SMALL HOLDER HOUSEHOLD LABOUR ALLOCATION IN FOOD PRODUCTION: A CASE STUDY OF IKOLOMANI DIVISION, KAKAMEGA DISTRICT.

BY

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A thesis submitted to the University of Nairobi (Faculty of Arts) in partial fulfilment of the requirements for the award of the degree of Master of Arts in Agricultural Geography.
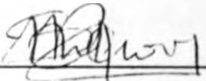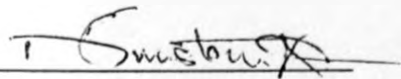
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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.
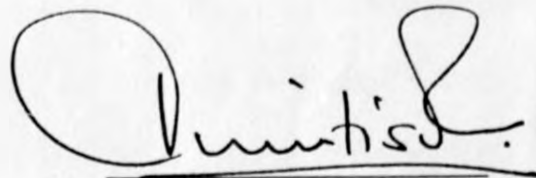
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DEDICATION

To my parents for their love, comfort, encouragement and patience during my long period of studies.

ABSTRACT

This study was based on Ikolomani Division of Kakamega District in Western Kenya. It deals with a rural part of Kenya where the standards of farming are still low and the majority of the farmers are resource poor. The primary objective of the study set out to identify and analyse the factors that influence the allocation of household labour with special reference to food production. The majority of the farmers rely on household labour and the study attempted to establish the link between labour productivity and a series of socio-economic indices that were regarded as being important in understanding the workings of rural environments.

A total of a hundred farms were sampled for detailed investigations. A systematic sampling strategy was employed to make the selection from all the registered farms in the Division. The methodology used to collect information from each household unit consisted of a written questionnaire which was administered personally by the researcher, in addition an interview of the divisional Agricultural personnel was carried out to help fill in details which could not be obtained from the farms surveyed. The general hypothesis of the study was to test if there was a significant relationship between selected socio-economic factors and household labour allocation particularly for food production. Additional hypotheses were also framed to deal with other factors like farm size, household size, household income, population migration and off-farm activities. In order to test the above hypotheses, simple and multiple regression and correlation analysis were used.

Coefficient of Determination (R^2) and correlation coefficient (r) were used to test the strength of interrelationship between variables. The resulting data indicated that farm size and household income were major factors influencing household labour allocation and the level of food production. It was further noted that farm size determined the total amount of time spent on the farm and the quantity of labourers hired. However, the number of hired labourers and level of food produced also increased with increasing income. Farm size and household income together explained for 37 percent of the variation in food production. The remaining 63 percent was explained for by other socio-economic factors and physical.

Small holder agriculture highly depended on household labour in the production of agricultural products especially food. There were however, a number of factors which affected the quantity of household labour available for off-farm and on-farm activities. These included migration, marriage and school attendance. These factors had led to increasing use of hired labour in the peak seasons. Hired labour was scarce and costly due to negative attitude of the youth on farm activities. Some factors like migration, family size, age, and off-farm activities were tested but in the final analysis were left out in the regression model because of their insignificant role influencing their dependent variable.

Women were found to be important food producers and farm managers. Their full participation in agricultural development was handicapped by their limited authority in decision making process and their marginalization on ownership of means of production particularly land.

The present credit system also denied women full acquisition of loans and other credit facilities. This research had important implication to policy planning. There are some households which were seen to have very low literacy levels and poor living standards because of poverty. The study therefore recommends that the government should look into means of improving the education level and vocational training of rural population in order to increase their productivity and efficiency in the production process. This will enable them to raise their income in rural based enterprises especially in agiculture.

It is also recommended that the government look into ways of improving women's access to, and ownership of important means of production especially land and capital. These were seen to be major hindrance to women's full participation in the development process in general and in agricultural production in particular.

Some recommendations have been made to future researchers working in the same area of study. There is need to further examine labour input in agriculture using a production function approach where land and capital are incorporated in the analysis of labour. This is because labour is just one among many production functions hence cannot be studied in isolation. Future researchers should also work into means of incorporating children in the analysis of labour input in agriculture. The study left out this aspect of household labour because of limited time and finances.

It has emerged out from the study that apart from sex and age, there were other factors that determined division of labour within the household. Future scholars should try to investigate some factors like education, urbanization and employment with an aim to finding out their role in influencing division of labour in household.

ACKNOWLEDGEMENTS

I would also like to express my appreciation to friends and teachers whose persistent faith in and high expectation of me were a constant source of inspiration in writing this thesis.

Finally, I extend my gratitude to all respondents and key informants as well as research assistants especially Mr Ali Sabatia and his family without whom this work would not be complete.

However, I am solely responsible for all the short comings in the thesis.

CONVERSION FACTORS AND SYMBOLS

1 hectare (ha)	=	2.4711 acres
1 metre (m)	=	3.3808ft. (3.28')
1 kilometre (km)	=	0.6214 miles
1 inch	=	25.4 millimetres (mm)
1 hectare	=	0.01 square kilometre
1 kilometre	=	1000 metres
1 square kilometre	=	100 hectares
1 kilogramme	=	2.2046 pounds
1 long ton	=	1.016 metric tonnes
1 metric tonne	=	1000 kilogrammes (kg)
1 Kenya Pound	=	Ksh.20
1 degree centigrade	=	1.8 degrees fahrenheit

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INTRODUCTION

CHAPTER 1

1.0 INTRODUCTION

Agriculture is still assigned an exceptionally prominent place in the development process of many developing countries. Its importance has been fostered because of inadequate mineral resources, low industrial development, and the fact that other sectors of the economy like tourism, transport and communication only serve as compliments. Many countries of the west serve as an example of how increase in agricultural production is a stepping stone towards industrial growth and economic development.

In Kenya, agriculture employs about 80% of the economically active population and generates 50% or more of the national income. Development of agricultural sector is very essential to ensure adequate food supply, employment opportunities, better living standards for the rural population. Increased agricultural production and the general development of agricultural sector can only be effective if there is a structural transformation of the production function.(Kenya 1985)

Labour is an important input in subsistence farming systems. In Kenya most of the farm work is done by hand. This has been encouraged because the costs of labour are relatively low as compared to machinery. Another reason may be land fragmentation which has made machinery use uneconomical. The characteristics of labour for instance, its mobility, education level, skills, age and sex does affect production level in agriculture.

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The division of labour within a household is an important feature in the production process. The increasing role of women as farm managers, food producers and child bearers has had a lot of effect on rural economies. Many women are still considered as housewives and mothers and not as cultivators. Some factors like the traditional ownership of property and inheritance patterns have continued to marginalise women from access to and control of productive resources like land and credit facilities. There is a greater need for data on the role of women in order to have a reasonable policy planning for rural areas.

The seasonal nature of agriculture activities lead to labour shortages that occur at certain times of the year despite the general consensus that there is surplus labour supply in rural areas. Labour shortages have been encouraged due to factors like schooling, migration, off-farm employment and low attitude of people towards farm activities. There is need to increase programmes related to labour mobility and labour productivity. However, this can only be done if the slack and peak seasons are identified. Information on who does what, why and with what consequences is also very essential in rural policy planning. Such information together with statistics related to the quantity of agricultural work per season and the time spent performing such activities by household members is very inadequate.

These features have made child labour to become less productive. However, children have remained an important source of farm labour in rural Kenya.

Male labour migration has exerted a lot of pressure on farm labour in agriculture. Their migration alters the structure of food requirements as well as the potential work input in food production. Although men who stay in urban areas contribute to the material welfare of their families, the withdrawal of their labour affects the workload of women and delays some male-dominated activities. This is an area which needs a deeper investigation. Many studies have considered the relationship between farm labour and agricultural production (Cleave 1974; Kongsted and Monsted, 1980; Barnes and Werner, 1982. However few of these studies have emphasized its implication to agricultural development. Food production absorbs a lot of labour in a subsistence economy as compared to any other activity. The manner in which labour is allocated between the farm and off-farm activities may not only affect the level of food production but also agricultural development in general.

1.1   STATEMENT OF RESEARCH PROBLEM

This study is a geographical investigation into the role of household labour allocation in small-holder food production in Ikolomani Division, Kakamega district. The production process in small-scale agriculture is affected by diverse factors. They include land, labour, capital, managerial skills and marketing. The nature of arable land, the quality and quantity of labour, the amount of capital and managerial skills determines the kind of agricultural enterprise a particular household practices. In many parts of Kenya, there is no absolute subsistence economy. Many small-holders produce crops for subsistence and a small portion is sold to improve their income levels.

In less developing countries labour has remained an important input in subsistence agriculture (Spencer 1976). Given the financial constraints especially in the purchase of agricultural machinery, a large proportion of agricultural activities in Kenya have remained labour intensive. Most of the agricultural labour is provided by the household. Rural households engage themselves in diverse activities to meet their daily food requirements as well as to improve their living standards. Apart from devoting labour to the production of food, some time is set aside for off-farm activities like household chores, children, community welfare projects, building and construction consume a lot of farmer's time which could otherwise be productively used in farm production. There is need for data on the types of off-farm activities that absorb members of rural households in order to facilitate agricultural and labour policy planning.

The labour inputs of various members of the household vary according to age and sex composition. Male members of the household are considered to provide more labour in agriculture as compared to their female counterparts and children (Murdock, 1949). This may be as a result of the variability of labour inputs of women and children and the likelihood that these inputs go into non-productive occupations, hence less easy to measure (Connel, 1977). This might not be true given the high rates of male migration and increasing number of children attending schools.

The role played by children in the production process has often been overlooked by researchers and even policy makers. Children participation in food production and other development activities is often considered less efficient and less productive.

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This may be because the lower age for the economically active population differ from one region to the other since working age is culturally determined. Although children participate in rural economics, they have often been termed as dependents. There are special characteristics of child labour, for instance their geographic immobility, their non-competitive position with other workers in most occupations and their tendency to find employment in part-time or peripheral activities.

The agricultural sector in less developing countries has often been viewed as a labour reservoir whose surplus is readily available for the Industrial sector (Fei-Renis, 1961; Schultz 1964). The advocates of this theory argue that this part of labour is wholly redundant hence its removal from agriculture will not reduce production. This may not be true in many rural areas of Kenya. There are several factors that affect the potential household labour in rural Kenya. They include children education, the increasing male labour migration and the triple-role of women as food producers, child bearers and community managers. Many rural areas are likely to suffer from labour shortage in agriculture especially during the peak seasons when the overall demand for labour is very high. There is a need to study the seasonal variation of labour in agricultural year in a view to finding out its productivity and efficiency.

High potential areas like Ikolomani Division experience seasonal labour shortages despite the increasing population, unemployment and congestion on arable land. This labour shortage which directly affects the level of food production has not been greatly considered by decision makers. An investigation into the patterns of

household labour organization and utilization could help to establish the root cause of the problem.

There has been a lot of studies on rural-urban migration (Rampell, 1970; Oucho, 1974; Owuor, 1974; Mbithi and Barnes; 1975). Most of these studies, however, have concentrated on its effect on urban economies. Although migration from rural areas reduces population pressure on arable land, it withdraws labour from the household as well as changes the structure of household food requirement. It has been established that urban relatives remit part of their income for rural household maintenance (Kenya 1977a). such income however, does not meet all the household production needs. Instead, the money is used for consumption purposes. Thus the gap that is left by migrants in terms of labour contribution in both on farm and off-farm activities is never filled.

1.2   RESEARCH OBJECTIVES

The general objective of this study is to identify and analyse factors that influence farm labour and its effect on food production.

<u>**Specific Objectives**</u>

1.　To examine labour allocation among the farm and non-farm activities

2.　To analyse the role of women in food production and agricultural development.

3.　To investigate the effect of male labour migration on food production and agricultural development

4.　To examine the role of farm size in food production.

5.　To find out the impact of labour shortages on food production.

1.3　HYPOTHESES

1.　Labour input in farm and non-farm activities is influenced by farm size and income levels.

2.　The role of women in food production is significantly associated with their marital status.

3.　Migrations education and non-farm activities do not significantly affect food production.

4　Farm size and income have a significant influence on number of hired labourers

1.4   OPERATIONAL DEFINITIONS

1.   **Household**

Central Bureau of Statistics defines a household as "a person or group of persons living together under one roof or several roofs within the same compound or homestead area, sharing a community life by their dependence on a common holding as a source of income and food which usually but not necessarily involves them eating from a common pot" (Integrated Rural Survey, 1974-75 P.20)

2.   **Household Head**

It is used to mean the senior member of the household resident in the household compound or though residing elsewhere returns at frequent intervals. When both the wife and husband are resident most of the time, the man is considered the head.   In cases where the man has died then the woman automatically becomes the head.

3.   **Division of Labour**

Refers to sexual division of labour with respect to allocation of tasks as well as the distribution of work and obligations between husband, wife, children and possibly other members of the household. (Kongstad and Monsted 1980:18).

4.   **Agricultural Development**

Used to mean production in agriculture not only in the narrow sense of raising the quantity of output per unit of input but also the introduction of new products; ; use of better farming methods, use of better farm implements,

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improvement of nutritional value of existing cash income, more leisure and improved comfort in living (Livingstone and Heinemann, 1981).

5.   **Small-holder**

A small holder is a farmer operating farms of less than twelve hectares with limited mechanization and investment in other agricultural inputs. Statistically in Kenya, a small holding is a piece of arable land ranging in size from 0.2 to 12 hectares. In this study small-holder is used interchangeably with small-scale farming and refers to subsistence farming.

6.   **Food Crops**

These are crops grown to meet the household daily food requirements although a small proportion may be offered for sale. Included in this study maize and beans were considered as major food crops because they dominate in the study area.

7.   **Cash-Crops**

They are crops grown mainly for sale and normally constitute a very limited part, if any of the farmers diet (Aketch 1990).

1.5   LITERATURE REVIEW

In traditional African societies labour was allocated to household members according to age and sex. For instance Murdock (1949) notes that "Man with his superior physical strength, can both undertake the more strenuous tasks such as lumbering, mining, quarrying, land clearing and house building. Not handicapped as women by the physiological burdens of pregnancy and nursing, he can range further afield to hunt, fish, to herd and to trade." He further notes however that; woman is at no

disadvantage in lighter tasks which can be performed in or near the home, e.g the gathering of vegetable products, the fetching of water, the preparation of food and the manufacture of utensils." He stresses gender variable as salient feature in household labour allocation.

Eicher and Baker (1982) noted that in East Africa, women are heavily involved in food production while in West Africa women play an important role in crop production and processing, trading, weaving and other non-farm activities. They further stress the importance of children aged ten to fifteen as a source of farm labour in many parts of Africa. Children work for fewer hours than adults and tend to specialise in tasks such as tending livestock, wood gathering and bird scaring.

Although the above authors have put a lot of emphasis put on the gender variable in the division of labour, many factors have been overlooked especially the changing social structures. There are several changes that have affected households in Africa. Among them is migration which has encouraged women-headed households, increasing urbanization that has contributed to the erosion of African culture and economic crisis. Today many rural households are pre-occupied with diverse socio-economic activities to meet their daily basic requirements. This has not been emphasized in their analysis of labour.

Snyden (1990) noted the importance of involving women in strategies to end hunger and poverty. Women are responsible for ensuring that adequate food supplies are available and that their families have access to enough income to purchase food if

they do not grow it themselves. Women also play important roles as labour allocators. Taylor (1985) asserts;

"Women have always known who weeds the sorghum, transplants the rice seedlings, picks the beans and tends the chickens. It has however taken a long time for the rest of the world to discover these facts".

Barber Conable, President of the World Bank noted how the arms of women hold the family together and the fact that their hands build the foundation of stable growing communities. In spite of this however, Connable asserts that development efforts have not lent enough strength to those arms, have not entrusted enough resources to these hands.

Despite efforts made by women to improve the living standards of their households, major decisions are still made by household heads who in most cases are men. Heyer (1981) noted that the predominance of males as decision makers hinders development process especially when some activities cannot be done because the male members of the household are absent. Women combine agricultural work with household chores and child care. In Tanzania for example women are thought to work harder in Ujamaa villages than men. Former President Julius Nyerere of Tanzania stressed; "In the village, the women work very hard. At times they work on Sundays and Public Holidays. Women who live in the village work harder than anybody else in Tanzania, but men who live in the village are on leave for half their lives."

Rural households form the basic units of production, consumption and marketing. The major concern is however, the need to meet the daily food requirements. Most of the labour is therefore pre-occupied in the production preparation and storage of food. The ability of the households to meet this objective depends on family size, income levels, farm size and the organizational patterns of labour as a major farm input. For instance Mock (1986) recognized the role played by individual household members in agricultural activities. He notes;

> "*Husbands and wives combine to carry on most tasks falling within the sphere of the household economy, children are drawn in to care for crops, animals and small children and combination of relatives or neighbours help each other in heavy jobs.*"

This unity within the household has been affected by the weakening bonds of marriage which has encouraged women-headed households, male labour migration, schooling and the general global economic crisis. He further stresses that if the male of the household seeks urban employment and maintains little contact with his rural family, the burden of his wife may be unbearable, agricultural production may decline and children become victims of malnutrition.

Spencer (1976) used an Integrated Agricultural Project in the Eastern Province of Sierra Leone to find out how agricultural development affected women. His major objective was to find out whether this project increased or decreased the workload of women. With a sample size of 143 households which participated in the programme, Spencer discovered that men formed a higher proportion of labour input in export crop cultivation while women did lighter work of weeding, under-brushing

and pest control. Women were however found to work slightly harder in the development projects than males and children. Although a wide range of information was collected on various aspects of women's contribution to agricultural development, Spencer overlooked the role women played as decision makers and the benefit they derive from such decisions. He also did not consider the multiplier effect of the income earned by women from agricultural activities to overall development. His analysis of the data collected was rather too qualitative.

In the study across the African and Asian continents, Boserup (1970) identified two major farming systems; male dominated and female dominated farming systems. These were categorized according to labour inputs in relation to sex. Whereas male dominated in heavy jobs and cash crop economy, women concentrated on lighter jobs especially those related to subsistence farming. She further noted the fact that women worked for longer hours or more days per week in agriculture than men. In samples collected in Gambia, men worked for less than ten hours per week in agriculture while women in Congo, Uganda and Kenya were found to work for around 25 hours per week. In all the cases recorded women were found to work more in agriculture than men. Boserup can be given a credit for having pioneered a study on the role of women in development. However, she overlooked a number of factors that influenced the division of labour. Her greater emphasis on biological attributes as the major factor behind male specific and female specific roles is far from reality.

Suda (1986) noted family labour as a dominant form of organizing labour in agriculture in Western Kenya. There was however a growing importance of hired labour whose

use depended on farm size, income and type of enterprise. She further noted that there was an increasing pressure on family labour because of schooling, migration and off- farm activities. Though a comprehensive study that covered Western Kenya, her sample size of 80 households did not adequately cover the study area. The study did explicate the role of women in agricultural development. However, only social aspects were emphasized. Suda overlooked some aspects of women in Western Kenya like their access to means of production, which were a stumbling block towards their full participation in agricultural development. The land tenure system in western province denied women the right to own land hence could not acquire loans due to lack of tangible security. Women did not make major decisions in the home despite her being farm manager.

The household is still a major source of farm labour in Western Kenya. A combination of children and male and female adults contribute to both off-farm and on-farm activities. During peak periods when the demand for labour is very high, relatives, hired labour and communal labour is used. Labour is still devoted to off-farm activities in order to supplement the family income (Kenya 1977a). Off-farm activities are done to meet both social and economic needs. They include household chores, child care, attending public meetings, communal ceremonies, trade, mining. These activities consume a lot of time which could otherwise be devoted to food production. On the other hand, they serve as an important source of income necessary for agricultural development.

Heyer (1968) established that in 14 households in Masii Location in Machakos District, the relationship between work hours on the land and off-farm work was 1:17. "Other work" was found to be more time consuming than on farm work. Off-farm-activities therefore form an important aspect of labour allocation within the household. Such activities however were undertaken in slack periods when labour demand is low. During the peak periods the demand for labour is too high such that there is no time for leisure and idleness.

There is a high correlation between household level of income and labour inputs in food production. Households with high income are likely to have larger farms, thus require higher labour inputs than their counterparts with low income. High income households buy labour and non of their family members sell labour. The poor farmers on the other hand, sell their labour throughout the year to earn a living (Nguyo, 1966; Gwyer, 1972; Kongstad and Monsted, 1980).

Livestock husbandry is a major farming activity which depicts division of labour between sexes. Traditionally livestock grazing was a male job whereas milking of cows was done by women at the homestead or males at the cattle camps?. Barnes and Werner (1982) found out that a large percentage of labour in Livestock was provided by men and children. There was however an increasing number of women who grazed their cattle. This was because of the high rates of male migration and school participation by children. Women thus, combined household chores with cultivation and animal husbandry.

Yotopolous (1967) in his study on allocative efficiency in economic development saw labour as an important factor in the production process. Effective use of labour was necessary in increasing agricultural production. He argued that, agricultural intensification through lowering the marginal productivity of labour raises the labour costs per unit of output. This in his view, led to food price increase and consequently raised agricultural surplus which was essential in providing money to pay for changes in agriculture. Agricultural surplus can then be used to finance the development of other sectors.

The assumption that the introduction of agricultural machinery creates unemployment by replacing agricultural labour seems to have very little relevance to Kenya. Many small holders have not sufficiently invested in mechanization due to several reasons. Kongstad and Monsted (1980), noted the low costs of labour to machinery. The investment in machinery is not sufficient and the transport and maintenance costs are very high and complicated in rural areas. This, they stress, is because the supply for cheap labour is sufficient for the existing production in many areas. They further noted that even the large scale farmers may with changing cultivation patterns have enough cheap labourers to maintain many of the work process. Despite their comprehensive research, Kongstad and Monsted overlooked factors like negative attitude to farm-work, migration and schooling which have reduced the number of labour supplies in rural areas hence has created the need for machinery use.

In their study on village and labour situations in developing countries, Connel and Lipton (1977) noted the difficulty in deciding the lower age for the economically active

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population. 'Working Age' in most cases has a cultural definition. They stressed, that

the characteristics of child labour like their geographical immobility (due to their

dependence on their parents), non-competitive position with other workers in most

occupations and their tendency to find employment in part-time or peripheral

activities, makes child labour less efficient and less productive. Women participation

in productive economy was also thought to be less than that of men because of

pregnancy and lactation and their pre-occupation with domestic chores. This had

severe impact on possible change in agriculture because it reduced the actual size and

duration of labour.

Melhuus (1984) in his study on tobacco production and family labour in Cornentes,

Argentina, emphasized the need for more research on the nature of crops grown, their

labour demands and the patterns of division of labour that emerges in any production

process. Tobacco growing in Argentina was found to be labour intensive and only a

few of the most labour-consuming operations had been mechanized. About 100

work days were necessary to cultivate 1 hectare of tobacco. However, tobacco

cultivation was not the sole pre-occupation of the household. There were a series of

household chores which had to be done to meet the physical and social requirements

of individual household members. He further stressed the need for careful planning

and extreme flexibility in the organization and co-ordination of tasks that fall within

the sphere of the household.

Although this study singled out household labour as a major source of farm labour,

other forms of labour like hired, communal were overlooked. The study also

concentrated on the mere description of labour input in tobacco in various seasons without relating this to the overall production.

Oluoch (1978) in his study on 48 small holder tea farms in Kericho and Kisii, analyses labour utilization in tea farms. Using Pearson correlation coefficient and Cobb-Douglas production function, he found a positive correlation between tea labour and tea acreage, total labour and hired labour. He also observed that, the output of tea was significantly immensely correlated with illness and off-farm work. Although there was an increasing use of hired labour, labour supply was not a problem and it highly complemented capital in production function. Oluoch, however, overlooked the effective use of leisure and assumed that there was time for idleness.

Correlation and repression analysis have increasingly been used in studies related to labour organizational patterns and allocation. Kamau (1981) used regression analysis in the study of land and labour productivity in Kiambu District. Hanger (1973) and Abbot (1974) used Spearman's rank correlation in their studies related to women contribution to household economy. To date, multiple regression analysis has not been widely used in the geographical investigation of labour use in food production.

The foregoing literature has emphasized the importance of labour in general and household labour in particular in the production process. A few of these studies have related the labour input to cash crop production. The area of food production needs deeper investigation because much of the labour in subsistence economy goes to the production and processing of food.

1.6 THEORETICAL FRAMEWORK

Production functions in agriculture include land, capital and labour. The combination of the three factors affects both the quantity and quality of agricultural products. However it has been established that the most significant input in subsistence agriculture is labour. (Spencer, 1976), Collier (1990) observed that; "Labour is the main resource of poor people and poor economies. Its allocation is, therefore, of central importance to both the level and distribution of income." The quality and quantity of labour supplied in agriculture not only affects the level of products, but also determines the general welfare of the household.The rural family can be considered a labour reserve (Spencer, 1976, Kongstad and Monsted, 1980). Individual household members contribute their labour to various farm activities on part time and full-time basis. Household members who reside on the farm provide their labour on both on-farm and off- farm activities throughout the agricultural year. However, those who reside elsewhere only contribute their labour during the peak seasons. Included here are school going children whose absence exerts a lot of pressure on the household in terms of off-farm labour. Relatives who stay in urban areas do contribute indirectly to household labour requirements by remitting part of their income for both consumption and productive purposes.

Apart from household labour, hired labourers form an important constituent of farm labour. Hired labourers are seasonal and come from within or out of the village. They render their services in exchange for cash money or material gains. There are also regular hired labourers who are employed to work on the holding on a regular basis to perform either off-farm or on-farm work. The determination, age, skills and sex of

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these labourers influences the quantity and quality of food produced. Their contribution however, depends on how effectively the household head assigns them duties and whether he takes care of their general welfare in terms of payment and working conditions.

It is assumed in this study that the organizational patterns of household labour not only affects the level of food production but also determines agricultural development at a farm household level. The use and non-use of other farm inputs like insecticides, improved seeds and farm machinery is determined by the education and income level of the household. Many rural households devote most of the available labour to food production and animal husbandry. In areas where cash crop production is a priority, much of the labour goes to the cash crops. Non-effective use of household labour often leads to starvation and malnutrition.

There are several socio-economic factors that influence labour allocation on farm and off-farm activities. The most outstanding factors include farm size, family size, age, income levels and education. In high density areas many households practice intensive farming systems hence there is hardly any time left for leisure and idleness. Such practices like zero-grazing,inter-cropping and agroforestry require more man-hours per day as compared to extensive farming activities practised in low density areas.

