	4
2	1,132.0	30	78	640.0	10	5	0	49	5
3	836.0	14	23	282.0	5	4	0	49	4
4	3,197.0	10	104	832.0	12	40	0	57	0
5	943.0	15	31	282.0	10	5	120.0	47	0
6	258.0	6	10	0	6	0	0	49	6
7	1,225.0	6	27	282.0	6	2	80.0	41	0
8	185.0	16	16	0	6	10	0	45	2
9	421.0	7	21	264.0	6	1	80.0	34	0
10	337.0	17	26	282.0	8	4	80.0	43	3
11	533.0	15	68	832.0	12	15	0	38	5
12	1,119.0	15	34	320.0	8	8	120.0	50	4
13	1,050.0	26	33	349.0	8	8	80.0	55	0
14	376.0	24	34	320.0	10	4	0	47	4
15	471.0	15	33	260.0	8	8	0	52	0
16	406.0	14	25	71.0	5	0	160.0	53	2
17	296.0	25	35	85.0	12	5	0	52	3
18	0	20	21	234.0	111	3	84.0	51	0
19	457.0	10	28	282.0	7	3	80.0	39	5
20	265.0	7	25	134.0	5	1	6.0	48	3
21	1,640.0	20	34	268.0	8	13	160.0	43	4
22	254.0	26	13	80.0	10	3	40.0	45	4
23	750.0	18	33	569.0	8	8	160.0	40	6
24	454.0	7	15	247.0	5	2	0	47	2
25	697.0	16	19	220.0	10	5	0	35	3
26	949.0	8	54	529.0	6	40	48.0	47	4
27	1,412.0	18	28	204.0	6	6	28.0	37	3
28	505.0	16	25	282.0	12	2	60.0	39	4

APPENDIX C

MULTIPLE REGRESSION RESULTS

TABLE C-I

MULTIPLE REGRESSION ... 1965/66

SELECTION 1

VARIABLE NO.	MEAN	STANDARD DEVIATION	CORRELATION X VS Y	REGRESSION COEFFICIENT	STD. ERROR OF REG. COEF.	COMPUTED T.VALUE
1	11.91304	3.76482	-0.19379	-16.98901	33.46365	-0.50768
2	15.34782	9.30595	0.67246	45.04734	14.84688	3.03412
3	52.73913	63.05853	0.16053	-4.44234	2.18674	-2.03148
4	5.04347	2.24578	-0.40283	-37.21672	48.84423	-0.76194
5	2.30434	1.74342	0.41506	63.88970	62.08924	1.02899
6	39.43478	47.44450	0.30017	2.51102	2.60676	0.96327
7	39.43478	6.29448	0.15267	10.05887	16.11162	0.62432
8	30.56521	22.99371	0.01279	2.86331	3.97601	0.72014
DEPENDENT						
9	614.10827	554.36364				

INTERCEPT	-183.32559
MULTIPLE CORRELATION	0.82301
STD. ERROR OF ESTIMATE	394.73681

ANALYSIS OF VARIANCE FOR THE REGRESSION

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	F VALUE
ATTRIBUTABLE TO REGRESSION	8	4579577.01367	572447.12670	3.67383
DEVIATION FROM REGRESSION	14	2181440.50585	155817.15661	
TOTAL	22	6761017.01171		

TABLE C-II

MULTIPLE REGRESSION ... 1967/68

SELECTION ... 1

VARIABLE NO.	MEAN	STANDARD DEVIATION	CORRELATION X VS Y	REGRESSION COEFFICIENT	STD. ERROR OF REG. COEF.	COMPUTED T. VALUE
1	13.85714	5.64186	0.43824	-7.02035	25.72232	-0.27292
2	24.71428	5.96816	0.57171	82.06198	18.77592	4.37059
3	247.46429	128.10736	-0.33502	-3.02070	0.77092	-3.91826
4	6.64285	3.67387	0.14899	5.57679	28.38325	0.19648
5	2.00000	2.96897	0.45869	25.60465	42.25765	0.6 591
6	73.07144	75.91506	0.07402	-0.18175	1.31810	-0.13789
DEPENDENT						
7	594.52893	657.91333				

