# SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACTS OF IRRIGATION-THE CASE OF ZIWAY STATE FARM



A Thesis
Presented to the
School of Graduate Studies
Addis Abeba University

In Partial Fulfillment of
the Requirements for the Degree of
Master of Arts in Geography

By
Mekonnen Cherinet
June 1992

ADDIS ABABA UNIVERSITY

School of Graduate Studies



# Socio-Economic and Environmental Impacts of Irrigation in Ziway Woreda, Ethiopia

by

Mekonnen Cherinet

College of Social Sciences

Approved by Board of Examiners:

Daniel Gamachu
Advisor

Mul Gamachu

MEKETE BELACHEW
Examiner

MEKURIA TAFESSE
Examiner

ACKNOWLEDGEMENTS

I would like to thank Ato Daniel Gamachu who was my advisor. I appreciate his assistance in helping me complete this study.

I am also indebted to Dr.K.N.Singh who most willingly and gladly became my advisor during the absence of Ato Daniel on research leave.

For the years of sharing in the difficulties of graduate work and research, my wife, Zenebework deserves so very much more than can ever be repaid. To her goes my deepest appreciation for her preservance and free gift of love and encouragement through the years.

My earnest thanks also goes to w/t Deberitu Megerssa who helped in typing this study.

The writer also wishes to thank the members of State Farm Development Office, Small Farms Co-ordination Office and Ziway Agricultural Development for helping me obtain data for this study.

While I wish to express sincere thanks to all of those who helped and facilitated my study directly or indirectly, I alone am responsible for whatever shortcomings one may find in this study.

TABLE OF CONTENTS

# CHAPTER ONE

## 1.1 The Problem

Water is one one of the basic resources required for agricultural production. The availability of water and the application of the right quantity at the right time is also vital for profitable results from irrigation agriculture; otherwise, all efforts to increase agricultural production through irrigation will fail. Irrigation facilities and their proper management are also necessary prerequisities for productive irrigation agriculture, specially in arid and semi-arid regions.

Irrigation is an important factor in agricultural development in areas where rainfall is inadequate and is unevenly distributed both in terms of time and space. The importance of irrigation is not only limited to areas of water stress, it is equally important in areas, where rainfall is adequate but its temporal distribution is irregular. In such a condition, irrigation greatly improves production and permits more than one harvest a year. It can also supplement the annual rainfall so that a second or third crop may be grown and thereby increase the agricultural potential of areas without expansion to virgin land. It is also beneficial in areas of bi-modal rainfall patterns where irrigation can effectively connect the two rainy periods into one growing season and encourage the cultivation of high value crops.

As often observed, irrigation primarily reduces the uncertainity of crop production and consequently increase agricultural production. It can increase crop yield even without any increased use of agricultural inputs, although lower risks

and certainity of crop production in irrigated agriculture are also likely to encourage greater use of agricultural inputs. Hence, irrigation makes it possible to grow crops all the year round and thereby can increase the cropping intensity.

While rapid growth in production is the primary result of irrigation development, employment generation is one of the important secondary effects. In the first instance, irrigation operation itself needs more labour and employment would depend on the number of waterings applied to crops and the actual area covered under different crops. Second, the introduction of irrigation facilities leads to a shift in the cropping pattern which again raises the employment potential on account of more labour intensive crops. Third, the use of inputs like fertilizer, insecticides and pesticides needs more labour use at the farm level. Fourth, irrigation leads to augmentation of area under double and multiple cropping which inturn provides more opportunities of work to labourers at the farm (Vaidyanathan, 1987). Thus, the advent of irrigation schemes lead to an increase in employment.

However, although irrigation increases agricultural production, lowers the rate of unemployment, improves the standard of living of people, its mismanagement and over use has also resulted in the problem of soil salinity, alkalinity, water logging and canal seepage. It has also exposed people to diseases such as malaria, schistosomiasis, dysentary, etc.

In the vicinity of Ziway town in Southern Shoa there are two irrigated farm projects. These are the State-owned Ziway

Agricultural Development farms and the Ziway prison Farm. They were established in 1967 and 1982 respectively. The irrigated farms of the Prison Department use water directly pumped from Lake Ziway and the State Farm from the Bulbula River whose source of water again is Lake Ziway. Both farms use furrow irrigation method though the State Farm often uses sprinkler and drip methods as well.

Initially, the State Farm was commercial farm established by three landlords. Following the land reform of the year 1975, it was nationalized and put under the Ministry of State Farms Development. Today, the farm is financed by the Ministry of State Farms Development and the main objective is the production of cash crops for domestic and foreign markets. The major products include flowers, vegetables and fruits. The flowers and vegetables are entirely meant for foreign markets whereas the fruits are sold to the consumers in Ziway and Addis Ababa. The vegetables and fruits include greeen beans, strawberries, melon, asparagus, papaya, grapes, oranges as well as avocadoes. This time, the project has a total of 284 permanent and 1500-3000 seasonal workers and the total hectarage developed under the project has reached 1000 hectares.

The irrigated farm of the Prison Department of Ziway on the other hand is financed by the Ministry of Finance and has the following objectives:

(1) To make prisoners productive
(2) To be able to supply food and non-food grains to the prisoners and the people in Ziway.

(3) To serve as a model for the surrounding peasants and semi-nomadic population in the area.

The total hectarage developed under the prison Farm project is 265 ha of which 80 ha are rainfed. The project produces cereals, vegetables and fruits such as maize, wheat, teff, tomatoes, onion, pepper, beet roots, cabbages, bananas, papaya and oranges. All of the cereals produced are consumed by the prisoners where as 60-70 percent of the fruits and vegetables are sold to Etfruit State marketing organization and distributed amongst consumers in Debre Ziet, Nazareth and Addis Abeba. The rest, 30-40 percent of the fruits and vegetables are sold to the prisoners and the people in Ziway. Prisoners are the only source of labour on the farm and 180-400 prisoners are being deployed every day depending on the varying number of prisoners.

So far, no comprehensive or reliable study has been made with regard to the profitability of each farm and the effects of irrigation in general. The purpose of this study is to analyse the performance and profitability of the State Farm and the impact of this irrigation project on the socio-economic development of the region. Originally, the intention of this study was to cover both irrigation farms. However, since May, 1991 the Prison Farm had stopped functioning for various reasons and the study of this farm was abandoned.

## 1.2 Objectives of the Study

The main objectives of the study are:

1. To assess the agricultural production and land productivity of the State Farm. Questions raised under this objective are:

(i) What are the major crops grown in the project ?

(ii) How is the cropping pattern, that is area covered by different types of crops ?

(iii) How often is land cultivated that is the intensity of cultivation ?

(iv) What percentage of the total cultivated area is under non-food or cash crops, that is the degree of commercialization ?

2. To assess the profitability of the State Farm

3. To assess the pulling effects of the State irrigated farm on the surrounding region and the socio-economic characteristics of hired labourers in the state irrigated farm.

4. To assess the impact of irrigation and its long run effect in the region. Questions raised under this objective are:

(i) To what extent has the development of irrigation, improved the agricultural situation, employment and income levels of labourers and peasants in Ziway and the surrounding regions ?

(ii) What are some of the socio-economic and environmental problems that have developed as the result of the introduction of irrigation in the region ?

5. To recommend action plans for improvement of agricultural production of the State Farm.

## 1.3 Justification and Rationale of the Study

Since most of agricultural production in Ethiopia heavily depends on rainfall, the development of modern irrigation systems is a recent phenomnon. Also, almost all of the major irrigation projects in the country are nationalized and are

State owned commercial farms. In the establishment of these irrigation projects very often, no prior study had been done to assess the region's suitability for irrigation development or their long run effects on the surrounding areas. The Ziway State irrigated farm is one of the many such projects in the country. The study of the impacts of this farm in the localities of Ziway can serve a useful purpose in understanding the problems of irrigation agriculture in general.

Ziway region was chosen as the study area for the following reasons:

(a) It is nearer to Addis Abeba and the project area is not very far from the main road (the road from Addis Abeba to Shashemenie). Hence, the problem of transportation is minimal.

(b) It is a region where the prospect for irrigation development has been thoroughly studied by Makin (1976).

(c) Hykoch and Butajeria Awraja of which Ziway is a part is considered as one of the surplus grain producing regions by FAO (1989).

## 1.4. Mehtodology

### 1.4.1 Types and Sources of Data Used

The data sources of this study are two:

(i) Primary sources

(ii) Secondary sources

Primary Sources:- The data in the study is mainly based on primary sources: a field survey using questionnaires, interviews, talks to individuals and personnel. The data was gathered by enumerators and the researcher. The enumerators

were employed on the basis of their knowledge of the locality and familarity with the habits, language and customs of the local population.

Secondary Sources:- Secondary data sources are various, including official documents and records of the State Farm, Ministry of State Farms Development, Land use planning, Small Farms Co-ordination office, National Meteorological service Agency and various books on irrigation agriculture.

1.4.2 Sample Size and Sampling Design

The survey mainly covered permanent and seasonal workers in the State Farm. The total number of the permanent workers is 284 where as the number of seasonal workers vary from 1500 to 3000 during peak season. Since crop cultivation in the State Farm is a year round activity, the harvesting period depends on the type of crops grown. Perennial crops (usually fruits) are harvested once in a year though there is time difference between the harvest of different types of fruits. On the other hand, the harvest of seasonal crops follow one another. Therefore, according to the officials of the State Farm, the peak period is not a fixed time interval. It is in general the time between October and February. Hence, in order to make the sample a representative of the whole and because of time and cost constraints, 50 persons from the permanent workers and 150 persons from the seasonal workers engaged between October and February have been considered. The samples from each group have been selected by using a systematic random sampling technique from the list of all farm workers in the State Farm.

## 1.5 Methods of Data Analysis

To achieve the objectives of the study, a variety of methods and techniques have been employed. Hence, simple analytical tools like ratios, percentages, standard deviation, Co-efficient of variation as well as maps and graphs have been used.

Ratio and percentages have been used throughout the study particularly in evaluating:

i) Efficiency or Benefit/cost ratio, that is value of output in birr/ha divided by total cost/ha. in birr.

ii) Land Productivity, which is measured as:

a) Intensity of Cultivation, that is area sown more than once during an agricultural year (July to June) expressed as percentage of net area sown within that year. (Boserup, 1981)

b) Degree of Commercialization, that is area under non-food crops as a percentage of total cropped area. (Park, 1970)

Standard deviation and Co-efficient of Variation, have been used to indicate the variability of temperature and rainfall.

# CHAPTER TWO

## Review of Related Literature

Some writers (for example, Boyce (1986); Ishikawa (1986); Vaidyanathan (1987); etc) emphasize the high yields that could be gained from irrigation by using a well co-ordinated sets of inputs. Others stress the difficulties of operating truly successful irrigation projects because of the intrusive and disruptive nature of irrigation to natural and man made systems (Berry, 1980). For example, irrigation creates new health, soil, water, socio-economic environments, etc. It increases health problems and renders considerable losses of irrigable land through water logging, salinization and poor management practices. Hence, the effects of irrigation development could be seen from both points of views.

### 2.1 Positive Impacts of Irrigation

Joshi (1987) in stating the effects of irrigation on production, has pointed out that irrigation, in conjuction with high-yielding crop varieties, chemical fectilizers and other improved practices, has substantially increased agricultural production in most parts of the world. For example, in the humid tropical areas of southern China, South East Asia and India irrigation has long improved yield through double cropping. In the drier parts of Asia, the Near-East, Africa and parts of Latin America irrigation has lengthened the growing season, improved the reliability and quantity of crop production and also assured protection against drought (Berry, 1980; Tillman, 1981; Bittner, 1987). Other researchers such as Vaidyanathan (1987), Ishikawa (1986), Boyce (1986) and Tillman (1981), noted that individual

crop yields are considerably higher under irrigation than under rainfed agriculture and irrigated areas grow more of high value crops. According to Boyce (1986) irrigation makes possible adaption of new crop varieties and techniques, increases the application of fertilizers and changes in land allocation in favour of high valued crops. Upton (1969) also argues that irrigation reduces the risk of complete crop failure besides increasing average returns.

Although the amount of yield increase depends upon many variables such as climate, soil, irrigation technique, type of farm management and experience, according to Tillman (1981) even five fold increase in production levels are not uncommon. For example, in Asia water control and other inputs on irrigated farms resulted in rice yields up to five times higher than those in unirrigated areas. On experimental farms, yields with irrigation can be as much as four to eight times higher than the yield on non-experimental irrigated farms (Berry, 1980; Tillman, 1981). Another researcher, Anderae (1983), describes that in regions with intensive irrigation cultures on terraced fields, notably in Japan and Taiwan, three to four harvests per field per year are possible. Recently Bittner (1987) tried to compare irrigated agriculture with that of rainfed and concluded that an irrigation farmer can nourish his family well on a plot of 1.5 to 3 ha, whereas on rainfed farm he needs two or three times as much space to obtain the same result.

In addition to agricultural benefits, irrigation can also contribute to public health and social benefits at local levels. Worthington (1977) describes that in many areas of developing

nations, irrigation projects have water supplies for domestic uses and in some cases villages are provided with piped water. Perhaps the most significant social impact of irrigation development is the modernization of rural economies. FAO (1987) argues that, irrigation development has changed rural areas from a barter economy to a cash economy so that savings do not have to be in the form of wasteful material goods. According to Tillman (1981) sedentraization of nomadic people and stabilizing of production through irrigation has also improved the quality of rural life and provided more jobs and higher incomes to the rural population in many of the arid and semi-arid regions of the world (see also FAO, 1987). In areas where malnutrition is a serious problem, the development of irrigation agriculture together with Live-stock raising and fish culture has improved nutrition levels by increasing the quantity and quality of available foodstuff (Worthington, 1977).

Highly successful irrigation projects and even those not so successful do contribute to national economic efficiency. Cash crop Exports of groundnuts from west Africa, high quality rice from Pakistan or cotton from north Africa are good examples (Tillman, 1981) as major foreign exchange earners.

The other important impact of irrigation is the improvement of transportation routes. Irrigation projects require an infrastructure to construct and operate the system and these routes can be used to provide other social services (Berry, 1980; FAO, 1987; Tillman, 1981). Still another impact of irrigation is the contribution it makes to soil conservation. Irrigation provides indirect benefits in erosion control (Berry,

1980; Tillman, 1981). Crop lands under irrigation are arranged to control water movements through the uses of levees, bunds, ditches or land leveling. In addition, irrigated crop lands are more likely to be covered by water or vegetation for longer periods than rainfed farmland. This therefore, can reduce soil losses by wind erosion.

## 2.2. Negative Impacts of Irrigation

Although the primary objective of irrigation is to provide a crop with adequate and timely amounts of water, the application and usage of the water needs careful attention. In the opinions of Arakeri (1984); clark (1970); Michael (1978) and Tillman (1981) irrigation water added to cropland in excess of crop requirements and soil drainage capabilities has resulted in raising the ground water level, a condition favourable for the creation of water logging. Moreover, the salt in the irrigation water will accumulate in the soil and thereby increase the osmotic pressure and concentration of solutions reducing the ability of plant roots to absorb water (Arakeri, 1984; Arar, 1969). According to Joshi (1987) as the concentration of salt in the soil increases, farm production declines. Even plants senstive to excess salt may be stunted in growth with burned edges even though the soil appears to have enough water (Arakeri, 1984). FAO (1987) indicated that secondary effects such as crusting of seed beds, excessive weeds, nutritional disorders and drawing of the crop as well as rotting of seeds have developed due to prolonged irrigation. Another researcher Bittner (1987) notes that it is not only a prolonged irrigation

that develops secondary effects on soil but also regular irrigation in regions with lack of sufficient drainage has the same effect. Nutrition leaching is another effect of over-irrigation and irrigation may also change the texture of soil (Yaalon and Yaron, 1966). Arar (1969:372) describes that it is the experience of many countries that gradual deterioration of land to water logging and salinity always followed the introduction of canal irrigation. In Egypt, Iran, Iraq and Pakistan, 70 percent of the irrigated land is salinized or waterlogged due to irrigation. India has about 12 million hectares of land affected (Huston, 1977). According to White (1978) in many parts of the world, extensive areas of land were out of cultivation due to the rise of ground water-table and accumulation of salt resulting from excessive irrigation and poor water management (see also Bis-was et.al., 1980).

Many examples of abandonment of land due to degradation of soil have been noted in many developing nations. Since in most of the developing nations the agricultural sector is the backbone of their economy, the degradation of agricultural land may lead to an economic crisis, the loss of national self-sufficiency and hence increase the nations need for world charity. Allan (1949) described land degradation as a process which results in a radical change in the complete character of the land due to the losses of mineral plant food, the disappearance of organic matter, the break down of soil structure, the degeneration of vegetation and the setting up of a new train of land and water relationships. Other writers give more

emphasis to the negative effects of degradation (FAO, 1977), Aggrey-Mensha, 1984).

It has been repeatedly noted that irrigation is not harmful if the system is well planned, carefully operated and maintained so as to avoid the occurrence of stagnant water. However, irrigation systems which are characterized by low yield and environmental deterioration could be considered as harmful (Who, 1978; White, 1978). It has also been said that "whereever water goes, disease follows in its wake", and this sad experience of man's development activity occurs nearly every time when man conveys water for development purposes. According to worthington (1977) the increase of faecal-oral disease (such as amoeba, dysentery, etc) normally follows the development of irrigation systems particularly in arid and semi-arid regions. Tillman (1981) states that the conversion from traditional rainfed agriculture to more intensive practices under irrigation calls for significant increase in the use of fertilizers and biocides both of which may cause adverse effects on health.

While irrigation can be beneficial, recent studies have shown a distressing series of social and economic ills (Joshi, 1980; Ehlers, 1977; Bharara, 1977; Steinberg et.a., 1980a; 1980b). The development of irrigation agriculture produces many far reaching changes in ecosystem. While the changes may provide short term economic benefits due to increased irrigation efficiency or increased yields, they are socially disruptive (Tillman, 1981). For example, in Sudan's Gezira, Schistosomiais

was unknown before irrigation. But with the advent of irrigation, the prevalence of schistosomiasis became such that the infection level reached more than 80 percent among children and 60 percent among the population as whole (Tessema, 1986).

Resettlement of dislocated population has been the most extensive social impact of irrigation (Tillman, 1981). Canals and ditches encourage pepple to use the water for other purposes including domestic supplies, recreation or for Livestock which may again bring adverse effects on health. In some areas, the diversion of labour from its village occupation such as fishing, wood cutting and home gardening into casual workers has resulted in the increase of the costs of those items (FAO, 1987; Tillman, 1981; Berry, 1980). Other settlement problems arising from irrigation development are the new housing patterns and disruption of traditional systems of communications (Tillman, 1981).

## 2.3. Irrigation in Ethiopia

Ethiopia, often referred to as, " the water tower of East Africa," has in principle a large water resource potential because of her high rainfall and big rivers which discharge large amounts of water every year.

production of agricultural products and in the provision of employment opportunities to a large number of people. Melka Sedi, Melka Warer, Amibara, Dubti, Ditbahri, etc, State irrigated farms are some of the good examples in the middle Awash valley (Tessema, 1986). However, almost all State irrigated farms are suffering from salinization, Water logging and loss of yield. According to Gezmu (1990:17), 10 million hectares of land is salinized in Ethiopia as a result of the introduction of irrigation projects. Haider, Tilahun and Endale (1988) noted that 30 percent of the 3500 hectares of Melka Sedi State Farm is seriousely affected by water logging and salinity. In the middle Awash Farms, in 1976, the abandoned farm land was 213 hectares. By 1985, it reached 895 hectares and in 1990, 1640 hectares was totally abandoned and 2400 hectares have been rendered less productive due to salinity (Gezmu, 1990). Even the banana field of Melka Sedi, which repeatedly produced 250 quintals/ha of high quality banana in the 1970's are presently producing about 60 quintals/ha of locally marketed bananas (Tessema, 1986, Gezmu, 1990).

