

**REPUBLIC OF ZAMBIA**

**BASIC DESIGN STUDY  
ON  
THE RURAL DEVELOPMENT PROGRAMME  
IN  
KAUNGA AREA**

**FINAL REPORT**

**SEPTEMBER, 1987**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

**GRF**

**87-116**



JICA LIBRARY



1041599[0]



**REPUBLIC OF ZAMBIA**

**BASIC DESIGN STUDY  
ON  
THE RURAL DEVELOPMENT PROGRAMME  
IN  
KAUNGA AREA**

**FINAL REPORT**

**SEPTEMBER, 1987**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

國際協力事業團		
受入 月日	88. 3. 15	533
登録No. 17288		80
		GRF

## P R E F A C E

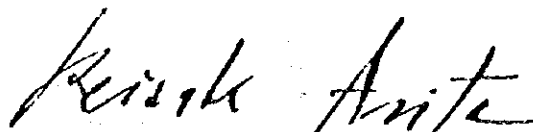
In response to the request of the Government of the Republic of Zambia, the Government of Japan has decided to conduct a basic design study on the Rural Development Programme in the Kaunga Area and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Zambia a study team headed by Mr. Sota Iwamoto, the Japanese Institute of Irrigation and Drainage, from 5th April to 4th May, 1987.

The Team had discussions on the Project with the officials concerned of the Government of Zambia and conducted a field survey in the Project area. After the Team returned to Japan, further studies were made, a draft report was prepared, and for explanation and discussion of the report, a mission headed by Mr. Koichiro KATSURAI, Agricultural Development Specialist, Institute for International Cooperation, JICA, was sent to Zambia from 21st August to 1st September 1987. As a result, the present report has been prepared.

I hope that his report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Zambia for their close cooperation extended to the team.