The conceptual framework presented here is based on four assumptions;

a. Labour is the most important input in subsistence farming and that most of this labour is provided by the household.

b. There are male and female dominated farming activities. The male members of the household devote their labour in clearing, animal husbandry, timber extraction, while the females pick vegetables, collect firewood, fetch water, prepare food and plant, weed and harvest crops.

c. The organizational patterns of household labour greatly affects the level of food production.
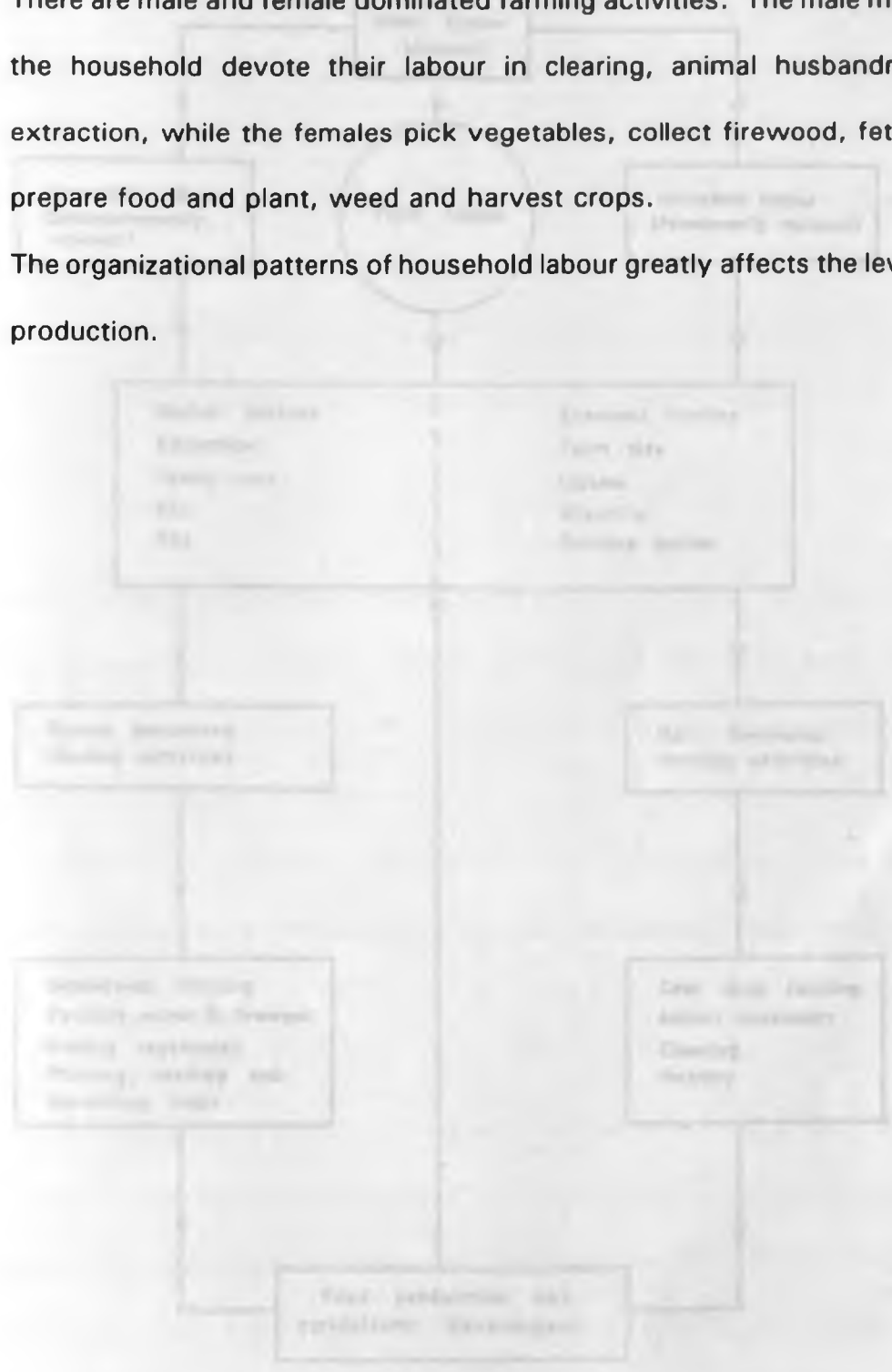
Fig 1   A Conceptual Model for Household Labour Allocation in Food Production


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                        ┌──────────────────┐
                        │   Hired  labour  │
                        │    (Amount)      │
                        └──────────────────┘

┌──────────────────────┐    ╭──────────╮    ┌──────────────────────┐
│ Household labour     │    │          │    │ Household labour     │
│ (Semi-permanently    │    │Farm labour│   │ (Permanently resident)│
│ resident )           │    │          │    │                      │
└──────────────────────┘    ╰──────────╯    └──────────────────────┘

┌───────────────────────────────────────────────────────────────────┐
│ Social  factors                │  Economic  factors                │
│ Education                       │  Farm size                        │
│ Family  size                    │  Income                           │
│ Sex                             │  Migration                        │
│ Age                             │  Farming system                   │
└───────────────────────────────────────────────────────────────────┘

┌──────────────────────┐              ┌──────────────────────┐
│ Female  dominated    │              │ Male  dominated      │
│ farming  activities  │              │ farming  activities  │
└──────────────────────┘              └──────────────────────┘

┌──────────────────────┐              ┌──────────────────────┐
│ Subsistence  farming │              │ Cash crop farming    │
│ Fetching water & firewood │         │ Animal husbundry     │
│ Picking  vegetables  │              │ Clearing             │
│ Planting, weeding and │             │ Forestry             │
│ harvesting crops     │              │                      │
└──────────────────────┘              └──────────────────────┘