The spread of disease such as malaria, schistosomiasis, amoebic and bacillary dysentery, etc. is another common problem of the irrigated areas. While malaria was a common disease in all lowland regions of Ethiopia. Schistosomiasis prevailed only in few areas (Tessema, 1986). At present malaria has become a wide spread disease in most of the irrigated farms of Ethiopia, killing a large number of workers every year and rendering hund-

reds more unproductive (Tessema, 1986). According to Cezmu (1990) Schistosomiasis is also becoming a growing source of human suffering and a serious threat to labour productivity in areas like the sugar cane farms of the Middle Awash. In a survey conducted in 1985, it was indicated that in almost all State Farms under irrigation in Ethiopia, the disease schistosomiasis is common (Tessema, 1986).

# CHAPTER THREE

## DESCRIPTION OF THE STUDY AREA

### 3.1 Location

The project area is located 160 Kms South of Addis Abeba on the main road to shashemenie. The State Farm is found at Gerbe some 10 Kms South East of the town of Ziway (Figure 5).

### 3.2 Climate

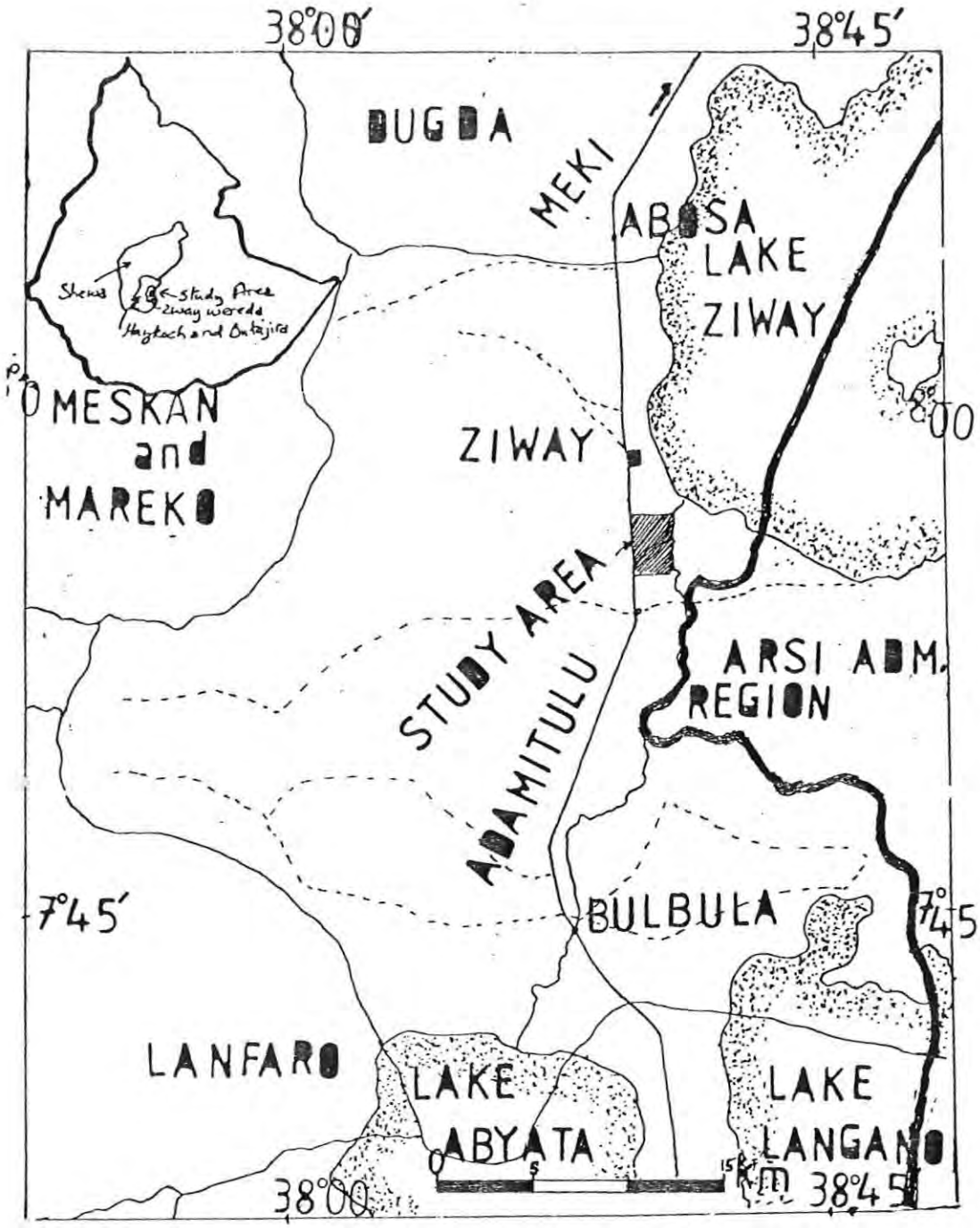
#### 3.2.1 Rainfall

Rainfall in Ziway is highly variable. The annual average rainfall (1970-89) is 749.8mm. The Standard deviation is 196.2 and the coefficient of variation is 26.2 percent. The highest amount of rainfall was 1096.1mm in 1977 and the lowest was 375.8mm in 1970 (Table 2).

Table-2: Annual Rainfall at Ziway (1970 - 89)

| Year | RF (mm) | Year | RF (mm) |
|---|---|---|---|
| 1970 | 375.8 | 1980 | 513.9 |
| 1971 | 613.0 | 1981 | 992.8 |
| 1972 | 659.6 | 1982 | 890.1 |
| 1973 | 681.7 | 1983 | 864.1 |
| 1974 | 855.7 | 1984 | 602.0 |
| 1975 | 956.0 | 1985 | 659.2 |
| 1976 | 558.7 | 1986 | 548.7 |
| 1977 | 1096.1 | 1987 | 552.9 |
| 1978 | 925.2 | 1988 | 707.3 |
| 1979 | 992.8 | 1989 | 951.1 |

Source: Based on Appendix II.




Source: MOA (LUPRD) (1988) Land Use Planning Study.

FIG.5 Location Map of the Study Area

The pattern of seasonal rainfall has also been very variable. The seasonal variability, as measured by the coefficient of variation is 34.4 percent (July to September, wet season), 94.4 percent (October to February, dry season) and 29.3 percent (March to June, intermediate season) (Figure 1)

3.2.2 Temperature

Temperature in Ziway is mild throughout the year. The annual average temperature (1970-89) is 19.7°C and varies little throughout the year. The variation, as measured by the coefficient of variation except for the months of July and August for mean monthly maximium and December, February, March, and June for mean monthly minimium, in both cases is not noticeable. (Figure 3)

Table-3: Mean Monthly Maximium Temperature at Ziway (1970-89) Measured in Standard Deviation and Coefficient of Variation

| | J | F | M | A | M | J | J | A | S | O | N | D | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total | 482.2 | 533.5 | 549.8 | 521.7 | 555.0 | 536.2 | 495.7 | 491.3 | 502.5 | 518.5 | 489.0 | 489.3 | 520.2 |
| Mean | 25.38 | 26.67 | 27.49 | 27.46 | 27.75 | 26.81 | 24.79 | 24.57 | 25.13 | 25.93 | 25.74 | 25.28 | 26.01 |
| S.D. | 1.55 | 1.56 | 1.55 | 1.71 | 1.50 | 1.69 | 2.04 | 1.99 | 1.46 | 1.51 | 1.57 | 1.76 | 1.35 |
| C.V. | 6.11 | 5.87 | 5.62 | 6.24 | 5.46 | 6.31 | 8.21 | 8.09 | 5.83 | 5.82 | 6.08 | 6.93 | 5.19 |

Source: Based on Appendix IA

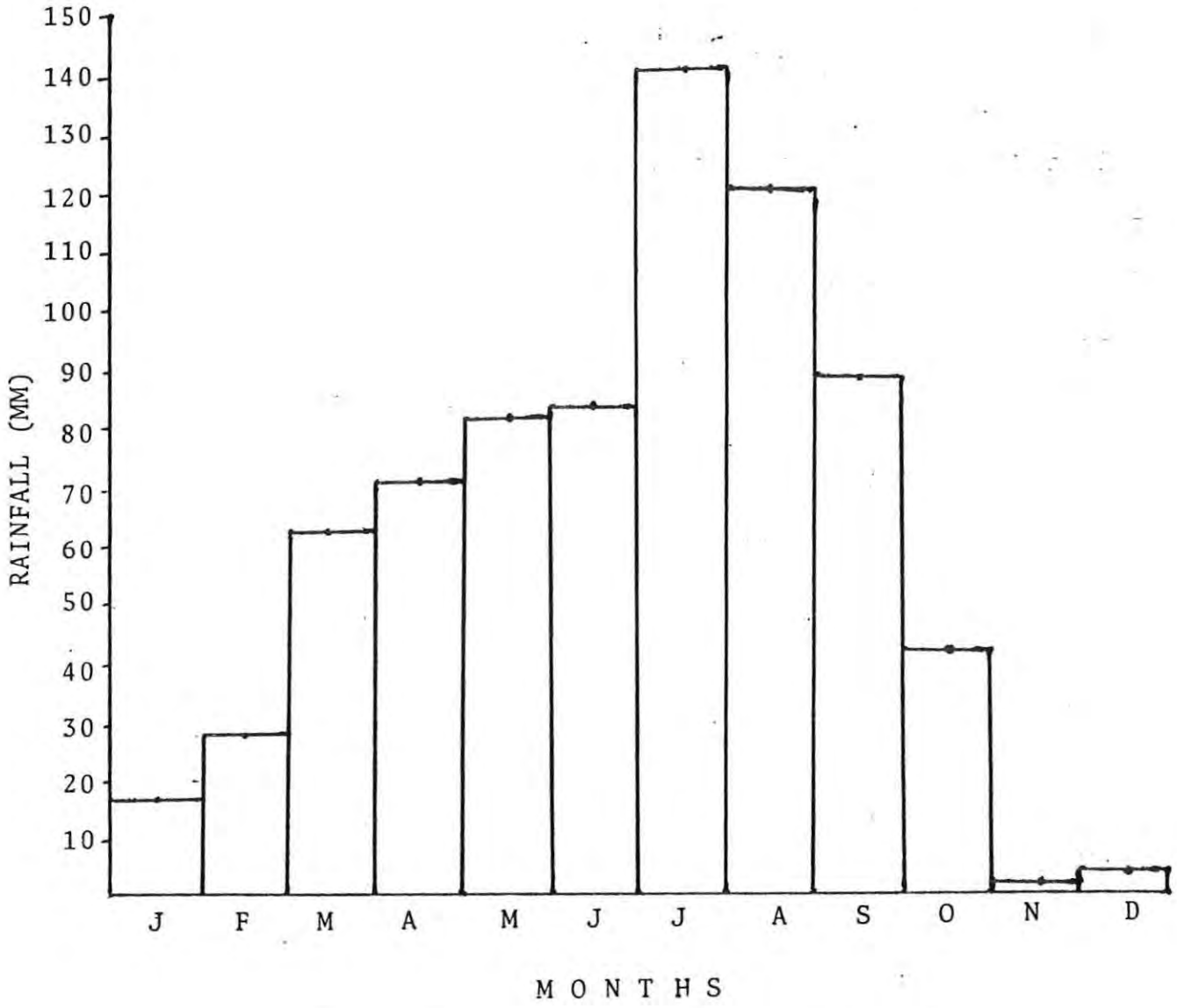



FIG - 1 : MONTHLY RAINFALL OF ZIWAY 1970 - 89

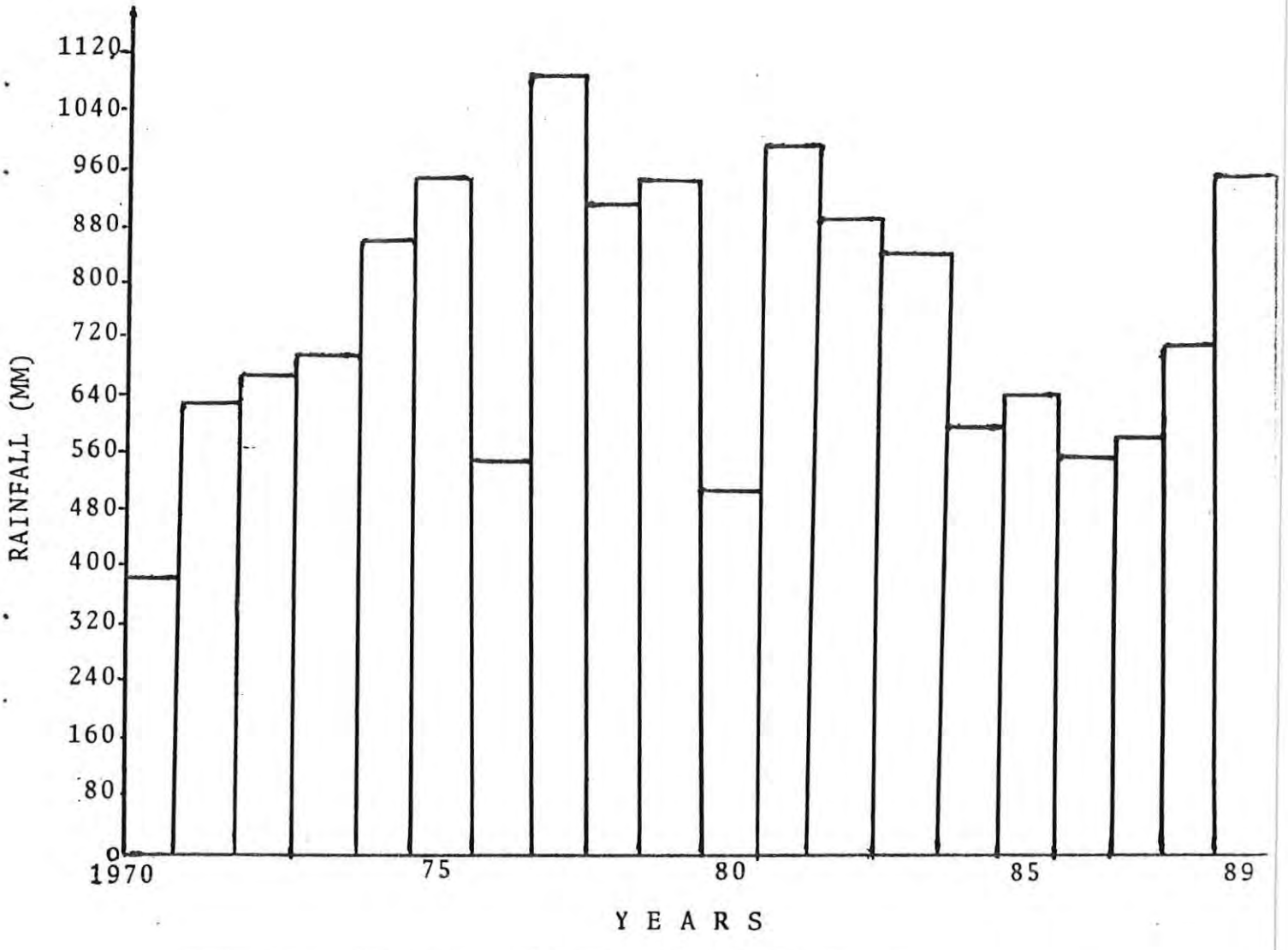



FIG - 2 ANNUAL RAINFALL OF ZIWAY 1970 - 89

Table-4: Mean Monthly Minimium Temperature at Ziway ( 1970-89) Measured in Standard Deviation and Coefficient of Variation

| J | F | M | A | M | J | J | A | S | O | N | D | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 224.0 | 259.4 | 279.6 | 266.2 | 288.4 | 283.1 | 286.8 | 281.5 | 270.0 | 248.6 | 226.5 | 217.3 | 266.2 |
| 11.79 | 12.97 | 13.98 | 14.01 | 14.42 | 14.16 | 14.34 | 14.07 | 13.50 | 12.43 | 11.92 | 11.44 | 13.31 |
| 1.33 | 2.60 | 2.90 | 1.58 | 2.73 | 2.79 | 1.38 | 1.57 | 1.64 | 1.67 | 1.55 | 2.03 | 1.67 |
| 11.27 | 20.74 | 20.74 | 11.30 | 18.90 | 19.70 | 9.60 | 11.17 | 12.12 | 13.47 | 13.03 | 17.75 | 12.55 |

Source: Based on Appendix IB

The highest temperatures occur between March and June prior to the start of the main rains. The average annual mean maximium and mean minimium temperatures for 20 years are 27.9$^{o}$C and 9.1$^{o}$C respectively. Mean minimium temperatures below 10$^{o}$C are common between Nevember and June. The lowest of the mean minimium is 2.9$^{o}$C implying a temperature at ground level close to 0$^{o}$C (Appendix IA). But according to the peasants in the State Farm, no evidence of crop damage due to freezing has been observed so far. Nevetheless, the mild temperatures prevailing throughout the year are suitable for a wide range of sub-tropical and tropical crops including wheat, Maize, Sugar cane, Sisal and Sesame provided water is available.