September, 1987



---

Keisuke ARITA  
President

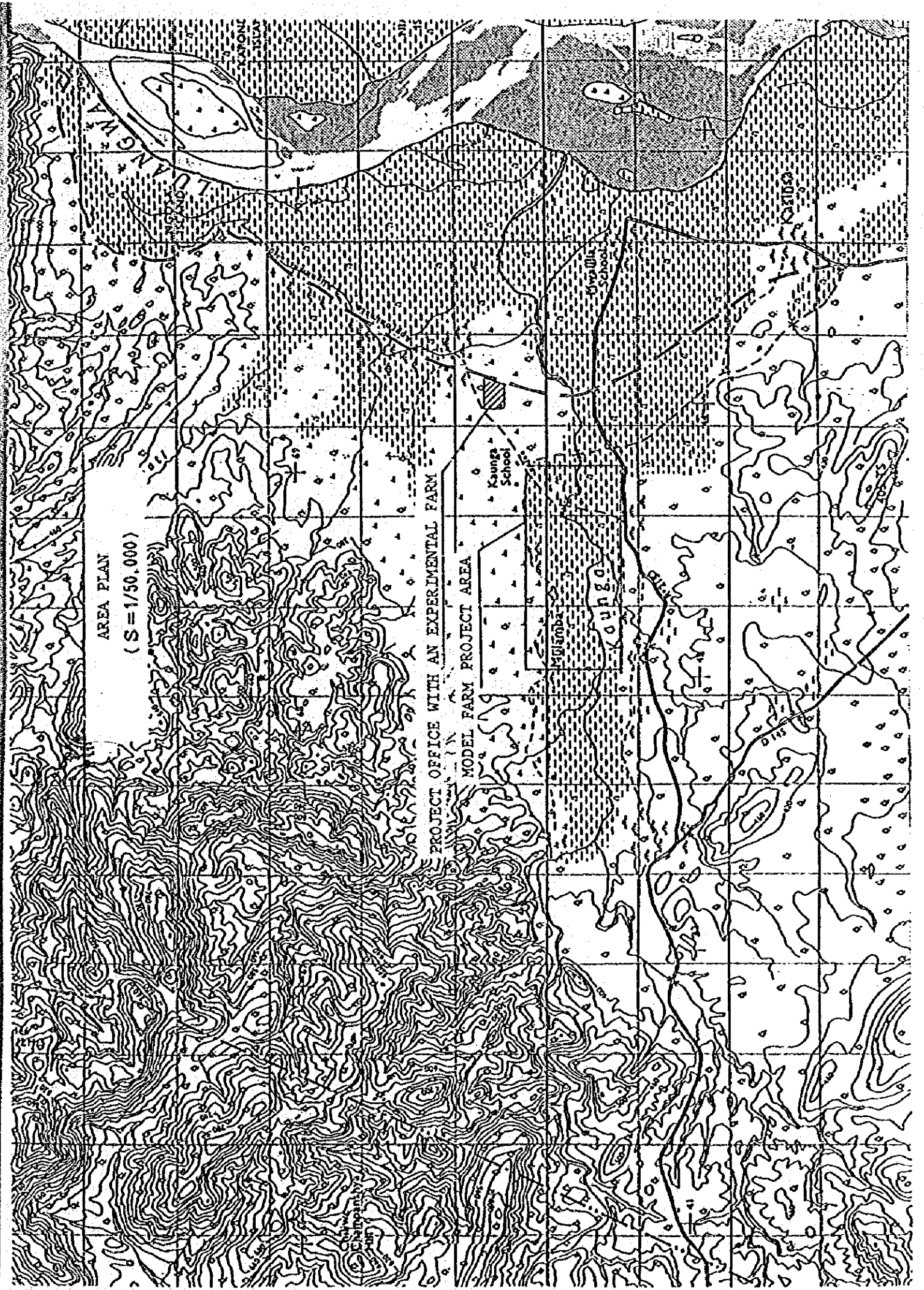
Japan International Cooperation Agency











AREA PLAN  
(S=1/50,000)

PROJECT OFFICE WITH AN EXPERIMENTAL FARM

MODEL FARM PROJECT AREA

Kaung School

Munda

Kaung

Munda School

Kaung

KAUNG

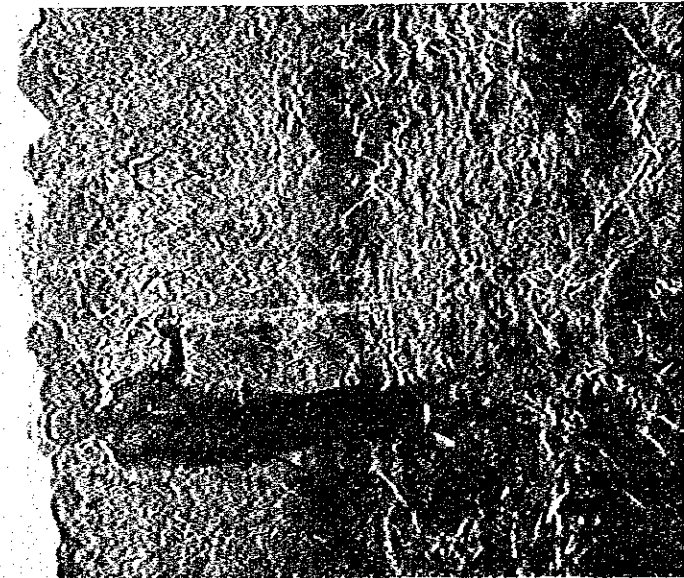
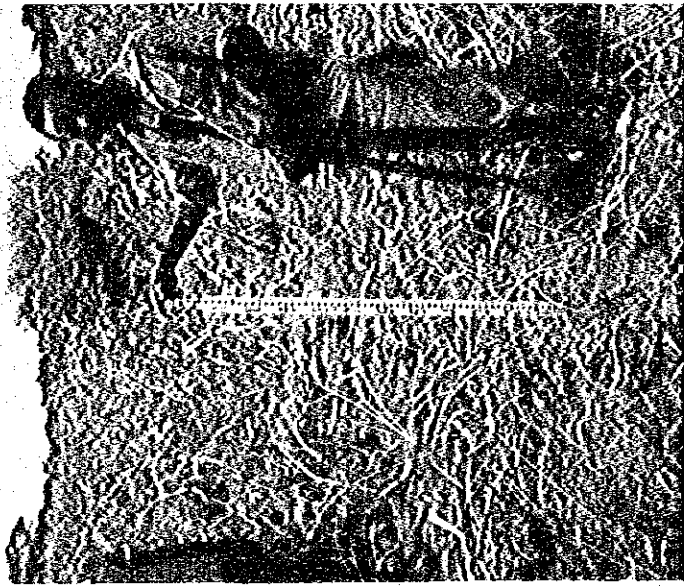
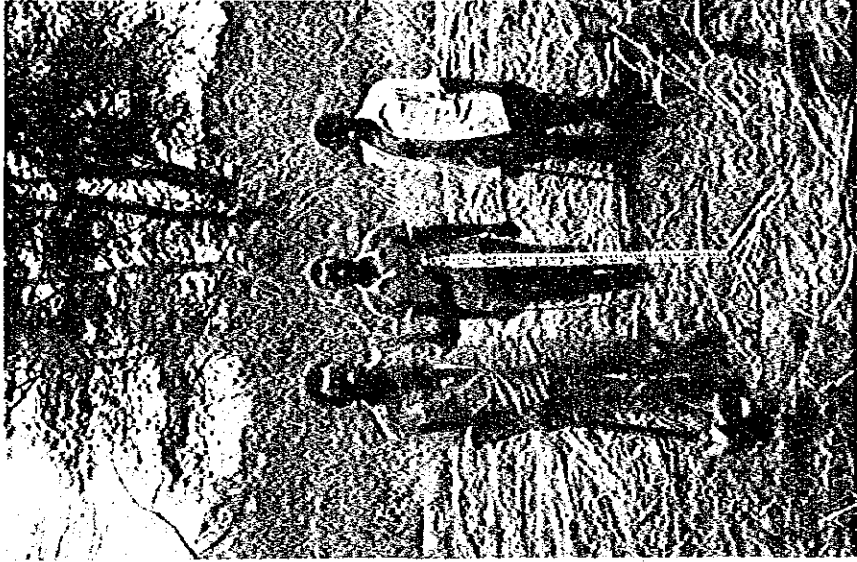
KAUNG