              ┌────────────────────────────────┐
              │ Food  production  and          │
              │ agricultural  development      │
              └────────────────────────────────┘
```

1.7 RATIONALE OF THE STUDY

Labour is not only an important component in the production process, but it is a necessary input. A large proportion of labour in agriculture is provided by the rural households. Features of household labour for instance their education level,their mobility,skills, age and sex composition greatly determines the level of production in any enterprise. There is a greater need of information on how labour is allocated and utilized at a household level. This will provide a rich insight in the production capacities of farm households. It also serves as a stepping stone towards rural labour policy formulation as well as the implementation of agricultural based development programmes.

The role of women and children in agricultural production has often been overlooked by many scholars and even policy makers. This has been encouraged by lack of national statistics on their contribution to rural economic development. African women have been called "Invisible farmers of African Agriculture". There is need for more data on women managers. Women can fully be absorbed in the economy only after their roles have been clearly identified. This is one of the major concerns of this study.

Off-farm activities occupy a large proportion of farmer's time. What farmers do when they are not working on the farm, the duration of these activities, reasons behind involvement and the type of compensation received can serve as an important basis for the design and implementation of rural based development programmes. Identifying the dominant off-farm activities among rural households is essential in

policy formulation. The information is also important in understanding the various opportunities open to a rural farmer and measures which could be taken to improve his production systems.

Ikolomani Division has been chosen because of the researchers familiarity with the area and its farmers. This will help overcome problems like language barrier, suspicion and financial constraints. The area is one of the densely populated divisions in Kakamega District. The findings will provide an overview of problems facing agricultural development in other related areas of Kenya.

1.8 SCOPE OF THE STUDY

There are many factors that determine labour allocation in food production. These factors range from the level of economic development of a country to the nature of the labour market. This study, however, limits itself to the socio-economic factors at a farm household level. The factors discussed include the households type of farming system, the age and sex composition. These factors not only influence labour allocation in the production process, but also affects the general level of agricultural development.

Agriculture involves the cultivation of diverse crops and the rearing of livestock. In this study, greater emphasis is given to food production because it is assumed that this area absorbs a large proportion of labour in Western Kenya. Food is a wider term and involves the cultivation of crops and keeping of animals for subsistence. However the study concentrated on the production of maize and beans which are the dominant

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staple crops in the study area. Other subsistence crops were not given weight because of the difficulty in measurement and their limitation to only a few farmers.

Although all members of the household contribute their labour in food production, a greater emphasis is put on women labourers. Factors influencing their roles and contributions in agriculture are examined in details.

The study limits itself to Ikolomani division of Kakamega District because of time and financial constraints. Two locations which form up the division are considered; namely, North and South Idakho.

1.9   ORGANIZATION OF CHAPTERS

Chapter one contains a detailed introduction of the research. It consists of research objectives, hypotheses, literature review and conceptual framework.

Chapter two is a general background to the study area. The physical, agricultural and demographic characteristics to the study are discussed.

Chapter three introduces the methodology used in collection and analysis of data. It also gives a detailed outline of the problems encountered in the field.

A detailed analysis of factors affecting household labour allocation in food production is given in chapter four. Factors discussed include farm size, family size, migration, age, sex.

In chapter five, women are singled out and their role in food production is discussed. Included here are factors that hinder them from participating fully in economic development.

Finally chapter 6 contains a summary of research findings, conclusions and recommendations to government and other researchers.

CHAPTER 2

2.O BACKGROUND TO THE STUDY AREA

This chapter attempts to give a detailed background to the study area. The physical and human factors that affect food production are discussed.

2.1 LOCATION AND EXTENT

Ikolomani Division is located on the Western corner of Kakamega District, Western Province (fig 1). The division is accessible from the Kakamega Kisumu road, 22km from Kakamega town. It lies between 0°35" N, 34°25" E. It covers an area of approximately 349 km².

The Division is one of the administrative units of Kakamega District. It is bordered by Lurambi Division to the North, Vihiga District to the south, Khwisero and Emuhaya Divisions to the West and East Isukha Location to the East (fig. 4).

This division comprises the administrative units of Idakho South and Idakho North. The locations are further sub-divided into several sub-locations namely; Sabane, Iguhu, Shitoli, Lukose, Shisejeri, Shivagala, Shikulu, Shibuname, Madivini and Shiseso. (fig. 5)

Fig. 2: Location of Kakamega District in Kenya

Source : Survey of Kenya

Fig. 3: Kakamega District Administrative Boundaries (showing Location of Ikolomani Division)

Fig. 4: Ikolomani Division Locational Boundaries

LURAMBI

BUTERE

SHINYALU

NORTH IDAKHO

N

KWISERO

SOUTH IDAKHO

IDAKHO

VIHIGA

LEGEND
- District Boundary
- Division Boundary
- Location Boundary

5   10 Kms.
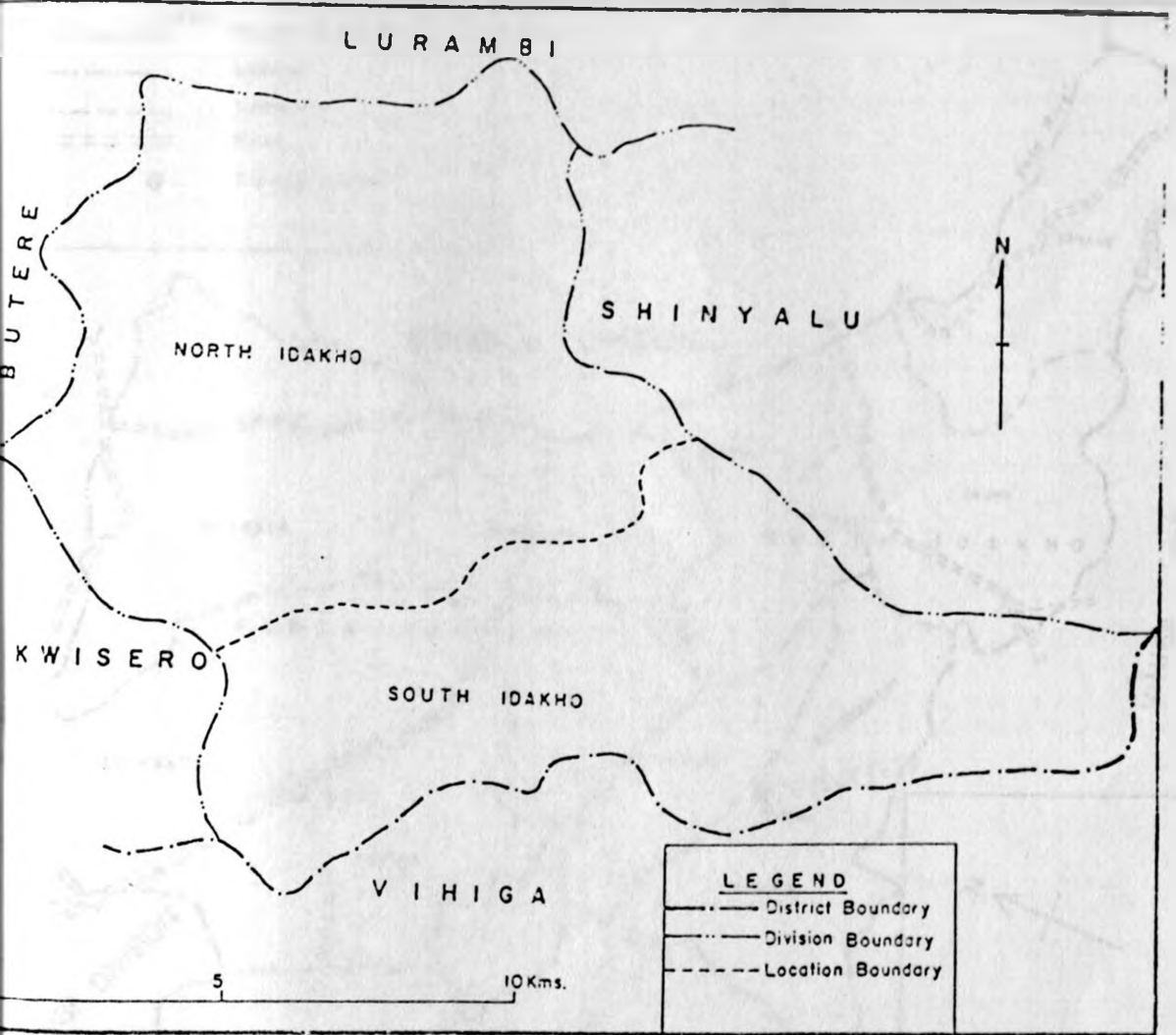
: Adapted from Kakamega D.D.P. 1989—1994

Fig. 5: Administrative Sub-Locations of Ikolomani Division
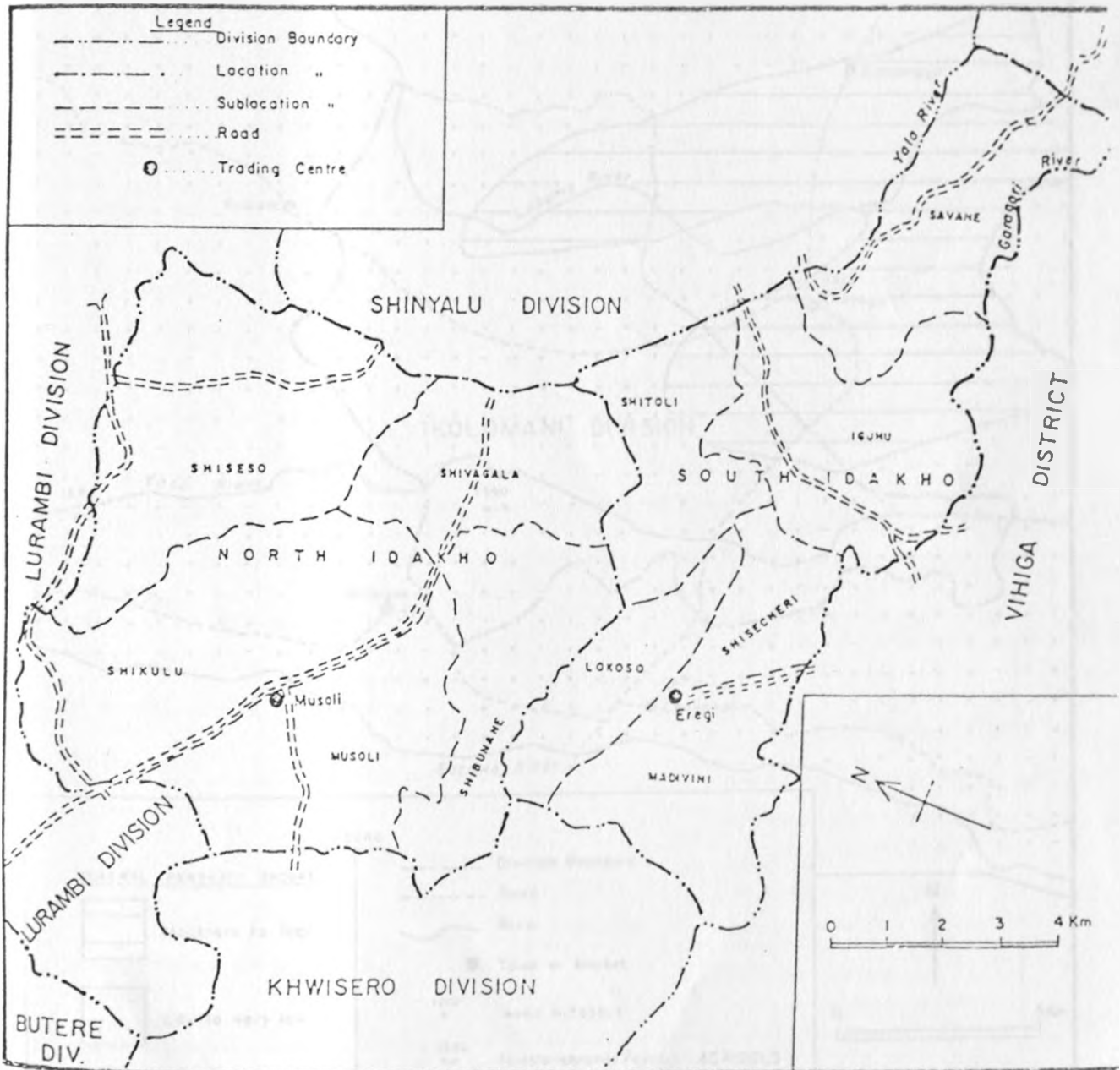
Source : Ministry of Lands, Dept of Survey

Fig. 6: soil map of ikolomani division
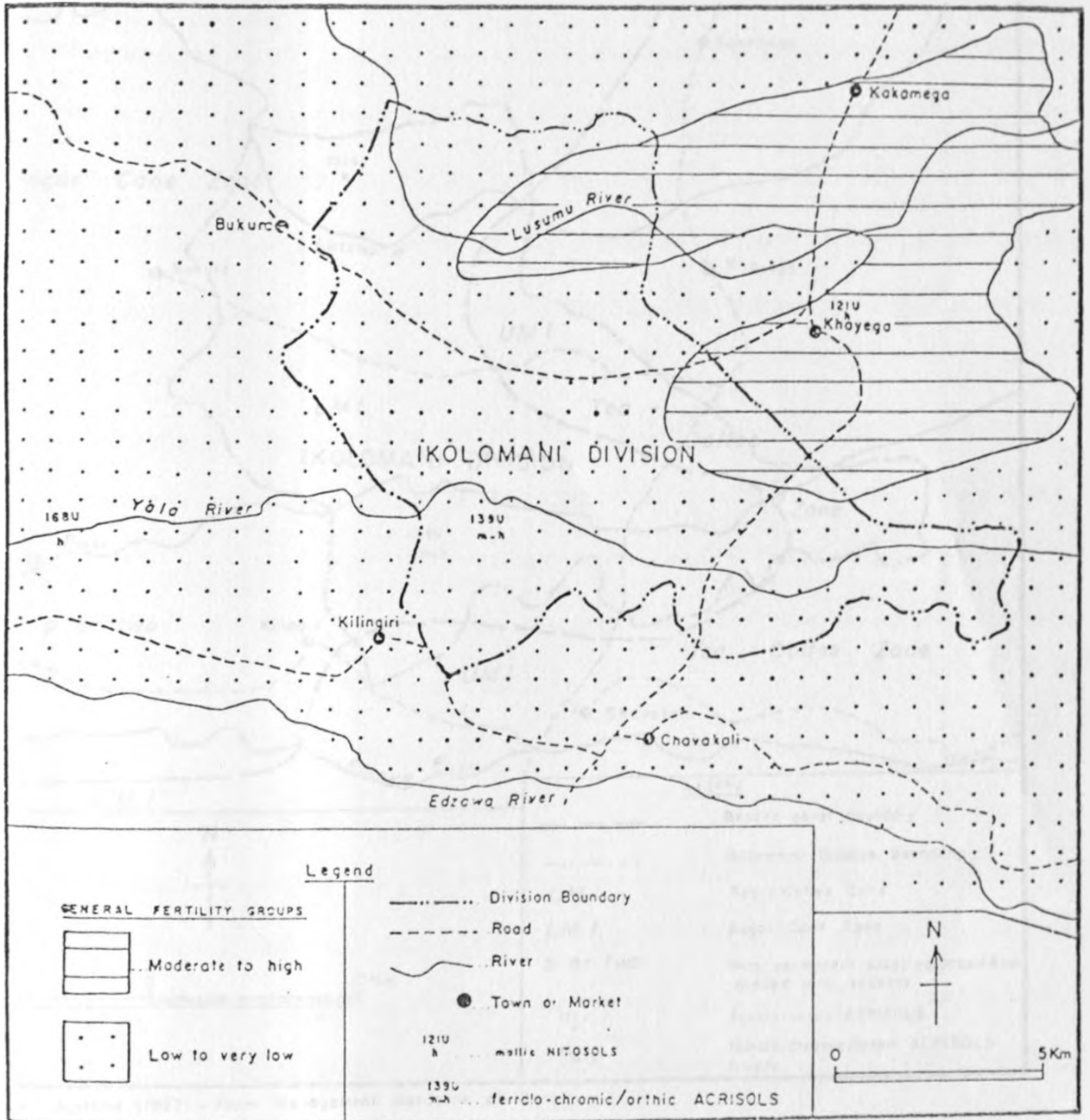
Source: Jaetzold (1982) — Farm Management Handbook of Kenya

Sugar Cane Zone

Kakamega

151U h

Lusumu R

Bukura

Khayega

UM I

LM I   Tea -

IKOLOMANI DIVISION

Coffee

Zone

Yala   River

139U m-h

p or two   Kilingin

Tea - Coffee Zone

Chavakoli

Edzawa River

UM I

N

0   5   10 Km

Legend

— · — · — · — · —	Broken zonal boundary
————	Ikolomani Division Boundary
UM I	Tea - Coffee Zone
LM I	Sugar Cane Zone
p or two	With permanent cropping possibilities divided into seasons
151U h	ferralo-orthic ACRISOLS
139U m-h	ferralo-chromic/orthic ACRISOLS
	Roads

Source : Joetzold (1982) - Farm Management Handbook of Kenya

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2.2   PHYSICAL ENVIRONMENT

2.2.1 Geology and Soils

The rocks in the area belong to Kavirondo and Nyanzian systems. The main rocks of this series include grits, conglomerates and mudstones. Mudstones include all the fine grained members of the series. They are usually dark grey or purplish soft rocks. They dominate the raised, well drained areas in the division. Grits are medium to dark grey rocks dominant in the lowland areas of the division.   There are also some remnants of Andersetic turfs of the Nyanzian systems which produce toothed exposures. They are mostly found in the Southern part of the division.

The soils of the areas have greatly been influenced by the geological setting. The soils are well drained, dark brown sandy loams.   However some hilly areas are dominated by well drained, very deep dark reddish brown to dusky red fable clays. These have been formed from basic igneous rocks. The soils support a variety of crops (Jaetzold and Schmedt 1982).

2.2.2 Physiography and drainage

The study area forms part of the undulating plains of the Lake Victoria basin. It lies between altitudinal range of 109.2 and 1346.2 metres. There are numerous hills and valleys that are major remnants of faulting and vulcanicity. The hills include Kimilili, Masiyenze, Eregi, Shikulu etc. The hills which are made up of granitic rocks have remained outstanding in lowland areas because of resistance to erosion.

Rivers Yala and Isiukhu are the major rivers that form drainage pattern in the area. There are numerous small streams that feed them. They include Galgol, Lilongo, Ikamelo, Ikanguvu, Shianda and Shisanya. The streams occupy rejuvenated valleys which have relatively steep sides dropping suddenly from the flattish divides to the stream beds. The rejuvenation of these rivers must have been caused by renewal of movement involving general uplift along the Nandi fault in fairly recent times which has tilted the peneplain surfaces in their present slopes towards the south west.

2.2.3 Climate and Vegetation

The amount and distribution of rainfall is associated with altitude. The altitude of the area ranges between 1500 and 1800m above sea level. There are two seasons of maximum rainfall; March to July and September to December. The rainfall is high in the hilly areas as compared to the lowlands. The annual average rainfall ranges between 1250mm to 2000mm. The rainfall varies in its duration and reliability in a given season.

Temperature varies between mean 32 degrees centigrade maximum of 26 degrees centigrade and mean minimum of 14 degrees centigrade and 18 degrees centigrade. (Jaetzold, R. *et al* 1982).

The amount of rainfall and its distribution in agricultural year affects the quantity of agricultural work and also determines the peak and slack periods. The rainy season is associated with heavy agricultural work on part of the household. Household members work for longer hours and also seek the assistance of hired labourers and

relatives. During the peak seasons, planting, weeding and harvesting, more time is devoted to farm work. Many off-farm activities are performed during the slack periods.

Apart from influencing the work load, the temperature variations determine the amount of time spent performing certain farm and off-farm activities. The mean annual duration of sunshine ranges from 7 - 8 hrs per day while solar-radiation received is between 300-400 calories per cm² per day. This greatly affects the amount of time spent performing certain activities. The hotter the day, the lesser the amount of work. Relative humidity ranges between 80% and 90% in the morning; 70% and 80% in the afternoon (Mugewa 1988).

During the hot seasons, household members tend to work for shorter hours on the farm. The morning hours are devoted to farm activities while the afternoons are set aside for off-farm activities. The cool seasons however, are associated with long on farm work.

The vegetation of the area is greatly influenced by soil distribution, relief and human settlement. Other factors which have either modified or reduced natural vegetation include burning, grazing, arable agriculture, building and construction and communications. There are however some remnants of natural tree and grass species. The area is dominated by scattered-tree grassland type of vegetation although in high areas there exist thickets. The tree species include *Erythrina abysinnia (Murembe)*, *Acacia themeda (Shikangania)*, *Cissus rofundifolia (Mutondo)*

and *Capparis tomentosa* (*Musinya*) grow luxuriously along the river banks where soils are fertile and well drained.

2.3 HUMAN ENVIRONMENT

2.3.1 Land Tenure and land use characteristics

Land tenure system is an important aspect in food production. It determines the size and distribution of farms and also influences the land use patterns. Land ownership also affects investment risks a farmer undertakes. The table below represents the major types of land ownership prevalent in the study area.

Table 1:   Land tenure systems in Ikolomani Division
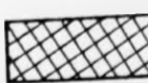
	Number of Farms	Percentage
Inheritance	80	80
Purchase	15	15
Tenancy	2	2
Lease	3	3

Source: Socio-economic survey of Ikolomani household labour allocation.

Fig. 8 : Calender of farm operations
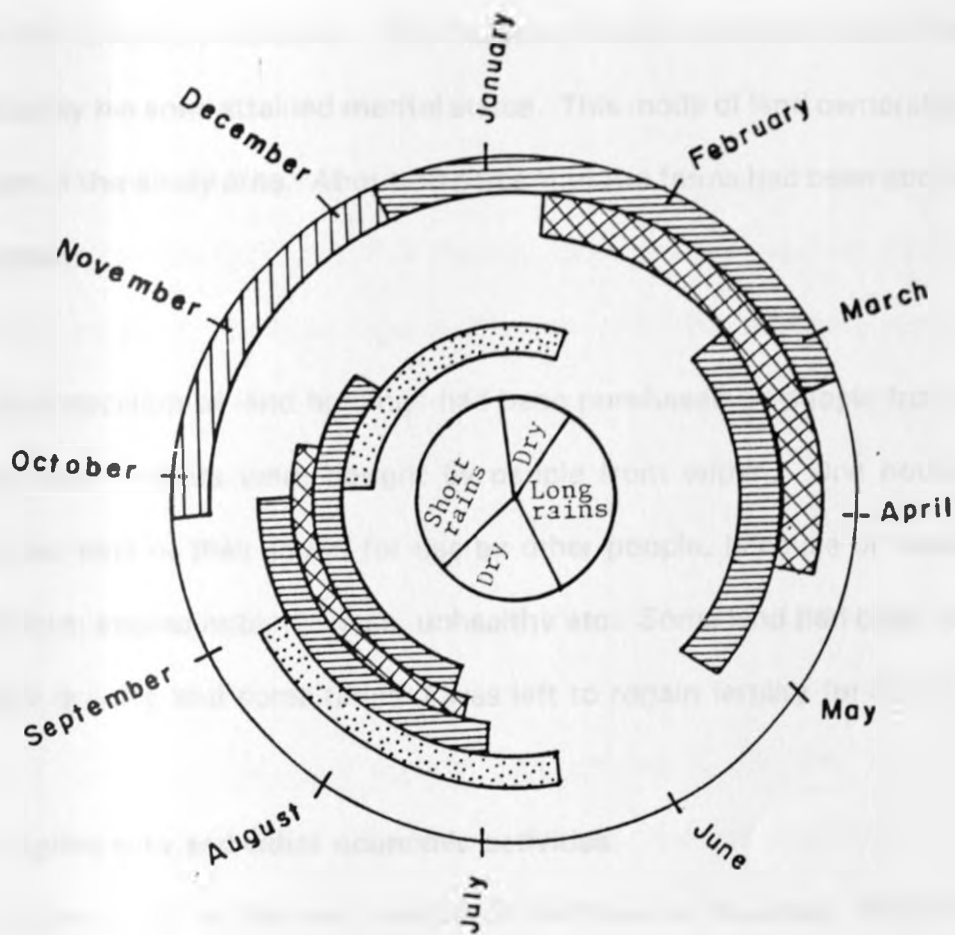
Keys

Land Preparations

Planting of maize and beans

Weeding of maize and beans

Harvesting of maize

NOTE: Beans are harvested earlier between May and June.

Source : Field survey.

Traditionally land belonged to household head (man). Upon his death the land was subdivided amongst his sons. The household head could also sub-divide the land immediately his sons attained marital status. This mode of land ownership is the most common in the study area. About 80 percent of the farms had been acquired through this system.

A small proportion of land holdings had been purchased by people from outside the division while others were bought by people from within. One household heads leased out part of their farms for use by other people, because of reasons such as limited farm implements, laziness, unhealthy etc. Some land had been left fallow for livestock grazing and some times it was left to regain fertility for future use.

2.3.2 Agriculture and other economic activities

Arable agriculture is the main source of livelihood in the area. Mixed farming is a major practice. Farmers grow a variety of subsistence crops and keep animals to supplement their daily food requirements. The areas are densely populated hence the fragmented small farms are wholly devoted to food production with a few farmers growing cash crops.

Subsistence crops dominant in the area include maize, *Zea mays* (*matuma*), beans, *Phaseolus vulgaris* (*makanda*), bananas, *Musa sapentum* (*Maremwa*), Sweet potatoes, *Ipomoea batatas* (*mabwoni*), sorghum, *Sorghum vulgare* (*Mavele*), finger millet, *Eleusine coracana* (*Vule*), cassava *Manihot esculenta* (*Mioko*), Arrow roots (Cocoyams)

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Colosasia antiquorum (*Tsinduma*). Maize and beans are the most dominant crops grown by all farmers. The two are inter-cropped due to limited land.

The agricultural landscape is also dominated by various fruit trees. They include pawpaw, *Carica Papaya* (*Lipopo*), Mangoes, *Mangifera indica* (*muembe*), passion fruit, *Passiflora epulis* (*matunda*), Guava *Psidium guayaba* (*Shibela*), Avocado *Persea gratissim* (*Mukado*). The fruits are normally sold on local markets for money to maintain the household.

Cash crops grown in the area include tea, *Camella sinensis* (*Majani*), Coffee *Coffea arabica* (*Ikahawa*) and Sugarcane, *Saccharum officinarum* (*Mikhonye*). A small portion of household labour is devoted to cash crop production. Income from cash crops is used for household maintenance and agricultural production.

Households not only devote their time to agricultural activities but also participate in other economic activities on part time basis.

Mining of gold in river, beds, trade, fishing, building and conservation, carpentry are practiced in order to raise household income. A small proportion of household heads (20 percent) perform these activities on full-time basis while their wive's manage the farms. The mining of gold for instance has attracted a large proportion of the young men. The activity which has been going on since colonial era has been a major source of livelihood for many households. The nature of production has discouraged many youth from migrating to urban centres for white collar jobs. Many feel that the

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activity is more paying than other activities. However the gold fields have been exhausted due to over exploitation.

2.3.3 Agricultural Labour

Three types of labour are used by farmers in the study area. They include family labour, casual labour and communal labour. Household labour is the most popular because it is cheap. However its efficiency and productivity is limited by factors such as migration, schooling, old age and poor health.

Casual labour though important is utilized only in the peak periods when the demand for labour is high. Labour is hired from within the villages or neighbouring villages on part-time basis. The labourers are normally paid in cash or in kind. The increasing use of this form of labour is due to factors that assent pressure on household labour.

Communal labour is mobilized by youth-groups, women groups and church organizations. This form of labour is cheaper compared to casual labourers.

2.3.4 Population and Demographic aspects

Population and demographic characteristics are very important in determining the available human resources that can be utilized in agricultural production as well as the consumption needs.

Ikolomani Division has one of the highest population in Kakamega District after Vihiga, Mumias, Emuhaya, Kabras and Tiriki (1979 census). Overpopulation is a significant

aspect of the area. This has not only affected the general welfare of the household in terms of living standards; but it has also contributed to land fragmentation, overgrazing, soil erosion, inter-cropping and generally low agricultural production. These factors have led to high rates of migration to urban areas in search of wage employment. Out migration on the other hand has exerted a lot of pressure on households in terms of labour available for farm production.

The division has a population of over 140,000 and land area of approximately 349 square kilometres (1979 census). The average density is about 402 persons per square kilometre. Some areas like Shitoli and Shivagala sub-locations have over 500 persons per square kilometre. The difference in density can be attributed in variation in soil fertility,vegetation and relief (table 2).

Table 2 Population by sex, sub-location, area and density in Ikolomani division

Sub-locations	Male	Female	Total	Km²	Density
Shivagala	3596	4028	7624	12	588
Madivini	2755	3123	5878	4	1312
Lugose	1556	1804	3360	11	291
Shikulu	5259	5540	10799	33	319
Iguhu	3005	3615	6620	15	420
Savane	3223	2543	4766	13	342
Shitoli	2232	2654	4886	9	515
Shibuname	2255	2653	4908	12	400
Shiseso	3359	3588	6947	19	348
Shisejeri	1855	2111	3966	5	693
Ikolomani	66526	74122	140648	349	402

Source: Kenya Population census 1979

Table 3 Population by sex sub-location and density in Ikolomani Division

Sub-Location	Male	Female	Tatal	Density
South-Idakho	18247	21084	39331	667
Iguhu	3996	4643	8639	540
Savane	2998	3255	6253	625
Madivini	3574	4177	7751	775

Lukose	1958	2387	4347	543
Shisejeri	2551	3009	5560	927
Shitoli	3170	3613	6783	754
North-Idakho	20495	22771	43266	534
Musoli	3610	3868	7478	534
Shikulu	3810	4148	7958	379
Shivakala	4899	5635	10534	810
Shiseso	4658	5088	9746	464
shibuname	3518	4032	7550	629
Ikolmani	38742	43855	82597	590

Source: Kenya Population census 1989

There is unbalanced sex ratio in the area. The female population tend to be higher than the male population. The imbalanced sex ratio has tended to affect labour allocation on basis of sex. This implies that there are more women performing farm work and other household chores as compared to men. For instance in 1979 there were 60526 males against 74122 females in Kenya (Republic of Kenya 1979).

Half of the population in the division consists of children below 15 years. Many of the children of school going age. This greatly affects the household labour available

for farm activities. Most children provide their labour on seasonal basis hence exerting a lot of pressure on the adults.

There was low educational standards in the study area. 40 percent of the total household heads had no formal education background, 50 percent never went beyond primary education and only 10 percent had secondary education. The low literacy level has had a negative effect on the livestock and crop production techniques. Many farmers still use traditional methods of farming probably due to ignorance as a result of low educational level.

Religion as a social activity plays an important role in agriculture. Church activities affect the labour available for farm production. Churches also work as important machinery for transmission of information necessary for agricultural development. Church groups also assist in provision of labour during peak periods. These groups are important in relieving households of heavy work and are preferable because of their low costs.

2.3.5 Justification of the choice of the study areas.

The background to the study area provides a framework to the analyses attempted in the forthcoming chapters. An overview of the physical and socio-economic conditions of the area gives a foresight into the nature of agricultural activities and potential labour supply in food production.

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2.4 SUITABILITY OF THE STUDY AREA

The whole of Kakamega District continues to experience a situation of fluctuating agricultural production. Many reasons have been given for instance the declining soil fertility because of poor agronomic practices, increased population pressure on arable land, financial constraint and the ever changing weather conditions. Ikolomani division is not an exception and unlike other parts of the district, the problems here are more pronounced. The division has very high population but surprisingly it suffers from intense labour shortages during the busy agricultural seasons. The common reason given is the fact that this area is a source of labour migrants to urban centres. There may be other factors which cause these labour shortages. There is a need for deeper investigation given the importance of labour as an input in the agricultural production process.

Another reason for selecting the division was because of its homogeneity in the crops grown, climate parameters, vegetation and soil distribution. The area also has homogeneous cultural traits which was an advantage in this kind of study. The population in the study area as made up of luhya who have. More so, the area is very accessible on the Kisumu-Kakamega road hence very little time could be wasted in trying to locate it.

Generally speaking, the author was familiar with the area and its population because of another earlier research on the reasons for contraception use and non-use in 1991. It was easier to communicate with farmers without them being suspicious.

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CHAPTER 3

3.0   RESEARCH METHODOLOGY

This chapter attempts to give a detailed discussion of the procedure used in identifying the sources and nature of data, methods used in data collection and analysis. It also identifies the problems of research and provides their solutions.

3.1   SAMPLING DESIGN

It is universally recognized that selection of study area and sampling design is a problem (Taylor, 1977; Salmon and Hanson, 1964). However, after a pilot survey of Kakamega District, Ikolomani Division was selected as the area of study due to reasons indicated in chapter one. The study area is divided into two locations, North and South Idakho. Prior to the actual field study, the author intended to cover the whole division. However due to the financial and time constraints, four sub-locations were chosen considering the area's ecological setting. Two sub-locations Iguhu and Shitoli were chosen from south Idakho and shivagala and Shibuname from North Idakho. The pilot survey indicated that farmers in this region are organized under a coffee cooperative society. However, the society could not be used because the data needed involved both cash crop and subsistence farmers. Maize and beans production was given a priority because they are grown by almost all farmers in the area.

Since it is the sample size and not the population that determines the accuracy of the sample (Blalock 1972; Dixon and Leach 1977), stratified random sampling procedure was employed to select asample size of 100 farms. A list of all the land parcels in each sub-location were obtained from the District Land Registry. Using random sampling without replacement, twenty five farms were randomly selected from each

of the four sub-locations. The plot numbers and their respective owners were identified and the questionnaire administered to household heads in this case the farm owner. In cases where the farm owner was unavailable the researcher either interviewed his representative or booked for appointment with head of household.

3.2 DATA COLLECTION PROCEDURES

3.2.1 Secondary Data

Secondary data from the Libraries Ministry of Agriculture, Central Bureau of Statistics and Meteorological stations was collected from the national, district and divisional levels. The data included statistics on agricultural production, migration and climatic characteristics of the study area were.

3.2.2 Primary Data

The collection of primary data involved the administration of a questionnaire. The questionnaire contained open-ended questions. A questionnaire is a very important tool in the collection of primary data in any field survey (Mosher, 1958). However in order for it to be useful, it needs to be well designed. In order to obtain relevant information, supervisors and interviewers should be well trained and the data should be properly processed and analyses (Brooks, 1949).

The data for this study was collected between October 1992 and february 1993. the questionnaire was written in English. The author, however, translated the questionnaire to Luhya language to ensure uniformity in the way questions were

understood. The responses were then recorded in English. The questionnaire was designed to collect information on farmer's age, family size, farm sizes, income levels, farming system, crop and livestock production and labour utilization.

Apart from the structured questionnaire, the author had open discussions with household heads, hired labourers on matters related to labour in agriculture. Through these discussions more pertinent factors affecting household labour allocation in food production were pin pointed.

In the course of the field survey, personal observations were made. this formed an important part of data collection procedure.

3.3 METHODS OF DATA ANALYSIS

3.3.1 Simple Regression Analysis

Simple regression analysis was used to test the relationship between food production and labour input, farm size and labour input, income level and number of hired labourers. The simple regression model is given by the following formula:

$$Y_i = \beta_0 + \beta_i x_{1i} + E_i$$

Where

Y_i = Dependent variable (Maize and beans produced in Kg/hectare in 1992)

X_1 = Explanatory variable (Labour input, farm size, income levels etc)

β_0 = A constant term

β_i = Regression coefficient

E_i = Residual\error term

3.3.2 Multiple Regression Analysis

Labour allocation in food production is influenced by many factors combined together. It is therefore important to find out the most important variable that influences the dependent variable. For this reason multiple regression analysis is used to find out the relationship between labour input and a set of independent variables. This technique has been used widely in studies related to labour organization in cash crop production. However the same technique has not been used in studies concerning food production which s the cornerstone of agriculture in developing countries.

Kamau (1981) used the technique to analyse land and labour productivity of small and large scale coffee farms in Kiambu district. Oluoch (1988) used the technique in analysing labour utilization in small holder tea farms in Kericho District. However, most rural households are pre-occupied with meeting their daily food requirements hence most of their labour is devoted to food production as well as household chores. The technique is used in this study because of its importance in the choice of independent variables and prediction purposes (Drapen and Smith, 1966). The model is given by the formula:

$$Y_i = \beta_0 + \beta_i X_i + \beta_2 X_{2i} .. + \beta_k X_{ki} + e_i$$

Where

Y_i = Dependent variable (Observed maize and beans yields in kg/hectare in 1992)

β_0 = A constant term

β_i = The regression coefficient (1, 2, ..., k)

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X_i = Explanatory variables (labour input, income migration, family size, etc

E_i = Residual\error term

The values of the dependent variable (y) were predicted by the equation presented below and are assumed to have been generated by the linear models outlined above.

$$Y = b_0 + b_i X_1 + b_2 X_2 .. + b_k x_k$$

Where

Y = Predicted food production in kg/acre

b_0 = A constant term

b_i = The regression coefficient (Estimate of bi)

x_i = Explanatory variable [i = (1, 2, ..., k)]

The assumptions of the regression analysis model are diverse and have been discussed by many scholars among them, Heady and Dillon, 1972, Ferguson, 1977; Lewis-Beck, 1980; Loeth and McTarish, 1989; Poole and Ofarel. The assumptions are as follows:-

a. It is assumed that the relationship between the dependent and independent variables is linear, plus an error term (disturbance term). If this assumption is violated then the following happens:

i. Wrong regressors. This refers to omission of relevant dependent variables or inclusion of irrelevant independent variables.

ii. Non-linearity occurs where the relationship between the dependent and independent variable is not linear.

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iii. Changing parameters, which mean that βo and βi, are not constant during the period within which data was collected.

b. The expected value of the disturbance term is zero, meaning that the mean of the distribution from which the disturbance term is drawn is zero E N(0,1) When this assumption is violated then there is a biased intercept.

c. The disturbance term have a constant variance and is not correlated with one another. If violation occurs then we have:

i. Heteroscedasticity. This means that the error variance is not constant over all the observations.

ii. Auto-correlation. This is when the covariance of the error term is not equal to zero.

d. Observations on the independent variables can be considered fixed in repeated samples. If this assumption is violated then we have

 i. Errors in variables

 ii. Auto-regression

 iii. Simultaneous equations.

e. It is further assumed that the number of observations is greater than the amount of independent variables and that there is no linear relationship between the independent variables. If this assumption is violated then we have multi-colinearity.

Given the violations that are likely to occur, the data analysis procedure involved some transformation of data. Further, the sample size was adequate enough to avoid some

violations that occur due to small sample size. The data for this study was analysed

using the SPSS package at the University of Nairobi's Geography department.

3.3.4 CORRELATION ANALYSIS

Correlation coefficient (r) was used to bring out the relationship between variables.

The coefficient which ranges between 0 and 1 indicates whether there is a significant

relationship between variables. A figure near to 0 shows a weak relationship while

a figure near to Unity indicates a strong relationship. Instead of running simple

Regressions for all the variables,Correlation Coeffiecient was used to check the

strength of interrelationships between different socio economic variables.

3.4   RESEARCH PROBLEMS AND THEIR SOLUTIONS

An agricultural study especially on labour allocation requires a long time series data

in order to examine the re-allocation of labour in different seasons. Labour allocation

in food production is not only seasonal but tends to vary according to the household's

socio-economic set-up. It is however very difficult to carry out a day-to day survey

throughout the agricultural year. In view of this problem, the author relied heavily on

the respondents' memories. The questionnaire was designed to enable the collection

of data in the whole year.

There is a problem in measuring the amounts of food produced per household because

much of the food is consumed on the farm before the actual harvest. This problem

has been brought about by limitation of land and generally low productivity. Many

households consume their food on the farm and hence there is normally little or no

food to be harvested. There is also a problem in measuring foodstuffs like bananas, cassava, fruits and vegetables given that they are eaten directly from the farm and thus farmers hardly know how much they produce in a season. Crops like maize, beans, sorghum and millet are stored hence easier to measure. This indicates why maize and beans were used in this study.

For the purpose of policy formulation or evaluation, there is need for data not only on different agricultural activities, but also on its productivity. It is however, very difficult to measure the two given that productivity is influenced by a variety of factors. The amount of food produced was used as an indicator of productivity of time.

A large proportion of farmers in the study area are illiterate hence there was a problem in collecting data on 'time' and 'work' concepts. Farmers rarely keep records of time spent on the farm and their conceptualization of work varies. Farmers excluded time spent walking to different farms while others did not consider household chores as work. In order to get accurate figures on time spent on farm and off-farm activities, calculations were done using the farmer's day to day account of activities and their duration. This was then recorded in man-hours per day. A pilot survey in the area also familiarized the author on units of measurement generally understood and used in the area.

Land ownership and tenure, income levels, savings and expenditure are important aspects in small units of production. However, farmers were not willing to disclose

such information because of suspicion. To encourage the respondents to give accurate information on the variables, there was privacy in interviewing, judicious cross-checking in private. The respondents were also assured that their information would be treated impersonally and confidentially. Questions which were misunderstood were cross-checked either through re-interviews or repetition through different ways.

CHAPTER 4

4.0 PRESENTATION OF EMPIRICAL DATA ON THE FACTORS AFFECTING HOUSEHOLD LABOUR ALLOCATION IN FOOD PRODUCTION

This chapter attempts to analyse some of the factors that influence household labour allocation in food production. Examined here is the allocation of labour among the farm and non-farm activities, farm size, family size, migration, age, income levels and hired labour. These factors not only affect the organizational patterns of household labour, but also determine the overall level of production

4.1 LABOUR ALLOCATION ON FARM AND NON-FARM ACTIVITIES

Household labour formed a large proportion of farm labour and labour in non-farm activities. Husband, wife and children provided their labour to the production of food as well as to various activities that fell within the sphere of the household. Some time was also spent on income generating activities and community welfare projects.

About 70 percent of-farm labour was provided by the wife of the household. The rest of the labour was a combination of the husband, children, relatives and sometimes hired labour. Women were found to work approximately five hours on the farm and 3 hours on off-farm activities, especially those falling within the domestic sphere. In the peak season, women worked for over 10 hours on the farm. The rest of the time was not accounted for. This was the time which was probably spent walking to the farm, gossiping, walking to the well etc. Off-farm activities which consumed a reasonable amount of the women's time included household chores of fetching water, collecting firewood, picking vegetables, child care, washing and preparing food.

The men who stayed in the village were farmers by occupation. However, they spent lesser time on the farm as compared to other activities. About 2 hours per day were spent on farm work, while 3 hours were spent in income generating off-farm activities. Men were found to be very busy during land preparation. In this season they spent much more time clearing the land, burning and ploughing. These were specifically male jobs. After this was done the rest of the work was left for the women to organize. The males only came in to assist when needed. Activities which engaged a large percentage of the male population included building and construction, mining of gold from river beds, forestry, carpentry, and small-scale retail trade.

Children from the age of six were assigned lighter tasks in order to reduce the work load of their parents. Between the ages of 6 to 15, children were able to perform agricultural tasks as well as other tasks that fell within the domestic sphere. Age and sex were major factors which determined the divisionof labour. Girls were assigned duties of collecting water, firewood and child care. The young boys on the other had were concerned with all duties relating to the cattle. They grazed, watered and also took the cattle for treatment. Milking was either done by the mother or father. If the two were busy then one of the young boys took the responsibility. The children offered their labour on part-time basis because of high rate of school attendance. Most of the work was done after school and during weekends.

The quantity of labour supplied on the farm and off-farm varied with seasons. The time spent performing these activities also depended on the household as a unit of production. Some households were more complex than others. Generally, the peak

seasons of planting, weeding and harvesting were very busy, hence there was a high

demand for labour. During this time, more time was allocated to farm-work than

elsewhere. Both husband, wife and children devoted their labour to activities related

to the farm. Off-farm activities were either overlooked or done in the evening.

However, during the slack periods, many people concentrated on off-farm activities.

About 80 percent of the household cited harvesting as the most labour intensive work

in the agricultural season. There was a high demand for labour to facilitate the

removal of ripen crops from the farm, dry them on the sun and eventually store. This

was done between August and October. A large percentage of farmers (70 per cent)

planted crops twice in agricultural year. By July the first harvest was over in order

to plant again for harvesting in December or January. Households reported use of

hired labour in the peak seasons. There was also the use of communal labour and

relatives. However the use and non-use of these forms of labour depended on other

factors as will be discussed later.

Several reasons were given for the involvement in off-farm activities by household

members. They included; need to supplement household income, to meet the daily

food requirements, to satisfy other physical and social needs. The participation in off-

farm activities for economic reasons was stressed by the males. The females

emphasized the desire to meet their households daily food requirements. This reasons

made them to spend longer hours on the farm than elsewhere.

4.2 RELATIONSHIP BETWEEN INCOME, HOUSEHOLD LABOUR AND FOOD PRODUCTION

Small-holder rural households are complex economic units engaged in diverse activities to meet their economic needs. The analysis of small-holder income is very problematic, bearing in mind the many sources involved in its generation of household income.

In this study, household income was build on four components (table 2); crop and livestock income, income from relatives and off-farm employment. The reference period for all income was the year 1992.

4.2.1 Crop and Livestock Income

At least all the households in the sample had grown some crops and about 80 percent kept some livestock. An average farmer grew two major food crops, maize and beans. Other crops grown included bananas, potatoes, finger millet, cassava, arrowroots and yams. Maize ranked number one among all households, followed by beans, The dominant cash crop was coffee, although most farmers had uprooted because of the low benefits derived from it. Tea was a second major cash crop grown by only 20 percent of the population.

In order to estimate income generated by crop output, there was an estimation of total crop produced in kilograms per acre, total crop consumed and total sales minus production costs in the preceding year. The official price for maize purchases was 10 shillings per kilo and 15 shillings per kilo of beans. However it should be noted that

coexisting with the official market is unofficial market where prices are slightly higher and subject to spatial and temporal variations. Households gave varying figures for maize and beans prices. However, this did not affect the study's total estimate of household income because most of the unofficial prices were local transactions between households. The production costs, was an estimate of total farm inputs purchased and not purchased. Included here was labour provided mostly by the household, fertilizers and seeds. The mean production cost was 300 shillings per household. The mean gross value of crop sales averaged 800 shillings per annum hence net income from crop sales was 500 shillings per annum.

Livestock income is rather a problematic component to measure. This is because of the mix-up of regular outputs such as milk and its seasonal fluctuations. The scale of the problem is discussed in "Kenya, Integrated rural survey 1 (1977a) which indicates that some 20 percent of households surveyed ended up with a negative farm income for the year. This could be as result of difficulty in the estimation of livestock income. This study estimated the income from Livestock from the total sales of live livestock, money got from sale of livestock products like milk, eggs and skins. Livestock income accounted for only 05 percent of the household income.

Non- farm earnings was derived from a variety of activities. All households interviewed reported some labour input in activities other than the farm. The income generating activities include small-scale retail trade, building and construction, mining, carpentry, knitting etc. These activities were done on part-time basis, but more time

would be devoted to them in the slack periods. A small percentage of household income (15 percent) was derived from these activities.

Remittances received from urban relatives formed an important component of household income. Urban relatives remitted a reasonable amount of money to their rural households for production and consumption purposes. The quantity of the remittance depended on the nature of enumeration of the job. The study reveals that 10 percent of rural households income is accounted for by remittances. This supports the findings of the Integrated Rural Survey (Kenya 1977a).

Total household income was derived by taking the average of the four components. Mean total household income was 2,686 shillings per annum. The income ranged from 245 to 13350 shillings. There was a mode of 500 shillings and a standard deviation of 2875.46. More than half of the household income was derived from crop output. The typical rural farmer was poor and only depended on his crops for survival. Poor harvest meant little or no income. This is slightly higher than the findings of the first integrated Rural Survey (IRS - I) which found that 90 percent of small holders have an income of less than KShs. 1500 per adult equivalent per year, 45% have income of less than 500 per adult equivalent per year which is barely enough to provide adequate caloric intake and 15% had negative cash balances (Smith 1978). This variation could have been caused by a few incidences of rich farmers who had bought large pieces of land in Settlement Schemes. Their incomes were much higher since they practiced large scale farming.

TABLE 4 Sources of Household Income

SOURCE	PERCENTAGE
Crop Output	60
Livestock	05
Remittance from Relatives	10
Non-farm Earnings	15
Off-Farm Employment	10
Total	100

Source: Socio-economic survey of Ikolomani household labour allocation.

4.2.2 Income and Labour Allocation

Household income played an important role in determining the organizational patterns of household labour, the quantity of hired labourers and the use and non use of communal labour.

About 17 per cent of the households interviewed had high income of over 5000 shillings per annum. There was a strong correlation between income per household and the number of hired labourers. A correlation coefficient of 0.32 indicates the significant relationship between hired labour and income. Households with high income tended to hire more labourers as compared to the low income households whose members sold labour throughout the year. High income households hired an average of 8 labourers in peak seasons.

The increasing use of hired labour among high income households could be explained by several factors. Such households had either household head or spouse engaged

in off- farm employment. This created a need for hired labour which performed most of the off-farm and on-farm activities in their absence. There was also a high level of schooling whereby their children went to boarding schools away from home. This was unlike the low income households whose children attended nearby schools hence were available for some work in the evening and over the weekends.

Income also influenced the size of the farm a household had. There was a positive relationship between income and farm size (r = 0.3). The average farm size among high income households was slightly high (3.54 acres) compared to the total average farm size of 2.18 acres. High income households had extra money to purchase land elsewhere as well as meet their household's basic requirements. A large farm size also called for more labour input in terms of hours worked per day as compared to small farms.

Income not only affected labour input but also determined the total amount of food produced per household. About 38 per cent of the variation in food production was explained for by households income. There was a strong relationship between household income and farm output. A correlation coefficient of 0.37 clearly indicates the importance of the income in determining the overall food produced. High income households produced an average of 1536 kilograms of maize and beans per annum.

Household income was used to purchase some farm inputs like seeds, fertilizers, farm implements. Some money went towards paying of school fees for the children while part of it was used to meet other basic necessities for example, health needs and

purchased food stuffs.Farmers wholly depended on their crops for survival. Involvement in off- farm activities was to ensure food security in case of crop failure.

4.2.3 A Test of Hypothesis

The results of step-wise multiple regression were used interpretation and discussion of results to test the hypothesis that "Labour input in farm and non-farm activities is influenced by farm size and income levels".

The foregoing findings indicate the importance of Household income in influencing both labour allocation in food production and total amount of food produced per household. A coefficient of determination (R^2) of 0.4 was used in the testing of hypothesis. The hypothesis is adopted at 0.05 level of significance. Income determined the number of hired labourers. The Total amount of time spent on the farm increased with income.

4.3   THE ROLE OF AGE IN HOUSEHOLD LABOUR ALLOCATION

The age of household head ranged between 27 and 80 years. There was a mean of 53.5 and a standing deviation of 12.5. 76 percent of the household heads were aged between 40 and 60 years while the rest (24 per cent) were either below 40 or above 60 years. This is a clear indication of migration of able-bodied people to urban centres. There was a strong correlation between migration and age. A correlation coefficient of 0.62 shows the strong relationship between the age and migration levels. Aged household heads reported a high number of migrants who were either

their sons or daughters. This was unlike young household heads whose sons and daughters were still young hence in school and staying with them.

Age of farmers also determined the size of the household hence defined the household labour available and potential labour supply. The correlation coefficient between age of household head and household size was 0.35.

The age of the farmer is very important in influencing the agronomic practice. Young farmers were known to easily adopt modern methods of farming while older farmers tended to retain traditional methods of cropping and livestock husbandry (Obara, 1983). The fact that many young people had migrated for white collar jobs in urban centres meant that agriculture would be stagnant. Older farmers could not easily adopt scientific methods of farming due to illiteracy as well as their tendency to stick to traditions. The aged population was also less energetic hence could not perform heavy duties. There were high incidences of fields lying fallow among the aged farmers because they could not manage the work involved in making it productive, did not have money to hire labourers. Such farmers rented part of their land to neighbours.

Age was an important factor in defining roles among household members. The less energetic members of the household mainly young children between ages 6 and 13 and the aged above 60 years were assigned lighter tasks especially those that fell within domestic sphere. They were also allocated lighter agricultural tasks like bird

scaring, removing maize grains from cobs. Other tasks included grazing, child care and guarding the homestead when everybody else is in the fields.

The young energetic men and women between age 25 and 35 were assigned heavy agricultural tasks. Men were responsible for clearing and digging virgin land, ploughing, felling trees and digging terraces. The females of this age planted crops, weeded, harvested and performed domestic work.

Food production was however not significantly correlated with farmers age. Age explained for only 0.7 per cent of variation in crop output. This is because it was the accessibility to the necessary production resources that determined the farm practices. Older farmers were seen to perform well in agricultural activities with the necessary facilities especially capital and land. Younger farmers though enterprising, were handicapped by poverty which still dominated in rural Kenya.

4.4 FARM SIZE

The size of land holdings was measured in hectares. Farm size was a major variable that determined the quantity of labour and the overall production of the household. The average land holding was 2.18 hectares. There was a mode of 2, a standard deviation of 6.52 and a variance of 4.25. About 25 percent of farms were below 2 hectares. 61 percent of the farms ranged between 0.80 and 2.02 hectares. This was found to be very small in comparison with the large family sizes of 8.

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The study reveals that 80 percent of the households had inherited land from their parents or grand parents. The remaining 20 per cent had either bought or rented land. About 50 per cent of the farmers interviewed had registered their farms and only half of this possessed title deeds.

The traditional land tenure system had encouraged land fragmentation whereby farms had been reduced to uneconomical size. The individual land ownership required that a father sub-divides the farm amongst his sons. As this trend continued, the land holding became smaller and smaller hence affecting the overall production level. Rich farmers purchased land in the neighbourhood while the poor farmers used the small holdings intensively. A small proportion of farmers had bought land in Lugari, Lurambi and other settlement schemes.

The study reveals a high level of land intensification. Every small piece of land was utilized. There were very few incidence of fallow land. An average farmer divided the land into various portions. Half of the farm was devoted to the cultivation of food crops. The rest fell under grazing, homestead, kitchen garden and small proportion to cash crops. There was also a high level of inter-cropping. Maize was grown together with beans, cowpeas and sometimes sorghum or millet. The kitchen garden was devoted to bananas which were grown together with vegetables (Onions, tomatoes, kales, pumpkin etc).

The study reveals a strong relationship between farm size and total crop output. Production was seen to increase with increase in farm size. About 24 percent of the

variation in crop output was explained for by farm size. A coefficient of determination of 0.24 is a clear indication of the importance of farm size in the production process. The remaining 76 percent could be explained for by physical factors like soils climate relief deseases and pests relief .there are other socio-economic parametes not examied in this thesis which are importand in influencing food production.Such factors include the level of education of the farmer, capital input, and farming methods etc.

There was a high inequality in land distribution. Despite the fact that a large proportion of farmers had small farms of below 3 hectares, there were some farmers (0.9 percent) who had 4.04 and more hectares. It was noted however that these farmers had purchased land elsewhere especially in neighbouring settlement schemes within the district and in Uasin Gishu, Nandi and Trans Nzioa Districts. Farmers who purchase land elsewhere had extra income and believed that it was an investment. Others bought farms in order to supply to their sons.

4.4.1   A Test of hypothesis

"Farm size and income has a significant influence on number of hired labourers."

In order to accept or reject this hypothesis, a test was done by use of coefficient of determination (R^2) and the correlation coefficient. Farm size was found to be an important factor determining not only the use of hired labour but also influencing the total amount of food produced. There was a positive correlation between farm size and the number of hired labourers ($r = 0.25$). Households with large farm sizes tended to hire more labourers than their counter parts with small farms. Members of rich households worked extra hard on the farm and did not sell their labour elsewhere.

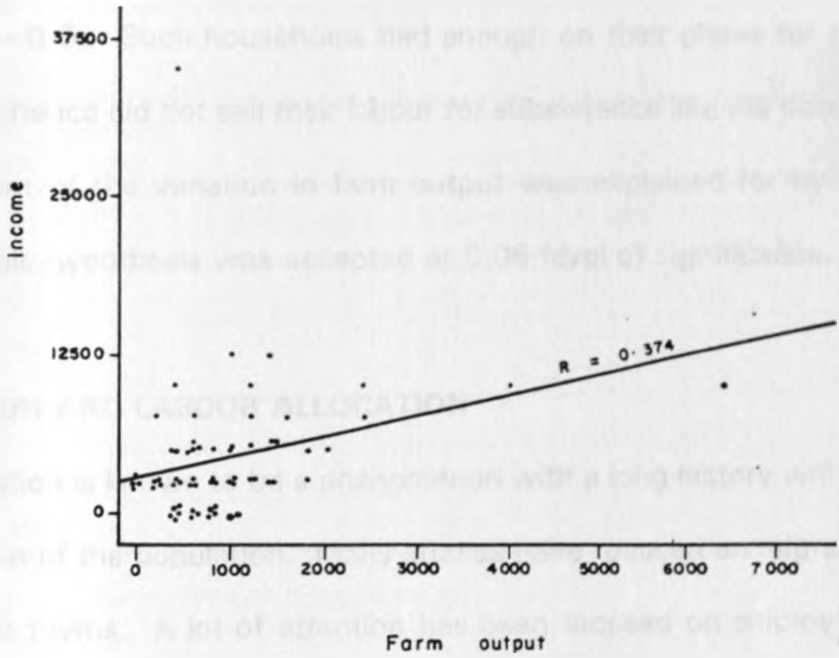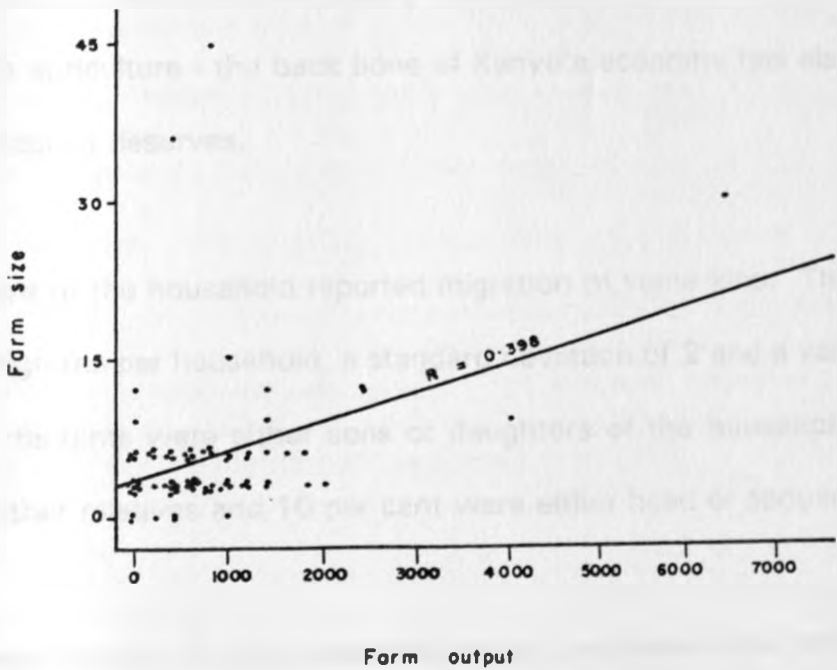Fig. 9 Relationship between household income and farm out-put.

Fig. 10 Relation ship between farm size and farm out-put.

This could be explained by the fact that farmers with large farms also tended to have high incomes ($r = 0.3$). Such households had enough on their plates for the whole agricultural year hence did not sell their labour for subsistence like the poor farmers. About 24 percent of the variation in farm output was explained for by farm size ($R^2 = 0.239$). This hypothesis was accepted at 0.05 level of significance.

4.5   MIGRATION AND LABOUR ALLOCATION

In Kenya, Migration is known to be a phenomenon with a long history which affects a large proportion of the population. Many studies have focused on migration using data collected in towns. A lot of attention has been focused on employment as a reason behind rural-urban migration. Other themes which are recognized as important in African economies like the increasing pressure on arable land and its effect to agricultural production have not been deeply investigated. The effect of migration on labour supply in agriculture - the back bone of Kenya's economy has also not been given the emphasis it deserves.

Some 90 percent of the household reported migration of some kind. There was an average of 2 migrants per household, a standard deviation of 2 and a variance of 4. 80 percent of migrants were either sons or daughters of the household head, 10 percent were other relatives and 10 per cent were either head or spouse.

The most common reason for migration was to seek employment for the sons while daughters were reported to have married either within or outside the district.

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TABLE 5   Reasons for Migration and Destination of Migrants (percentages)

DESTINATION	REASONS FOR MIGRATION				
	TO SEEK WORK	MARRIAGE	SHORTAGE OF LAND	OTHER REASONS	TOTAL
Nairobi	40	10	07	03	60
Other Major Town	15	03	01	0	19
Local Town	05	02	0	02	09
Another Village	05	05	02	0	12
TOTAL	65	20	10	05	100

Source: Socio-economic survey of Ikolomani household labour location.

Migrants kept a close link with their rural households. Only one quarter of those who had migrated had never returned to visit their people. One half were reported to visit the village frequently while one quarter visited them once in a year. Probably during Christmas and Easter Holidays. The study also reveals that 70 percent of the migrants who had gone to seek employment remitted part of their income for household maintenance. The quantity of the remittance however depended on whether the migrants were employed or not and the nature of remuneration. Apart from money there was also material support for example household goods like utensils, clothing, farm implements and purchased foodstuffs.

About 80 percent of the migrants were young people aged between 30 and 35 years. Most of them wanted white collar jobs elsewhere. There was also a high tendency of male heads of household to migrate for better income in urban centres. This had

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encouraged a high percentage of women-headed households (26.3 percent). More so, there was increasing pressure on women as decision makers, producers and reproducers.

Migration created a big labour supply gap that could not be easily filled. Migrants who otherwise could positively contribute to agricultural development, disregarded it in favour of white collar jobs. The more people migrated from the household, the greater was the need to hire labour. The relationship between migration and number of hired labourers was high. There was a correlation coefficient of 0.41. Migration of males made many agricultural tasks to lag behind. Traditionally women were not allowed to plant trees hence with absence of many men from the farms, agro-forestry could hardly be practised. Without this practice the soils continued to detoriate thus reducing their productivity.

Women whose husbands and sons had migrated had very heavy work loads. They combined both household chores and farm activities. They also performed heavy male dominated jobs like clearing land, burning and felling trees. This was because hiring labour to perform such heavy duties was very costly. They (women) preferred to use the money for subsistence and perform the work themselves.

4.6   HOUSEHOLD SIZE AND LABOUR ALLOCATION

Small-holder agriculture in Ikolomani division heavily relies on family labour. The average household size was 8.9. Household size ranged between one and 23. The large household size could be explained by practices of polygamy. A large percentage (35) of households ranged between six and eight.

A large household was very much valued in Western Kenya. This was because parents believed that their children were a source of wealth. Daughters made their parents wealthy through dowry while sons got jobs in urban centres hence remitted part of their income to their parents. The size of the household was a very important source of labour. It determined the use and non-use of hired labour. Large families used their children and even relatives' labour. There was little or no need of hiring labour unless children were in school or many members were staying elsewhere. Small Families hired labourers to assist in both off- farm and on farm work.

TABLE 6   Household size by Frequencies

HOUSEHOLD SIZE	NUMBER OF HOUSEHOLDS	PERCENTAGE
1	1	1.05
2	2	2.11
3	2	2.114
4	4	4.21
5	5	5.26
6	14	14.74
7	13	13.68
8	7	7.37
9	8	8.42
10 +	39	41.05
TOTAL	95	100.00

Source: Socio- economic survey of Ikolomani household labour allocation.

Children from the age of six were capable of performing some duties either on the farm or in domestic sphere. They were assigned lighter agricultural work. However many children of school going age attended schools hence affecting the quantity of labour available for both farm work and domestic work. Only 45 percent of the households had no children attending school. The rest 55 percent had at least one or more children in schools. The high level of schooling could be explained by the government policy of free primary eduction and the milk scheme. The other reason could be the belief that education was the only way to upward social mobility

TABLE 7   Number of Children in Schools by Households

No. of Children	Frequency	Percentage
1	12	12.63
2	12	12.63
3	14	14.74
4	06	06.32
TOTAL	54	54.07

Source: Socio-economic survey of household labour allocation.

4.7   HIRED LABOUR

Hired labour formed an important component of farm labour in Ikolomani division. The study reveals an average of 4.5 hired labourers per household. However the use and non-use of this form of labour depended on seasons and some other factors like farm size and the household income levels. This tended to back the views held by Cleave (1974) that hired labour in small farms in Kakamega constituted about 13 percent of farm labour.