### 3.2.3 Growing Period

The growing period is the period in a year when moisture availability is sufficient for crop growth. It depends on the relative balance of precipitation, Evapotranspiration and soil moisture storage (FAO, 1987). Since the study area is within the

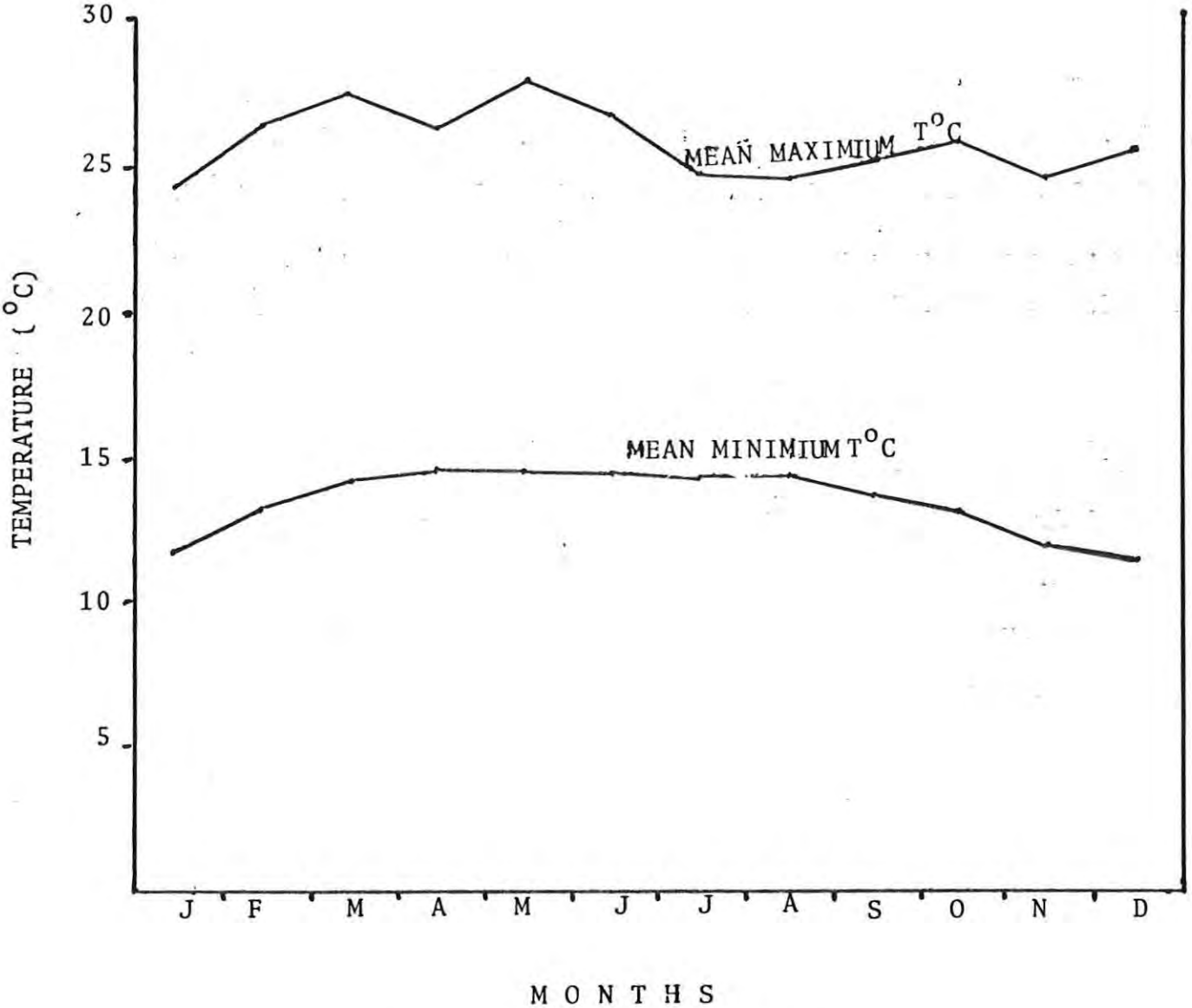



FIG - 3 MEAN MAXIMUM AND MEAM MINIMUM TEMPERATUREE OF ZIWAY 1970 - 89

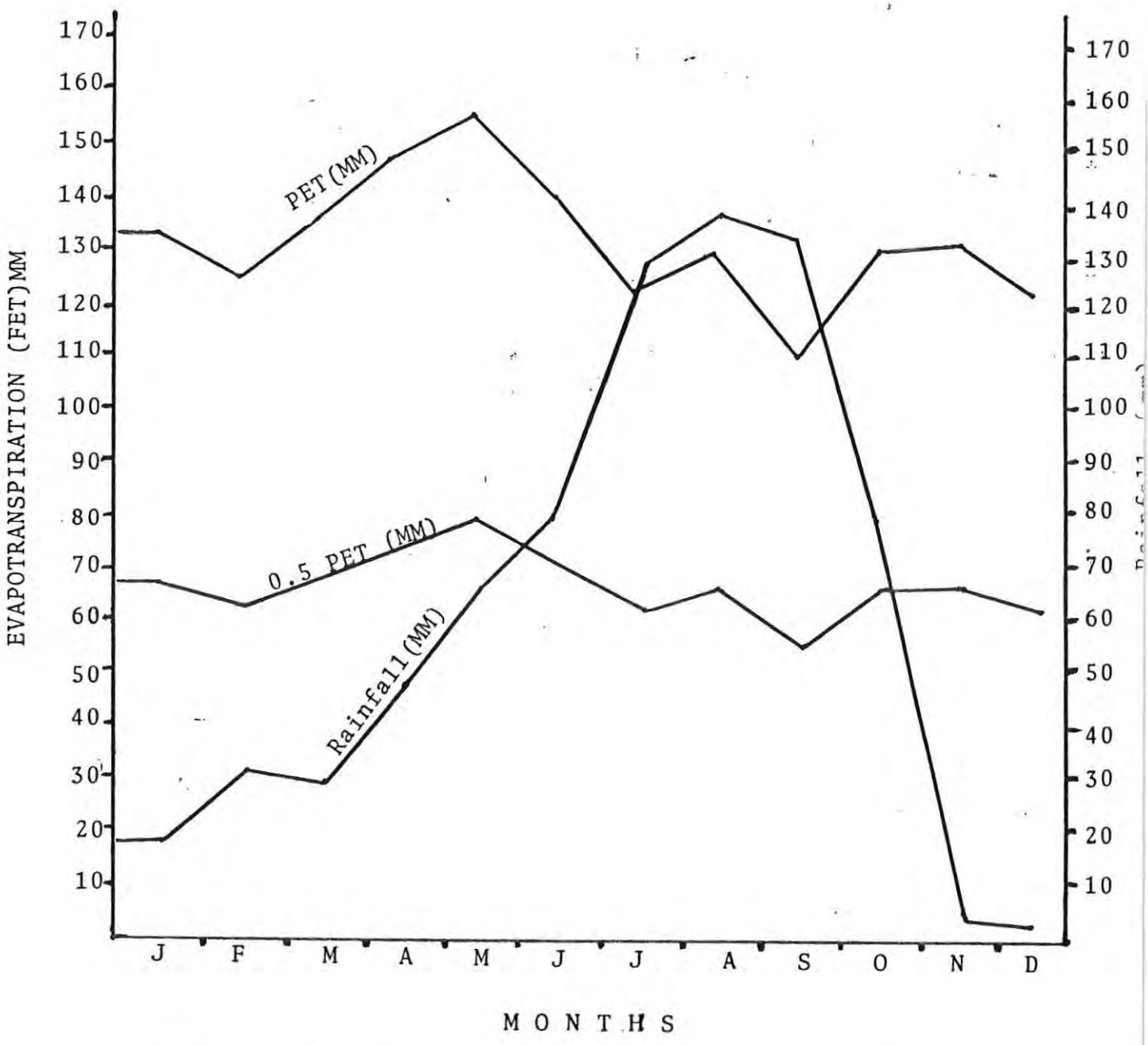



FIG - 4 : THE RELATIONSHIP BETWEEN RAINFALL AND EVAPO-TRANSPIRATION IN ZIWAY.

Southern Rift Valley region where the climate is semi-arid, it has a low growing period. Thus, the growing period of the region is estimated by considering the rainfall, Evapotranspiration and temperature (Table 5). Accordingly, the total length of the growing period is 139 days (the 3rd of June to the 20th of October). Out of this, the reliable growing period (wet season) is only of 73 days (July 12 to September 23rd) (Figure 4). Hence, rainfed crops are not usually planted until the end of June or early July owing to the un reliability of rainfall in the preceding periods. The short duration of the growing periods for crops coupled with the un reliability of rainfall also restricts the range of crops that are suitably grown. Therefore, a response to irrigation system could confidently be expected in the wet season as well as at other times of the year.

Table-5: Average Climatic Data at Ziway (PET = Potential Evapotranspiration)

| | J | F | M | A | M | J | J | A | S | O | N | D | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rainfall (mm) | 19 | 31 | 29 | 46 | 66 | 79 | 125 | 135 | 132 | 78 | 3 | 1 | 744 |
| PET (mm) | 133 | 125 | 135 | 148 | 155 | 141 | 121 | 129 | 108 | 129 | 130 | 121 | 1575 |
| Temperature (°C) Average | 18.7 | 19.8 | 20.2 | 20.2 | 19.7 | 20.1 | 19.5 | 19.1 | 19.0 | 19.1 | 18.8 | 17.6 | 19.3 |
| Mean Max. (°C) | 25.4 | 27.1 | 27.7 | 28.2 | 27.7 | 27.3 | 25.1 | 24.6 | 25.1 | 25.8 | 25.2 | 25.4 | 26.2 |
| Mean Min (°C) | 11.9 | 12.5 | 12.6 | 12.2 | 11.6 | 12.8 | 13.9 | 13.6 | 12.8 | 12.3 | 12.3 | 9.8 | 12.4 |

Source: FAO (1984); FAO (1988)

### 3.2.4 Evapotranspiration

The annual evapotranspiration at Ziway is about 1575 mm. It is greatest between March and June (135-155 mm per month) and least during the moist season (108-121 mm per month) (Table 5)

## 3.3 Geology and Physiography

Lake Ziway lies at an altitude of 1636m within a broad down faulted basin of internal drainage formed through local subsidence of the Rift Valley floor (Makin, 1976). Both to the west and east, the land rises within 10km of the lake to a higher lying faulted ridges. To the west of the lake, there are a series of low lacustrine terraces exhibiting only subdued relief. The town of Ziway which is to the west of the lake lies at an altitude of 1640m. In general, the whole region around Ziway is dominated by flat plain topography and is characterized by Kolla agro-ecological zone (FAO , 1989).

## 3.4 Soils

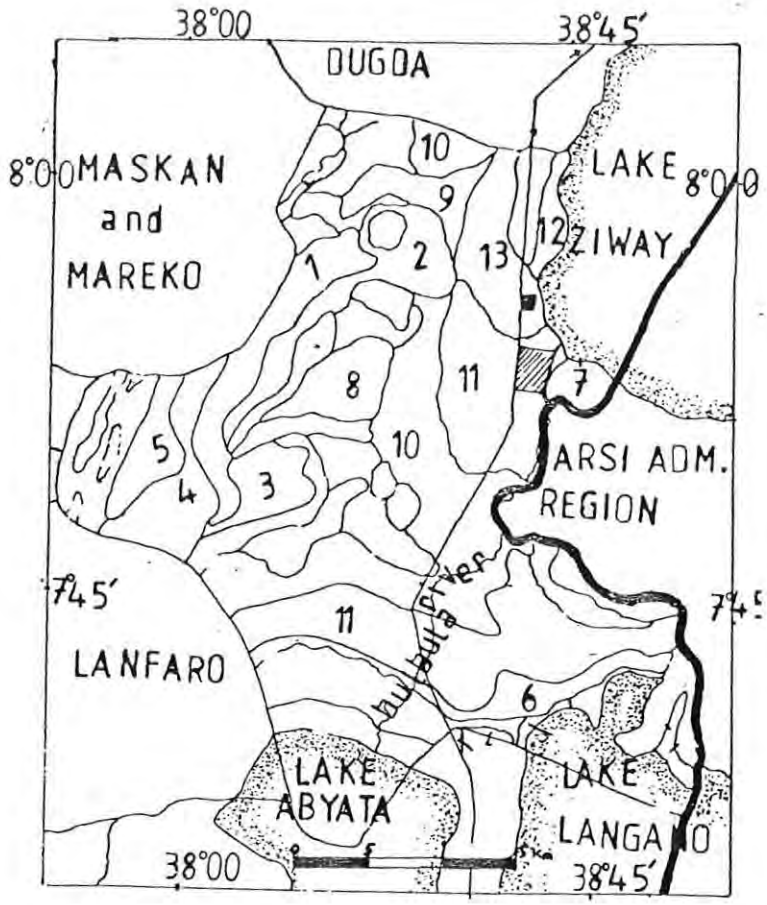
Ziway area is dominated by plain and poorly drained vertisols (FAO, 1989). According to Makin (1976), the soils of Ziway area are classified into two categories.

i) Coarse-textured soils on pumic sand and gravel

ii) Medium-textured soils on ash.

As summarized from Makin (1976), the pumic sands have weakly developed profiles which are poorly structured and low in organic matter. In such soil types, surface texture is usually sandy loam and the sand content increases gradually with depth. 75 to 100 percent of the soils in the State Farm are deep, coarse loamy vitric Andosols of Meki series (Figure 6). Makin (1976) also observed that, the soils in Ziway area have high level of sodium content.

According to FAO (1985) high content of sodium in soils result with low infiltration rates. Hence, if irrigation is




Source: MOA (LUPRD) (1988) Land Use Planning Study.

FIG.6 Physiography and Soils Map of Ziway Wereda

| Symbol | Description |
|---|---|
| 1 | Clayey Haplic Nitisols |
| 2 | Lithic Leptosols & Nitisols with Cambisols |
| 3 | Lithic Leptosols and Nitisols |
| 4 | Clayey Haplic Nitosols |
| 5 | Loamy to clayey plani-mollic Fluvisols |
| 6 | Deep, coarse loamy (Fluvi) Vitric Andosols. |
| 7 | Shallow loamy Mollic Leptosols |
| 8 | Moderately deep to deep mollic Andosols |
| 9 | Lithic Leptosols and alluvial land, vertisols |
| 10 | Deep, coarse loamy (Fluvi) Vitric Andosols |
| 11 | Deep, Coarse loamy (Fluvi) Vitric Andosols |
| 12 | Clayey Haplic Nitisols |
| 13 | Deep, coarse loamy (Fluvi) Vitric Andosols |

to be used in such soils, first, a prolonged application of water would be needed to get the required amounts of soil moisture. Second, the probability of the soil to be salinized would also be high if there is lack of good drainage facilities.

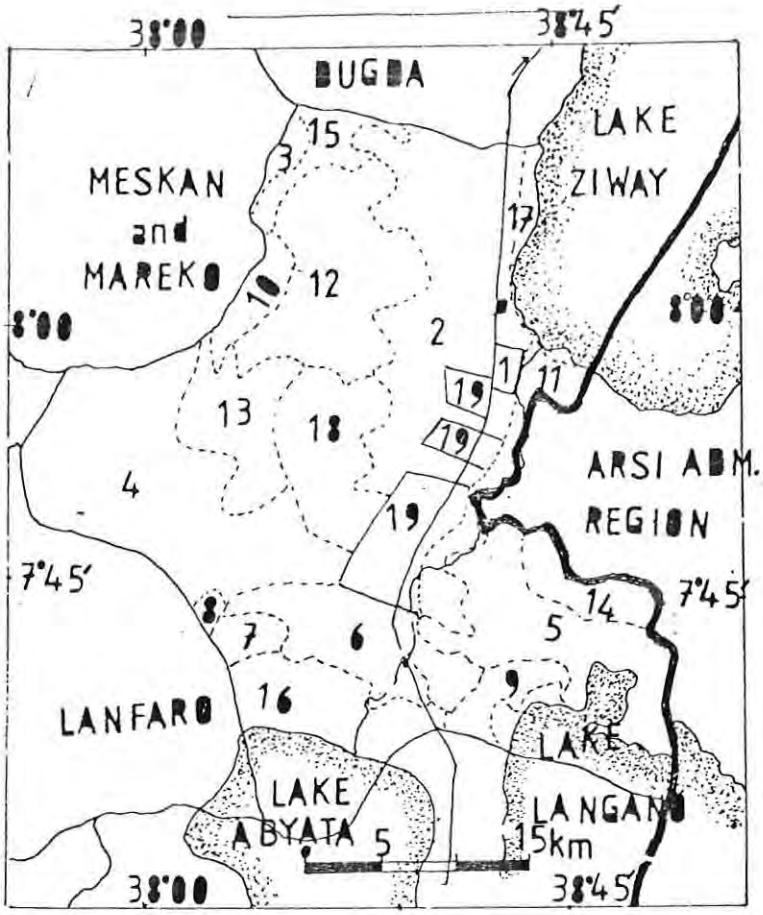
## 3.5 Vegetation

The scattered remnant patches of acacia bush land indicate that, once the area was wooded. But today, much of the land has been cleared and put under cultivation. Therefore, the region is dominated by farm land and there is an acute shortage of fuel wood (FAO, 1989). Along the lake shore, vegetation Zonation is controlled by the water level. The shore line itself is fringed by discontinues blocks of papyrus and in open water, there is a continuous floating belt of reed with water lily. Along the west shore, there are expanse of grasslands which provide grazing when the lake level is low. The State farm is within the zone where there is intensive cultivation with 14 to 25 percent is under woody vegetation (Figure 7).

## 3.6 Water Resources

### 3.6.1 Surface Water Resources

Although Ziway area has no perennial river, the catchment of Lake Ziway includes Bulbula, Catar, Meki rivers and several other mineralized springs. There might also be a significant ground water flow towards the lake (Makin, 1976). The only river in Zway area is Bulbula and its source again is Lake Ziway. The entire out flow of the lake is carried by the Bulbula River and is discharged into Lake Abiyata. Therefore, the only source of




Source: MOA (LUPRD) (1988) Land Use Planning Study.

FIG.7 Land Use and Land Cover Map of Ziway Wereda

| Symbol | Description |
|---|---|
| 1 | . State Farm |
| 2 | . Intensively Cultivated with 14 to 25% Woody Vegetation. |
| 3 | . Intensively Cultivated with 11% Scattered trees and 5% grass cover Unit. |
| 4 | . Intensively Cultivated with an average of 4 to 11% woody Vegetation and 2 to 10% grass cover. |
| 5 | . Moderately Cultivated area with 30% to 35% Patches of Woody Vegetation ( including Scattered trees with in the cropland). |
| 6 | . Moderatly cultivated within 40% Patches of Woodland. |
| 7. | . Sparsely Cultivated within 65% Shrub Grass-land and 5% trees within the Cropland. |
| 8. | . Sparsely Cultivated within 60% Woodland and 20% Shrub grassland. |
| 9 | . Sparsely Cultivated within 95% Woodland |

| | | | |
|---|---|---|---|
| 10. | . Grassland | 15. | ..Degraded shurb grassla |
| 11. | . Open woodland, | 16. | . Grassland |
| 12. | . Wooded bushshrub grassland | 17. | . Seasonally in undated gras |
| 13. | . Woodedbushland | | land. |
| 14. | . Wooded shrub grassland | 18. | . Open Forest |
| 15. | . Degraded shrub grassland | 19. | . Ranch |

surface water in the region is Lake Ziway and this indicates that there is an acute shortage of surface water in Ziway region.

### 3.6.2 Ground Water Resources

According to Makin (1976) a survey was under taken in February 1974 that assessed the depth and quality of ground-water beneath. On the basis of the survey, it was found that the water Table is near to the surface around Meki River and Lake Ziway. But the survey under taken from hand dug wells also indicated that, the water is found to be saline and therefore its use is confined to domestic purposes and for Livestock only. From this it can be said that the conjuctive use of ground water for irrigation is very much limited. Hence, the agricultural production in Ziway area has no alternative except depending on the effective rainfall and the lake water. Even the lake water has to be monitored frequently as it can easily be affected by the Saline water underground.

## 3.7 Land Use and Cropping Pattern

According to FAO (1989) the total land area of Ziway wereda is divided into four major land use groups.

| | |
|---|---|
| Arable crop land | 70 percent |
| Fuel wood or perennial forests | 0 percent |
| Wet land grazing ..... | 7 percent |
| Restricted grazing ..... | 8 percent / (Ranch) |
| Exclusion ..... | 15 percent |
| Total:- | 100 percent |

The land use pattern above indicated that the major part of the area is under cultivation. (Figure 7). The dominant and most important crop is maize. Observations indicate that, during the moist season, maize occupies up to 80 percent of the land under cultivation. Maize held the dominant position because it is a short maturing crop. Besides this, small irrigated plots grow a variety of vegetable and fruits.