INTERCEPT -653.75012

MULTIPLE CORRELATION 0.807688

STD. ERROR OF ESTIMATE 439.85614

ANALYSIS OF VARIANCE FOR THE REGRESSION

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	F VALUE
ATTRIBUTABLE TO REGRESSION	6	7624004.014	1270667.253	6.56765
DEVIATION FROM REGRESSION	21	4062941.506	193473.407	
TOTAL	27	11686946.024		

TABLE C-III

MULTIPLE REGRESSION ... 1970/71

SELECTION 1

VARIABLE NO.	MEAN	STANDARD DEVIATION	CORRELATION X VS Y	REGRESSION COEFFICIENT	STD. ERROR OF REG.COEF.	COMPUTED T VALUE
2	25.75000	5.23962	0.26350	48.30148	28.06164	1.72126
3	215.96429	92.88916	-0.08018	-1.01221	1.74864	-0.57885
4	6.89285	2.31483	0.14906	45.20846	63.43901	0.71262
5	6.35714	9.67705	-0.02857	2.62126	15.43727	0.16980
6	60.71428	47.91416	-0.12889	-2.65785	3.39984	-0.78175
DEPENDENT 1	1235.96435	695.31750				
INTERCEPT			43.89453			
MULTIPLE CORRELATION			0.38955			
STD. ERROR OF ESTIMATE			709.43945			

ANALYSIS OF VARIANCE FOR THE REGRESSION

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	F VALUE
ATTRIBUTABLE TO REGRESSION	5	1980893.0034	396178.5632	0.78715
DEVIATION FROM REGRESSION	22	11072698.0274	503304.3757	
TOTAL	27	13053590.02734		

TABLE C-IV

MULTIPLE REGRESSION ... 1971/72

SELECTION 1

VARIABLE NO.	MEAN	STANDARD DEVIATION	CORRELATION X VS Y	REGRESSION COEFFICIENT	STD. ERROR OF REG. COEF.	COMPUTED T VALUE
2	40.60714	23.41310	0.88953	71.93138	14.73420	4.88193
3	259.39288	143.39544	0.80116	2.74862	2.61648	1.05050
4	7.39285	2.64348	0.15835	-110.86247	79.13711	-1.40089
5	6.07142	8.64925	0.67864	27.30540	35.38125	0.77174
6	51.00000	41.16274	-0.00616	4.23922	5.13108	0.82618
DEPENDENT						
1	2353.32178	2298.11719				

INTERCEPT	-842.97131
MULTIPLE CORRELATION	0.91562
STD. ERROR OF ESTIMATE	1023.55676

ANALYSIS OF VARIANCE FOR THE REGRESSION

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	F VALUE
ATTRIBUTABLE TO REGRESSION	5	119547472.21875	23909492.04687	22.82162
DEVIATION FROM REGRESSION	22	23048708.04678	1047668.37646	
TOTAL	27	142596192.43750		

TABLE C-V

MULTIPLE REGRESSION 1972/73

VARIABLE NO.	MEAN	STANDARD DEVIATION	CORRELATION X VS Y	REGRESSION COEFFICIENT	STD. ERROR OF REG.COEF.	COMPUTED T VALUE
1	15.46428	6.61357	-0.06868	-2,27247	18.35411	-0.12381
2	33.00000	20.36700	0.69521	20.04831	7.60796	2.63517
3	301.14288	210.22079	0.57196	0.00129	0.01349	0.09612
4	8.00000	2.50924	0.11305	-48.95240	50.92678	-0.96123
5	7.60714	9.84825	0.64396	14.65001	14.70821	0.99604
6	49.50000	55.90103	0.04493	1.88290	1.71154	1.10012
7	45.78572	6.09406	0.21574	0.83031	16.80887	0.04939
8	1.09387	0.00000	-0.00000	0.00000	0.00000	0.00000
DEPENDENT						
9	763.50012	632.92358				