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A small proportion of households (17 percent) hired no labour. The rest 83 percent reported some cases of hired labour in peak seasons. Labour was hired on part-time basis. There were more cases of hired labour in high income households as compared to low income. Farm size also influenced the number of hired labourers per season. Harvesting season was the busiest in agricultural year. The demand for labour to facilitate the removal of ripen crops from the farm was very high. The other busy seasons were land preparation and planting and weeding.

TABLE 8   Number of Hired Labourers by Frequencies

Number	Frequencies	Percentage
0-3	45	47.4
4-7	25	26.3
8-11	13	13.7
12-15	06	6.3
16 +	06	6.3
TOTAL	95	100

Source: socio-economic survey of ikolomani household labour allocation.

The table indicates that a large proportion of households (47.4) hired one to three labourers. This is due to the high cost of hired labour, making it unaffordable to many households. Labourers were either paid in cash on in kind. Women labourers were paid 15 shillings per day while males were paid 20 shillings per day. This however tended to vary with nature of work. In cases where the farmer had no money, an agreement was reached on whether the labourers could be paid in form of maize,

beans or a bunch of bananas. Since those who sold their labour were mainly poor farmers, many preferred exchanging labour for subsistence.

As indicated earlier there was a high correlation between the size of the farm and the number of hired labourers. Farmers with large farms hired a large number of labourers. Many activities took place on large land holdings. Activities like poultry, zero grazing of graded cows, cash crop and food crop cultivation required more hours per day as compared to mono-culture. Poor farmers who owned small pieces of land grew only food crops and kept one to two cows. These required a small quantity of labour which could be provided by the household.

Migration was found to correlate strongly with number of hired labourers (0.41). Migration withdrew labour from the household hence creating a gap which was substituted by hiring labourers.

The number of hired labourers was strongly correlated with farm size and income. This leads to the acceptance of the hypothesis that the" use and non-use of hired labour depended on farm size and income levels". The hypothesis was adopted at 0.05 level of significance. The foregoing findings indicate a significant relationship between farm size and hired labour.

Fig. 11 Relationship between Income,and number of hired laboures.
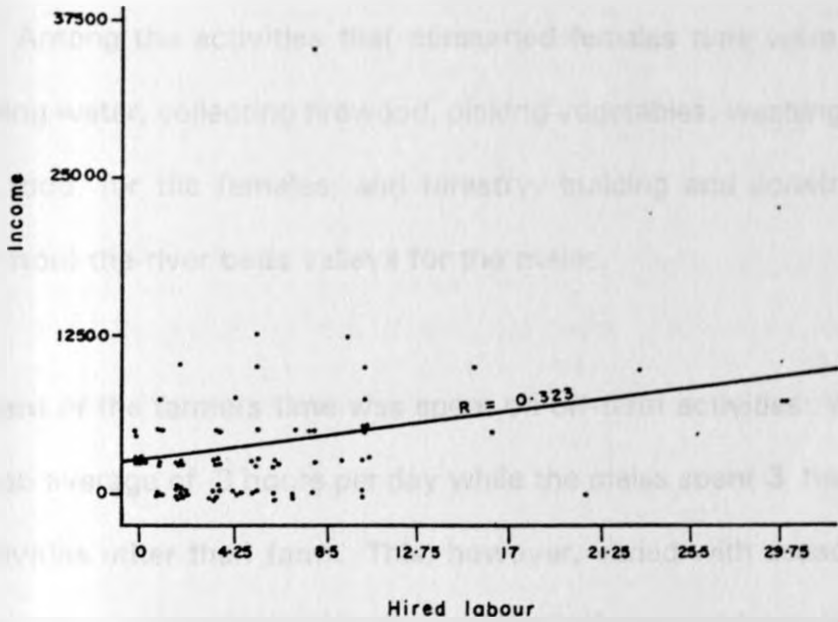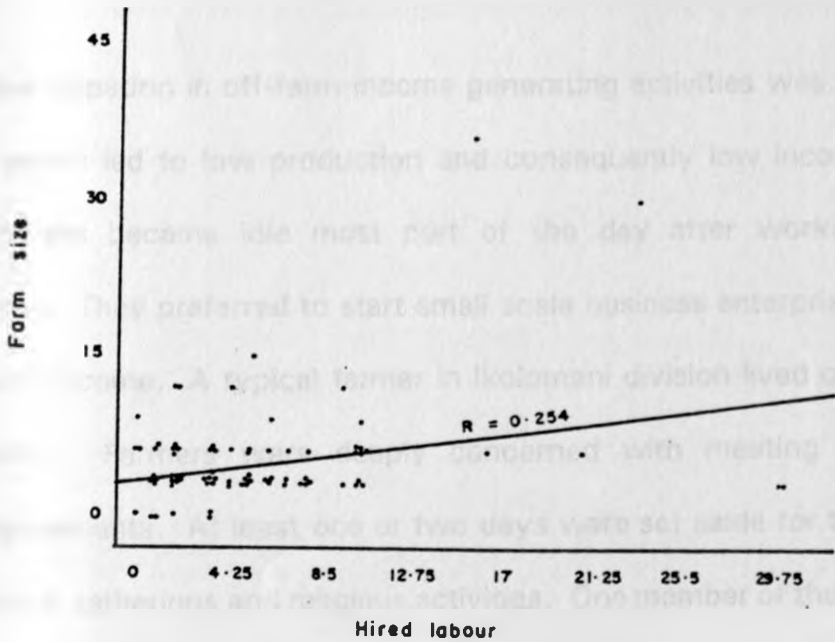

Fig. 12 Relationship between farmsize and Number of hired laboures.

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4.8 OFF-FARM ACTIVITIES

Off-arm activities took a large proportion of farmers time. There was a need to involve in other activities other than farming in order to meet other household requirements. Among the activities that consumed females time were household chores of fetching water, collecting firewood, picking vegetables, washing, child care and preparing food, for the females; and forestry, building and construction and mining of gold from the river beds valleys for the males.

About 30 percent of the farmers time was spent on off-farm activities. Women The females spent an average of 3 hours per day while the males spent 3 hours per day performing activities other than farm. This, however, varied with seasons. In the busy seasons farmers overlooked off-farm activities in favour of farm work. In the slack period more time was spent on off-farm activities in order to generate extra income to meet the households daily food requirements.

An increasing participation in off-farm income generating activities was because of land shortage which led to low production and consequently low income. Many household members became idle most part of the day after working on the fragmented farms. They preferred to start small scale business enterprises in order to generate more income. A typical farmer in Ikolomani division lived on "hand to mouth" economy. Farmers were deeply concerned with meeting their daily subsistence requirements. At least one or two days were set aside for trade in the local market, social gatherings and religious activities. One member of the household mainly a child or the wife was assigned the duty of selling a few farm products like

eggs, fruits, sugarcane and vegetables in the local market. In return the money was used to purchase salt, sugar, tea leaves and other household requirements.

Apart from off-farm activities, there were some farmers who engaged in off-farm employment on full-time basis. At least 15 percent of heads of household were not farmers by occupation. They were employed elsewhere and only practiced farming on part time basis or hired labour most of the time to perform agricultural work in their absence.   More than half of the 15 percent were teachers in local primary schools. The rest were either community nurses, village elders, agricultural officers, carpenters etc.

The participation in off- farm activities also depended on the size of the farm, family size and the income level of the household. Farmers with large farms were busy throughout the day. They employed permanent labourers to deal with their business transactions. A large family released some members for income generating activities while the rest were engaged on the farm.

Table 9
Variability of some socio-economic factors affecting Household labour
allocation Ikolomani Division

VARIABLE	VARIABLE	MEAN	STANDARD DEVIATION
Farmer's age (Years)	X_1	53.5	12.4
Farm size (Ha)	X_2	5.2	6.4
Migration (Persons/ household)	X_3	2.5	2.1
Household size (No)	X_4	8.8	3.2
Income (KShs/p.a.)	X_5	2686.2	2811.9
Hired labour (No)	X_6	4.5	5.0
On-farm labour (Hours/day) Male	X_7	4.8	2.4
Female	X_8	6.9	2.5
Off-farm labour (Hours/day) Male	X_9	3.9	2.7
Female	X_{10}	2.9	2.0
Crop output (Kg/Ha)	Y	706.5	909.4

Source: Computation from Appendix 2.

Table 10   Variables in the regression Model

Variables in the equation
Multiple R   .58419
R Square   .34128
Adjusted R Square   .33456
Standard Error   713.62712

Variable	B	SE	Beta	T	Sig T
X_s	.18175	.02551	.58419	7.126	.0000
Constant	238.41439	98.93043	2.410		.0178

The second most important variable to be entered in the step-wise regression Model

was farm size. The R² rose up to 0.37. Thus income and farm size together

accounted for 37 percent of the variation in food production. The remaining 63% was

explained for by other socio-economic factors namely age education level, household

size capital and environmental factors like soil, climate altitude etc.

Multiple R		.61584
R Square		.37926
Adjusted R Square		.36646
Standard Error		696.31211

Variable	B	SE	Beta	T	Sig T
X_2	30.16641	12.9927	0.50822	2.321	0.0225
Constant	95.90217	105.72909	0.216339	0.907	0.3668

Variable	B	SE	Beta	T	Sig T
X_5	.14569	.02896	.46827	5.031	.0000
X_2	31.19339	12.80475	.22675	2.436	.0167
Constant	172.47877	100.25285		1.720	.0885

The emerging regression model in this study is as follows

$$Y = 172.47 + 31.19X_2 + 0.15X_5$$

Where

Y = predicted food production in Kg/hectares.

X_2 = farm size in hectares

X_5 = Income in Ksh. per annum

Table 11 Some variables not in the regression Model

Variable	Beta In	Partial	Min Tole	T	Sig T
X_1	.02926	.03654	.72047	.358	.7209
X_3	.02667	.03366	.73496	.330	.7421
X_4	-.06322	-.07267	.61519	-.714	.4770
X_6	.07179	.08374	.68151	.823	.4124
X_7	-.03672	-.04603	.72055	-.451	.6527
X_8	.12341	.15607	.73475	1.548	.1249
X_9	-.04343	-.05485	.73445	-.538	.5917
X_{10}	.09659	.12191	.73073	1.203	.2317

Note the names of variables given in appendix 2

Table 12 Matrix of Correlation Coefficients for Some Socio-Economic Factors Affecting Food Production

lation Matrix:

Y	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}
000										
10	1.000									
66	.179	1.000								
92	.592	.079	1.000							
99	.472	.412	.489	1.000						
84	.088	.511	.101	.123	1.000					
03	.051	.291	.344	.069	.378	1.000				
03	.030	-.009	-.288	-.041	-.139	-.195	1.000			
83	-.116	-.085	-.109	-.004	-.044	-.116	.089	1.000		
97	-.100	-.099	-.143	-.047	-.067	-.064	.150	.028	1.000	
64	-.087	-.099	-.151	-.186	-.019	-.199	.108	-.040	.107	1.00

4.9   SUMMARY OF FINDINGS

The foregoing Chapter identified and analysed factors that had influenced household

labour allocation in food production. It emerged from the analyses that farm size and

income were important factors influencing food production in the division. The two

variables explained for 37 percent of the variation in food production. The fluctuating food be explained by the decreasing sizes of farms which can be explained by population increase. The small farms had also deteriorated in fertility due to over cultivation. Lack of capital was seen as a major hinderance to adaptation of new agricultural technology.

Off-farm activities, migration and school attendance were seen to be important factors that withdrew labour from the household. This exerted a lot of pressure to the household in terms of work load on the farm hence creating the need for use of hired labourers. Hiring of farm labourers had become very necessary especially in peak seasons when the demand for labour was very high.

chapter illustrates the fundamental roles played by women in the production of
Emphasis is placed on the contribution of women to rural economies and to
ulture. Much of women labour goes to the production of food in order to meet
ubsistence needs of the household. In order to understand women's roles, there
eed to examine the household in a broader context. Although the organizational
rms of labour within the household are internalised, various external factors
ence the decision making process of the household members.

CHAPTER 5

e is an increasing trend of women headed households in Bulamani division. 20
nt of the households were headed by women. Among these, 20 percent were
holds whose male heads had migrated to urban centres to seek employment.
emaining 6 percent were widows.

vision of labour within a household is based on gender and age. There are
tasks which are male specific while others are female oriented. Some female
especially those falling within the domestic sphere like child care, picking
bles, fetching water, collecting firewood are not interchangeable. However
re some tasks which are traditionally meant for men but can as well be
med by women. They include animal husbandry, land clearing, etc.

engage themselves in diverse activities. It is the household as a unit of
tion which defines the total farm work and house-work a women performs. The
y of household chores have also put a definite limitation on how time may be

5.0   THE ROLE OF WOMEN IN FOOD PRODUCTION

This chapter illustrates the fundamental roles played by women in the production of food. Emphasis is placed on the contribution of women to rural economies and to agriculture. Much of women labour goes to the production of food in order to meet the subsistence needs of the household. In order to understand women's roles, there is a need to examine the household in a broader context. Although the organizational patterns of labour within the household are internalized, various external factors influence the decision making process of the household members.

There is an increasing trend of women headed households in Ikolomani division. 26 percent of the households were headed by women. Among these, 20 percent were households whose male heads had migrated to urban centres to seek employment. The remaining 6 percent were widows.

The division of labour within a household is based on gender and age. There are certain tasks which are male specific while others are female oriented. Some female tasks especially those falling within the domestic sphere like child care, picking vegetables fetching water, collecting firewood are not interchangeable. However there are some tasks which are traditionally meant for men but can as well be performed by women. They include animal husbandry, land clearing, etc.

Women engage themselves in diverse activities. It is the household as a unit of production which defines the total farm work and housework a woman performs. The quantity of household chores may also set a definite limitation on how time may be

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spent on the farm. Normally there is no agreement on who should perform what domestic work. The household chores are specifically meant for the women or young girls. However, women and men can together agree on who does what on the farm. The triple roles of women as housewives, reproducers and producers has been well documented and need no further emphasis (Moock, 1976, 1981; Livingstone, 1981; Sands, 1983).

Women participate in all stages of production. They produce, process, store and market surplus farm products. The task of rearing animals which was traditionally a man's job has also shifted to women. Poultry keeping and the responsibility of caring for household property has become a woman's work. These tasks have shifted to women due to the high rate of male migration and the fact that many children attend schools.

5.1 ROLE OF WOMEN IN RURAL ECONOMIES

Women are the foundation for the development of rural areas. Their roles are not only confined to the kitchen as it were a few decades ago. Women perform diverse activities which are necessary for the economic development of their areas. Many activities which were once dominated by men such as grazing, building and construction, digging trenches, clearing land are now performed by women. There is an increasing trend towards the integration of women in the rural economies.

Women are necessary for the stability of the household. The general upbringing and education of children rests in the hands of the mother. The provision of food and the

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nutritional level of the members of the household all depend on the woman. There can only be a reasonable development if the household as a unit of production and consumption is stable. Their subsistence, health and educational needs have to be met. A woman's labour plays a significant role in all these aspects.

Women labour predominates in community self-help projects. Construction of feeder roads, nursery and primary schools, hospitals and village centres comprises more that 50 percent of women labour. Many education and health centres have come up with the helping hand of women. In Kenya women provide 80 percent of self-help labour.

In Ikolomani Division many projects have been successful through the assistance of women groups and individual women. They include water supply, construction of tea and coffee collection centres. Women provide 80 percent of labour in fuel supply, 90 percent in water supply, 70 percent in food production, 100 percent in food processing and storage and 90 percent in clearing and food preparation (Table 14).

Table 13 **Participation of Women in Traditional Rural Economy: A Case of Ikolomani Division**

RESPONSIBILITY	PERCENTAGE OF CONTRIBUTION
A. **Production/Supply/Distribution**	
1. Food Production	70
2. Domestic food storage	60
3. Food Processing	100
4. Marketing	60
5. Animal Husbandry	60
6. Brewing	70
7. Water Supply	90
8. Fuel supply	80
9. Food preparation	90
B. **Household/Community**	
i. **Household**	
1. Bearing, rearing and initial education of children	100
2. Cooking for husband, children and elders	100
3. Cleaning, washing etc	100
4. House building	30
5. House repair	50
ii. **Community**	
1. Self-help Projects	70

Source: Socio-economic survey of Ikolomani hosehold labour allocation.

5.2   WOMEN LABOUR IN FOOD PRODUCTION

More than half of the population in Ikolomani Division comprises of active women.

The predominance of female population has been encouraged by high level of male

migration and the high rate of school attendance.

Women participate in both food and cash crop production. It is probably fishing and

hunting which do not absorb women labourers. Women are responsible for the

production, processing and storage of food. Food crop farming particularly is an area

dominated by women. Men devote most of their labour in cash crop farming and animal husbandry. The provision of food to the entire household is woman's work. She has to make sure that enough food has been produced, processed and prepared ready for consumption. In case of crop failure a woman seeks means of purchasing food for the household.

About 70 percent of labour in food production was provided by women. Women were found to be busy on the farm throughout the day. They worked an average of 5 hours per day on the farm during the slack periods. In the peak seasons women worked for more than 10 hours on the farm. The males on the other hand worked for only 3 hours on the farm while the rest of the time was spent on income generating off-farm activities. Men assisted in the clearing of land and ploughing. After this was done, the rest of the work of weeding and harvesting was left to women with little assistance from children. Planting was done by the entire household. The man prepared the rows (lines), the women dug the holes while the children placed the seeds and covered them with soil. There was negotiation on who should do what when it came to planting.

The division of labour in food and cash crop farming could be traced back to colonial era. The colonial government introduced plantation agriculture which attracted a large number of males. Men sought for wage labour in order to afford paying of taxes and other demands of the colonialist. The women remained in the villages cultivating food crops. Women were responsible for anything pertaining to food crops including the processing, storage and marketing of farm products. The mentality of multiplication

of income through the production of income through the production of cash crops still lingers in the minds of rural men. They spent more time in the cultivation of cash crops hence neglecting food crops which are equally important. The production of food is simply to ensure self sufficiency. In case of crop failure the women had a rough time seeking for means of survival.

Table 14   <u>**Division of Labour by Sex in Africa (Percentage)**</u>

TYPE OF WORK	MEN	WOMEN
Felling trees in forest and clearing land	95	5
Ploughing	70	30
Sowing and planting	50	50
Hoeing and weeding	30	70
Harvesting	40	60
Gathering in the harvest	20	80
Storing the harvest	20	80
Food Processing	10	90
Selling of surplus food on market	40	60
Fetching water and firewood	10	90

Source: ECA Sept. 1984

Women were found to be busy throughout the day. The day of typical rural woman began at 6 O'clock in t he morning. Before going to the farm one fetched water from the well, cooked for the household then walked to the farm for planting, weeding or harvesting. The daily schedule of women in Ikolomani (table 9) clearly reflects what is happening in the rest of Africa (table 15).

Table 15   Daily Schedule of Rural Women in Ikolomani Division

TYPE OF WORK	TIME SPENT
Farm Work	7-8 hours
Fetching water, Collecting Firewood and Picking Vegetables	3 hours
Food Preparation	3 hours
Child care	1 hour
Total	14-15 hrs per day.

Source:socio-economic survey of iklomani household labour allocation.

Women not only cultivated crops but they were also concerned with the animals. Traditionally animal husbandry was a male job. This responsibility was now being performed by women who grazed, watered and sheltered the cattle. Because of limited land grazing was done on pathways. Women grazed on their way to the farm and back home. This was due to time limitation. 50 percent of women tied the animals in their grazing yards all day long. They watched over them and only rushed for a few minutes to water them. Grazing took place in the evening after the young boys came from school. Milking of the cows was done by either the man or woman. In general women provided only 40 percent of labour in animal husbandry. Marketing of animal products especially hides, skins and live animals was done by the men. The marketing of milk was shared between the husband and wife.

The process of pregnancy child birth and upbringing laid heavy responsibilities on the women. Coupled with household chores and farm work, pregnant women had to seek the assistance of communal labour or hire labourers. In cases where there was no extra money to hire labour, some farm activities lagged behind during the late stages of pregnancy and after delivery.

5.3 ACCESS TO MEANS OF PRODUCTION

5.3.1 Land

Land is a very essential resource in the production process, not only in agriculture but in other sectors of the economy. Historically land was a communal property. Today the government has encouraged individual ownership.

Traditionally women neither own land nor inherit it, unless there are no males in the immediate family. The father divided his land among the sons. Women and girls have been marginalised from access to and control of this most important factor of production. This is contrary to inheritance laws which were revised together with succession Act of 1981.

26% of the households were headed by women. In these households the male heads were staying elsewhere because of job requirements. Despite the fact that these women were heads of their households, they did not own land, neither did they have rights over the land and had no authority to sell it. 90 percent of the land was registered under the husbands name. The remaining 10 percent was either under the first born son or widow incase the husband had died. Although widows claimed rights over land they were not allowed to sell it unless the first born son together with others agreed to it. Widows decided on the types of crops to be grown on the farm and the nature of agronomic practices. She also had authority over farm products.

Women whose husbands were staying in the village or elsewhere were allocated the proportion of land to be devoted to the various farm activities. They could not make major decisions pertaining to the use of the land and whatever that was produced. This situation hindered women from initiating any development on the farm. Most rural women stayed on the farm throughout the agricultural year. They knew the best planting and harvesting time. Women also had knowledge of the soil fertility and how it varied on their holding. Given the opportunity, the women were in a better position to chose the proportion of land to set aside for grazing, terraces, vegetables, food and cash crops.

After the harvest, the husband decided on the amount of food to be stored in the household's granary and the amount to be sold. The money from the sales of surplus farm products was either used to buy farm inputs, pay school fees or purchase household goods. The woman had authority over a small proportion of the land near the kitchen where she planted vegetables for sale or household consumption. Potatoes, bananas, cassava were under the jurisdiction of the woman.

5.3.2.   Agricultural Technology

Agricultural technology is very important in the production process. There are some agricultural activities which have been mechanized to facilitate ease of work, expand production and save time. Technology is also essential in the improvement of the quality of the agricultural machinery are diverse and can be used in all stages of production, particularly land preparation, planting, weeding harvesting and processing. In rural Kenya most agricultural activities have not been mechanized due to various

size and ignorance . The common machinery used in agriculture include ox-drawn ploughs, tractors and combine harvesters. Despite the fact that agricultural machinery has been introduced in various parts of the country, the hoe and stick remain the dominant implement used by many rural women. Many activities that are performed by women have not been mechanized. Traditionally land preparation is a man's job. Men use ploughs and tractors in preparing the land for planting. Clearing and ploughing increase the cultivated area whereas the work of weeding and harvesting which is typically a woman's work has not been mechanized. Mechanization of agriculture has therefore contributed to the increase of a woman's work load.

During land preparation, ox-drawn ploughs are normally on high demand. Most of the ploughs are owned by heads of households who are men. Women headed households are disadvantaged hence they have to hire male labour for ploughing which is very costly. A lot of time is also wasted waiting for ploughs. This may delay planting hence affecting the overall production.

A part from machinery, the agricultural extension services have also been oriented towards heads of households who are men. The agricultural officers still consider men as the producers and women as housewives. The agricultural advise on agronomic practices and use of farm inputs is given to men yet the majority of producers are women. Today there are men who are more conversant with scientific methods of farming than women. Most women continue to use traditional methods of farming unless advised otherwise by their husbands. A large number of the agricultural extension officers are men and tend to have female bias. They tend to

overlook women headed households. If women are ignored in this manner, then agricultural production risks being reduced even further.

5.3.3 Credit Facilities

Cooperative movements are essential tools to agricultural development. In order for farmers to improve their productivity, they need assistance from various creditors. This may be in form of cash money or agricultural inputs. With increasing poverty, many rural households cannot afford improved farm inputs hence need a helping hand.

Commercial banks allocated small percentage of their loans to agricultural sector. The beneficiaries of these loans are normally men who have land to offer as collateral. More so, agricultural development banks give credit to heads of households who are often men. The other financial institutions which could be an alternative to the rural women have very high interest rates. Thus the poor rural woman finds it very difficult to get loans under this credit system.

Women in Ikolomani Division like many other women in rural Kenya know very little about the existence of credit facilities. Only 30 percent of the women knew about Cooperatives. 10 percent of the above had made use of cooperatives by acquiring loans. However a large percentage of these women belonged to job oriented cooperatives but not to agricultural societies. The lack of knowledge of the existing credit system and its importance to development could be attributed to the high level of illiteracy among rural women. A large proportion of women had very little

education hence were not exposed to loans and investment facilities. Another reason could be the fact that most of the financial institutions are concentrated in towns hence have very few rural customers.

There was a lot of female bias in the registration of cooperative members. Cooperatives registered heads of household who were seen as producers. This limited women from acquiring loans and other credit facilities. Since they could not afford various farm inputs, most women opted for traditional methods of farming which did not require expensive inputs like fertilizers, insecticides, hybrid seeds etc. The low agricultural production in Ikolomani division could be attributed to, among other factors, the lack of finance to purchase farm inputs. This calls for a more flexible credit system that would have a deeper concern for women producers. This could help in improving the production level in agriculture.

Only farmers who grew coffee and french beans acknowledged the receipt of farm inputs, among them, fertilizers, seeds and pesticides. 30 percent of the households grew coffee. Half of the 30 percent had either neglected or ignored their coffee bushes. Reasons given were among others the decreasing supply of inputs, delays in payment and low income which could not compensate for the production costs.

5.4 WOMEN AND FOOD PROCESSING

After the harvest the entire responsibility of drying and food storage is a woman's job. Every morning the maize cobs are spread out in the sun and returned in the house at sunset. The beans are also dried and prepared for storage. These activities

demanded extra amount of time on the side of women. The intensity of work makes the women to seek assistance from other women who are either paid in cash or in kind.

Traditionally food was processed locally using the grinding stone. Today grain mills have been introduced which process grains efficiently using a shorter time. Women spent time walking to the posho mill to grind maize. Cassava, millet and sorghum were sometimes grounded at home using grinding stone. The women were assisted in this task by the young girls. About 10 percent of the woman's time was spent on food processing.

5.5 WOMEN AND MARKETING

Small-holder farmers in Ikolomani division are not purely subsistence farmers. They do participate in market economy in order to generate extra income as well as meet other household requirements. Farmers hardly produce enough food to last for the whole agricultural year. They purchase more food from the market when the supply is low. Apart from purchasing some commodities such as sugar, salt, cooking fat, clothing, match-boxes etc, they also sell surplus farm products like eggs, fruits, sugarcane etc.

Marketing of surplus farm products is normally done by both men and women. However women dominate in the marketing of foodstuffs while men market animal products such as skins, hides and live animals. During market days women forego farm activities in order to sell a few farm products and in return purchase the

necessary household goods. A lot of time is spent walking to and from the market with luggage on the head.

5.6   SUMMARY OF FINDINGS

A point to be stressed here is the need for women to be given the rightful resources in order to participate fully in development process. Women in rural areas are no longer just housewives but they make important contributions to the economy of their rural areas and to the nation at large.

It is clear from the foregoing chapter that women contribution to the decision making process greatly depends on their marital status. Major decisions pertaining to crop production, animal husbandry and the use of farm products are made by the husband. The woman had very little say yet she toiled all day to meet the household's subsistence. Marginalization of women from enjoying the fruits of their labour was one factor behind lack of initiative among rural women. Most rural women were not enterprising because they lacked the necessary resources and were discouraged by the social set up.

The qualitative analysis of women participation and contribution to agriculture leads to the acceptance of the hypothesis that "The role of women in food production and agricultural development is greatly associated with their marital status."

CHAPTER 6

6.0 SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENTATIONS

The general objective of this study was to identify and analyse the factors that influence farm labour and its effect to food production. Household labour was the centre of interest. However, other forms of labour that were essential in the production of food were examined.

The quantitative analysis shows that small holder agriculture in Ikolomani division heavily relies on household labour for the production of food and other farm products. A combination of the husband, wife, children and members of the extended family helped in all tasks falling within the sphere of the households. The ultimate objective of the maximum use of labour is to meet the subsistence needs of the household. The increasing trend towards the use of household labour in the production process could be explained by the high costs of hiring labour. Hired labour was not only expensive in a rural situation but it was very rare given the negative attitudes towards farm work. The household as a unit of production and consumption performed all duties pertaining to food production. They prepared the land, planted, weeded the crops, harvested, processed ad stored the food. About 80 percent of farm labour was provided for by the household. The remaining 20 percent was a combination of communal and hired labour. The household hired labour only when it was necessary. This was when the workload was heavy in the peak seasons.

The study reveals that hired labour was an important form of labour in small holder agriculture. The use and non-use of this form of labour depended on farm size and household income. There was a very strong correlation between farm size, income

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and number of hired labourers. Households with averagely large farm sizes tended to hire more labourers than their counterparts with small farms. This was probably due to the many activities that took place on the farm. The high costs of hiring labour limited its use to households with extra income. Hired labourers were not only paid in kind or cash but they were fed at least three times a day. They worked for an average of 8 hours per day. Only the rich farmers hired labour while their poor farmers sold their labour during the peak seasons to earn subsistence.

At least all farmers who grew cash crops reported the use of hired labour. One member of household supervised hired labourers in the cash crops while the rest of the household members worked on food crops and also performed household chores. The use of hired labour was very seasonal. Farmers used it only in the peak seasons of weeding and harvesting.

Communal labour emerged out as important constituent of farm labour. Women formed teams of between 3 and 6 members. They assisted each other on any work pertaining to agriculture, in turns. They helped each other in land preparation, weeding, harvesting and processing. Many women had opted to this form of labour because it was cheaper. The women who belonged to these groups only needed to prepare some food for the rest as they performed the task assigned to them. However, these women also sold their labour outside the group. The money received was kept by one of them and shared when there was need.

Migration and schooling were important phenomenon that withdrew labour from household. There was a high rate of schooling and college attendance because of changing attitude towards education. Migration which affected the energetic male members of the household exerted a lot of pressure on the women. With the children in school, the women responsibilities increased tremendously. Apart from migration and schooling, there was the marriage factor. Many households had married off their daughters away from the village. The migrants and the married daughters were not replaced. This situation affected the quantity of labour supplies and could have a negative effect on the level of production.

Apart from farm work, a large proportion of the household time was spent in off-farm activities. The men devoted some time to building and construction, mining, social gatherings, carpentry and other income generating activities. The women on the other hand spent a lot of time fetching water, collecting firewood, child care, picking vegetables, cooking, washing and other household chores. These activities were very necessary in meeting the physical, social and economic needs of the household. They however served to reduce the total amount of labour available for the farm. Men participated in off-farm activities in order to generate more income to meet the household needs of food, health, education and shelter.

Women were found to be important food producers in Ikolomani. They laboured for more than 10 hours a day in order to meet their households subsistence needs. Women's responsibilities had increased due to withdrawal of part of household labour by migration, schooling and marriage. The women workload was very heavy. She

combined farm work, household chores and animal husbandry. In most cases because of too many demanding tasks the work is not performed efficiently hence there is a likelihood of poor production. Although women are an important link in the production chain, they are not accessible to the rightful resources, women lacked resources to improve production. The resources include land, credit facilities and agricultural technology. Women also do not make decisions pertaining to production. This hindered initiative among rural women.

Farm size and household income are crucial factors influencing household labour allocation in food production. Farm size is strongly correlated with food production and labour input. Farmers with averagely large farms hired more labourers and their members worke extra hard on the farm. There is a strong relationship between income, labour input and total food produced per household. Households with higher income are able to meet the expenses of hired labour.

Farmers in Ikolomani concentrated on the cultivation of food crops. Cash crops growing and animal husbandry were done in order to supplement food crops in terms of subsistence. The income from cash crops is used for both production and consumption needs of the household. Farmers grow a variety of food crops, among them maize, beans, bananas, cowpeas, yams, cassava, sweet potatoes, arrowroots and various kinds of vegetables. Maize and beans are the major food crops and they were grown together. The rest of the food crops are grown to supplement the major crops. Women devote their labour to the production of potatoes and cassava during off-peak periods. They are used when the maize supply was low. The major cash

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crops are tea, coffee and french beans. These are grown particularly for commercial

purposes.

A large percentage of households keep indigenous cows. A small proportion (20

percent) mixed the indigenous cows and cross-bred animals. Farmers keep a small

number of cattle because of limited grazing land. There is an average of four cows

per household. Other animals kept included sheep, goats and donkeys. However this

is on a very small scale. Animals were kept for milk, manure and a form of

investment. There is also the special reason of payment of dowry which is given by

90 percent of the households.

Remittances from urban relatives was important source of household income. Urban

relatives kept a close link with their rural households. they remitted part of their

income to meet the households production and consumption needs. The amount of

money remitted depended on the kind of job and remuneration the person was

exposed to. Apart from sending part of their income, urban relatives visited their rural

households regularly in the agricultural year. Their labour is available for an average

of 30 days in a year. Most of the relatives stay in Nairobi, Mombasa or the other

major town in the country.

6.1   RECOMMENDATIONS TO POLICY MAKERS

The findings of this study is not only important in the academic circles, but also carry

vital implications to policy planning.

Food is a very essential commodity in any society. It is necessary for energy, nutrition, development and the general stability of any nation. The production of food should be of primary concern to any government which is committed to the improvement of living standards of its population. Self-sufficiency in food is a pre-requisite to the development process. There are however, many problems that face the production of agricultural products in general and food in particular. They include capital, technology, land and human resources. The study recommends that these problems be critically addressed by policy makers. Much of rural household labour is less productive and inefficient because of increasing poverty. There is need to increase the use of farm machinery in the production of food. These machinery should be affordable to the rural farmers.

It is known that the household as a unit of production plays an important role in agriculture. The household comprises of the head , wife, and children. The interests of these people should always be at the centre of policy planning in agriculture. Their labour is not only important but very essential to agricultural production. The members of rural households therefore need to be exposed to the necessary technology, capital and other resources to enable them improve the production systems. Although the government has made a recognizable effort in trying to reach the rural households through agricultural extension system, this area needs a better orientation to the needs of the farmers. A proper follow-up in all the stages of production would ensure efficiency and improve production level.

Off-farm activities consume a reasonable proportion of the farmers time. With the low income from agriculture, the farmer looks for other means of survival. Farmers engage in various income generating activities which need to be deeply investigated. These activities are not performed in isolation but are important sources of income which is necessary for both household maintenance and food production. Men spent time in building and construction, mining, forestry, carpentry and small scale retail trade. There was need for better training in these areas to ensure good quality of the products which would fetch reasonable income for the rural farmer. An expansion of the village polytechnics and other technical institutions is very necessary for the semi-literate rural population.

There is a proportion of household labour which needs more attention. These are female labour suppliers. Several measures could be taken to improve the working conditions of rural women.

This would not only allow them to fully participate in the production process but will go ahead to improve their status and the general living standards of their households. The measures include:

a.   Making women more accessible to training programmes for agriculture, home economics and cooperative techniques. Extension services which have been very helpful in improving rural agriculture should be oriented to women producers.

b.   There is need to create agriculture, cooperatives for production, marketing and consumption. These cooperatives should be very flexible in their provision of

credit facilities to women farmers. The social background of rural women should not be a hinderance against receiving any assistance. The cooperatives should look more to the capability of the farmer in the use and repayment of the credit facilities exposed to them.

c.   Improvement of the legal status of women particularly their access to land and right to inherit property, equality of employment and remuneration. This would only be effective if the legal process is adjusted to the changing needs of women.

It is evident from the current study that agricultural sector is faced with seasonal labour shortages despite the increasing population in rural areas. The major factors behind these shortages are migration and schooling which withdrew a large number of labourers from the household. However another reason which has began to surface is the negative attitude people have on farm work. The young generation seem to have low opinion over agriculture. This could be because of the limited profit margins in the sector as compared to other sectors of the economy. In order to attract more people into the agricultural sector especially in the production process, the benefits from agriculture should be seen to be more attractive than they are now. This calls for the improvement of the marketing and pricing systems. The quantity of labour suppliers can only improve if the producers are seen to be benefiting from their labour.

6.2   RECOMMENDATIONS TO SCHOLARS

The current study cannot claim to have exhausted the area of household labour in food production. There are some aspects of labour and factors influencing its use and efficiency that need a deeper investigation.

The household is a complex economic unit. Each member contributes to its physical, social and economic needs. This study intended to cover the labour contributions of all household members. However, because of the time and financial limitations the study only examined the role played by male and female adults. Children who are a major source of labour in both agriculture and domestic sphere were left out. This calls for research on the roles played by young girls and boys in the production process. Although children spent most of their time in schools, some time is normally available for performing off-farm and on-farm activities.

Division of labour within the household is a very crucial aspect which needs more examination. Apart from sex and age, there are other factors that influence labour division. Traditionally, age and sex were the major factors that determined the specification of roles in a household. However, with the changing attitude towards work, other factors like education, urbanization, employment are emerging as very vital in influencing division of labour. With increasing literacy level among rural households, the attitude of people on work is changing tremendously. Today females can perform what were traditionally male dominated tasks while men can also do otherwise.

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6.2 RECOMMENDATIONS TO SCHOLARS

The current study cannot claim to have exhausted the area of household labour in food production. There are some aspects of labour and factors influencing its use and efficiency that need a deeper investigation.

The household is a complex economic unit. Each member contributes to its physical, social and economic needs. This study intended to cover the labour contributions of all household members. However, because of the time and financial limitations the study only examined the role played by male and female adults. Children who are a major source of labour in both agriculture and domestic sphere were left out. This calls for research on the roles played by young girls and boys in the production process. Although children spent most of their time in schools, some time is normally available for performing off-farm and on-farm activities.

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The current study limited itself on labour allocation among on-farm and non-farm activities. It has emerged out from the quantitative analysis that small holder agriculture in Ikolomani is not purely subsistence. Farmers engage themselves in diverse activities which contribute to market economy. Farmers decisions though localised depends on the national and international economic policies. There is need to further consider the relationship between rural households and the wider capitalistic economy.

Women reproductive and productive roles have widely been studied by different scholars. However this area needs further investigation. There is still need for more data and statistics on women contribution to economic development in general and to agriculture in particular. The study should be able to quantify the women roles in domestic circles which have always been termed unproductive.

It is clear from the current study that labour productivity cannot be easily measured using the level of food production. It is indeed difficult to compare the man-hours spent on the farm and what is produced. This is because production is not only influenced by labour input but numerous other physical and economic factors. Labour as a factor of production can therefore not be examined in isolation of other production functions. Future researchers in this area should approach the subject from a wide context. Labour can be examined together with other factors of production like land and capital.

and is a very important factor in the production process. The size of the land played an important role in labour allocation in food production. This resource is however very scarce especially in high potential areas like Ikolomani where there is increasing population pressure on arable land. There is need for more data on land fragmentation and its effect to the general level of production. This process poses a risk to agricultural development and in order to solve the problem, more research is needed.

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RESEARCH QUESTIONNAIRE

1. Name of household head _____
2. Age: _____
3. Sex: Female _____ 1
          Male _____ 2
4. Marital Status: Single _____ 3
                          Married _____ 4
                          Widowed _____ 5
                          Divorced _____ 6
                          Separated _____ 7
5. Do you have any education?
                          Yes _____ 1
                          No _____ 0
6. (If yes) what was the highest grade attained?
                          Primary _____ 1
                          Secondary _____ 2
                          University _____ 3
                          Others (specify) _____ 4
7. Do you have a job?
                          Yes _____ 1
                          No _____ 0
8. Is it
          Off - farm job _____ 1
          On - farm job _____ 2

ACCESS TO MEANS OF PRODUCTION
a) **Land**
9. Is this your own parcel of land
                          Yes _____ 1
                          No _____ 0

10. How did you acquire the farm
                          Inherited _____ 1
                          Bought _____ 2
                          Rented _____ 3
                          Permanent gift _____ 4
                          Temporary gift _____ 5
                          Other (specify) _____ 6

11. Is this land   Adjudicated _____ 1
                          Surveyed _____ 2

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| | Registered | _____ 3 |
| | Titled | |

12. What is your land tenure status?

	Individual ownership	_____ 1
	Owner occupier	_____ 2
	Free holding	_____ 3
	Share cropping	_____ 4
	Tenancy	_____ 5
	Lease holding	_____ 6
	Communal ownership	_____ 7
	Others (specify)	_____ 8

13. Who owns the land

	Husband	_____ 1
	Wife	_____ 2
	Son	_____ 3
	Relative	_____ 4
	Others (specify)	_____ 5

14. Who has the right to sell the land?

	Husband	_____ 1
	Wife	_____ 2
	Son	_____ 3
	Relative	_____ 4
	Others (specify)	_____ 5

15. Do you own parcels of land elsewhere?

| | Yes | _____ 1 |
| | No | _____ 0 |

16. What is the size of your land holding?

| | Ha | _____ |
| | Acres | _____ |

17. How did you allocate it?

	Garden	_____ 1
	Agriculture foodcrops	_____ 2
	Cash crops	_____ 3
	Livestock	_____ 4
	Agroforestry	_____ 5

b)   **Labour**

18. What is the total number of household members? _____

19. How many   Children   _____ 1
               Male adults   _____ 2
               Female adults _____ 3

20. Do you use any hired labour?

        Yes _____ 1

        No

21. Specify family members who help full-time

        Number of persons _____

        Type of activity _____

        Type of compensation _____

        Permanent _____

        Temporary _____

22. State numbers and duration of use of seasonal labour.

Number _____

Duration _____

23. Does family contribute to communal work?

        Yes _____ 1

        No _____ 0

24. Who performs the following operations?

        Clearing _____ 1

        Planting _____ 2

        Weeding _____ 3

        Pruning _____ 4

        Harvesting _____ 5

        Others (specify) _____ 6

25. Please mention what agricultural activities you are involved in and when during the year:

Activity	J	F	M	A	M	J	J	A	S	O	N	D

Operations

a = Bush clearing
b = seed bed preparation
c = sowing
d = first weeding
e = second weeding
f = dusting
g = thinning
h = harvesting
i = storage
j = terracing construction
k = terracing maintenance
l = coffee picking
m = coffee sales
n = water harvesting
o = firewood harvesting
p = milking

Performed by

1 = head
2 = wife
3 = sons
4 = daughters
5 = other relatives
6 = hired labour
7 = communal labour

q = foraging
r = attend communal
s = domestic chores
t = spraying
u = others (specify)

26. What time is spent on household operations and by whom. Labour input by each household member (hrs per week)

activity	1	2	3	4	5	6	7	8	9	10

Capital/Income

27. What is the source of your income?

regular employment	_____ 1
casual labour	_____ 2
remittance from relatives	_____ 3
sales from trading and home craft	_____ 4

28. List the crops you produced last year.

Crop	Total production (specify units, debes, kgs bunches bags) each year	Total sales last year (specify units)	Price per unit	Total revenue last year

1 = coffee   11 = groundnuts
2 = cotton   12 = vegetables
3 = tobacco   13 = soya beans
4 = tea   14 = sweet potatoes
5 = maize   15 = Irish potatoes
6 = finger millet   16 = cassava
7 = sorghum   17 = yams
8 = wheat   18 = sugarcane
9 = rice   19 = fruits

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10= beans   20 = others (specify)

29.   What are the major food crops of the household (in order of   their
      importance)

      1.   _____
      2.   _____
      3.   _____
      4.   _____

30.   Which are the major cash crops of the household (in order of   their
      importance).

      1.   _____
      2.   _____
      3.   _____
      4.   _____

31.   What did you do with the money from sales?

32.   Who has the right over this money?
      Wife _____   1
      Husband _____   2
      Children _____   3
      Others (specify) _____   4

Agricultural **Development**

Technology

33.   What tools do you use for the following operations
      tillage _____
      Harvesting _____

34.   Where do you store your crops?
      On farm _____   1
      In village _____   2
      In district _____   3

35.   How do you process?

36. Which of the following do you employ on your cultivated fields?

Input	Apply	Cost	Source
Manure	_____	_____	_____
Chemical	_____	_____	_____
Fertilizer	_____	_____	_____
Improved seeds	_____	_____	_____
Nursery seedlings	_____	_____	_____
Pesticides	_____	_____	_____
Other inputs	_____	_____	_____

37. Do you access to credit facilities
    Yes _____ 1
    No _____ 2

38. (If yes) what is the source of credit
    Bank _____ 1
    Money Lender _____ 2
    Credit Union _____ 3
    Kin/friend _____ 4
    Others (specify) _____ 5

39. Who has access to this credit?
    Husband _____ 1
    Wife _____ 2
    Son _____ 3
    Daughter _____ 4
    Relative _____ 5
    Others _____ 6

40. Have you ever taken a loan?
    Yes _____ 1
    No _____ 0

41. (If yes) for what purpose
    Consumption _____ 1
    Production _____ 2

42. Do you belong to any cooperative society?
    Yes _____ 1
    No _____ 0

43.   Name of cooperative society?

Marketing

44.   Where do you sell the food produced on the farm?
        On parcel _____   1
        Village _____   2
        Others (specify) _____   3

45.   How did you transport the food to the market?
        Human transport _____   1
        Bicycle _____   2
        Matatu/bus _____   3
        Others (specify) _____   4

46.   Type of buyer
        Buyer from village _____   1
        Trader from village _____   2
        Trader from outside village _____   3
        Cooperative _____   4
        State corporations _____   5

Migration

47.   How many household members are living away _____

48.   How are they related to the household
        Spouse _____   1
        Child _____   2
        Father/mother _____   3
        Grand child _____   4
        Others specify _____   5

49.   Reason for living away
        Employment _____   1
        Marriage _____   2
        Education _____   3

50.   What was their destination?
        In the district _____   1
        Outside district _____   2
        Inside the country _____   3

51. Frequency of visit per year
    Regularly _____   1
    Once in a year _____   2
    Once in 5 months _____   3

52. Does he contribute to household income
    Yes _____   1
    No _____   0

53. What about household maintenance
    Yes _____   1
    No _____   0

Livestock **Husbandry**

54. Do you keep any livestock
    Yes ____·_____   1
    No _____

55. (If yes) what is the quantity, production and income from the livestock

Livestock	Quantity	Production	Income
Indigenous cattle	_____	_____	1
Upgraded cattle	_____	_____	2
Sheep	_____	_____ ____	3
Goat	_____	_____ ____	4
Hens	_____	_____ ____	5
Pigs	_____	_____ ____	6
Others (specify)	_____	_____ ____	7

56. Why do you keep livestock?
    type   Reason
    _____   1. _____ 2. _____ 3. _____
    _____   1. _____ 2. _____ 3. _____
    _____   1. _____ 2. _____ 3. _____
    _____   1. _____ 2. _____ 3. _____

57. How do you provide the animals with feed?
Cut and carry _____ 1
Grazing _____ 2
Buy feed _____ 3
Others _____ 4

58. Who performs the following activities
Grazing _____ 1
Milking _____ 2
Taking to dip _____ 3

Off-farm **employment**

59. Does any member of this household work off the farm?
Yes _____ 1
No _____ 2

60. Approximately how many days per month did the person(s) work?
1 - 2 days _____ 1
3 - 4 days _____ 2
1 week _____ 3
1 week + _____ 4

61. What was the type of work done
Agricultural _____ 1
Non-agricultural _____ 2

62. What was the compensation for the work?
Cash _____ 1
Kind _____ 2

RAW DATA

OB	Y	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
1	80	58	2.83	4	11	200	10	4	0.00	4.00	2.00
2	34	55	2.42	4	10	500	0	2	1.00	5.00	3.00
3	52	40	2.42	2	10	1000	4	4	0.00	1.75	0.00
4	122	50	2.42	3	11	1000	10	3	1.00	0.25	2.65
5	0	64	4.45	5	12	500	2	3	0.55	3.00	2.00
6	110	59	4.00	4	10	3500	6	2	1.00	1.00	3.00
7	106	52	0.80	0	1	500	0	5	0.25	3.00	0.00
8	540	50	1.62	0	7	4000	0	4	0.95	2.00	8.00
9	212	65	1.21	5	11	700	0	4	2.00	3.00	2.00
10	4050	60	4.04	5	9	10000	10	2	0.45	2.00	8.00
11	362	27	0.40	0	4	2100	0	2	0.65	0.25	4.00
12	520	57	1.21	3	10	3200	6	1	1.00	8.00	8.00
13	1080	60	1.21	4	15	5110	0	4	2.00	2.00	0.00
14	820	56	18.21	2	23	4800	3	5	3.00	4.00	1.00
15	1485	54	3.23	2	11	2535	0	6	2.00	3.00	7.00
16	180	59	2.02	2	12	2245	1	5	2.00	4.00	1.00
17	1350	58	2.42	4	12	5000	1	4	1.00	4.00	2.00
18	820	51	2.83	1	10	1800	3	3	2.00	0.00	5.00
19	2430	62	4.85	4	14	10166	2	4	1.00	2.00	5.00
20	540	52	0.80	2	10	735.5	1	8	6.00	2.00	6.00
21	184	56	0.81	2	8	610	5	7	0.65	3.00	8.00
22	180	62	2.02	3	7	245	2	7	0.25	3.00	4.00
23	212	74	1.21	2	9	632	6	2	3.00	0.00	2.00

24	278	46	0.61	0	7	723	3	7	7.00	3.00	1.45
25	400	40	1.21	2	7	723	3	6	0.00	2.00	0.75
26	1100	51	2.83	2	10	5000	7	7	7.00	4.00	1.00
27	88	32	0.20	1	4	1550	1	1	0.00	3.00	1.35
28	540	60	2.83	4	12	4200	10	3	1.00	4.00	0.00
29	110	50	0.80	3	5	820	1	2.5	6.00	0.00	4.00
30	570	58	2.02	0	6	3500	5	7	1.00	4.00	1.00
31	404	59	1.62	2	8	945	2	8	3.65	2.00	0.55
32	0	66	0.81	3	11	350	0	6	6.00	5.00	1.00
33	556	62	0.81	2	7	500	2	7	1.00	4.00	8.00
34	212	56	1.21	4	5	1000	4	5	0.00	6.00	0.00
35	220	48	1.61	3	9	1000	5	5	0.55	4.00	2.65
36	890	51	2.02	2	9	846	2	5	0.00	7.00	3.00
37	1440	52	4.45	2	6	13350	9	6	6.00	4.00	1.00
38	990	40	5.66	0	6	12320	5	8	1.00	3.00	0.05
39	106	77	1.21	3	15	1020	0	8	0.75	0.00	0.00
40	1260	36	0.81	1	6	9020	5	2	0.25	8.00	8.00
41	286	70	0.40	5	7	569	3	4	2.00	2.00	1.00
42	482	47	2.02	0	8	5520	1	1	0.55	3.00	4.00
43	540	46	1.61	3	10	1735	3	0	3.00	0.00	3.00
44	1260	54	0.81	2	10	2350	2	2	6.00	5.00	1.00
45	630	41	0.81	3	10	1765	2	0	8.00	2.00	1.00
46	1660	52	1.61	1	8	1580	0	8	4.00	1.00	0.55
47	1350	35	2.51	0	5	2500	0	5	2.00	5.00	1.00
48	1808	66	2.51	4	14	4893	16	8	8.00	6.00	0.00
49	0	53	0.40	3	7	500	3	5	0.00	6.00	1.00
50	990	55	0.40	2	7	3500	2	2	8.00	5.00	0.95

51	556	32	2.01	2	7	3840	10	5	0.15	3.00	2.00
52	32	76	1.61	9	14	254	10	7	0.00	3.00	0.00
53	0	70	0.80	6	7	324	2	0.5	0.25	0.00	3.00
54	270	59	0.80	4	9	650	4	9	9.00	2.00	4.00
55	1260	66	0.80	8	9	7000	30	0	0.00	2.00	0.00
56	270	46	0.80	1	12	200	2	3	4.00	5.00	2.00
57	900	30	0.80	1	7	1500	9	4	0.00	4.00	1.00
58	738	30	2.83	1	6	1000	20	5	3.00	3.00	5.00
59	450	60	2.02	5	13	5000	5	2	0.55	4.00	3.00
60	664	72	12.14	6	11	9450	23	2	0.95	3.00	1.00
61	6480	70	14.57	3	11	10155	15	4	0.00	0.00	2.00
62	360	45	1.21	1	6	3000	5	2	2.00	2.00	0.55
63	106	31	0.80	0	6	905	2	8	0.45	3.00	10.00
64	190	35	1.01	0	5	2650	10	1	0.50	10.00	0.65
65	106	30	1.61	1	6	540	7	6	0.00	6.00	3.68
66	212	67	1.21	4	6	430	1	6	4.00	8.00	7.45
67	540	49	2.42	7	11	3800	10	1	0.00	9.00	0.29
68	450	65	1.01	3	12	575	1	5	4.00	4.00	0.80
69	730	70	1.61	1	8	350	7	5	1.00	2.00	0.50
70	0	57	0.80	4	14	435	0	6	0.75	7.00	0.78
71	90	67	1.21	0	8	4086	3	8	0.00	8.00	4.00
72	780	38	0.80	3	8	2000	8	1	5.00	5.00	5.00
73	2070	68	1.41	8	10	2400	5	1	4.00	10.00	2.00
74	16	54	4.04	4	14	5720	6	8	2.00	4.95	1.00
75	90	64	2.67	0	8	3400	3	8	0.00	8.65	3.00
76	1080	32	1.61	0	6	2105	12	10	0.27	4.00	0.50
77	466	65	1.21	5	9	5500	3	10	0.00	3.95	6.80
78	1440	43	1.61	2	11	2200	8	8	8.00	8.45	1.65

OB	Y	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
79	450	43	1.21	1	9	250	0	0.7	3.00	6.00	0.00
80	0	40	0.61	0	3	1450	0	9	6.00	4.00	3.00
81	800	40	2.83	4	12	755	2	10	5.00	4.00	5.00
82	184	55	1.41	2	14	2400	0	8	0.50	3.00	4.00
83	360	48	2.42	1	5	3800	2	6	2.00	2.00	1.00
84	980	46	2.02	1	6	800	3	8	3.00	1.00	8.00
85	392	62	1.21	3	7	670	3	9	0.50	4.00	6.00
86	340	65	2.42	2	6	780	0	10	0.00	5.00	2.00
87	1260	70	1.09	5	18	2840	6	5	0.00	0.00	0.50
88	2350	62	5.26	1	7	6760	8	6	1.00	5.00	0.00
89	1980	60	2.42	4	8	5100	4	0.8	1.00	2.00	8.00
90	234	32	1.01	0	4	769	4	4	0.00	8.00	8.00
91	1560	56	2.83	2	7	6500	0	3	8.00	3.00	9.00
92	1080	80	0.80	9	12	3500	10	0.9	0.00	0.00	0.00
93	964	57	1.21	1	5	1750	2	8	0.70	2.00	3.00
94	1300	38	0.80	1	5	890	5	0	5.00	3.00	0.00
95	765	40	1.03	0	6	2052	2	9	5.00	8.00	1.60
96	540	56	1.21	2	8	1780	1	7	1.00	10.00	2.70
97	1250	35	0.72	0	4	965	3	8	6.00	9.00	5.00
98	650	70	1.94	1	14	550	0	7	0.95	15.00	7.90
99	340	69	1.57	2	8	895	2	6	0.65	6.00	6.35
100	900	53	1.07	3	6	1040	6	7	2.00	3.00	8.00

OB Obsevation
Y Farm Out-put/Food Production kg/hec
X1 Age
X2 Farm size (hectares)
X3 House hold size
X4 House hold size
X5 House hold income
X6 Hired labour

X7 On-Farm labour (males)
X8 On-Farm labour (females)
X9 Off-Farm labour (males)
X10 Off-Farm labour (females)

**** M U L T I P L E   R E G R E S S I O N ****

Listwise Deletion of Missing Data
Equation Number 1   Dependent Variable..   Y
Beginning Block Number   1. Method: Stepwise
Equation Number 1   Dependent Variable..   Y
Variable(s) Entered on Step Number 1.. X_5