## 3.8 Population and Social Structure

The total population of Ziway Zuria Wereda is 61,144 (CSO, 1985). Out of this total 14.7 percent or 8,982 is urban and the rest 85.3 percent or 52,185 is rural. The major tribal group according to Makin (1976) is the Arsi Oromo who form the majority of the cultivators and herdsmen. Before the revolution (1974), most of the Arsi were nomadic or semi-nomadic pastoralists. But later when land was distributed, the nomadic way of life all but disappeared and many became settled farmers. The development of Ziway and Meki towns have also contributed much of the growth of the population by attracting kembatta tribesmen to this region some of whom became farmers otherwise are more commonly migrant labaurers. Although Amharic is the language of business, the majority speak several dialects of Oromigna.

# CHAPTER FOUR

# LAND USE AND CROP PRODUCTION

## 4.1 Land Use

One of the out comes of the 1975 land reform in Ethiopia was the conversion of the pre-reform commercial farms scattered over various parts of the country into State Farms. Subsequently, the Government paid greater attention to opening new State farms and expanding the existing ones as an instrument of policy designed to increase the supply of food to towns, raw materials to industries, increase agricultural exports and to a lesser degree create employment.

Ziway State Farm is one of such designated farms. Before nationalization, the farm was used to produce maize, teff, beans, tomatoes, fruits and had some sort of Livestock production. But after nationalization, it has been realized by the Ministry of State Farm Development that, if the farm continues under such production condition, it will no longer be profitable because, irrigated agriculture is both labour and capital intensive. Therefore, on the basis of the recommendation, the farm has been transfered into Horticulture Development Corporation and started producing fruits and vegetables since 1980. After eight years of production, in 1989, an Italian named Anitonio Ferrera has made a special agreement with the corporation so as to produce flowers in addition to the production of fruits and vegetables. So today, the farm produces flowers, fruits and vegetables.

An assessment of the land-use pattern in the farm for 1991/92 indicates that, the total cultivated land (Irrigated

and fallow land) accounted for about 71.2 percent of the total area of 1000ha. In the farm, land is double or triple cropped except for lands under perennial crops such as fruits. According to the estimate made, double or triple cropped area accounts for about 47.1 percent (470.68ha) of the irrigated area (Table 6). In this case, double or triple cropping may even make the percentage of irrigated area greater than the actual.

Table - 6 Land-Use types 1991/92

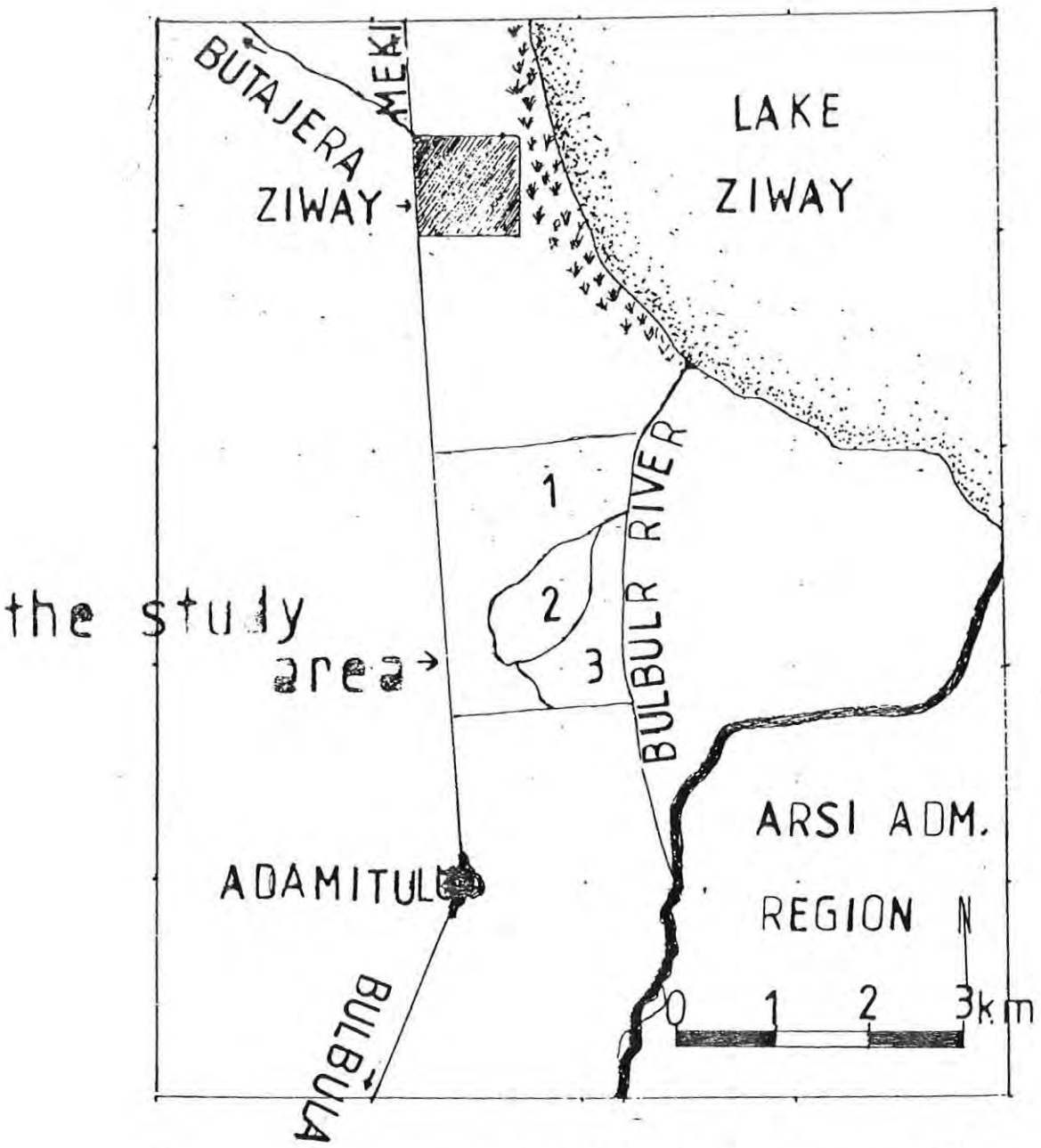
| Types of Land Cover | Area in (ha) | % of the total |
|---|---|---|
| Crop Land | 642.98 | 64.3 |
| Annual Crop | 470.68 | 47.1 |
| Perennial Crop | 172.3 | 17.2 |
| Fallow land | 68.93 | 6.9 |
| Settlement, offices roods and canals | 288.09 | 28.8 |
| Total:- | 1000.00 | 100.0 |

Source: Field Survey 1991/92

Analysis of the land-use pattern in table 6 reveals that the ratio of the area under crops to the total area is 1:1.5 indicating that there is an effective usage of land on one hand and a further expansion condition on the other (FIGURE 8).

## 4.2 Crop Production

The total crop out put in 1991/92 was estimated to be 25,464 quintals (Table 7). The predominant crops in terms of area and volume of out put were green beans from vegetables, grapes from fruits and statice from flowers. This estimation doesn't include




Source: MOA (LUPRD) (1988) Land Use Planning Study.

FIG.8 Land Use Map of the State Farm

| Symbol | Description |
|---|---|
| 1 | Land under annual crops |
| 2 | Built-up areas |
| 3 | Land Under Perennial Crops |

the double or triple cropped condition of green beans and flowers. However, 250 hectares or 38.9 percent of the total area was occupied by green beans alone.

Table-7: Crop Production, Yield and Area Covered by Major Crops for the Year 1990/91

| Crop type | Production in Quintals | Yield in Quintal/ ha | area in ha | % of the total area |
|---|---|---|---|---|
| A : Vegetables | 9730.00 | 78.19 | 353.89 | 55.04 |
| Green beans | 6692.19 | 30.77 | 350.00 | 38.9 |
| Melon | 462.12 | 118.49 | 14.00 | 2.2 |
| Asparagus | 77.18 | 154.36 | 50.00 | 7.8 |
| Straw-berries | 156.90 | 17.93 | 8.75 | 1.4 |
| Onion | 1779.12 | 76.65 | 23.21 | 3.6 |
| Other Vegetables | 562.50 | 70.93 | 7.93 | 1.2 |
| B : Fruits | 9374.08 | 124.41 | 172.3 | 26.8 |
| Grape | 2384.61 | 35.59 | 67.00 | 10.4 |
| Orange | 2496.39 | 243.55 | 55.80 | 8.6 |
| Papaya | 3922.80 | 182.37 | 35.00 | 5.4 |
| Avocado | 75.20 | 75.20 | 4.00 | 0.6 |
| Other Fruits | 495 .08 | 85.36 | 10.80 | 1.7 |
| C : Flowers | 6360.40 | 37.51 | 116.79 | 18.2 |
| Statice | 4347.14 | 110.25 | 39.43 | 6.1 |
| Dill | 253.39 | 23.75 | 10.67 | 1.7 |
| Cartamus | 220.37 | 23.64 | 9.32 | 1.4 |
| Eupherbia | 770.57 | 45.65 | 16.88 | 2.6 |
| Allium | 459.30 | 22.45 | 20.46 | 3.2 |
| Ammemajus | 105.84 | 17.61 | 6.01 | 0.9 |
| Atriplex | 192.44 | 19.21 | 10.02 | 1.6 |
| Other Flowers | 11.35 | 10.05 | 4.00 | 0.6 |

Source: Ziway Agricultural Development Office

Note: Other flowes include; Delphinium
Other Vegetables include; Yeferenge Karia, Chat, Gesho, etc
Other fruits; include passion fruit, Cazmer, mango, Gishetta.

As revealed in table 7, out of the total land under annual crops such as flowers and vegetables (470.68ha), approximately 353.87 hectares or 55.04 percent was occupied by vegetablesaand they accounted for about 9730 quintals or 38.2 percent of the annual crop production. Fruits with 172.3 hectares or 26.8 percent of the total area accounted for 36.8 percent where as flowers for 25 percent with 116.79 hectares.

On the basis of the analysis, the allotment of land to different crops namely vegetables, fruits and flowers seems reasonable from the point of view of total out put. But when one views the yield /ha of each crop , the picture becomes different. For example, oranges with 243.55 quintals/ha holds the first position followed by papaya 182.37 quintals/ha from the same group, asparagus 154.36 quintals/ha, Melon 118 quintals/ha and statice from flowers with 110.25 quintals/ha. But green beans and grapes which occupied 317.0 hectares or 31.7 percent of the total irrigated land have 30.77 quintals/ha and 35.59 quintals/ha respectively. The point that should be noted about green beans and grapes is that, there is a possibility for both crops to be harvested twice a year. Even in the case of green beans, they could be harvested three times a year. Therefore, the yield/ha of land under these crops may be raised and compensated as well. Otherwise, more land should be alloted to oranges, papaya and asparagus for they are the most productive of all crops that grow in the farm.

## 4.3 In-Puts Used

### 4.3.1 Labour

Irrigated agriculture is labour intensive. The improvement in the agricultural practices and growth in the cropped area in Ziway State Farm has brought a high demand for labour both skilled and unskilled.

At the time of nationalization (1975), there were 300-400 seasonal and 114 permanent workers (Ziway Agricultural Development Office). Today, with the expansion of the farms, the permanent workers have reached 284 where as the number of seasonal workers ranges between 1500-3000 depending on peak and scack seasons.

Table-8: Growth in Irrigated Area and Labour

| Year | Total area in ha | Irrigated area in ha | Growth rate % | Labour | | | Growth rate % |
|---|---|---|---|---|---|---|---|
| | | | | Permanent | Seasonal | Total | |
| 1986 | 371.36 | 319. 52 | - | 203 | 1745 | 1948 | - |
| 1987 | 410.70 | 351.75 | 10.1 | 203 | 2079 | 2282 | 17.1 |
| 1988 | 525.65 | 465.37 | 32.3 | 205 | 2334 | 2539 | 11.3 |
| 1989 | 661.35 | 592.42 | 27.3 | 211 | 2593 | 2804 | 10.4 |
| 1990 | 661.35 | 592.42 | - | 263 | 2729 | 2992 | 6.7 |
| 1991 | 676.92 | 676.92 | 14.3 | 284 | 2148 | 2432 | 18.7 |

Source: Ziway Agricultural Development Office

A close look at table 8 reveals that a growth of irrigated area by 111.9 percent has brought a 53.6 percent increase in the total employment. When compared to pre-nationalization the

increase in labour is 482 percent. Nevertheless, there is an acute shortage of manual labour during peak seasons. In order to attract more labour, the Farm encourages labourers to work an additional four hours of work besides the normal eight hours on a parttime basis.

Most of the permanent workers are relatively skilled and are assigned in the management and supervision of the farms. The seasonal workers on the other hand are assigned in field operations such as harvesting, picking, weeding, watering and in all manual cultivations. Hence, most of the seasonal workers stay for 12 hours in the farm and are paid on the basis of piece-rates. As to the payments of seasonal workers, there are six different conditions. The majority of the seasonal workers are paid birr 1.92/person/ day if they stay for eight hours of work and provided they accomplish the required amount of work. Above the required amount, they will be paid according to their performance.

The other five groups stay for 12 hours and the payment as well as work assignment is different. Watering and canal controllers are paid birr 3.80/person/day, attendance recorders birr 2.50, Formans birr 4.50, Time-keepers birr 4.00 and guards birr 2.88. Such workers are chosen among the seasonal workers by the experience and long years of service they have in the farm. Despite the incentives made, the demand for seasonal labourers has been increasing since 1989. In fact, in 1990/91, there has been a drastic change in the total number of seasonal labourers due to security problems (Table 8).

### 4.3.2 Farm Machinery and Fertilizers Used

The types of Crops grown and the kinds of farm activities decide the number and types of farm machineries to be used. Most of the activities in the farm are done manually except ploughing. Even ploughing in the farm is limited to lands under annual crops. Therefore, the use of farm machineries in the farm is limited to tractors alone except those used for sprinkler and drip methods of irrigation.

During nationalization (1975), there were about 3 tractors. In 1989, the number has reached 15 and today, the total number of tractors are 21 (Ziway Agricultural Development Office). The increase in the number of tractors indicate the growth of cropped area as well as the intensive usage of land. As to the use of fertilizers, it differs from crops to crops and in the types of fertilizers. The most intensively used fertilizers in the farm are nitrogen and phosphate. The amount of nitrogen as well as phosphate used for fruits, vegetables and flowers is different. For example, for all fruit types, the amount of nitrogen and phosphate applied is 2 quintals/ha each and for vegetables 1 quintal/ha of nitrogen and 2.5 to 3 quintals/ha of phosphate. But as to flowers, the amount of nitrogen and phasphate applied differs from flowers to flowers; where 2-3 quintals/ha of nitrogen and 2 to 5 quintal/ha of phosphate is the usual amount.

In general, a large amount of money has been spent in the purchase of fertilizers and the amount spent varies from year

to year. To have some idea, the amount spent for three of the crop types (Vegetables, fruits and flowers) for three consecutive years is displayed in Table 9.

Table-9: The Purchase of Fertilizers 1989-1991

| Year | Types of crop | Cost of fertilizer in birr | Total | % increase |
|---|---|---|---|---|
| 1989 | Vegetables | 13914.85 | 44553.78 | - |
| | Flowers | 26341.79 | | |
| | Fruits | 4297.14 | | |
| 1990 | Vegetables | 69508.95 | 128524.65 | 188.5 |
| | Flowers | 40649.40 | | |
| | Fruits | 18366.30 | | |
| 1991 | Vegetables | 87880.97 | 149306.75 | 16.2 |
| | Flowers | 41375.00 | | |
| | Fruits | 20050.78 | | |

Source: Ziway Agricultural Development Office

A look at Table 9 indicated that the farm has been spending a large amount of birr for the purchase of fertilizer. In 1989, the amount spent was birr 44553.78 and in the subsequent years, it was birr 128,524.65 and 149306.75 respectively. Although the increase of 1991 was not as high as that of 1990, in general there is an increasing trend in the amount of birr spent.

### 4.3.3 Irrigation Water

Temperature condition in the area is favourable to grow crops throughout the year provided water is available. According

to the farm supervisors, water is not a problem in the farm unless maintenance and electricity problem arises. Therefore, perennial irrigation system has been adapted in the farm. By perennial irrigation, it is meant that, there is a possibility to plan for a harvest of one annual crop like orange or two harvests one of melon and another of green beans or three harvests of short-duration crops in one agricultural year.

In the Farm, water is applied to crops in three different methods of irrigation namely sprinkler, drip and furrow. Furrow irrigation method is used mainly for perennial crops particularly fruits where as sprinkler and drip methods are for annual crops such as melon, green beans, onion, etc. Water from the lake is pumped by the help of electric motors and brought to the farm through main canal which is 2225 meters long, of which 945 meters is lined. The main canal passes the water to the secondary canals which are 6078.5 meters of length and of which only 2058.5 meters is lined.

Generally, water is pumped to the farms throughout the day(for 24 hrs during the dry season and for 8 hrs during the wet season)(Table 10).

Table - 10: Irrigation Water Application

| Period | $M^3$/sec. | Number of hrs | Number of days | Total discharge in $m^3$ |
|---|---|---|---|---|
| Dry season | 3.7/sec or 1320/hr | 24 hrs | 240 days | 7,608,000 |
| Wet season | $0.7m^3$/sec or $250m^3$/hr | 8 hrs | 60 days | 120,000 |
| Total:- | | | 300 days | $7,728,000m^3$ |

Source: Field Survey 1991/92

As indicated in Table 10 water is discharged from the lake for 300 days a year. Although the amount of water applied to the farm differs from season to season, a large amount has been discharged every year. On the basis of the discharged water, quite a number of crops have been grown. But the point to be noted is, no attention has been given in the application of water to different crops in different seasons. As observed in the field and being confirmed by the farm supervisors, no soil-plant-water relationship has been taken into account while applying water. Water is simply applied irrespective of crop needs.

## 4.4 Marketing of Crops

The Horticulture Development Corporation (where Ziway State Farm is in Corporated) is responsible for the production and

marketing of all perishable products such as vegetables, fruits and flowers. On the basis of this, the crops produced in the farm are marketed in three different ways. The first one is on Farm Sale, where whole salers buy the product on the farm before it is harvested. This is usually done for fruit crops like oranges, grapes and papaya. The second is the sales done through the Croporation where adequate transport facilities have been offered to transport the products to urban centers like Addis Abeba, Nazerath and Debre Zeit. This includes the shipping of Export crops. The third case is the retail trade done by the Farm through a shop established in Ziway town.

Accordingly, each of the crops produced in the farm are marketed either in Ziway, outside of Ziway and even it goes up to the extent of export. But the amount marketed in each areas depend on the type of crop and the demand for it in Ziway town. For example, onion products are entirely sold (marketed) in Ziway. On the other hand the products of all types of flowers are exported. Except for the two exceptional cases, all other crop products have been marketed in Ziway as well as in other towns mentioned above.

A close look at Table 11 indicates that almost all crops except flowers are partial or wholly marketed in Ziway. Out of the total out put of 23,927.66 quintals in 1990/91, 8871.1 quintals or 37.1 percent was marketed in Ziway and the greater part of the out put, 10,548.79 quintals or 44.1 percent was exported. From the individual crop points of view, almost all crops are exported except onions and oranges. Only 18.8 percent

or 4507.77 quintals have been marketed in other towns like Addis Abeba, Nazerath and Debre Zeit. The important crops marketed in other towns include straw-berries 42.2 percent, oranges 35.9 percent and grapes 86.0 percent of the total out put. But, when one views the general picture of the markating condition, it could be concluded that the farm's product are more of export oriented.