INTERCEPT	285.61151
MULTIPLE CORRELATION	0.76448
STD. ERROR OF ESTIMATE	486.38104

ANALYSIS OF VARIANCE FOR THE REGRESSION

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	F VALUE
ATTRIBUTABLE TO REGRESSION	8	6321223.01367	790152.87670	3.34008
DEVIATION FROM REGRESSION	19	4494765.01171	236566.53167	
TOTAL	27	10815988.02734		

LIST OF TABLES

TABLE		PAGE
I	MAIZE INTAKE BY THE NATIONAL AGRICULTURAL MARKETING BOARD OF ZAMBIA(NAMB), 1963-1972.	3
II	MONTHLY AND ANNUAL RAINFALL(INCHES) AT MAGOYE RESEARCH STATION	10
III	FREQUENCY DISTRIBUTION OF ALL YEAR FAMILY RESIDENTS	24
IV	NON-FAMILY LABOUR EMPLOYED DURING OCTOBER, 1966	26
V	LABOUR FORCE	27
VI	OXEN EQUIPMENT	29
VII	ANALYSIS OF GROSS FARM INCOME ACCORDING TO CROPS	55
VIII	ACREAGE DATA OF SAMPLE FARMERS	57
IX	YIELDS PER ACRE: MAIN CROPS	58
X	FREQUENCY DISTRIBUTION OF GROSS FARM INCOME 1971 TO 1973	59
XI	PERCENTAGE FREQUENCY DISTRIBUTION OF GROSS FARM INCOME	60
XII	COMPARISON OF LOWEST AND HIGHEST NET FARM INCOMES	62
XIII	FREQUENCY DISTRIBUTION OF NET FARM INCOME	63

LIST OF TABLES (Continued)

TABLE		PAGE
XIV	PRODUCER PRICES FOR SELECTED CROPS, 1965-1973.	65
XV	ESTIMATES OF REGRESSION COEFFICIENTS FOR THE SURVEY DATA, NGWEZI SETTLEMENT SCHEME, ZAMBIA.	68
XVI	ANALYSIS OF NET FARM INCOME ACCORDING TO HOUSEHOLD SIZE	70
XVII	ANALYSIS OF NET FARM INCOME ACCORDING TO ACREAGE	72
XVIII	ANALYSIS OF NET FARM INCOME ACCORDING TO FERTILISER COST.....	75
XIX	ANALYSIS OF NET FARM INCOME ACCORDING TO PERMANENT LABOUR	77
XX	ANALYSIS OF NET FARM INCOME ACCORDING TO CASUAL LABOUR	79
XXI	ANALYSIS OF NET FARM INCOME ACCORDING TO TRACTOR HIRE	81
XXII	RELATIONSHIP BETWEEN AGE AND NET FARM INCOME	83

LIST OF FIGURES
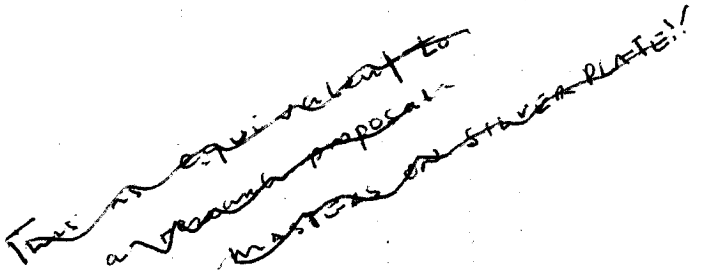
FIGURE		PAGE
I	LOCATION OF NGWEZI SETTLEMENT SCHEME	9