```
Multiple R             .58419
R Square               .34128
Adjusted R Square      .33456
Standard Error     713.62712
```

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	25857454.23082	25857454.23082
Residual	98	49907838.80918	509263.66132

F =   50.77420   Signif F = .0000

Equation Number 1   Dependent Variable..   Y
----------------- Variables in the Equation -----------------

Variable	B	SE B	Beta	T	Sig T
X_5	.18175	.02551	.58419	7.126	.0000
(Constant)	238.41439	98.93043		2.410	.0178

Equation Number 1   Dependent Variable..   Y
------------- Variables not in the Equation -------------

Variable	Beta In	Partial	Min Toler	T	Sig T
X_1	.05923	.07269	.99232	.718	.4746
X_2	.22675	.24011	.73864	2.436	.0167
X_3	.03300	.04045	.98979	.399	.6910
X_4	.02763	.03379	.98480	.333	.7399
X_6	.09664	.11026	.85752	1.093	.2773
X_7	-.02217	-.02705	.98065	-.266	.7904
X_8	.10861	.13369	.99806	1.329	.1871
X_9	-.05790	-.07118	.99553	-.703	.4838
X_{10}	.07538	.09286	.99964	.919	.3606

Equation Number 1   Dependent Variable..   Y

Variable(s) Entered on Step Number 2.. X_2
```
Multiple R             .61584
R Square               .37926
```

Adjusted R Square   .36646
Standard Error   696.31211

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	2	28734789.37657	14367394.68828
Residual	97	47030503.66343	484850.55323

F =   29.63263   Signif F =   .0000

Equation Number 1   Dependent Variable..   Y
------------------ Variables in the Equation ------------------

Variable	B	SE B	Beta	T	Sig T
X_5	.14569	.02896	.46827	5.031	.0000
X_2	31.19339	12.80475	.22675	2.436	.0167
(Constant)	172.47877	100.25285		1.720	.0885

Equation Number 1   Dependent Variable..   Y
------------ Variables not in the Equation ------------

Variable	Beta In	Partial	Min Toler	T	Sig T
X_1	.02926	.03654	.72047	.358	.7209
X_3	.02667	.03366	.73496	.330	.7421
X_4	-.06322	-.07267	.61519	-.714	.4770
X_6	.07179	.08374	.68151	.823	.4124
X_7	-.03672	-.04603	.72055	-.451	.6527
X_8	.12341	.15607	.73475	1.548	.1249
X_9	-.04343	-.05485	.73445	-.538	.5917
X_{10}	.09659	.12191	.73073	1.203	.2317

End Block Number   1   PIN =   .050 Limits reached.

Equation Number 1   Dependent Variable..   Y

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	264.0029	2774.8894	726.6400	538.7489	100
*RESID	-1821.0200	3705.1106	-.0000	689.2428	100
*ZPRED	-.8587	3.8019	.0000	1.0000	100
*ZRESID	-2.6152	5.3210	-.0000	.9898	100

Total Cases = 100

Standardized Scatterplot
Across - X_1 Down - Y