Table-11: Marketed Quantity and Mjor Crop Types 1990/91

| Types of crop | Production in Quintal | Marketed in Ziway | Marketed outside Ziway | Exported in Quintal | % of Exported |
|---|---|---|---|---|---|
| Beans | 5111.02 | 627.57 (12.3) | 698.49 (13.7) | 3784.96 | 74.1 |
| Asparagus | 77.18 | 6.33(8.2) | - | 70.85 | 91.8 |
| Onion | 1779.12 | 1779.12(100.0) | - | - | - |
| Melon | 462.12 | 170.31(36.9) | 15.44(3.3) | 276.37 | 59.8 |
| Straw berry | 156.50 | 70.71(45.1) | 66.21(42.2) | 19.88 | 12.7 |
| Other vegetables | 562.50 | 562.50(100) | - | - | - |
| Oranges | 2496.39 | 1599.80(64.1) | 896.59(35.9) | - | - |
| Grape | 2384.61 | 334.72(14) | 2049.89(86) | - | - |
| Papaya | 3992.80 | 3148.51(80.3) | 751.99(19.2) | 22.30 | 0.6 |
| Avocado | 119.56 | 104.00( 87) | 3.72 (3.1) | 11.84 | 9.9 |
| Other fruits | 495.08 | 467.53(94.4) | 25.09(5.1) | 2.46 | 0.5 |
| Statice | 4347.14 | - | 0.25 (0.01) | 4346.89 | 99.99 |
| Eupherbia | 770.55 | - | - | 770.55 | 100.00 |
| Ammemajus | 105.84 | - | - | 105.84 | 100.00 |
| Dill | 253.39 | - | - | 253.39 | 100.00 |
| Carthamus | 220.37 | - | - | 220.37 | 100.00 |
| Allium | 459.30 | - | - | 459.00 | 100.00 |
| Atriplex | 192.44 | - | - | 192.44 | 100.00 |
| Other flowers | 11.35 | - | - | 11.35 | 100.00 |

Source: Ziway Agricultural Development Office. Figures in Parenthesis are percentages.

Note: Other flowers include; Delphinium, Stratifolia, Caster,etc
Other fruits include; Passion fruit, cazmer, mango, Gishetta, etc.
Other vegetables include; Yeferenge Karia, Chat, Gesho,etc

## 4.5 Cost of Production

A project has two kinds of costs. Direct and an associated or farm operation costs. Direct costs can be defined as the value of goods and services used to establish, maintain and operate a project. It includes investment on farm equipment, buildings and construction, working capital and replacement which must be incurred in order to permit the project to function. Associated or farm operation costs on the other hand are the value of goods and services needed beyond the direct costs to make the output of the project being produced. The main concern of this study is therefore on the associated or farm operation costs.

The associated or farm operation costs in this case are the cash out lays that are used for the purchase of hired labour, fertilizer, chemical, equipment use and other production inputs. Accordingly, a large amount of birr has been incurred to purchase the inputs used in the farm.

Table-12: Purchase of Inputs in '000 birr 1989-91.

| Types of crops | Cost of labour in birr | Cost of Fertilizer in birr | Cost of Fuel in birr | Maintenance and other costs | Total | Year |
|---|---|---|---|---|---|---|
| Fruits | 503,405.66 | 4297.14 | | | | |
| Vegetables | 458,673.32 | 13914.85 | 88181.96 | 102599.43 | 1807937.2 | 1989 |
| Flowers | 610,523.23 | 26341.79 | | | | |
| Fruits | 497,845.28 | 18366.30 | | | | |
| Vegetables | 592,301.19 | 69508.95 | 142943.02 | 79615.44 | 2068260.1 | 1990 |
| Flowers | 627,030.64 | 40649.40 | | | | |
| Fruits | 1,460,256.31 | 200050.78 | | | | |
| Vegetables | 668,189.95 | 87880.97 | 191906.38 | 80442.54 | 3165898.8 | 1991 |
| Flowers | 615,797.16 | 41375.00 | | | | |

Source: Ziway Agricultural Development Office.

The largest consumer of the cash out lays is labour and indicated the labour intensiveness of the farm. On the average 85.6 percent of the out lays incurred was used for the purchase of labour. However, the total amount of the out lays has been seen increasing from year to year. If 1989 is taken as the base year, the cash out lays have been increased by 75.1 percent. This is also true for labour whose cash out lays has been increased by 74.5 percent.

## 4.6 Productivity and Profitability

Agricultural productivity is a measure of the efficiency with which inputs are used in agriculture to produce an out put. The most important inputs in agriculture are land and labour. In irrigated agriculture these two inputs (land and labour) are highly intensified. Since the main concern of this paper is on land productivity, labour would also be discussed in association with land productivity.

The most important effect of irrigation on productivity is the way it helps in avoiding crop failure by increasing the yield per hectare, by making possible the cultivation of more lucrative crops and by allowing multiple cropping. In all of these processes, there is an intensification of land and labour. As labour and land are intensively used, the productivity of land would be high and so does the out put. Hence, inorder to measure the productivity of land, the following indices have been used.

Intensity of cultivation or the frequency with which a parcel of land is cultivated is one measure of land productivity.

The higher the percentage of the parcel of land cultivated more than once during an agricultural year, the more intensive labour becomes and the larger is the out put. This is so because, frequent use of land necessitates an increase in the level of inputs (labour plus other inputs) where more people would be engaged either in the production process or in conserving the natural fertility of the soil so as to satisfy the increased demand. Boserup (1981) even contends that a positive relationship exists between population density on one hand and frequency of cultivation and level of technology on the other hand.

The other index that measures land productivity is the Degree of Commercialization or the area under non-food crops as a percentage of total cropped area. Since irrigation is labour as well as capital intensive, usually high valued crops (lucrative crops) are cropped more than low valued crops (food crops). Hence, the possibility of land to be under high valued crops is more than that of low valued crops. Therefore, as commercialization increases, a unit of land or labour will produce a larger out put because commercialization requires a higher level of inputs per unit area (park, 1970). In other words, intensification of agriculture will lead to higher out put per hectare of land.

On the basis of such premises, land productivity of the Farm has been worked out by taking into account the following variables.

(i) Total cropped area (642.98ha). This is considered twice as a total cropped area and land under non-food crops because, no food crop is cultivated in the farm.

(ii) Land under annual crops (470.68ha). This is the total land that is cultivated more than once in one agricultural year.

Accordingly, the intensity of cultivation and degree of commercialization of the farm was calculated by using the following formulas. ( See also Chapter 1.5)

$$\text{Intensity of Cultivation} = \frac{\text{Area sown more than once during a year}}{\text{Total cropped area}} \times 100$$

$$\text{Degree of Commercialization} = \frac{\text{Land under non-food crops}}{\text{Total cropped area}} \times 100$$

Thus, the intensity of cultivation and degree of commorcialization of the farm was found to be 73.2 and 100 percent respectively. From the results it could be concluded that both land and labour has been intensively used and indicated that the farm is highly productive. The best proof of this would be the increased demand for labour and the large amount of cash out lays used for the purchase of other inputs.

Although the farm is considered to be productive, this may not imply to its profilability. Of course, productivity is an increase in the efficiency and the rate at which goods are produced. It may or may not end at a profit. The only way the profitability of the farm could be told is by comparing the total amount of birr incurred and the return obtained. This then could be done by measuring the efficiency ratio of the farm.

The efficiency ratio in question can be measured in various degrees. The crudest of all efficiency measures is the ratio of

the value of current gross out put to the associated costs at current prices (associated cost being understood to mean labour, fertilizer, equipment use, and other material input costs only). If a value of this measure less than unity, it can be taken as an indicator of in-efficiency while a value in excess of unity indicates efficiency. On the basis of this analysis the value of incicator of the farm is shown in Table 13.

Table-13: Gross Income form Crops/Total Farm Operating Cost 1989-91

| Year | Total operating Cost/ha in birr | Gross income from Crops Produced in birr | Efficiency Ratio |
|---|---|---|---|
| 1989 | 1,807,937.2 | 3945548.6 | 2.18 |
| 1990 | 2,068,260.1 | 2720284.5 | 1.32 |
| 1991 | 3,165,898.8 | 2674509.2 | 0.84 |

Source: Ziway Agricultural Development Office.

As can be observed from Table 13, the performance of the farm has been seen for a period of three years. Accordingly, for the first two years, the farm could be judged to have been efficient in attaining its out put objectives. But the attainment was in a decreasing order and infact, in 1991, it was found to be in-efficient. However, this measure fails to take account of the indirect costs which are understood to mean, administrative, setting and distribution, depreciation, corporation and enterprise over head costs and export expense.

Taking account of these costs would mean using the benefit/cost ratio at current market prices as over measures of efficiency.

Table-14 : Benefit/Cost Ratio of the Farm 1989-91

| Year | Total cost/ha in birr | Gross income from crops produced in birr | Benefit Ratio |
|---|---|---|---|
| 1989 | 1,361,547.75 | 3,945,548.6 | 0.90 |
| 1990 | 3,982,819.08 | 2,720,284,5 | 0.68 |
| 1991 | 5,572,320.27 | 2,674,509.2 | 0.48 |

Source: Ziway Agricultural Development Office.

As indicated in Table 14 the benefit/cost ratio of the farm was found to be in-efficient for the periods mentioned. According to the information from the Small Farm Co-ordination Office, the farm has never been considered as a profitable project since its nationalization. All the years through, it has been subsidized by the Government as other State Farms.

# CHAPTER FIVE

# LABOUR FLOW AND SOCIO-ECONOMIC CONDITIONS OF SEASONAL WORKERS

## 5.1 The Labour Market

The sphere of influence of the labour market of the farm has no definite limit. Since the farm has an acute shortage of labour, it employs labourers indiscriminately. The flow area of the labourers is not also confined to one particular region. They flow towards the farm from any direction. Hence, there is no boundary line as to the labour market of the farm. The farm even doesn't need any sort of advertisement. It is the push factor of each labourer at its original (birth place) and the struggle for existence that makes the flow of labourers to the farm a continuous and un-interrupted process. The flow is from every part of the country.

A close look at Table 15 reveals that the birth place of the labourers are different and spatially distributed throughout the country. Actually the flow is dominant from north and south of the farm. This is to say, the great majority of the labourers engaged in the farm are from northern and southern administrative regions. The other fact observed among the labourers was that, the flow seems to be governed by distance from the farm on one hand and to the degree of the problem at the home village of the individuals on the other.

For example, the largest part of the seasonal workers (37.3 percent) were from Ziway and Arsi (immediate localities from the farm) indicating the contribution of distance to the flow of workers. But on the other hand, about 29.4 percent

of the seasonal workers have been observed flowing from very far places like Wello, Gojjam, Gondar, Mehale Meda, Geshie, Merhabetie and Tigray.

Table-15: Original Place (birth) of Seasonal Workers 1991/92.

| Birth place | Number of workers | % of the total |
|---|---|---|
| Addis Abeba | 2 | 1.3 |
| Arsi | 26 | 17.3 |
| Bale | 1 | 0.7 |
| Debre Brehane | 1 | 0.7 |
| Debre Zeit | 2 | 1.3 |
| Dilla | 1 | 0.7 |
| Geshie | 4 | 2.7 |
| Gojjam | 6 | 4.0 |
| Gondar | 5 | 3.3 |
| Gurage | 13 | 8.7 |
| Jiru | 5 | 3.3 |
| Kembatta | 9 | 6.0 |
| Mehale Meda | 4 | 2.7 |
| Merhabetie | 1 | 0.7 |
| Mojo | 1 | 0.7 |
| Nazerath | 2 | 1.3 |
| Sebeta | 1 | 0.7 |
| Sellalie | 1 | 0.7 |
| Shashemenie | 1 | 0.7 |
| Tigray | 4 | 2.7 |
| Wolayitta | 13 | 8.7 |
| Wello | 16 | 10.7 |
| Wonji | 1 | 0.7 |
| Ziway | 30 | 20.0 |
| Total:- | 150 | 100.0 |

Source:- Field Survey 1991/92

Still, 23.4 percent of the seasonal workers have been seen flowing from areas like Wolayitta, Kembatta and Gurage. All in all, 52.8 percent of the seasonal workers were from distance places and proved the limited effect of distance on the flow of labourers. Hence, it could be justified that, though distance has some contiribution to the flow of labourers, the driving force for the flow of labourers to the farm is an avoidable problem of the individual at his home village such as the effect of drought, population pressure and above all, the immediate relief the individual could be awarded (job) at the farm.

To confirm the condition of the problem, an open ended questions have been forward to some of the seasonal worker, during the survey. Accordingly, different answers were given because most of the indicated areas above have had more or less some sort of problem in the past.

Table-16: Reasons for the Withdrawals from ones Birth Place.

| Reasons | Number of People | | | % of the total |
|---|---|---|---|---|
| | Male | Female | Total | |
| To look for jobs | 34 | 56 | 90 | 60.0 |
| To visit relatives | 8 | 21 | 29 | 19.3 |
| In search of higher Education | 5 | 4 | 9 | 6.0 |
| Ones own birth place | 7 | 9 | 16 | 10.7 |
| Others | - | 6 | 6 | 4.0 |

Source: Field Survey 1991/92

Note: Others include; Marriage and family transfer

As observed from Table 16, 60 percent of the total sample seasonal workers have left their original (birth place) to look for jobs. This can at least indicate the magnitude of the problem at home. 19.3 percent have given the alternative " to visit relatives". One could also judge the condition of these individuals who are no better than the first group because they could not escape the danger of being daily labourers. Others, 20.7 percent were from Ziway and the surrounding areas whose fate is no different than the two groups mentioned above. The only difference was that the later ones were at least with their families in their home town. In general for the majority of the seasonal workers, the farm is not only an area of immediate relief but is the only means of living. Therefore, a large number of them have worked for more than 10 years.

Table-17: Number of Years Worked on the Farm.

| Year | Number of People | % of the total |
|---|---|---|
| less than 1 year | 51 | 34.0 |
| 1 - 5 years | 60 | 40.0 |
| 6 - 10 years | 29 | 19.3 |
| greater than 10 years | 10 | 6.7 |
| Total:- | 150 | 100.0 |

Source: Field Survey 1991/92

A close look at Table 17 reveals that 60 persons or 40 percent of the total sample seasonal workers have worked for years

1 - 5 and 19.3 percent for years 6-10. Still some 6-7 percent have worked for more than 10 years. Although the number of labourers who have worked for less than 1 year were not negligible (34 percent), the majority of the seasonal workers have worked for longer periods and indicated that, the farm is the only means of living for some members of the labourers. Even from the meager income they earn in the farm, the majority of the labourer send some amount back to their families in their home villages.

## 5.2 Socio-Economic Characteristics of Seasonal Workers

### 5.2.1 Age, Sex and Marital Status

Most migration studies incicate that, the young and un married are the most mobile. Accordingly, out of the total sample seasonal workers surveyed in the farm for the year 1991/92, about 38.7 percent were in the age groups 15-19, 22 percent in 20-24, 11.3 percent in 25-29 and 11.3 percent in 30-34. If we consider the age groups 15-35 as young, almost 83.3 percent of the sample seasonal workers were included as young. Only 1 person was in the age groups between 55-59. Actually the predominance of the young is quite understandable because such large scale modern irrigated farms usually offer manual works like planting, weeding, picking, harvesting of fruits and other related activities which cannot be performed by old people specially when the work is extended beyond 8 hours of work a day.

Table-18: Age, Sex and Marital Status of Seasonal Workers 1991/92.

| Age Group | Male | Female | Married | un married | Divorced | Total | % of the total |
|---|---|---|---|---|---|---|---|
| 0-4 | - | - | - | - | - | - | - |
| 5-9 | - | - | - | - | - | - | - |
| 10-14 | - | 3 | - | 3 | - | 3 | 2.0 |
| 15-19 | 14 | 44 | 8 | 49 | 1 | 58 | 38.7 |
| 20-24 | 14 | 18 | 15 | 15 | 3 | 33 | 22.0 |
| 25-29 | 9 | 9 | 9 | 7 | 1 | 17 | 11.3 |
| 30-34 | 9 | 8 | 10 | 5 | 2 | 17 | 11.3 |
| 35-39 | 5 | 3 | 4 | 2 | 2 | 8 | 5.3 |
| 40-44 | 1 | 4 | 5 | - | - | 5 | 3.3 |
| 45-49 | 2 | 2 | 2 | 1 | 1 | 4 | 2.7 |
| 50-54 | - | 4 | 1 | - | 3 | 4 | 2.7 |
| 55-59 | 1 | - | 1 | - | - | 1 | 2.7 |
| >60 | - | - | - | - | - | - | 0.7 |

Source:- Field Survey 1991/92 (Based on 150 Seasonal Workers)

As observed in Table 18 females are dominant among the seasonal workers. Out of 150 sample seasonal workers, 63.3 percent were found to be females and only 36.7 percent males. Females were seen dominant in the farm because of two reasons. The first is the low payment the enterprise pays (birr 1.92/ person/day) which doesn't attract male labourers who can easily get that amount if they go and trap fishes from the lake around.

The second is the type of payment (piece rate) where females are fast working and could perform more than males.

The general feature observed among the seasonal workers was, most of them were single either because they were not married or divorced due to the problem they had. From the sample seasonal workers surveyed, 63.3 percent were un married and 36.7 percent were married. As to some of the labourers, even marriage in some cases could be taken as one factor that made individuals come and be hired in the farm as daily labourers. If not, he/she may be in a position not to feed his or her family. Hence, the majority of the labourers whether they are married or not have large families and they were hired as daily labourers because they could not feed their big families.

As indicated in Table 19, the number of persons in each family ranges between 1-17 the average being 7.7 persons per family. More than 50 percent of the sample labourers have large families. To prove the reason why they came to the farm, an open ended questions have been forwarded to some of the labourers and the greater majority indicated that, it is the number of persons in their families and the low level of living forced them to be daily labourers.

Table-19: Family Size and Persons in the House Hold

| Family Size | Number of Persons in the house hold |
|---|---|
| 1 | 17 |
| 1 | 11 |
| 2 | 13 |
| 3 | 12 |
| 4 | 9 |
| 5 | 10 |
| 6 | 8 |
| 12 | 5 |
| 13 | 7 |
| 15 | 3 |
| 16 | 4 |
| 17 | 2 |
| 23 | 6 |
| 32 | 1 |
| Total: 150 | |

Source:- Field Survey 1991/92

### 5.2.2 Occupational and Educational Status

The type of occupation at home and the size of holdings an indivicual possess has a significant role in the individuals day to day life. The occupation of a person has to gurantee one self too. Otherwise, it is not worth mentioning as an occupation.

In the survey, the types of occupations reported by the sample seasonal workers were not many.

Table-20: Occupation of Seasonal Workers at Home

| Types of Occupation | Number of Persons | % of the total |
|---|---|---|
| Farmers | 7 | 4.7 |
| ex-Soldiers | 11 | 7.3 |
| Students | 60 | 40.0 |
| House wives | 62 | 6.7 |
| Jobless | 62 | 41.3 |
| Total:- | 150 | 100.00 |

Source:- Field Survey 1991/92

As indicated in Table 20, the types of occupation reported by the sample seasonal workers at home were limited. Only 4.7 percent of the sample seasonal workers were farmers and these were the only group among the labourers who had an actual occupation. Although 7.3 percent of the seasonal workers were ex-soldiers, these days they are also among the jobless. Therefore, almost 95.3 percent of the total seasonal workers could be considered as occupationless. The educational status of them have also been surveyed and was found to be low. Out of the total sample labourers, 58 percent were below grade 7.

Table-21: Educational Status of Seasonal Workers 1991/92

| Grade level | Male | Female | Total | % of the total |
|---|---|---|---|---|
| illiterate | 0 | 15 | 15 | 10.0 |
| Read & Write | 8 | 26 | 34 | 22.7 |
| 1 - 6 | 19 | 19 | 38 | 25.3 |
| 7 - 12 | 10 | 14 | 24 | 16.0 |
| 9 - 12 | 17 | 21 | 38 | 25.3 |
| 12 | 1 | - | 1 | 0.7 |

Source:- Field Survey 1991/92

A close look at Table 21 reveals that, 10 percent of the seasonal workers were illiterate, 22.7 percent could read and write and 25.3 percent were between grades 1-6. Nearly 42 percent of the seasonal workers were between 7-12 and there was 1 person above grade 12. From this, it could be analized that, more than half of the general seasonal workers have low educational status. But as the majority of the seasonal workers were young and at least literate, there might be a possibility that most of them have been forced to leave or discontinue their education because of financial constraints. Others which are better off and have completed grades 8-12, might have been hired as daily labourers because they had no choice.

In general, as the labour market of the farm has no boundary so is the characteristic features of the seasonal workers in the farm. All are from different nationalities, regions,

Educational and Economic background. Some were students, house wives, soldiers, farmers, etc. But now, all of them are hired labourers and paid birr 1•92/person/day. Even the multi-directional flow of the seasonal workers and the meager payment at the farm indicates how labour is cheap or how worsening the economic condition of the country is.

# CHAPTER SIX

## SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACTS

There are certain specific goals which a development oriented project is expected to achieve when it is proposed for imptementation. During the course of action, it may or may not fulfill its assigned objectives. Whether it has succeeded in attaining its proposed objectives or not it is subject for evaluation. Hence, its impact on the society at any cost should be considered.

The Farm is one of the several development investment projects proposed for implementation. It is a large-scale modern farm. There is no doubt for the importance of irrigated agriculture in the region because, it has inadequate and very variable rainfall with precipitation not exceeding evaporation. The growing period is very short. It has mild temperature throughout the year and is favourable for the production of tropical and sub-tropical crops. Besides, the region has good transportation facilities and is not very far from the capital city, Addis Abeba indicating good market conditions.

But the fear is, could it be efficient or not ? In the analysis made in the previous chapters, the farm has attained its out put objectives and failed to be economically profitable. Nevertheless, it has contributed a lot in one aspect and failed to do so in the other. Therefore, it would be quite useful to evaluate the farm under the following points.

### 6.1 Impacts on Out Put and Income

Irrigation affects crop production both directly and Via its influence on the scope for using other inputs (specially

fertilizers) and the efficiency with which inputs are used. The most prominent change observed in the production system as the result of the provision of irrigation facilities in Ziway State Farm was, the shift made from inferior food crops (cereals) to lucrative (high valued) non-food crops. The cropping pattern has been changed from one dominant crop (maize) followed by teff to 26 different families of vegetables, fruits and flowers. There is also a shift from indigenous crops to a varieties of High Yielding Crops specially in the case of flowers and vegetables. A change has also been observed in the direction of agricultural practices. The traditional small scale fragmented subsistence farming has been changed into large-scale modern farming for sale.

The most interesting condition of irrigated agriculture is that, the main season crop would be produced even if the irrigation system did not exist. The contribution made from the irrigated farm in Ziway State Farm is derived solely from the production of second crop (during the dry season) and the intensity of cultivation. As a result, it was indicated that 73 percent of the land in the farm was frequently cultivated. In addition the high level of input applied resulted in elevating the Yield/ha of land as well as labour (17 to 243/ quintals/ha in irrigated farm compared to 8-10 quintals/ha in the traditional rainfed agriculture around).

The income produced or obtained in peasant and state farms could also be compared. For example, in rainfed peasant farms, 100 hectares of maize yielding 10 quintals/ha and 50

hectares of teff yielding 8 quintals/ha when converted into monetary term (at the rate of birr 150/quintal for maize and birr 200/quintal for teff) could be estimated to be birr 230,000 per year. While on the State Farm, it could be estimated to be birr 2,674,509.2 as indicated on table 13 and 14 (see chapter 4.1.6).

Thus, the provision of irrigated agriculture in Gerbe not only resulted in the increase of out put and income, it has also made available different kinds of fruits and vegetables which otherwise could have not been done by the peasants around. Hence, the people of Ziway and else where in Addis Abeba have enjoyed the out come. The product is not only limited within the country, it extended up to the extent of export where it became one of the important sources of hard currency for which the country at the moment is in short with.

## 6.2 Impacts on Employment

Large-scale modern irrigated farming is among the most labour intensive activities in the non-traditional sector of the less developed countries. Their requirement for skilled man power is very low. Their rural location and the seasonal labour requirements is another favourable condition for the under employed.

As indicated in chapter four, the farm is one of the large-scale modern farms in rural Ethiopia. Its role in employment generation is considered to be high. It employs different types of labour both skilled and unskilled on permanent and

reasonal basis. The main sources of skilled professional workers are university or Junior college graduates, while the major sources of seasonal labour force are peasant associations in different part of the country and to a lesser extent the urban unemployed. What ever the source be, the farm has employed a large number of employees since its establishment. The majority of the employees were seasonal labourers. As indicated in Table 8 in chapter 4.3.1, the demand for seasonal labour is highly unstable. Demand reaches peak during the picking or harvesting season which roughly runs October through April. The period specially from January to April is the time where most of the farmers in the country are considered to be idle. It is thus this seasonality of demand for labour that makes the farm an instrument for allievating the rural underemployed at this particular period. Since the majority of the seasonal workers as indicated earlier were young, the farm has also been playing a significant role in reducing the push factor to the swelling of the urban unemployed through rural-urban migration.

Most of the seasonal labour forces were rural origin and many of them were not from the surrounding areas of Ziway. Close to 60-70 percent of the work force of the farm rather came from far away regions of kembatta, Hadiya, Wolayitta and Gurage which are known for their high population density as well as from the northern administrative region such as Wollo, Tigray and Semen Shoa which have recently been affected by drought.

Another important impact of the farm on employment generation is its contribution towards the employment of female labourers. Close to 63 percent of the seasonal labourers were females. The kinds of work offered in the farm such as picking, weeding, collecting, harvesting, etc. have facilitated to the employment of females. Moreover, it has been indicated by farm supervisors that, females are faster and perform more qualitatively than males. Except for watering and ploughing, most of theworks in the farm could effectively be done by female labourers. Hence, the employment potential of the farm for women seems greatest than males and revealed the substantial contribution of female labour in crop production. That is why a large number of female labourers had been and are still being attracted towards the farm which otherwise would have been moved to different towns and could have been victimized. After all,the majority of them were young and thanks to the existence of the farm they are saved from being seen as social evil groups among the nation. Therefore, the provision of irrigated agriculture in the region not only allievated the unemployment problem, but also has became a protection for some and a means of living for others.

## 6.3 Impacts on Housing

If the proportion of farm workers migrating to a project area is rather large, the availability of adequate food, clean water supply and shelter are among the many important problems. The problem of food supply becomes even more acute when one considers that the area is in general food deficit. Unfortunately, the problem of food in Ziway region is not noticeable. The most acute problem of the region is housing.

As to the housing condition, none of the Staff has been provided with any sort of houses. All of the permanent as well as seasonal workers have been living in the near by village or in Ziway town. The Farm has some grass and currugated iron covered houses which are given to some of the permanent workers who have been nationalized with the farm and for other workers who are engaged in activities like guards and canal controllers. Except the few mentioned, the other permanent and seasonal workers including the manager of the Farm have been left to live by their own.

As indicated in Table 22, the majority of the workers live either with their relatives or rented a room from private individuals. For example, 77 persons or 38.5 percent of the total surveyed workers have indicated that they live in rooms rented from private individuals and pay birr 90.00 per month.

Table-22: Housing Condition Among the Permanent and Seasonal Workers in the Farm

| Living Conditions | No of People | % of the total |
|---|---|---|
| Living with relatives | 36 | 18.0 |
| Rented in private houses | 77 | 38.5 |
| Rented from kebele | 18 | 9.0 |
| Live in the project's house | 34 | 17.0 |
| Live in ones own house | 35 | 17.5 |
| Total:- | 200 | 100.0 |

Source:- Field Survey 1991/92

The most striking condition is that in a single room 3 to 4 workers are living together because of the scarcity of houses as well as the high prices of the rent. Only 9 percent of the total surveyed workers have rented rooms from kebele and this is another indicator for the scarce condition of housing. If rooms to be rented from kebeles were plenty, more workers would have rented because the rent for kebele houses is very low compared to private dwellings. Thus, the already existing housing problem has been aggravated by the flow of labourers from different directions in search of jobs. If the condition continue in this manner, I am afraid the farm will face a hard time in getting seasonal workers.

## 6.4 Innovation Diffusion

One of the advantages of a large-scale modern farming in the traditional sector of agriculture is the possibility of diffusing innovation to the surrounding regions. But innovation diffusing ability of the farm for the adjoining and adjacent region is different. The diffusion for the adjacent settlement is very much limited due to lack of water because this settlement is on the other side of the main road where the lake has no reach at all. For such regions, I am afraid, the farm will tend to remain as an island of production as far as the region doesn't get water. But for the adjoining regions where the lake water is at their disposal, it has contributed much. For that matter, Saint Gebreal's Priest Training College in the north eastern part of the farm has developed some 10ha of land and started producing papayas, bananas, onion, cabbages. etc. The

same is true with the co-operative societies South of the farm who have been seen producing onion, pepper, cabbages, oranges, sugar cane and Gesho. It also appears that due to the operation of the farm, many settlers along the bank of Bulbula River have come to realize the advantage of vegetables and fruit production and the possible benefits from irrigation.

## 6.5 Dislocation of Peasants

It is a rare case where the land pattern required by irrigation system be super imposed on the existing land use without any change or distrubances. Tn the case of the Farm, tenants were evicted and peasants were dislocated. The tenants were evicted by the three landlords who started the irrigation work in 1967. At that time, the total land area was 626ha (Ziway Agricultural Development Office). After nationalization, 300ha of land was converted into irrigated agriculture. Peasants who were on the 300ha of land were dislocated and given land adjacent to the farm. Eventhough the peasants were given land and shelter, they have no way of taking their animals to the lake. Hence, water has to be fetched on human back both for home consumption and livestock. Moreover, pasture land also became scarce and the peasants have to quit animal tendering and depend only on crop cultivation. Some even went to the extent of fishing. Thus, the provision of irrigated agriculture in the region has made canal water as the only source of water both for domestic purposes as well as for animals. It has also changed the traditional way of life of the pesants by converting them to the occupation which they have never practiced.

## 6.6 Impacts on the Environment

The decision made to use irrigate agriculture in Ziway area needs no emphasis. As mentioned earlier, it has made possible the production of numerous crop on one hand and the provision of jobs to a large number of the labour force on the other. But, no due attention has been given to its adverse effects on the environment. Because of the provision of irrigated agriculture, the soils of the farm have been subject to salinity due to seepage of water that has been flowing through un-lined main and secondary canals. This is so because, in region where the water table is nearer to the surface and the water is saline under ground (Makin, 1976) seepage loss from irrigation water conveyance and distrubution is the biggest contributor to the ground water recharge and rise in the ground water-Table. As the result, crystals of salt have been observed in the furrows of the farm. Moreover, un closed or un burried system of conveyance and distribution associated with seepage of water encouraged the growth of weeds in either sides of the excavated channel with top embarkments of loose earth fills. These weeds favoured the growth of mosquitoes which aggravated the already existing malaria of the region. For a question raised on the disease malaria, almost all of the surveyed workers in the farm have indicated that, although the disease malaria is prevalent in the region, these days its effect has became a serious threat to the majority of the workers in the farm.

In addition to the above mentioned facts, a large amount of water has been discharged (7,728,000$m^3$/year as indicated in

chapter 4.3.3) from Lake Ziway to irrigate the farm. The extraction of such a large volume of water in connection with the tapping of some of the recharging rivers (to the lake) in the west (Meki River) and (Catar River in Arsi in the east) for irrigation purposes (Forech, 1988) has caused a remarkable drop in the lake level. The extraction of water from the lake with out giving due attention to the crop-water relationship and to the shallow depth of the lake, will result in the reduction of the surface area of the lake in the long run. Infact land marks along the shore line indicate the retreating condition of the lake. Since the entire flow of Lake Ziway is carried by Bulbula River into Lake Abiyata, the lowering of the water level of Lake Ziway will result in a decrease of the necessary over flow to Lake Abiyata. Thus, a decrease in the volume of water of Lake Abiyata will result in the reduction of the birds population in the near future. This is because Lake shalla and Abiyata form an ecological system where birds feed at Lake Abiyata and sleep, breed and hatch at Lake Shalla (Forech, 1988). But sofar, no one has given any attention, instead every one seems rooted in the needs of the immediate situation rather than guided by a long term rationale.

# CHAPTER SEVEN

# CONCLUSION AND RECOMMENDATION

## 7.1 Conclusions

Ziway State Farm Produces flowers, friuts and vegetables for domestic and foreign markets. The study has revealed that the performance of the farm has strong as well as weak points.

Although the financial rate of return (benefit)/cost ratio) of the farm confirmed that the farm is a heavy financial loser and can be kept going only through heavy Government subsidies, it has managed to meet its production objectives. The annual crop production and crop marketing performance of the farm indicated that products such as flowers, fruits and vegetables have been made available both for domestic and foreign markets since the establishment of the Farm. The farm has also managed to change the cropping pattern and proved that if water is available in the region, all kinds of tropical and sub-tropical crops could be grown. Though the contribution of the farm in diffusing modern technology in the vicinity was limited due to the acute shortage of water, the adjoining settlers and peasants have benefited a great deal from it. It also appears that due to the operation of the farm many peasants have come to realize the advantages of irrigation water and the possible benefits from it.

The poor performance of the farm was largely due to a farm management policy that puts the very decision variates away from the farm level on one hand and the low level farm gate prices on the other. The outstanding farm management variables such as resource allocation i.e, land, labour and

finance are mainly at the disposal of the corporation (Horticulture Development Corporation) and enterprise (Small Farms Co-ordination Office). This excessive centralization has been the key problem of the farm that resulted in high administration costs to the farm operation.

As to the labour absorptive capacity, though the farm does not discriminate among labourers (of urban or rural origin), it was unable to substantially contribute to the easying of the unemployment problems in urban areas but it has provided jobs to many of the rural underemployed, specially women. Moreover, it has managed to curtail to some extent the push factor to the swelling of unemployment through rural urban migration where a large number of young male and female labourers have been made productive rather than urban unemployed. Hence, the farm has managed to allievate to some extent the unemployment problem. Nevertheless, due to the low level of payment (Birr 1.92/person/day), the farm has never fulfilled its labour requirements specially during peak periods (October to April). However, the knid of work available at the farm and its low level requirements of skilled man power has encouraged all types of labourers (illitrate or literate) from all corners of the country to get employment at the Farm. However, this multi-directional flow of labourers to the area in search of jobs has resulted in aggravating the already acute housing problem in the area.

On the other hand the establishment of irrigated agriculture in the area has dislocated quite a large number of peasants.

On the Farm itself, there seems to be loss of irrigable land through salinization. Although the properties which determine the diagnosis.of Salt-affected soil such as PH, Presence of Soluble salts, exchangeable sodium and others have not yet been examined (tested in the laboratory), the salt crystals observed in the furrows of the farm indicate that the soils of the farm are salinized due to in-efficient utilization of water (seepage through canals). The open canal systems have also encouraged the growth of weeds along the sides of the channel which create a favourable condition for mosquitoes to live and breed in . Workers also drink water from the canal since it is within their reach, thus being exposed to various water-borne diseases. Above all, the continuous discharge of a large volume of water from Lake Ziway year after year for irrigation and the tapping of the recharging rivers in the north west (Meki, river) and in the east (Catar river) have contributed much for the retreat and drop in the lake level although the real causes for the retreat or drop of the lake level is yet to be identified. If this continues unchanged, the whole ecosystem of the lake and its vicinity can be distrubed.

## 7.2 Recommendation

The main effect of development projects such as the Ziway State Farm is not only at the local level. Its impact can be regional as well as national. Therefore development planners must look to the total environment within which a project must operate before it is put into effect. Based on the findings of this study, the following are recommended:

1: Since the out come of any project is a direct reflection of its management, successful farm operation demands a constant process of decision making which takes into account the importance of time and place. In the Ziway State Farm there is a significant gap between the decision makers and the actual production process. In order to make the farm more productive and viable, the important decision variables which are now being made in Addis Abeba at the Corporation and Enterprise level should be made at the farm.

2: Irrigation facilities in the area should be improved. Ziway area has great endowment of natural resource potentials with locational advantages. But the efficiency of the farm is questionable. The canals should be improved; and soil-water-plant relationship while applying water to farms should be based on scientific knowledge. The monitoring of soil and water should be done on continuous basis.

3: The labour absorptive capacity of the farm should be encouraged for it can allievate the unemployment problem in the region specially that of women.

4: To improve the production and profitability of the farm, more research has to be undertaken related to soils, water quality as well as labour and socio-economic factors.

BIBLIOGRAPHY

Aggrey-Mensah, W.(1984) Degradation of the Ethiopian Highlands and Actions to Combat it. Social and Economic Implications, Costs and benefits. EHRS, Working Paper No. 12, Addis Abeba.

Allan, W. (1949) Studies in African Land usage in North Rhodesia. Capetown: Oxford University Press.

Andreae, B. (1983) Irrigation and Food Production. In: Applied Geography and Development, a binnual Collection of Recent German contribution. Volume 30: Tubingen: Institute for Scientific Co-Operation.

Arakeri, H.R. (1984 Principles of Soil Conservation and Water Management. New Delhi: Oxford and IBH Publishing Co. PVT.LTD.

Arar, A. (1969) The Role of Drainage in Agricultural Development in the Middle East. In: Man, Food and Agriculture in the Middle East, Symposium Preceedings. Beirut: Fucalty of Agricultural Sciences.

Barkin, D.&T. King (1970) Regional Economic Development. The River Basin Approach in Mexico. Cambridge: Cambridge University Press.

Bergmann, H.&T-M.Boussard (1976) Guide to the Economic Evaluation of Irrigation Projects. France: Organization for Economic Co-Operation and Development.

Berry, L.,R.F; R.H. (1980) The Impact of Irrigation On Development. Issues for a Comprehensive Evaluation Study, A.I.D. Program Evaluation, Discussion paper No. 9.

Bharara, L.P. (1977) Socio-Economic Consequences of Canal Irrigation in an arid district of Rajasthan. An arid Zone 16(4).

Biswas, A.K.; Hady Samaha, M.A.; Amer, M.H; Abuzeid, M.A. (eds) (1980) Water Management for Arid lands in Developing Countries. Oxford; Pergamon Press.

Bittner, A. (1987) Irrigation and Food Production. In: Applied Geography and Development, a Biannual Collection of Recent German Contributions. Volume 30: Tubingen: Institute for Scientific Co-Operation.