```
Out ++---------+---------+---------+--- . --+ . --+---------++
 3 +                                .        .                +          Symbols:
                                                                         
 2 +                              :                           +             Max N
                                    .
 1 +                      ...    .     .    ...                +          .        1.0
               :.. .      ::  .   .    ...                                :        2.0
          ..      . .     :....   .                                       *        4.0
 0 +      .     .* .   . .         .            :.            +
        .   .    ..::::. .:*: .*.
          ::.    :  :.:.:*:*.:* : .:
-1 +                                                          +

-2 +                                                          +

-3 +
Out ++---------+---------+---------+---------+---------+------++
   -3        -2        -1         0         1         2       3 Out
```
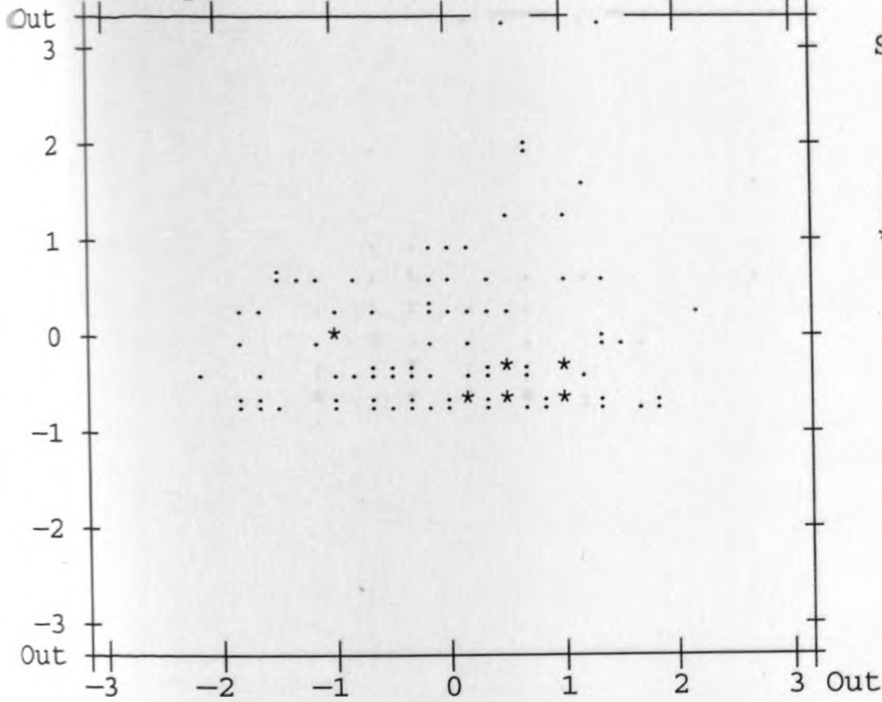
Standardized Scatterplot
Across - X_2 Down - Y

```
Out ++---------+---------+---------+--- . --+---------+------- . 
 3 +                                                          +          Symbols:
                                                                         
 2 +                              .                           +             Max N
                               .
 1 +                      .   ..                              +          .        2.0
               *... .          .                                         :        4.0
               ...:.. .     .                                            *       11.0
 0 +           .... :                                    .    +
             .:*:::.
             ***:..:.    .
-1 +                                                          +