Boserup, E. (1981) The Conditions of Agricultural Grawth, London: George Allen and Unwin.

Boyce, (1986), Irrigation and Agricultural performance in Bangladesh. The Bangladesh Development Studies, Volum 14, No. 4.

Cantor, L. (1967), A World Geography of Irrigation. London: Oliver and Boyd.

Clark, C. (1970) The Economics of Irrigation. 2nd edition, Pergamon Press.

Degefu, W. (1986). Meteorological Drought-Ethiopian Science and Technology Conference, Addis Abeba.

Ehlers, Eckart (1977) Social and Economic Consequences of large-Scale Irrigation Development-the DEZ Irrigation Project. Khuzestan, Iran. In: arid land Irrigation in Developing Countries: environmental Problems and effects E.B Worthington (ed.), Oxford: Pergamon Press.

FAO (1989) Assistance to land use Planning Phase III. Project Finding and Recommandations. FAO: Addis Abeba: Ethiopia.

FAO (1988) A Summary of the Agricultural Ecology of Ethiopia: Supplementary Data. FAO: Rome

FAO (1984) Agroclimatological Data for Africa. Vo. I: Countries North of the equator. FAO Plant Production and Protection Series No. 22. FAO: Rome.

FAO (1985 Water Quality for Agriculture. Irrigation and Drainage Paper 29 Rev. 1. FAO: Rome.

FAO (1987) Consulation on Irrigation in Africa. Irrigation and Drainage Paper 42. FAO: Rome.

FAO (1968) Successful Irrigation, Planning Development management. Land and Water Development Series No. 5.

Foerch, G. (1988) Water Resource Development: Some Impacts on Environment. Proceedings AAU-DAAD Conference Problems of Man in the Biosphere Addis Ababa: Addis Ababa University.

Gezmu, E. (1990) Operation and Management of Irrigation Farms. In: National Irrigation Policy and Strategy Workshop, Discussion Papers. Addis Abeba: Ethiopia.

Griffen, K. & Roger Hay (1985) Problems of Agricultural Development in Socialist Ethiopia: An Overview and Suggested Survey Journal of Peasant Studies. Vol. 13

Haider, G.; Tilahun, H. and Endale, B. (1988) Management of Vertisols in Sub-Saharan Africa. Preceeding of a Conforence Held at ILCA. Addis Abeba: 31 August-45 September, Ethiopia.

Houston, E.B. (1977) Irrigation Development in the World. In: Arid land Irrigation in Developing Countries. Environmental Problems and Effects. E.B. Worthington (ed). Oxfored: Pergamon Press.

IShikawa (1986) Irrigation and Agricultural Performance in Bangladesh. The Bangladesh. Development Studies, Volume 14, No. 4.

Johnston, R.J. (1986) Multi-Variate Statistical Analysis in Geography, NewYork.

Joshi, P.K. (1987) Effects of Surface Irrigation on land Degradation Problems and Strategies. Indian Journal of Agricultural Economics, Volume 42, No. 3.

Kandian, A. (1981) Water Requirements of Some Selected Crops in the Middle Awash Environment. Irrigation Agronomy, Melka Werer Research Station. Institute of Agricultural Research, Bulletin No. 3.

Kanwar, (1987) Effects of Surface Irrigation on Land. Degradation Problems and Strategies. Indian Journal of Agricultural Economics, Volume 42, No. 3.

Makin, M.J.j T.T. Kingham; A.E. Waddams; C.J. Birchall; & B.W. Eavis (1976) Prospects for Irrigation Development around Lake Ziway. Ethiopia: Land Resources Study 26.

Massoud, F.I. (1977) Basic Principles for Prognosis and Monitoring of Salinity and Sodicity. In: Managing Saline Water for Irrigation, Planning for the future. Texas: Technical University, Lubbock,

Michael, A.M (1978) Irrigation theory and Practice. New Delhi: Vikas Publishing House PVT. LTD.

Ministry of Agriculture: Irrigation Development, National Small-Scale Irrigation Expansion Project Study. July 1976 E.C. in Amharic.

Obeng, L. (1977) The view Point of UNEP. In: Arid Land Irrigation in Developing Countries. Environmental Problems and Effects. E.B. Wnthington (ed.), Oxford: Pergamon Press.

Park, J.H. (1970) Effects of Increasing Commercialization on Resourc use in Semi-Subsistence Farms in South Korea. In Subsistence Agriculture and Economic development, ed. London: Frank Cass and Co.

Solomon, B. (1989) Ethiopia's Agricultural Production Strategies. An Overview. In: Towards A Food and Nutrition Strategy for Ethiopia.

Steinberg, D.I.; Caton, D.J. Holloran, S.; Hobgood, T. (1980a) Philippine Small Scale Irrigation. Project, Impact Evaluation No. 4 U.S. Agency for International Development, Washington

Ten-Year Perspective Plan, 1984/85.

Tessema, W. (1986) Land use and Irrigation. In: Ministry of State Farms Development, State Farms Sub-Sector Review. Soils, Land use, Irrigation and Mechanization, Volume 4. Addis Abeba: Ethiopia.

Tillman, R.E. (1981) Environmental Guidelines for Irrigation. United States Man and the Bio-Sphere Programme and United States Agency for International Development. New York: Mill Brook.

Upton, M. (1969) Irrigation In Botswana, University of Reading, Department of Agricultural Economics, Development Study No.5

Vaidy-anathan, A. (1987) Irrigation and Agricultural Growth. Indian Journal of Agricultural Economics, Volume 42, No. 4

White, G.F. (1977) Environmental Effects of Complex River Development. West view Social Studies in Natural Resources and Energy management. Colorado: Boulder.

White. G.F. (1978) Bnvironmental Effects of Arid Land Irrigation in Developing countries. MAB Technical Notes 8. Paris: UNESCO.

Worthington, E.B. (ed.) (1977) Arid land Irrigation in Developing Countries: Environmental Problems and Effects, Based on the International Symposium, 16-21 Feb. 1976. Egypt: Alexandria, Oxford pergamon Press.

Wrigley, G. (1982) Tropical Agriculture, the Development of Production. London: English Language Book Society, Fourth Edition.

Yaalon and Yaron, B. (1966) Framework for Man-made Soil Changes an out Line of Metapedogenesis. Soil Science 102(4).

Monthly-Mean-Maximum Temperature of Ziway for 20 Yrs.

| Year | J | F | M | A | M | J | J | A | Sep. | Oct. | N | D | Aver-age. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1970 | 24.9 | 27.9 | 26.4 | 27.3 | 30.7 | 32.3 | 32.0 | 26.4 | 25.5 | 26.9 | 25.7 | 26.7 | 27.9 |
| 71 | 24.9 | 27.9 | 28.5 | 28.52 | 27.7 | 25.5 | 24.1 | 23.9 | 24.8 | 26.7 | 25.7 | 24.1 | 26.0 |
| 72 | 26.6 | 25.8 | 28.0 | 27.5 | 28.2 | 28.0 | 25.7 | 25.5 | 26.0 | 27.0 | 27.3 | 27.2 | 27.1 |
| 73 | 27.5 | 28.9 | 30.7 | 31.1 | 29.1 | 28.1 | 24.8 | 24.8 | 26.1 | 26.5 | 27.1 | 15.2 | 27.5 |
| 74 | 26.8 | 27.9 | 26.7 | 29.0 | 28.4 | 27.1 | 24.8 | 25.8 | 25.1 | 26.5 | 25.6 | 25.5 | 26.6 |
| 75 | 26.4 | 27.5 | 28.8 | 29.2 | 28.9 | 26.3 | 23.6 | 23.8 | 25.2 | 26.2 | 27.7 | 26.5 | 26.5 |
| 76 | 22.8 | 28.3 | 28.5 | 28.4 | 27.8 | 27.8 | 25.0 | 24.8 | 25.6 | 24.9 | 23.8 | 21.8 | 25.7 |
| 77 | 23.4 | 23.7 | 25.8 | 26.4 | 26.4 | 25.0 | 23.5 | 23.5 | 23.8 | 24.3 | 23.4 | 24.1 | 24.4 |
| 78 | 23.0 | 25.2 | 26.2 | 27.1 | 26.4 | 25.3 | 22.5 | 23.4 | 23.1 | 23.9 | 23.5 | 24.0 | 24.6 |
| 79 | 33.0 | 25.2 | 25.6 | 26.2 | 25.6 | 25.0 | 25.1 | 23.5 | 23.5 | 24.8 | 24.5 | 24.5 | 24.5 |
| 80 | 24.8 | 26.6 | 26.8 | 26.5 | 27.2 | 25.5 | 23.3 | 23.6 | 24.0 | 24.9 | 25.1 | 24.5 | 25.2 |
| 81 | 25.8 | 26.5 | 24.6 | 24.4 | 26.7 | 26.7 | 23.1 | 23.3 | 23.1 | 24.5 | 24.5 | 24.0 | 24.8 |
| 82 | 25.1 | 25.3 | 26.2 | 25.3 | 25.7 | 25.8 | 23.8 | 22.5 | 23.7 | 22.8 | 24.8 | 24.1 | 22.9 |
| 83 | 25.0 | 25.6 | 27.1 | 25.1 | 24.7 | 25.0 | 23.6 | 22.7 | 22.8 | 24.1 | 24.4 | 24.2 | 24.5 |
| 84 | 23.6 | 24.4 | 26.9 | - | 28.0 | 26.7 | 26.7 | 25.3 | 26.1 | 27.3 | 27.6 | 27.0 | 26.3 |
| 85 | 27.5 | 27.9 | 28.4 | 27.4 | 27.7 | 28.2 | 24.8 | 24.3 | 25.9 | 26.6 | 26.6 | 25.8 | 26.8 |
| 86 | 26.2 | 24.6 | 26.9 | 27.4 | 28.9 | 25.3 | 25.0 | 26.6 | 26.6 | 28.1 | 28.0 | 27.2 | 26.7 |
| 87 | 26.4 | 28.4 | 28.5 | 28.8 | 27.5 | 27.6 | 27.4 | 27.2 | 28.5 | 28.7 | - | 27.8 | 27.9 |
| 88 | 27.4 | 28.9 | 30.9 | 29.8 | 30.4 | 27.9 | 24.2 | 25.6 | 26.2 | 26.6 | 26.8 | 26.4 | 27.6 |
| 89 | 26.0 | 27.0 | 28.3 | 26.0 | 29.0 | 27.1 | 24.7 | 25.7 | 26.0 | 27.2 | 27.7 | - | 26.7 |

Source:- National Meteorological Services Agency.

Appendix II

Monthly Rainfall (MM) of Ziway for 20 years

| Year | J | F | M | A | M | J | J | A | S | O | N | D | Tota |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1970 | 66.5 | 0.0 | 70.2 | 43.6 | 21.2 | 15.2 | 9.2 | 9.4 | 93.7 | 46.85 | 0.0 | 0.0 | 375.8 |
| 71 | 6.8 | 1.0 | 30.4 | 100.8 | 67.0 | 143.6 | 116.2 | 114.4 | 27.8 | 0.0 | 3.4 | 1.6 | 613.0 |
| 72 | 0.0 | 0.0 | 0.0 | 178.9 | 78.2 | 46.9 | 124.8 | 232.3 | 67.1 | 31.4 | 0.0 | 0.0 | 659.6 |
| 73 | 0.0 | 0.0 | 0.0 | 9.0 | 164.4 | 70.5 | 168.8 | 121.2 | 111.4 | 33.8 | 0.0 | 2.6 | 681.7 |
| 74 | 3.6 | 5.5 | 152.4 | 1.2 | 67.6 | 75.2 | 118.1 | 218,7 | 213.4 | 0.0 | 0.0 | 0.0 | 855.7 |
| 75 | 0.0 | 29.4 | 3.3 | 23.6 | 105.6 | 187.8 | 304.1 | 48.6 | 246.5 | 7.1 | 0.0 | 0.0 | 956.0 |
| 76 | 0.0 | 1.8 | 47.3 | 31.8 | 96.2 | 64.2 | 175.3 | 76.2 | 37.1 | 6.9 | 21.9 | 0.0 | 558.7 |
| 77 | 63.1 | 9.0 | 6.0 | 154.3 | 96.4 | 168.7 | 180.4 | 143.9 | 55.5 | 218.8 | 0.0 | 0.0 | 1096.1 |
| 78 | 10.9 | 178.3 | 45.6 | 65.6 | 13.2 | 181.9 | 61.9 | 221.8 | 93.4 | 45.5 | 1.6 | 5.5 | 925.2 |
| 79 | 91.9 | 102.4 | 70.0 | 61.6 | 148.6 | 105.2 | 150.0 | 98.0 | 87.9 | 71.0 | 0.0 | 6.2 | 992.8 |
| 80 | 25.8 | 14.9 | 14.4 | 48.3 | 3.6 | 53.8 | 129.3 | 116.8 | 63.4 | 43.6 | 0.0 | 0.0 | 513.9 |
| 81 | 0.0 | 28.2 | 248.9 | 68.7 | 21.7 | 2.2 | 237.1 | 145.4 | 234.2 | 5.2 | 0.0 | 0.0 | 992.8 |
| 82 | 51.0 | 14.7 | 136.2 | 76.8 | 68.0 | 16.6 | 117.0 | 218.7 | 39.3 | 142.3 | 9.5 | 0.0 | 890.1 |
| 83 | 34.4 | 56.3 | 85.9 | 100.6 | 152.1 | 43.3 | 153.2 | 146.5 | 64.6 | 27.2 | 0.0 | 0.0 | 864.1 |
| 84 | 0.0 | 0.0 | 10.6 | 50.6 | 90.6 | 57.5 | 213.0 | 116.2 | 63.5 | 0.0 | 0.0 | 0.0 | 602.0 |
| 85 | 0.4 | 0.0 | 30.6 | 105.4 | 118.6 | 40.0 | 155.7 | 138.2 | 69.0 | 1.3 | 0.0 | 0.0 | 659.2 |
| 86 | 0.0 | 53.0 | 19.7 | 53.7 | 110.3 | 88.4 | 70.5 | 54.0 | 65.8 | 22.2 | 11.1 | 0.0 | 548.7 |
| 87 | 0.0 | 29.8 | 56.3 | 47.6 | 219.6 | 16.2 | 67.5 | 54.1 | 44.7 | 17.1 | 0.0 | 0.0 | 552.9 |
| 88 | 3.2 | 20.9 | 1.8 | 49.8 | 13.0 | 118.9 | 138.2 | 92.9 | 169.3 | 99.1 | 0.0 | 0.2 | 707.3 |
| 89 | 4.7 | 50.3 | 195,7 | 129.9 | 2.9 | 102.9 | 120.0 | 150.5 | 133.1 | 12.5 | 0.0 | 49.6 | 951.1 |

Source:- National Metheorological Services Agency.

Appendix IB.

**Monthly-Mean-Minimum Temperature of Ziway for 20 Years**

| Year | J | F | M | A | M | J | J | A | Sep. | Oct. | N | D | Aver-age |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1970 | - | 15.1 | 14.8 | 15.3 | 15.1 | 15.4 | 15.1 | 14.6 | 9.9 | 9.4 | 10.8 | 10/7 | 13.3 |
| 71 | 8.4 | 9.4 | 6.8 | 6.2 | 5.8 | 6.0 | 14.7 | 12.3 | 12.7 | 12.6 | 10.6 | 15.5 | 10.8 |
| 72 | 2.9 | 4.7 | 6.4 | 9.3 | 8.8 | 10.0 | 11.4 | 11.3 | 10.8 | 11.6 | 11.7 | 9.8 | 9.1 |
| 73 | 11.9 | 11.4 | 13.5 | 13.6 | 13.6 | 14.1 | 14.0 | 13.5 | 13.2 | 10.9 | 11.5 | 8.5 | 12.5 |
| 74 | 10.9 | 11.6 | 13.9 | 11.8 | 13.6 | 13.5 | 12.2 | 13.8 | 12.0 | 10.3 | 9.4 | 9.5 | 11.9 |
| 75 | 11.6 | 12.8 | 13.6 | 10.5 | 14.7 | 14.2 | 14.0 | 14.4 | 13.7 | 11.7 | 10.8 | 10.4 | 12.7 |
| 76 | 12.3 | 11.9 | 12.5 | 12.9 | 13.9 | 13.6 | 13.3 | 12.5 | 12.2 | 13.0 | 13.9 | 12.8 | 12.9 |
| 77 | 15.9 | 14.1 | 15.6 | 15.7 | 16.0 | 15.6 | 15.3 | 15.2 | 15.0 | 14.7 | 13.3 | 12.7 | 14.9 |
| 78 | 12.7 | 13.5 | 15.7 | 15.4 | 16.2 | 16.6 | 16.0 | 15.4 | 15.5 | 15.4 | 14.8 | 13.6 | 15.1 |
| 79 | 14.9 | 14.9 | 15.3 | 16.2 | 16.9 | 16.5 | 15.8 | 15.6 | 15.7 | 13.6 | 12.8 | 13.7 | 15.2 |
| 80 | 13.7 | 15.4 | 16.6 | 16.9 | 17.3 | 16,7 | 15.9 | 15.9 | 15.6 | 14.3 | 13.2 | 11.3 | 15.2 |
| 81 | 13.2 | 14.7 | 16.3 | 16.5 | 16.0 | 15.4 | 15.7 | 15.5 | 14.9 | 13.7 | 12.3 | 11.1 | 14.6 |
| 82 | 14.8 | 15.6 | 15.4 | 15.6 | 15.8 | 15.7 | 15.4 | 15.5 | 14.6 | 14.5 | 14.7 | 15.3 | 15.2 |
| 83 | 14.0 | 17.2 | 18.4 | 17.6 | 17.7 | 15.5 | 15.1 | 15.5 | 14.6 | 12.6 | 11.9 | 11.9 | 15.2 |
| 84 | 11.3 | 11.5 | 13.8 | - | 14.5 | 13.6 | 13.0 | 13.4 | 12.4 | 10.8 | 10.8 | 10.5 | 12.4 |
| 85 | 10.9 | 11.7 | 13.0 | 13.8 | 13.8 | 13.7 | 12.9 | 12.5 | 12.3 | 10.6 | 10.0 | 8.4 | 12.0 |
| 86 | 8.5 | 12.6 | 12.4 | 13.5 | 13.2 | 12.5 | 12.0 | 10.1 | 11.7 | 10.6 | - | 9.0 | 11.5 |
| 87 | 11.8 | 12.7 | 16.0 | 14.8 | 15.8 | 15.2 | 14.7 | 14.8 | 14.0 | 13.9 | 11.6 | 11.6 | 13.9 |
| 88 | 13.0 | 14.9 | 14.6 | 15.5 | 15.6 | 15.5 | 15.3 | 15.1 | 14.9 | 13.0 | 9.4 | 11.0 | 14.0 |
| 89 | 11.3 | 13.7 | 15.0 | 15.1 | 14.1 | 15.1 | 15.0 | 14.6 | 14.3 | 11.8 | 11.8 | - | 13.8 |

Source:- National Meteorological Services Agency.