-2 +                                                          +

-3 +
Out ++---------+---------+---------+---------+---------+------++
   -3        -2        -1         0         1         2       3 Out
```

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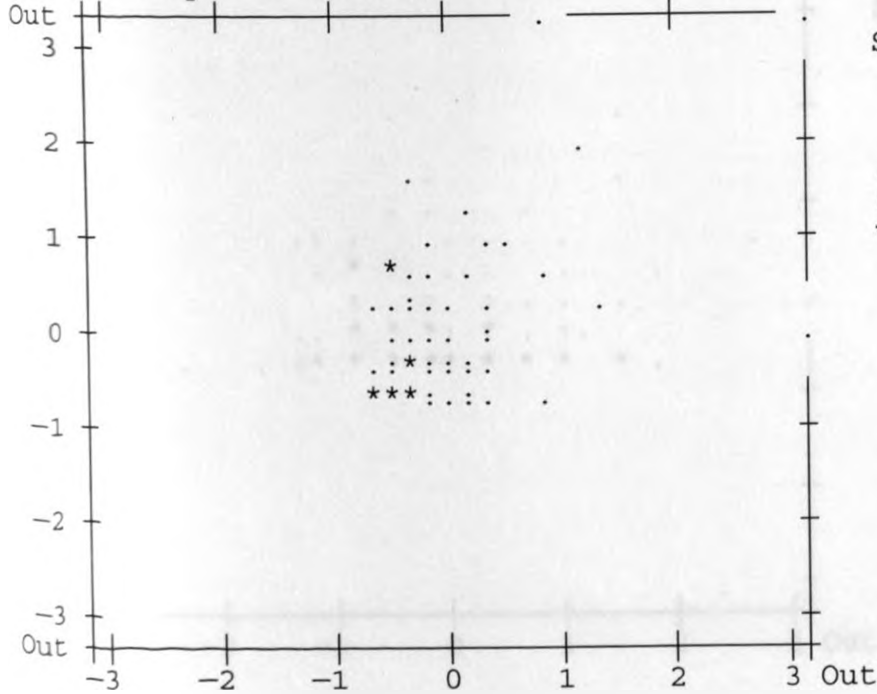
Standardized Scatterplot
Across - X_3　　　　　Down - Y
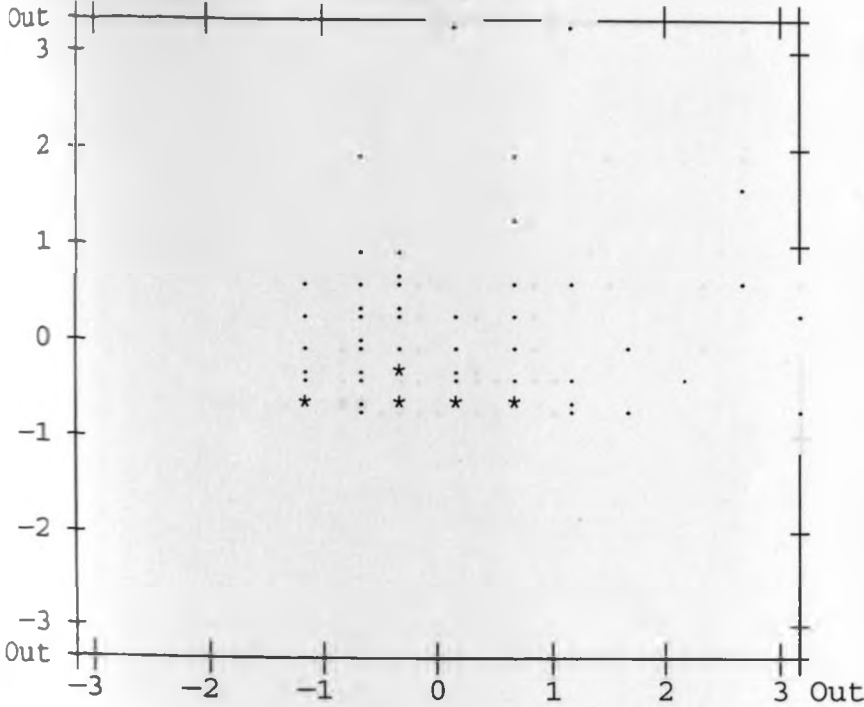
Symbols:

Max N

. 2.0
: 4.0
* 8.0

Standardized Scatterplot
Across - X_4　　　　　Down - Y
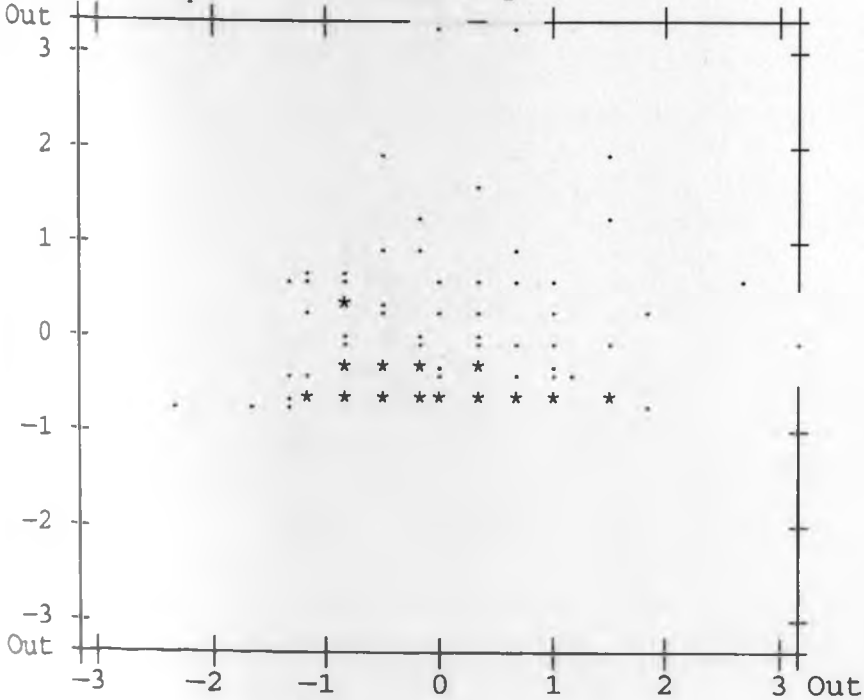
Symbols:

Max N

. 1.0
: 2.0
* 5.0

137

Standardized Scatterplot

Across - X_5 Down - Y
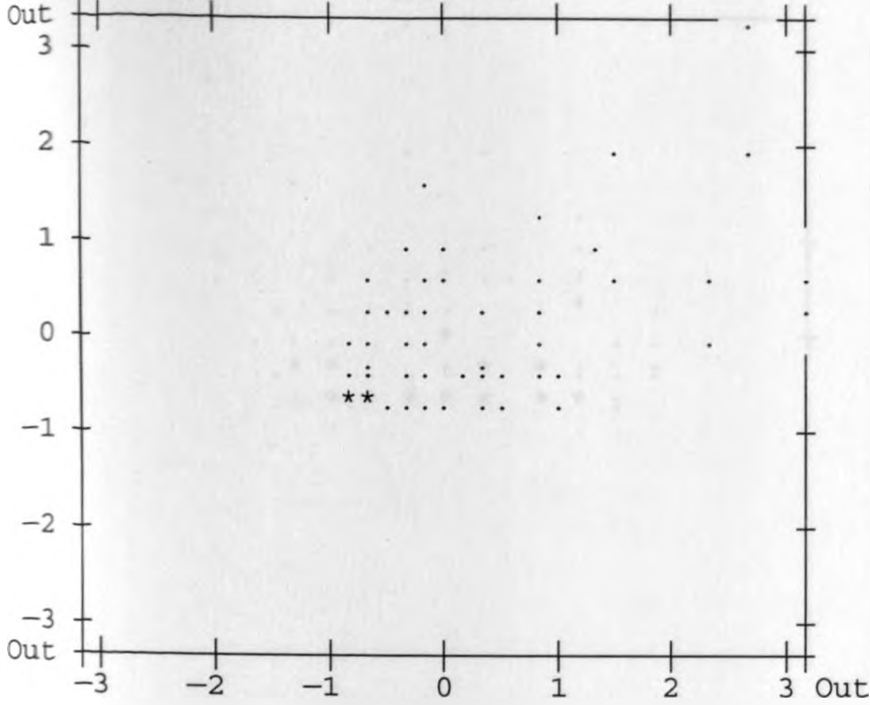
Symbols:

Max N

.   3.0
:   6.0
*   14.0

Standardized Scatterplot

Across - X_6 Down - Y

Symbols:

Max N

.   2.0
:   4.0
*   8.0

138

Standardized Scatterplot
Across - X_7 Down - Y
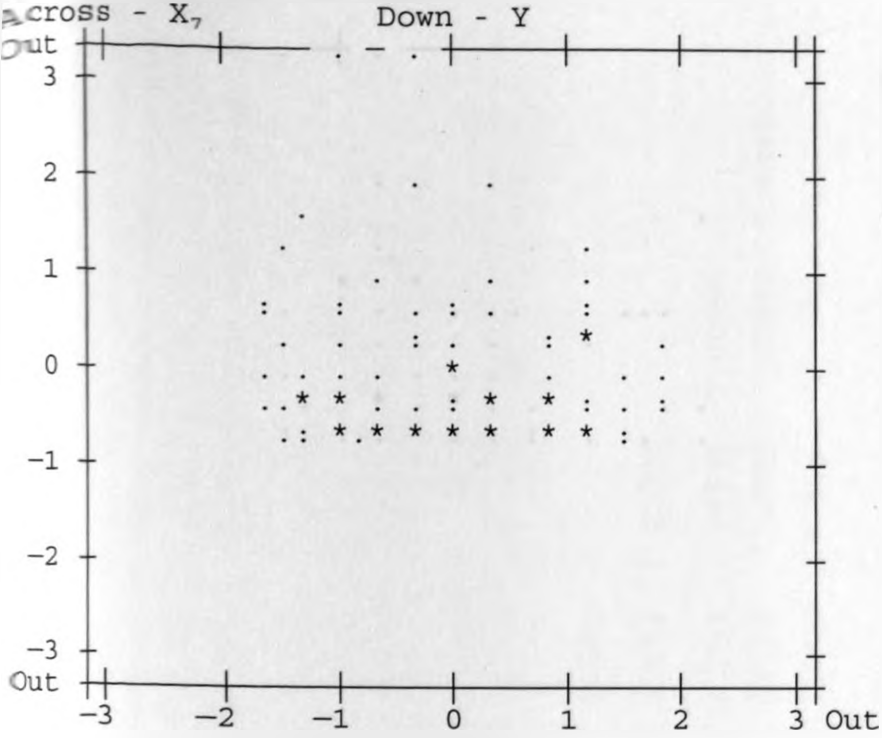
Symbols:

Max N

. 1.0
: 2.0
* 6.0

Standardized Scatterplot
Across - X_8 Down - Y
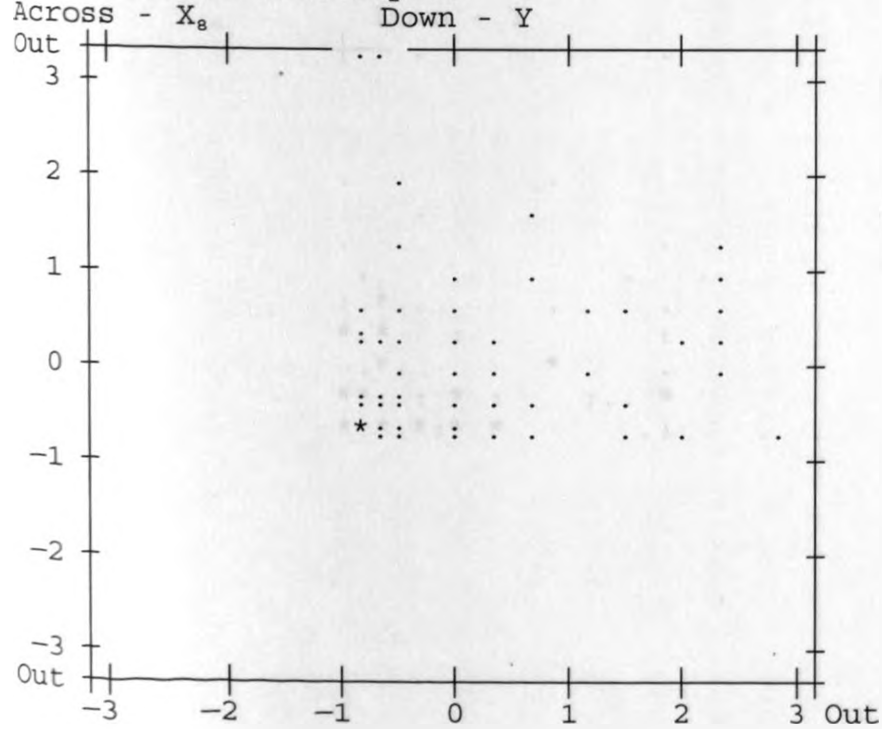
Symbols:

Max N

. 3.0
: 6.0
* 13.0

139

Standardized Scatterplot
Across - X_9 Down - Y
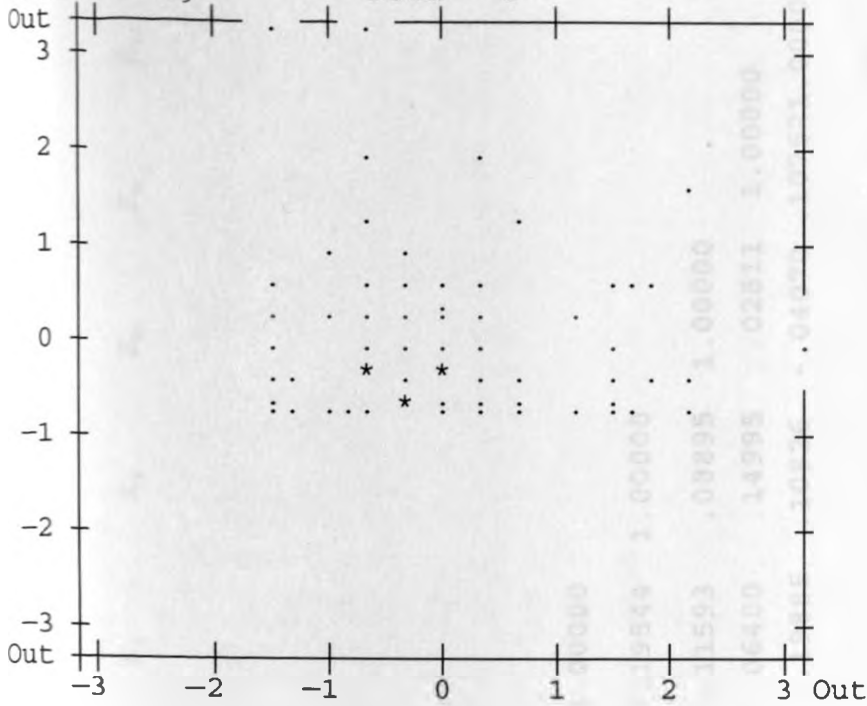
Symbols:

Max N

.   2.0
:   4.0
*   10.0

Standardized Scatterplot
Across - X_{10} Down - Y

Symbols:

Max N

.   1.0
:   2.0
*   6.0
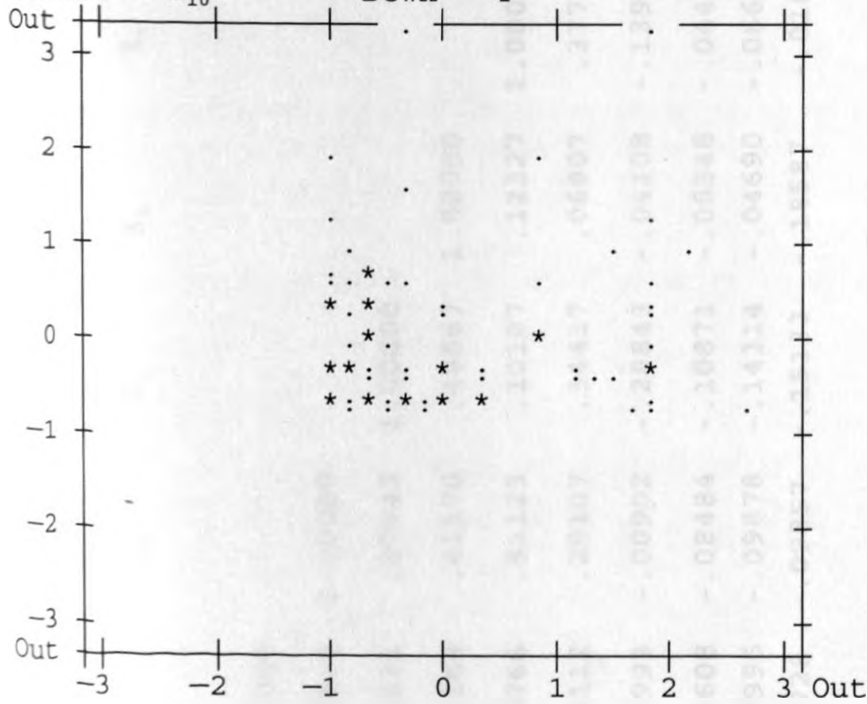
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Correlation Matrix:

	Y	X_1	X_2	X_3	X_4
Y	1.00000				
X_1	.10998	1.00000			
X_2	.46615	.17909	1.00000		
X_3	.09171	.59231	.07943	1.00000	
X_4	.09923	.47164	.41170	.48867	1.00000
X_5	.58419	.08766	.51123	.10107	.12327
X_6	.30339	.05112	.29107	.34417	.06907
X_7	-.10299	.02993	-.00902	-.28843	-.04108
X_8	.08264	-.11608	-.08484	-.10871	-.00348
X_9	-.09670	-.09995	-.09878	-.14314	-.04690
X_{10}	.06434	-.08728	-.09857	-.15133	-.18587

X_5	X_6	X_7	X_8	X_9	X_{10}
1.00000					
.37747	1.00000				
-.13909	-.19544	1.00000			
-.04408	-.11593	.08895	1.00000		
-.06685	-.06400	.14995	.02811	1.00000	
-.01886	-.19885	.10826	-.04070	.10752	1.00000

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Frequencies

Value Label	Value	Frequency	Valid Percent
Y	.0	6	6.0
	16.0	1	1.0
	32.0	1	1.0
	34.0	1	1.0
	52.0	1	1.0
	80.0	1	1.0
	88.0	1	1.0
	90.0	2	2.0
	106.0	4	4.0
	110.0	2	2.0
	122.0	1	1.0
	180.0	2	2.0
	184.0	2	2.0
	190.0	1	1.0
	212.0	4	4.0
	220.0	1	1.0
	234.0	1	1.0
	270.0	2	2.0
	278.0	1	1.0
	286.0	1	1.0
	340.0	2	2.0

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| | Cum |
Percent	Percent
6.0	6.0
1.0	7.0
1.0	8.0
1.0	9.0
1.0	10.0
1.0	11.0
1.0	12.0
2.0	14.0
4.0	18.0
2.0	20.0
1.0	21.0
2.0	23.0
2.0	25.0
1.0	26.0
4.0	30.0
1.0	31.0
1.0	32.0
2.0	34.0
1.0	35.0
1.0	36.0
2.0	38.0

360.0	2	2.0
362.0	1	1.0
392.0	1	1.0
400.0	1	1.0
404.0	1	1.0
450.0	3	3.0
466.0	1	1.0
482.0	1	1.0
520.0	1	1.0
540.0	6	6.0
556.0	2	2.0
570.0	1	1.0
630.0	1	1.0
650.0	1	1.0
664.0	1	1.0
730.0	1	1.0
738.0	1	1.0
765.0	1	1.0
780.0	1	1.0
800.0	1	1.0
820.0	2	2.0
890.0	1	1.0
900.0	2	2.0
964.0	1	1.0

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2.0	40.0
1.0	41.0
1.0	42.0
1.0	43.0
1.0	44.0
3.0	47.0
1.0	48.0
1.0	49.0
1.0	50.0
6.0	56.0
2.0	58.0
1.0	59.0
1.0	60.0
1.0	61.0
1.0	62.0
1.0	63.0
1.0	64.0
1.0	65.0
1.0	66.0
1.0	67.0
2.0	69.0
1.0	70.0
2.0	72.0
1.0	73.0

980.0	1	1.0
990.0	2	2.0
1080.0	3	3.0
1100.0	1	1.0
1250.0	1	1.0
1260.0	4	4.0
1300.0	1	1.0
1350.0	2	2.0
1440.0	2	2.0
1485.0	1	1.0
1560.0	1	1.0
1660.0	1	1.0
1808.0	1	1.0
1980.0	1	1.0
2070.0	1	1.0
2350.0	1	1.0
2430.0	1	1.0
4050.0	1	1.0
6480.0	1	1.0

TOTAL		100.0

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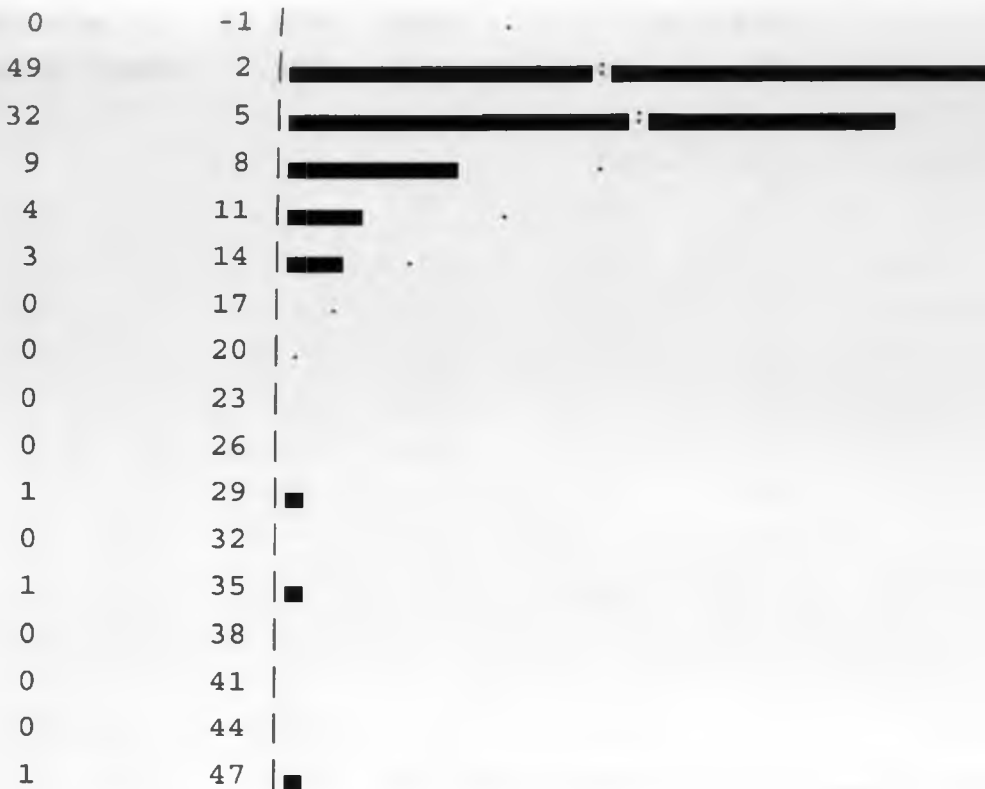|	
1.0	74.0
2.0	76.0
3.0	79.0
1.0	80.0
1.0	81.0
4.0	85.0
1.0	86.0
2.0	88.0
2.0	90.0
1.0	91.0
1.0	92.0
1.0	93.0
1.0	94.0
1.0	95.0
1.0	96.0
1.0	97.0
1.0	98.0
1.0	99.0
1.0	100.0
-------	-------
100.0	100.0

```
    Count    Midpoint
       41         184  |████████████████████ :████████████████
       23         566  |████████████████████████ :██████
       16         948  |██████████████████████ .
       11        1330  |███████████████ .
        3        1712  |███ .
        2        2094  |██ .
        2        2476  |█ :
        0        2858  |.
        0        3240  |
        0        3622  |
        1        4004  |█
        0        4386  |
        0        4768  |
        0        5150  |
        0        5532  |
        0        5914  |
        1        6296  |█
```

Y

Mean	726.640	Std Err	87.482
Mode	.000	Std Dev	874.818
Kurtosis	19.786	S E Kurt	.478
S E Skew	.241	Range	6480.000

Median	530.000
Variance	765305.990
Skewness	3.656
Minimum	.000

145

| Maximum | 6480.000 | Sum | 72664.000 |
| Valid Cases | 100 | Missing Cases | 0 |

x_1

Value Label	Value	Frequency	Valid Percent
	27.0	1	1.0
	30.0	3	3.0
	31.0	1	1.0
	32.0	4	4.0
	35.0	3	3.0
	36.0	1	1.0
	38.0	2	2.0
	40.0	6	6.0
	41.0	1	1.0
	43.0	2	2.0
	45.0	1	1.0
	46.0	4	4.0
	47.0	1	1.0
	48.0	2	2.0
	49.0	1	1.0
	50.0	3	3.0
	51.0	3	3.0
	52.0	4	4.0
	53.0	2	2.0
	54.0	3	3.0
	55.0	3	3.0

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| | Cum |
Percent	Percent
1.0	1.0
3.0	4.0
1.0	5.0
4.0	9.0
3.0	12.0
1.0	13.0
2.0	15.0
6.0	21.0
1.0	22.0
2.0	24.0
1.0	25.0
4.0	29.0
1.0	30.0
2.0	32.0
1.0	33.0
3.0	36.0
3.0	39.0
4.0	43.0
2.0	45.0
3.0	48.0
3.0	51.0

56.0	5	5.0
57.0	3	3.0
58.0	3	3.0
59.0	4	4.0
60.0	5	5.0
62.0	5	5.0
64.0	2	2.0
65.0	4	4.0
66.0	3	3.0
67.0	2	2.0
68.0	1	1.0
69.0	1	1.0
70.0	6	6.0
72.0	1	1.0
74.0	1	1.0
76.0	1	1.0
77.0	1	1.0
80.0	1	1.0
	TOTAL	100.0

X_1

Count	Midpoint	
1	27.03	
8	30.36	

148

5.0	56.0
3.0	59.0
3.0	62.0
4.0	66.0
5.0	71.0
5.0	76.0
2.0	78.0
4.0	82.0
3.0	85.0
2.0	87.0
1.0	88.0
1.0	89.0
6.0	95.0
1.0	96.0
1.0	97.0
1.0	98.0
1.0	99.0
1.0	100.0
-------	-------
100.0	100.0

3	33.69	▇▇▇▇▇.
3	37.02	▇▇▇▇ .
7	40.35	▇▇▇▇▇▇▇▇:▇▇
3	43.68	▇▇▇▇ .
7	47.01	▇▇▇▇▇▇▇▇▇ .
11	50.34	▇▇▇▇▇▇▇▇▇▇▇▇
8	53.67	▇▇▇▇▇▇▇▇▇▇
11	57.00	▇▇▇▇▇▇▇▇▇▇▇▇
9	60.33	▇▇▇▇▇▇▇▇▇▇▇.
11	63.66	▇▇▇▇▇▇▇▇▇▇:▇
6	66.99	▇▇▇▇▇▇▇:
7	70.32	▇▇▇▇▇▇▇:▇▇
2	73.65	▇▇▇ .
2	76.98	▇▇:
1	80.31	▇.

X_1

Mean	53.520	Std Err	1.251
Mode	40.000	Std Dev	12.514
Kurtosis	-.676	S E Kurt	.478
S E Skew	.241	Range	53.000
Maximum	80.000	Sum	5352.000
Valid Cases	100	Missing Cases	

X_2

Median	55.000
Variance	156.596
Skewness	-.248
Minimum	27.000

149

Value Label	Value	Frequency	Valid Percent	Cum Percent
	.50	1	1.0	1.0
	1.00	4	4.0	4.0
	1.50	2	2.0	2.0
	1.80	1	1.0	1.0
	2.00	19	19.0	19.0
	2.50	4	4.0	4.0
	2.60	1	1.0	1.0
	2.65	1	1.0	1.0
	2.70	1	1.0	1.0
	3.00	15	15.0	15.0
	3.50	2	2.0	2.0
	3.90	1	1.0	1.0
	4.00	11	11.0	11.0
	4.80	1	1.0	1.0
	5.00	7	7.0	7.0
	6.00	8	8.0	8.0
	6.20	2	2.0	2.0
	6.60	1	1.0	1.0
	7.00	7	7.0	7.0
	8.00	1	1.0	1.0
	10.00	2	2.0	2.0
	11.00	2	2.0	2.0

```
Percent
    1.0
    5.0
    7.0
    8.0
   27.0
   31.0
   32.0
   33.0
   34.0
   49.0
   51.0
   52.0
   63.0
   64.0
   71.0
   79.0
   81.0
   82.0
   89.0
   90.0
   92.0
   94.0
```

12.50	1	1.0
13.00	1	1.0
14.00	1	1.0
30.00	1	1.0
36.00	1	1.0
45.50	1	1.0
	TOTAL	100

1.0	95.0
1.0	96.0
1.0	97.0
1.0	98.0
1.0	99.0
1.0	100.0
-------	-------
100.0	100.0

X_2

Count	Midpoint	
0	-1	
49	2	████████████████████ : ██████████████████
32	5	████████████████ : ████████████
9	8	██████
4	11	███
3	14	██
0	17	
0	20	
0	23	
0	26	
1	29	■
0	32	
1	35	■
0	38	
0	41	
0	44	
1	47	■

Histogram Frequency

X_2

Mean	5.220	Std Err	.636	Median	
Mode	2.000	Std Dev	6.359	Variance	
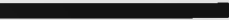
152

3.500
40.439

Kurtosis	22.687	S E Kurt	.478
S E Skew	.241	Range	45.000
Maximum	45.500	Sum	521.950
Valid Cases	100	Missing Cases	0

Skewness   4.426
Minimum   .500

X,

Value Label	Value	Frequency	Valid Percent	Cum Percent	Percent
	.0	17	17.0	17.0	17.0
	1.0	17	17.0	17.0	34.0
	2.0	22	22.0	22.0	56.0
	3.0	15	15.0	15.0	71.0
	4.0	15	15.0	15.0	86.0
	5.0	7	7.0	7.0	93.0
	6.0	2	2.0	2.0	95.0
	7.0	1	1.0	1.0	96.0
	8.0	2	2.0	2.0	98.0
	9.0	2	2.0	2.0	100.0
			-------	-------	-------
	TOTAL		100.0	100.0	100.0

X_3

COUNT	VALUE	
17	.00	████████████████████ : ████████████████
17	1.00	████████████████████████ : ████
22	2.00	████████████████████████████ : ████
15	3.00	████████████████████
15	4.00	████████████████████ :
7	5.00	████████

154
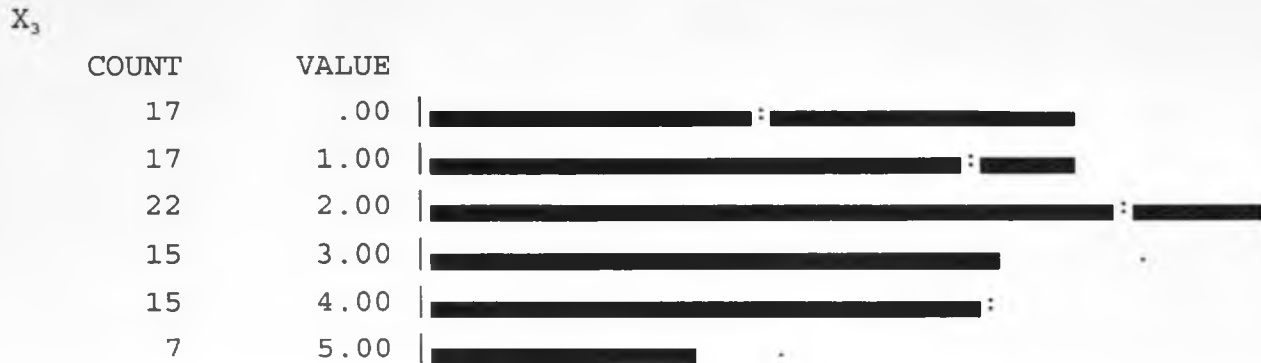
```
2      6.00  |████
1      7.00  |██ ·
2      8.00  |:███
2      9.00  |███
```

                              Histogram Frequency

X_3

Mean	2.540	Std Err	.206	Median	2.000
Mode	2.000	Std Dev	2.062	Variance	4.251
Kurtosis	1.108	S E Kurt	.478	Skewness	.993
S E Skew	.241	Range	9.000	Minimum	.000
Maximum	9.000	Sum	254.000		
Valid Cases	100	Missing Cases	0		

X_4

Value Label		Value
		1.0
		3.0
		4.0
		5.0
		6.0
		7.0
		8.0
		9.0
		10.0
		11.0
		12.0
		13.0
		14.0
		15.0
		18.0
		23.0

| | Valid | Cum | |
Frequency	Percent	Percent	Percent
1	1.0	1.0	1.0
1	1.0	1.0	2.0
4	4.0	4.0	6.0
7	7.0	7.0	13.0
14	14.0	14.0	27.0
14	14.0	14.0	41.0
11	11.0	11.0	52.0
8	8.0	8.0	60.0
11	11.0	11.0	71.0
9	9.0	9.0	80.0
8	8.0	8.0	88.0
1	1.0	1.0	89.0
7	7.0	7.0	96.0
2	2.0	2.0	98.0
1	1.0	1.0	99.0
1	1.0	1.0	100.0
	-------	-------	-------
TOTAL	100.0	100.0	100.0

X₄

Count	Midpoint	
0	.0	|.
1	1.5	|■ .
1	3.0	|■ .
11	4.5	|■■■■■■■■■:■■■■
14	6.0	|■■■■■■■■■■■■■:■■
25	7.5	|■■■■■■■■■■■■■■■■
8	9.0	|■■■■■■■■
20	10.5	|■■■■■■■■■■■■■■■:
8	12.0	|■■■■■■■■ .
8	13.5	|■■■■■■■:■■
2	15.0	|■■ .
0	16.5	| .
1	18.0	|:■
0	19.5	|
0	21.0	|
1	22.5	|■
0	24.0	|
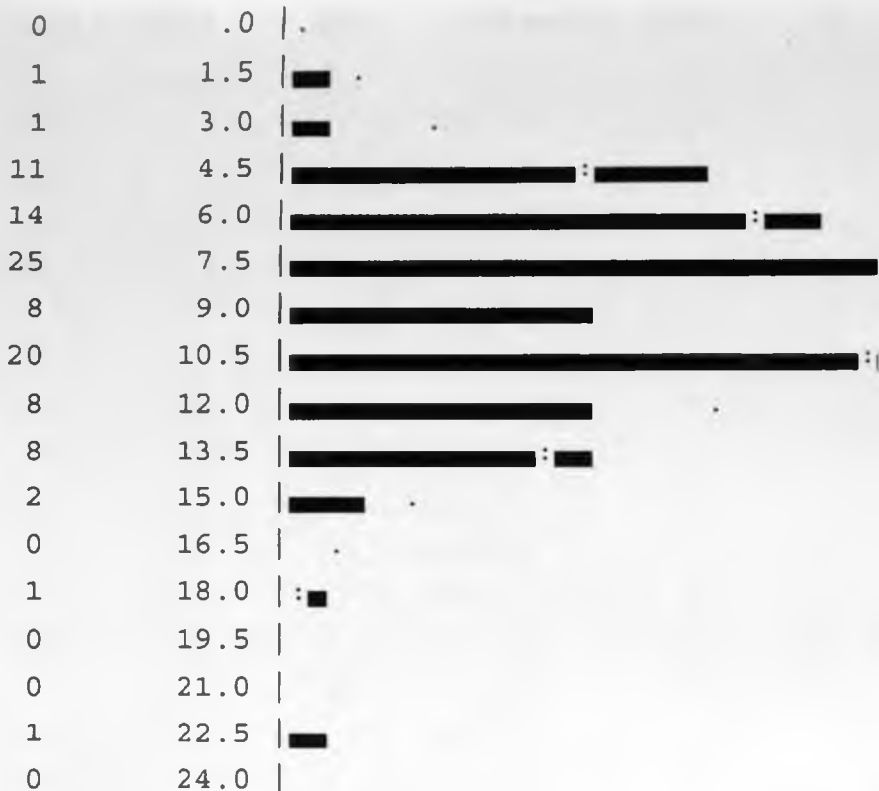
X₄

Mean	8.840	Std Err	.343
Mode	6.000	Std Dev	3.425
Kurtosis	2.064	S E Kurt	.478

Median	8.000
Variance	11.732
Skewness	.904

S E Skew	.241	Range	22.000
Maximum	23.000	Sum	884.000
Valid Cases	100	Missing Cases	0

Minimum   1.000

X_5

Value Label	Value
	200.0
	245.0
	250.0
	254.0
	324.0
	350.0
	430.0
	435.0
	500.0
	540.0
	550.0
	569.0
	575.0
	610.0
	632.0
	650.0
	670.0
	700.0
	723.0
	735.5

	Valid	Cum	
Frequency	Percent	Percent	Percent
2	2.0	2.0	2.0
1	1.0	1.0	3.0
1	1.0	1.0	4.0
1	1.0	1.0	5.0
1	1.0	1.0	6.0
2	2.0	2.0	8.0
1	1.0	1.0	9.0
1	1.0	1.0	10.0
5	5.0	5.0	15.0
1	1.0	1.0	16.0
1	1.0	1.0	17.0
1	1.0	1.0	18.0
1	1.0	1.0	19.0
1	1.0	1.0	20.0
1	1.0	1.0	21.0
1	1.0	1.0	22.0
1	1.0	1.0	23.0
1	1.0	1.0	24.0
2	2.0	2.0	26.0
1	1.0	1.0	27.0

```
 755.0
 769.0
 780.0
 800.0
 820.0
 846.0
 890.0
 895.0
 905.0
 945.0
 965.0
1000.0
1020.0
1040.0
1450.0
1500.0
1550.0
1580.0
1735.0
1750.0
1765.0
1780.0
1800.0
2000.0
```

1	1.0	1.0	28.0
1	1.0	1.0	29.0
1	1.0	1.0	30.0
1	1.0	1.0	31.0
1	1.0	1.0	32.0
1	1.0	1.0	33.0
1	1.0	1.0	34.0
1	1.0	1.0	35.0
1	1.0	1.0	36.0
1	1.0	1.0	37.0
1	1.0	1.0	38.0
5	5.0	5.0	43.0
1	1.0	1.0	44.0
1	1.0	1.0	45.0
1	1.0	1.0	46.0
1	1.0	1.0	47.0
1	1.0	1.0	48.0
1	1.0	1.0	49.0
1	1.0	1.0	50.0
1	1.0	1.0	51.0
1	1.0	1.0	52.0
1	1.0	1.0	53.0
1	1.0	1.0	54.0
1	1.0	1.0	55.0

2052.0
2100.0
2105.0
2200.0
2245.0
2350.0
2400.0
2500.0
2535.0
2650.0
2840.0
3000.0
3200.0
3400.0
3500.0
3800.0
3840.0
4000.0
4086.0
4200.0
4800.0
4893.0
5000.0
5100.0

1	1.0	1.0	56.0
1	1.0	1.0	57.0
1	1.0	1.0	58.0
1	1.0	1.0	59.0
1	1.0	1.0	60.0
1	1.0	1.0	61.0
2	2.0	2.0	63.0
1	1.0	1.0	64.0
1	1.0	1.0	65.0
1	1.0	1.0	66.0
1	1.0	1.0	67.0
1	1.0	1.0	68.0
1	1.0	1.0	69.0
1	1.0	1.0	70.0
4	4.0	4.0	74.0
2	2.0	2.0	76.0
1	1.0	1.0	77.0
1	1.0	1.0	78.0
1	1.0	1.0	79.0
1	1.0	1.0	80.0
1	1.0	1.0	81.0
1	1.0	1.0	82.0
3	3.0	3.0	85.0
1	1.0	1.0	86.0

```
                          5110.0
                          5500.0
                          5520.0
                          5720.0
                          6500.0
                          6760.0
                          7000.0
                          9020.0
                          9450.0
                         10000.0
                         10155.0
                         10166.0
                         12320.0
                         13350.0
```

X_5

Count	Midpoint	
38	583	|━━━━━━━━━ : ━━━━
12	1357	|━━━━━━━━ : ━━
14	2131	|━━━━━━━ : ━━
5	2905	|━━━━ .
9	3679	|━━━━━━ .
3	4453	|━━━ .

1	1.0	1.0	87.0
1	1.0	1.0	88.0
1	1.0	1.0	89.0
1	1.0	1.0	90.0
1	1.0	1.0	91.0
1	1.0	1.0	92.0
1	1.0	1.0	93.0
1	1.0	1.0	94.0
1	1.0	1.0	95.0
1	1.0	1.0	96.0
1	1.0	1.0	97.0
1	1.0	1.0	98.0
1	1.0	1.0	99.0
1	1.0	1.0	100.0
	-------	-------	-------
TOTAL	100.0	100.0	100.0

```
8     5227  |■■■■■■■:■
1     6001  |■         .
3     6775  |■■■■·
0     7549  |    ·
0     8323  |  ·
2     9097  |:■
3     9871  |:■■■
0    10645  |
0    11419  |
1    12193  |■
1    12967  |■                              Histogram Frequency
```

X_5

Mean	2686.225	Std Err	281.188	Median	1742.500
Mode	500.000	Std Dev	2811.882	Variance	7906681.34
Kurtosis	3.165	S E Kurt	.478	Skewness	1.794
S E Skew	.241	Range	13150.000	Minimum	200.000
Maximum	13350.000	Sum	268622.500		
Valid Cases	100	Missing Cases	0		

X_6

Value Label	Value	Frequency	Valid Percent	Cum Percent	Percent
	.0	18	18.0	18.0	18.0

163

1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
12.0
15.0
16.0
20.0
23.0
30.0

9	9.0	9.0	27.0
17	17.0	17.0	44.0
13	13.0	13.0	57.0
5	5.0	5.0	62.0
9	9.0	9.0	71.0
6	6.0	6.0	77.0
3	3.0	3.0	80.0
3	3.0	3.0	83.0
2	2.0	2.0	85.0
9	9.0	9.0	94.0
1	1.0	1.0	95.0
1	1.0	1.0	96.0
1	1.0	1.0	97.0
1	1.0	1.0	98.0
1	1.0	1.0	99.0
1	1.0	1.0	100.0
-------	-------	-------	
TOTAL	100.0	100.0	100.0

```
X₆
Count    Midpoint
   0        -1 |
  27         1 |████████████████████
  30         3 |████████████████████
  14         5 |████████████████████
   9         7 |███████████████
   5         9 |████████
   9        11 |███████████████  :  ██
   1        13 |██      .
   1        15 |██  .
   1        17 |: ██
   0        19 |
   1        21 |██
   1        23 |██
   0        25 |
   0        27 |
   0        29 |
   1        31 |██
```
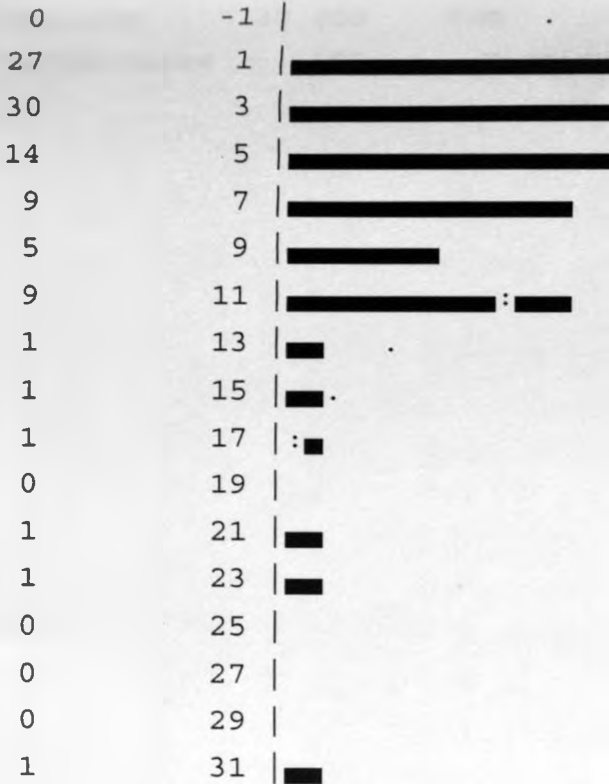
X_6			
Mean	4.520	Std Err	
Mode	.000	Std Dev	

Histogram Frequency

.505	Median	3.000
5.052	Variance	25.525

Kurtosis	7.569	S E Kurt	.478
S E Skew	.241	Range	30.000
Maximum	30.000	Sum	452.000
Valid Cases	100	Missing Cases	0

Skewness   2.328
Minimum   .000

X_7

Value Label	Value	Frequency	Valid Percent	Cum Percent
	.0	4	4.0	4.0
	.5	1	1.0	1.0
	.7	1	1.0	1.0
	.8	1	1.0	1.0
	.9	1	1.0	1.0
	1.0	7	7.0	7.0
	2.0	11	11.0	11.0
	2.5	1	1.0	1.0
	3.0	6	6.0	6.0
	4.0	11	11.0	11.0
	5.0	13	13.0	13.0
	6.0	10	10.0	10.0
	7.0	10	10.0	10.0
	8.0	15	15.0	15.0
	9.0	4	4.0	4.0
	10.0	4	4.0	4.0
	TOTAL		100.0	100.0

167

```
Percent
  4.0
  5.0
  6.0
  7.0
  8.0
 15.0
 26.0
 27.0
 33.0
 44.0
 57.0
 67.0
 77.0
 92.0
 96.0
100.0
------
100.0
```

X_7

Count	Midpoint
0	-1.00
4	-.25
3	.50
8	1.25
11	2.00
7	2.75
0	3.50
11	4.25
13	5.00
10	5.75
0	6.50
10	7.25
15	8.00
4	8.75
0	9.50
4	10.25
0	11.00
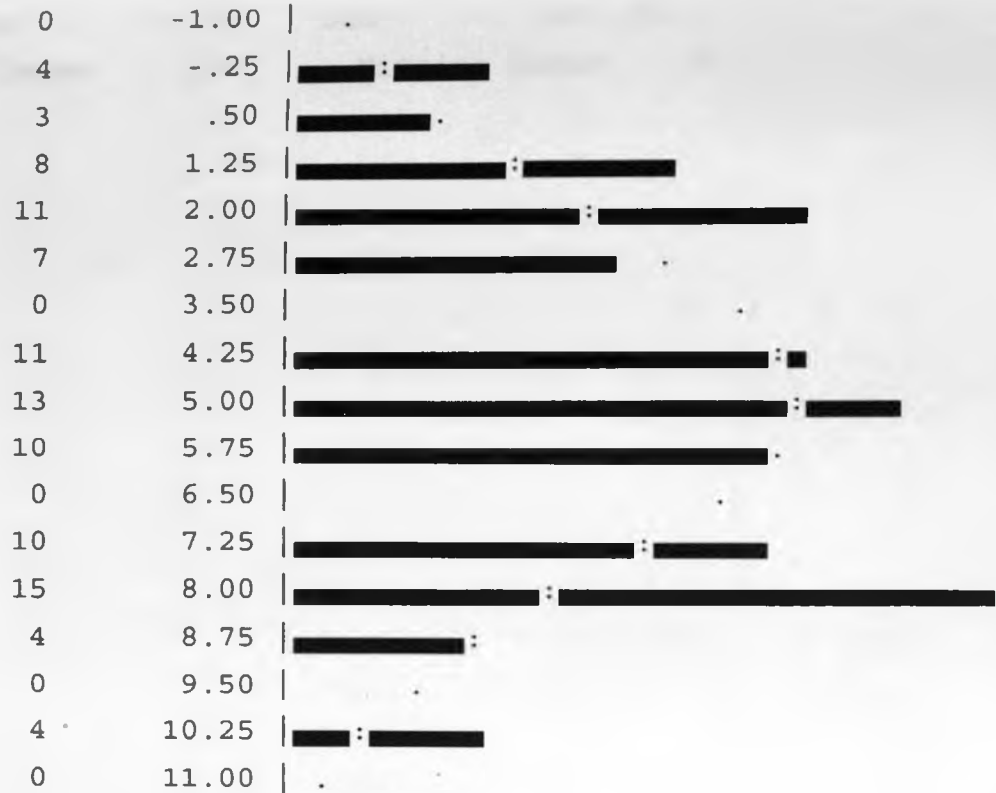
Histogram Frequency

X_7

Mean	4.874	Std Err	.279	Median	5.000
Mode	8.000	Std Dev	2.794	Variance	7.809

Kurtosis	-1.075	S E Kurt	.478
S E Skew	.241	Range	10.000
Maximum	10.000	Sum	487.350
Valid Cases	100	Missing Cases	0

Skewness   -.042
Minimum   .000

169

X.

Value Label	Value
	.00
	.15
	.25
	.27
	.45
	.50
	.55
	.65
	.70
	.75
	.95
	1.00
	2.00
	3.00
	3.65
	4.00
	5.00
	6.00
	7.00
	8.00
	9.00

Frequency	Percent	Valid Percent	Cum Percent
20	20.0	20.0	20.0
1	1.0	1.0	21.0
4	4.0	4.0	25.0
1	1.0	1.0	26.0
2	2.0	2.0	28.0
3	3.0	3.0	31.0
4	4.0	4.0	35.0
3	3.0	3.0	38.0
1	1.0	1.0	39.0
2	2.0	2.0	41.0
3	3.0	3.0	44.0
14	14.0	14.0	58.0
11	11.0	11.0	69.0
6	6.0	6.0	75.0
1	1.0	1.0	76.0
5	5.0	5.0	81.0
4	4.0	4.0	85.0
7	7.0	7.0	92.0
2	2.0	2.0	94.0
5	5.0	5.0	99.0
1	1.0	1.0	100.0

100.0   100.0

171

X_a

Count	Midpoint	Histogram Frequency
0	-1.50	
0	-.75	
26	.00	████████ ： ██████████████
32	.75	████████████ ： █████████████████
0	1.50	
11	2.25	██████████
6	3.00	████
6	3.75	████
0	4.50	
4	5.25	███
7	6.00	██ ： ████
2	6.75	█
0	7.50	
5	8.25	： ███
1	9.00	█
0	9.75	
0	10.50	

Histogram Frequency

X_a
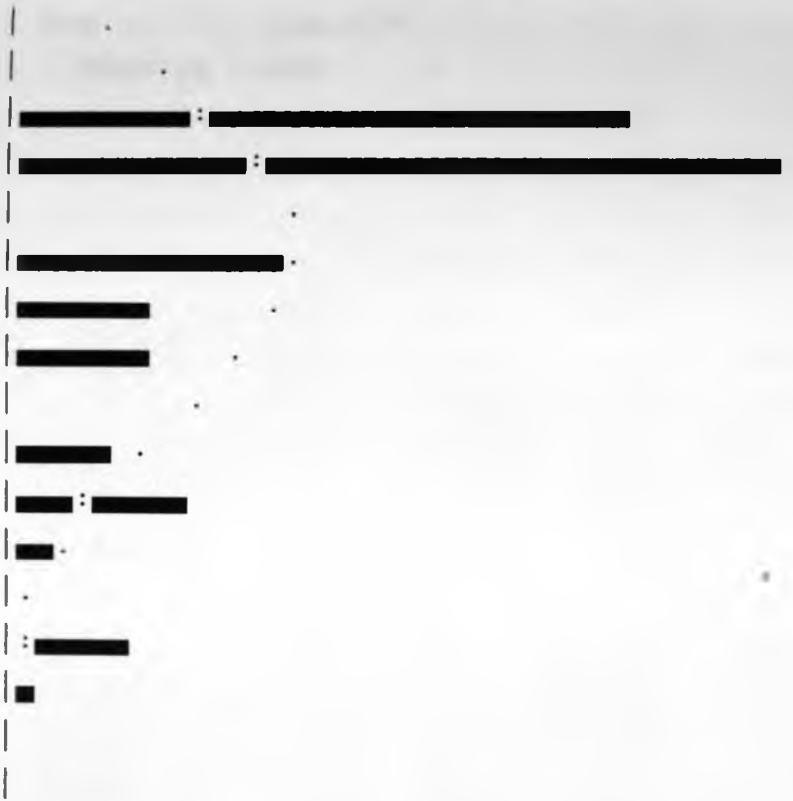
Mean	2.157	Std Err	.246	Median	1.000
Mode	.000	Std Dev	2.461	Variance	6.055

Kurtosis	.307	S E Kurt	.478	Skewness	1.206
S E Skew	.241	Range	9.000	Minimum	.000
Maximum	9.000	Sum	215.670		
Valid Cases	100	Missing Cases	0		

X_9

Value Label	Value
	.00
	.25
	1.00
	1.75
	2.00
	3.00
	3.95
	4.00
	4.95
	5.00
	6.00
	7.00
	8.00
	8.45
	8.65
	9.00
	10.00
	15.00

| | | Valid | Cum |
Frequency	Percent	Percent	Percent
9	9.0	9.0	9.0
2	2.0	2.0	11.0
3	3.0	3.0	14.0
1	1.0	1.0	15.0
16	16.0	16.0	31.0
19	19.0	19.0	50.0
1	1.0	1.0	51.0
17	17.0	17.0	68.0
1	1.0	1.0	69.0
9	9.0	9.0	78.0
6	6.0	6.0	84.0
2	2.0	2.0	86.0
6	6.0	6.0	92.0
1	1.0	1.0	93.0
1	1.0	1.0	94.0
2	2.0	2.0	96.0
3	3.0	3.0	99.0
1	1.0	1.0	100.0
-------	-------	-------	-------
TOTAL	100.0	100.0	100.0

```
X₉
Count   Midpoint
  0       -1 |
 11        0 |████████████:██████████
  3        1 |██████
 17        2 |██████████████████:████████████
 19        3 |██████████████████████████:██████████████
 18        4 |██████████████████████████:██████████
 10        5 |████████████████
  6        6 |████████████
  2        7 |███
  7        8 |██████████:██████
  3        9 |████:
  3       10 |██:████
  0       11 |.
  0       12 |.
  0       13 |
  0       14 |
  1       15 |██
```
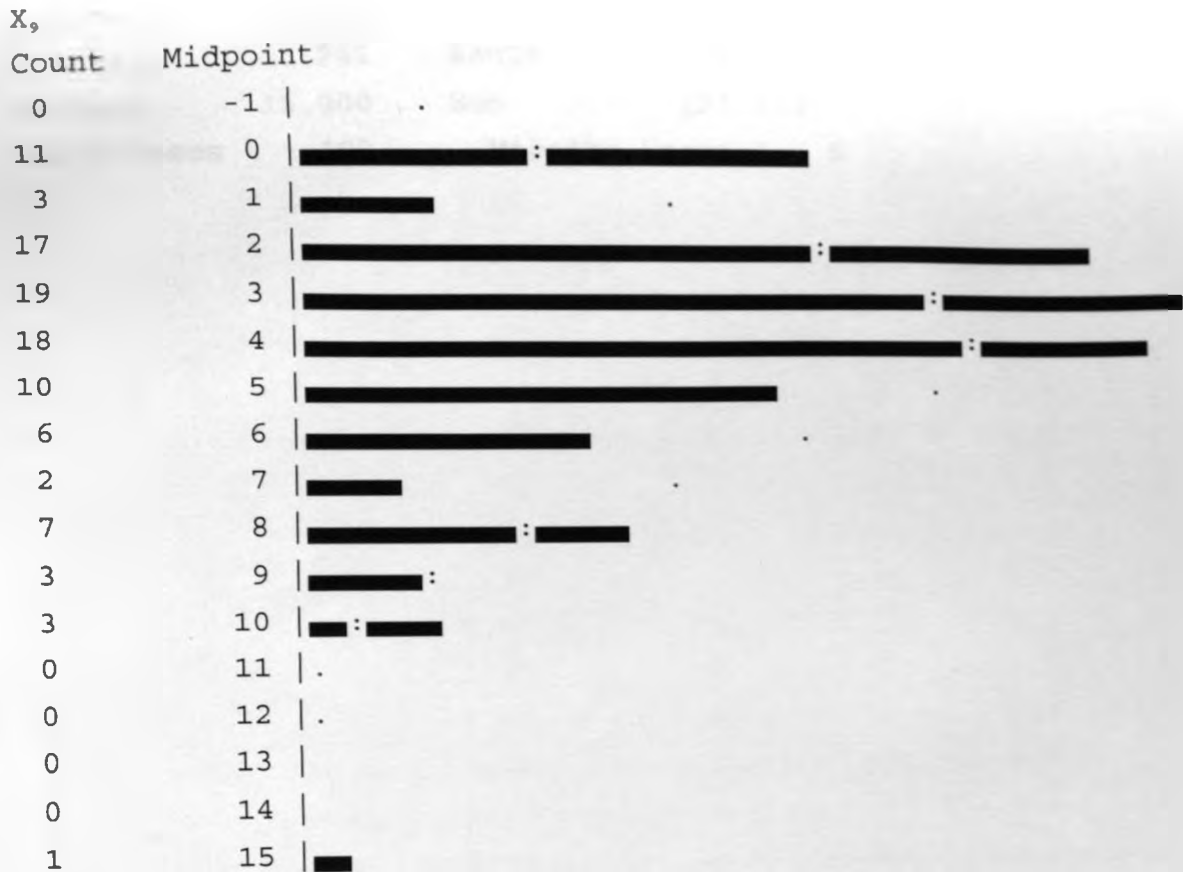
Histogram Frequency

X₉						
Mean	3.942	Std Err	.276	Median	3.475
Mode	3.000	Std Dev	2.762	Variance	7.628

175

Kurtosis	1.732	S E Kurt	.478
S E Skew	.241	Range	15.000
Maximum	15.000	Sum	394.250
Valid Cases	100	Missing Cases	0

Skewness   1.039
Minimum   .000

X_{10}

Value Label	Value
	.00
	.05
	.29
	.50
	.55
	.65
	.75
	.78
	.80
	.95
	1.00
	1.35
	1.45
	1.60
	1.65
	2.00
	2.65
	2.70
	3.00
	3.68
	4.00

Count	Midpoint	
	-1.00	
	.25	
	.75	
	1.25	
	2.00	
	2.75	
	3.50	
	4.25	
	5.25	

	Valid	Cum	
Frequency	Percent	Percent	Percent
13	13.0	13.0	13.0
1	1.0	1.0	14.0
1	1.0	1.0	15.0
3	3.0	3.0	18.0
3	3.0	3.0	21.0
1	1.0	1.0	22.0
1	1.0	1.0	23.0
1	1.0	1.0	24.0
1	1.0	1.0	25.0
1	1.0	1.0	26.0
15	15.0	15.0	41.0
1	1.0	1.0	42.0
1	1.0	1.0	43.0
1	1.0	1.0	44.0
1	1.0	1.0	45.0
10	10.0	10.0	55.0
2	2.0	2.0	57.0
1	1.0	1.0	58.0
9	9.0	9.0	67.0
1	1.0	1.0	68.0
7	7.0	7.0	75.0

5.00	6	6.0	6.0
6.00	2	2.0	2.0
6.35	1	1.0	1.0
6.80	1	1.0	1.0
7.00	1	1.0	1.0
7.45	1	1.0	1.0
7.90	1	1.0	1.0
8.00	10	10.0	10.0
9.00	1	1.0	1.0
10.00	1	1.0	1.0
		-------	-------
	TOTAL	100.0	100.0

X_{10}

Count	Midpoint
0	-1.00
14	-.25
11	.50
19	1.25
11	2.00
12	2.75
1	3.50
7	4.25
6	5.00

```
      81.0
      83.0
      84.0
      85.0
      86.0
      87.0
      88.0
      98.0
      99.0
     100.0
    -------
     100.0
```

```
  2      5.75  |████
  2      6.50  |████
  2      7.25  |████       .
 11      8.00  |███:████████████████████████
  1      8.75  |██ .
  0      9.50  |  .
  1     10.25  |:█
  0     11.00  |
```
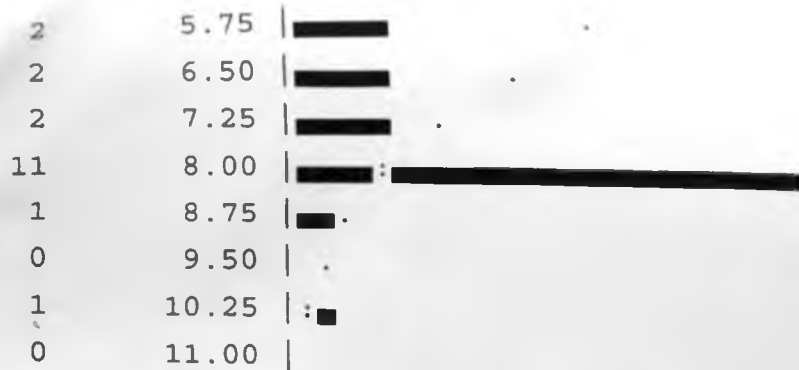
Histogram Frequency

X_{10}

Mean	2.916	Std Err	.274	Median	2.000
Mode	1.000	Std Dev	2.739	Variance	7.503
Kurtosis	-.399	S E Kurt	.478	Skewness	.893
S E Skew	.241	Range	10.000	Minimum	.000
Maximum	10.000	Sum	291.650		
Valid Cases	100	Missing Cases	0		