Questionnaire to be filled by seasonal workers in the State Irrigated Farm of Ziway (Werda)

Questionnaire No._____

Name of interviewee_____

Date of interview_____

I. Survey area

1. Place Name_____
2. Awraja_____
3. Administrative Region_____

II. Background Information

4. Name of seasonal worker_____
5. Age_____ Years
6. Sex _____ Male_____ Female_____
7. Marital Status

   Married_____ not married_____

   Divorced_____ widow/widower_____

   Separated_____ others (specify)_____

8. Ethnicity

   Amhara_____ Tigrie_____ Wolayitta_____

   Oromo_____ Gurage_____ Kembatta_____

   Others (~~Soecity~~ specify)_____

9. Educational status

   illetrate_____ 1-6_____ 9-12_____

   Read & write_____ 7-8_____ above 12_____

10. Number of people in the house hold

    2_____ 3_____ 4_____ 5_____ 6_____ 7_____ 10____ 10_____

11. Is your place of birth other than your current place of reåidence?

    Yes_____ No_____

12. If the answer for question No.11 is yes, what kind of area was the actual place of birth of the respondent ?

13. What is the reason for leaving ones original (birth place)?

    to look for job_____

    in search of higher level of education_____

    to visit a relative_____

14. What is the length of residence of the sesonal worker ?

    in years or months (weeks, months, years)

15. If the respondent is a migrant, how is the problem of housing (shelter) solved ?

    by staying in a relative house without paying rent_____

    Rented a room in a private dwelling_____

    Rented a room from kebele_____

    by constructing a house_____

    others (specify)_____

16. What is your major occupation ?

    Farming_____ Wood cutting_____

    Animal raising_____ daily labourer_____

    Fishing_____ others (specify)_____

17. If the answer for question No. 16 is farming, what is the size of your holding (land) ?

    _____in local unit _____in hectares

18. In your region, how much land size is considered to be the highest land holding ?

    _____ in local unit in hectares

19. Do you raise cattle ?

    Yes _____ No_____

20. If you raise cattle, what is the size of your cattle ?

cows_____ sheep_____ draft animals_____

oxen_____ Goats_____

21. Are you engaged other than farming (i.e in income generating activities or occupations such as

Weaving_____ Pottery_____

trading_____ Carpet making_____

basket making_____ hired labourer_____

22. If you are working as a hired labourer in the state irrigated farm, for how long did you work ?

one year_____ four years_____ seven years_____

two years_____ five years_____ eight years_____

threeyears_____ Sixyears_____ nine years_____

10 years_____ grater than ten years_____

23. If your are a hired labourer in the state irrigated farm, which part of the year do you work ?

the rainy season_____ All the year_____

the dry season_____

24. If you are working part of the year in the state irrigated farm, where do you spent the rest of the year?

working in my holding_____

Looking for other kinds of work_____

stay until the arrival of the next harvest season_____

of the state irrigated farm_____

others# (specify)_____

25. If you are working as a hired labourer in the state irrigated farm, what is the main reason for doing so ?

In-sufficient means of subsistence_____

Need for modern goods and clothing_____

Payment of tax_____

to buy agricultural materials_____

26. What is the major purpose served with the earnings you get from the state irrigated farm ?

Satisfy primary needs_____

improve housing conditions_____

buy agricultural implements_____

pay tax_____

others (specify)_____

27. What is your average monthly income from the state irrigated farm ?_____ in kind_____ in cash_____

28. How do you rate your standard of living compared to your past experience when you were not working as a hired labourer in the state irrigated farm ?

High_____ low_____ medium_____ No change_____

29. Do you have any other source of income other than the income you get from the state irrigated farm ?

Yes_____ No_____

30. If the respondent is crop producer, what were the major crops grown some 10-15 years back in the area.

Names of crops_____

_____

31. Is there any change in the crops grown some 10-15 years and now ?

Yes_____ No_____

32. What are the major crops grown these days ?

Names of crops_____

_____

33. If the answer for question 31 is yes, what is the main reason ?

shortage of land_____

each of water (rainfall)_____

wild animals_____

Decline in soil fertility_____

climatic change_____

introduction of irrigation water in the area_____

34. How is the need of vegetables such as cabbages, potatoes, etc. is fulfilled by the respondent ?

by growing around the homestead_____

by buying from markets_____

No vegetable is consumed by the house hold._____

35. If the respondent is growing vegetables around the home stead or in the farms how is the need of water fulfelled ?

from hand dug wells _____

from water collected during the rainy season_____

no vegetable is grown during the dry season_____

by using irrigation water_____

36. If the respondent grows vegetables during the dry and rainy seasons, what is the size of area covered and the types of vegetables grown ?

| Rainy season vegetables | | Dry season vegetables | |
|---|---|---|---|
| Types | area | Types | area |
| | | | |
| | | | |

37. If the respondent is using irrigation water for crop production, what other purpose does irrigation water serve ?

Is a source of water for domestic use_____

Is a source of water for animals_____

Is a source of water for washing clothes_____

38. Of the respondent uses irrigation water for drinking purposes, does it boil the water ?

always_____ sometimes_____ never_____

39. What kind of disease is commonly affecting him and his family

common cold_____ Amoeba_____ dysentery_____

malaria_____ Schistosomasis_____ other (specify)_____

40. What disease is said to be common in the area ?

malaria_____ Schistosomasis_____ sleeping sickness_____

others(specify)_____

41. In the opinion of the respondent, do the above diseases have any connection with the development of irrigation schemes in the area ?

Yes_____ No_____

42. Has any member of the respondents family died from such diseases

Yes_____ No_____

43. In the opinion of the respondent, what other problem is associated with the development of irrigation project in the area ?

Lack of pasture land (decreased pasture land)_____

decreased size of individual holdings_____

evicted some of the peasantary_____

44. What is the general attitude of the respondent towards the existence of irrigation project in the area ?

has positive attitude_____

has Negative attitude_____

cannot identify_____

45. In the respondents opinion, what are the major climatic problems in the area ?

Drought_____ flood_____ wind_____

Frost_____ others (specify)_____

46. What is the condition of the natural vegetation in the area ?

Stable_____ Depleting_____ Depleted_____

Cannot be determined_____

47. If the answer for question 46 is depleting or depleted, can you indicate the main cause ?

Deforestation

clearing of land for cultivation_____

climatic condition_____

Introduction of irrigation project in the area_____

48. In the opinion of the respondent, is it really advisable to have irrigation facilities in the area ?

Yes_____ No_____

49. How do you rate the soil conservation on the farm ?

Not eroded_____ Moderately eroded_____

extremely eroded_____ Do not know_____

50. What is the nature of soil fertility on your farm ?

very fertile_____ moderately fertile_____

low in fertility_____ Do not know _____

51. What effect in general has the introduction of irrigation project brought in the area ?

Salinized the soil_____

made the lake water decrease in volume_____

minimized the condition of drought in the area_____

has brought all the above mentioned changes._____

Questionnaire to be filled by permanent workers in the State Irrigated farm of Ziway

Questionnaire No._____

Name of interviewee_____

Date of interview_____

I Survey area

1. Place Name_____
2. Awraja_____
3. Administrative Region_____

II Back ground information

4. Name of permanent worker_____
5. Age_____ Years_____
6. Sex_____ male_____ Female_____
7. Educational Status

   illetrate_____ 1-6_____ 9-12_____

   Read & write_____ 7-8_____ 12_____

8. What is the length of residence of the worker at this particular site ?

   _____ years

9. How is the problem of housing solved ?

   The project provides with housing facilities_____

   stay or live in a relative house without paying rent_____

   Rented a room from the kebele_____

   Rented a room in a private divelling_____

   constructed one own hause_____

10. What is the average monthly income of the worker ?

    _____birr

11. What are the major climatic problems in the area ?

    Drought_____ Frost_____

    Flood_____ Others (speeify)_____

    wind_____

12. In your opinion, what major problem is solved due to the establishement of irrigation project in the area

    growing periods have increased_____

    number of crops grown have increased_____

    both growing periods and number of crops grewn have increased_____

    water problem for agriculture has been solved_____

    all of the above_____

13. What is the major problem observed as the result of the establishment of irrigation project in the area ?

    Peasants have been dislocated_____

    Grazing land has decreased _____

    Individual land holding has decreased_____

    Forest land is decreased_____

14. Are you willing to do any work as long as it guarantes you better income than what you are getting now ?

    Yes_____ No_____ Do not know_____

15. What kind of disease is commonly affecting you and your Collegeaus working in this project ?

    Malaria_____ Schistosomasis_____

    Amoeba_____ others ( specify)_____

16. Does the above sieknesses have any thing to do with the development of irrigation in the area ?

    Yes_____ No_____ Donot know_____

Horticulture Development Corporation

Small Farms Co-Ordation office

Statement of Export Sales for the Year 1981/82

| | Item | Quantity in Kg/Steam/ Carton | Quantity in Qunital | Amount in Birr |
|---|---|---|---|---|
| 1. | Statice | 8216613 | 2347.61 | 1,511,111.50 |
| 2. | Eupherbia | 1189675 | 594.84 | 134,611.55 |
| 3. | Ammemajus | 387250 | 104.67 | 54,496.14 |
| 4. | Dill | 705455 | 352.73 | 123,729.95 |
| 5. | Carthamus | 294752 | 98.25 | 60,510.92 |
| 6. | Allium | 970825 | 485.42 | 197.129.69 |
| 7. | Delphinium | 89060 | 29.69 | 9,552.32 |
| 8. | Atriplex | 60230 | 33.47 | 12,151.59 |
| 9. | Bobby Beans | 86714 | 3468.56 | 427,764.58 |
| 10. | Solo Papaya | 45 | 1.80 | 397.48 |
| 11. | Avocado | 43 | 2.15 | 218.29 |
| 12. | Passion Fruit | 62 | 1.86 | 361.73 |
| 13. | Asparagus | 519 | 10.38 | 44,639.13 |
| 14. | Strowberry | 6432 | 36.48 | 19,972.43 |
| 15. | Mellon | 11476 | 573.80 | 44,639.13 |
| 16. | Beans | 420 | 16.80 | 4,774.44 |
| 17. | Rosel | 4500 | 2.25 | 166.05 |
| | | | | 2,606,497.33 |

Horticulture Development Corporation
Small Farms Cordinating Office
Local Expenses of Export for Flowers, Fruits & Vegtable for the Year 1981/82

| Item | Dispached in Stem/Kg | Fright | Custom | Mtsc | Quarntine Service | Bank Charge | Total |
|---|---|---|---|---|---|---|---|
| Statice | 10,114,980 | 1085569.07 | 47,465.28 | 1,087.43 | - | 10,738.37 | 1,144,860.15 |
| Euphorbia | 13,000.70 | 198828.19 | 4,290.19 | 218.98 | - | 945.57 | 204,284.09 |
| Ammimajus | 456,480 | 35186.06 | 2,834.76 | 50.62 | - | 319.02 | 38,390.46 |
| Dille | 898.160 | 112982.27 | 4,115.80 | 133.98 | - | 903.78 | 118,135.83 |
| Carthamus | 471,800 | 81244.38 | 1,977.16 | 102.86 | - | 424.94 | 83,749.34 |
| Allium | 1,064,400 | 91720.47 | 4,509.93 | 181.80 | - | 1,349.72 | 97,761.92 |
| Delphinium | 88,700 | 4259.00 | 346.10 | 40.90 | | 66.24 | 4,712.24 |
| Atriplex | 155,280 | 18354.05 | 571.77 | 45.96 | - | 38.01 | 19,059.79 |
| Bobby Beans | 384,848 | 173853.04 | 11,585.18 | 459.00 | 1,958.06 | 3,186.39 | 191,041.67 |
| Solo Papaya | 288 | 686.73 | 10.58 | 1.55 | 1.06 | 2.94 | 702.86 |
| Avocado | 123 | 2752.44 | 5.18 | 12.36 | 0.85 | 1.83 | 2,772.66 |
| Passion Fruit | 117 | 147.31 | 8.52 | 22.96 | 0.90 | 2.89 | 182.58 |
| Asparagus | 1031.5 | 1487.33 | 125.78 | 10.78 | 8.71 | 36.30 | 1,668.90 |
| Mellon | 45902 | - | 1,077.46 | 44.97 | 223.26 | 331.36 | 1,677.05 |
| Roses | 19840 | | 4.22 | 3.47 | - | 1.43 | 3,350.51 |

Horticulture Development Corporation

Small Farms Co-Ordination Office

Statement of Export Sales for the Year 1980/81

| | Item | Despached in Stem/Kg | Sold in Stem/Kgs | Amount in Birr |
|---|---|---|---|---|
| 1. | Statics | 10998330 | 10362713 | 1,844,003.74 |
| 2. | Epherbia | 1299530 | 1215105 | 193,060.02 |
| 3. | Amimajus | 709000 | 1727853 | 123,345.94 |
| 4. | Dill | 875440 | 850240 | 174,876.82 |
| 5. | Carthamus | 989350 | 794571 | 86,364.54 |
| 6. | Allium | 1726510 | 1693288 | 528,928.77 |
| 7. | Delphinium | 436400 | 382370 | 53,246.12 |
| 8. | Atriplex | 36000 | 32000 | 5,985.67 |
| 9. | Bobby Beans | 363688 | 355010 | 870,774.69 |
| 10. | Avocado | 89 | 89 | 313.85 |
| 11. | Passion Fryits | 236 | 223 | 593.59 |
| 12. | Asparagus | 5093 | 5097.5 | 26,775.51 |
| | | | Total:- | 3,908,269.26 |

Horticultural Development Corporation

Small Farms Co-Ordination office

Statement of Export Sales for the Year 1982/83

| | Item | Quantity Desparhed in Kg/ Stem | Quantity Sold in Kg/ Stem | Amount in in Birr |
|---|---|---|---|---|
| 1. | Allium | 1,252,500 | 1,246,455 | 197,622.93 |
| 2. | Statice | 9,616,115 | 8,881,215 | 1,355,292.82 |
| 3. | Ephorbia | 1,279,980 | 1,193,405 | 123,856.67 |
| 4. | Carthamus | 300,940 | 300,940 | 61,906.81 |
| 5. | Dille | 548,680 | 501,465 | 113,154.78 |
| 6. | Amimajus | 340,295 | 302,950 | 27,916.15 |
| 7. | Roses | 37,788 | 37,870 | 4,728.69 |
| 8. | Atriplex | 336.720 | 324,940 | 52,442.33 |
| 9. | Stratifolia | 895 | 895 | 339.65 |
| 10. | Castes | 600 | 600 | 364.30 |
| 11. | Bobby Beans | 98,732 | 97,524 | 205,981.53 |
| 12. | Beans | 442,840 | 442,840 | 229,168.70 |
| 13. | Mlon | 26,781 | 26,781 | 22,174.66 |
| 14. | Aparagus | 7,085 | 7,085 | 21,998.92 |
| 15. | Srawberry | 2,064 | 2,064 | 4,272,48 |
| 16. | Ppaya | 1,755 | 1,746 | 2,257.72 |
| 17. | Avcado | 1,164 | 1,129 | 3,650.84 |
| 18. | Pssion Fruit | 57 | 55 | 198.73 |
| 19. | Boby Beans | 16,208 | 15,800 | 36,134.88 |
| 20. | Gren Chillies | 15,524 | 15,212 | 41,293.33 |
| | | | Total:- | 2,504.756.92 |

Horticultural Development Small Farm
Cordination Office Local Expense of
Export Crops During the Year 1982/83

| Item | Freight Charge Birr | Bank Charge Birr | Custom Birr | Quarantine Birr | Photo Sani- Birr | Mtsc Birr | Total Cost Birr |
|---|---|---|---|---|---|---|---|
| Allium | 164,050.99 | 1,186.20 | 6,397.95 | - | 53.30 | 230.90 | 171,919.34 |
| Statice | 1,451,865.70 | 8,134.94 | 48,912.46 | - | 498.13 | 304.53 | 1,509,715.76 |
| Euphorbia | 254,943.66 | 743.43 | 6,529.88 | - | 89.43 | 237.60 | 262,544.00 |
| Carthamus | 79,462.30 | 371.59 | 1,695.88 | - | 25.54 | 250.99 | 81,806.30 |
| Dille | 84,496.72 | 679.19 | 2,802.74 | - | 29.70 | 230.91 | 88,239.26 |
| Amimajus | 42,175.41 | 167.56 | 1,738.28 | - | 12.28 | 60.24 | 44,153.77 |
| Roses | 2,986.69 | 28.38 | 193.03 | - | 1.00 | 80.32 | 3,289.42 |
| Atripliex | 66,598.37 | 314.78 | 1,721,79 | - | 22.30 | 194.10 | 68,851.34 |
| St.Latifolia | 159.68 | 2.04 | 4.57 | - | 0.04 | 16.73 | 183.06 |
| Caster | 262.88 | 2.19 | 3.06 | - | 0.10 | 6.69 | 274.92 |
| Boby Beans | 152,218.68 | 1,236.37 | 4,209.92 | 987.79 | 114.68 | 143.90 | 158,911,34 |
| Beans | - | 1,375.56 | 3,770.15 | 4,430.50 | 514.39 | 117.13 | 10,207.73 |
| Melon | - | 133.10 | 364.80 | 267.94 | 31.11 | 60.24 | 857.19 |
| Aspargus | - | 132.05 | 361.91 | 70.88 | 8.23 | 70.28 | 643.35 |
| Strawberry | - | 25.64 | 70.29 | 20.65 | 2.40 | 33.46 | 152.44 |
| Papaya | 2,654.92 | 13.55 | 70.01 | 17.56 | 2.04 | 10.04 | 2,768.12 |
| Avocado | 1,677.13 | 21.98 | 39.64 | 11.64 | 1.35 | 33.46 | 1,785.20 |
| Passion Fruit | 101.77 | 1.19 | 1.94 | 1.94 | 0.07 | 13.39 | 118.93 |
| | | | | | Total;- ..... | | 2,406,421.47 |

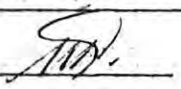
Horticultural Development Corporation
Small Farms Cordinating Office
Local Expenseof Export for Flower,
Fruits and Vegtable for the Year 1980/81

| Item | Freight Charge Birr | Custom Birr | Mtsc Birr | Quaranttne Service Birr | Total |
|---|---|---|---|---|---|
| Statice | 1279638.59 | 65,989.20 | 200 | - | 1,345,827.79 |
| Euphorbis | 142,624.24 | 8,268.26 | 250 | - | 151,142.50 |
| Amimajus | 60,937.18 | 8,694.79 | 160 | - | 65,791.97 |
| Delphinam | 27,076.90 | 8,229.95 | 160 | - | 35,466.85 |
| Dill | 88,165.89 | 5,388.46 | 80 | - | 93,634.35 |
| Carthamus | 145,816.51 | 6,292.39 | 140 | - | 152,248.90 |
| Allium | 149,414.56 | 11,533.99 | 30 | - | 160,978.55 |
| Boby Beans | 507,591.58 | 22,651.67 | 540 | 1,569.41 | 533,352.66 |
| Atraplex | 4,193.55 | 224.56 | 30 | - | 4,448.11 |
| Asparagus | 7,453.89 | 423.31 | 230 | 305.28 | 8,412.48 |
| Avocado | 2,669.46 | 3.68 | | 0.63 | 2,673.77 |
| Passion Fruits | 361.05 | 9.76 | 70 | 1.68 | 442.49 |
| | 2,416,161.33 | 133,721.82 | 1,910 | 1,877.00 | 2,553,610.15 |

# D E C L A R A T I O N

I, the undersigned, declare that this thesis is my original work and that all sources of material used for the thesis have been duly acknowledged.

Name Mekonnen Cherinet

Signature 

Place and date of Submission

College of Social Sciences, Addis Abeba University

June 1992.