AREA OF MODEL FARM





AREA OF MODEL FARM

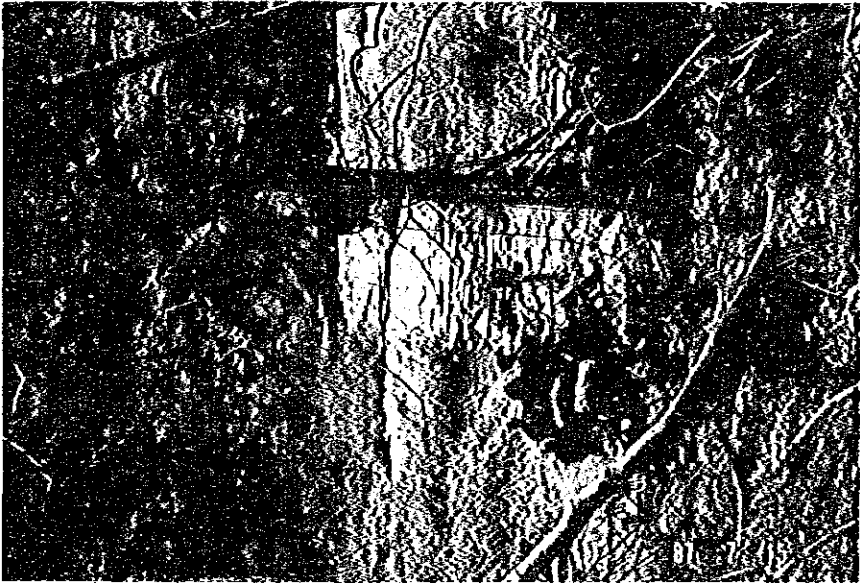
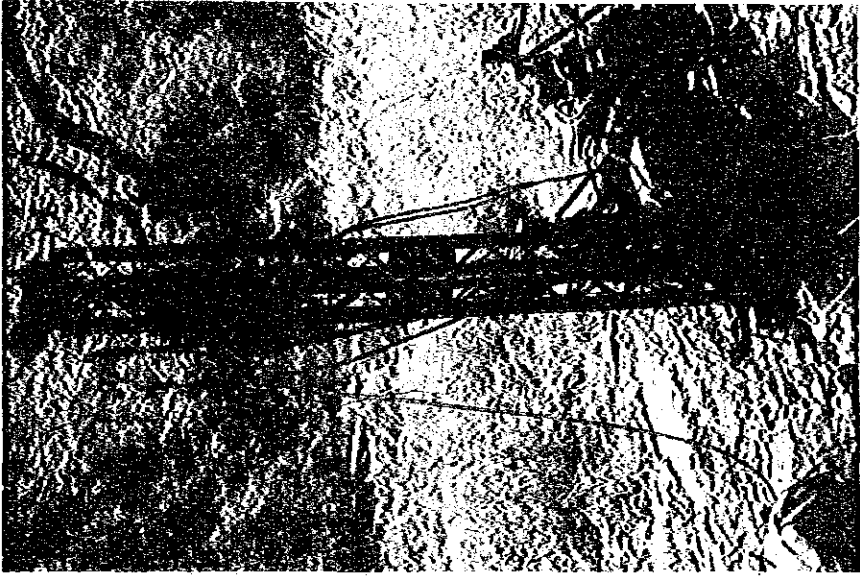






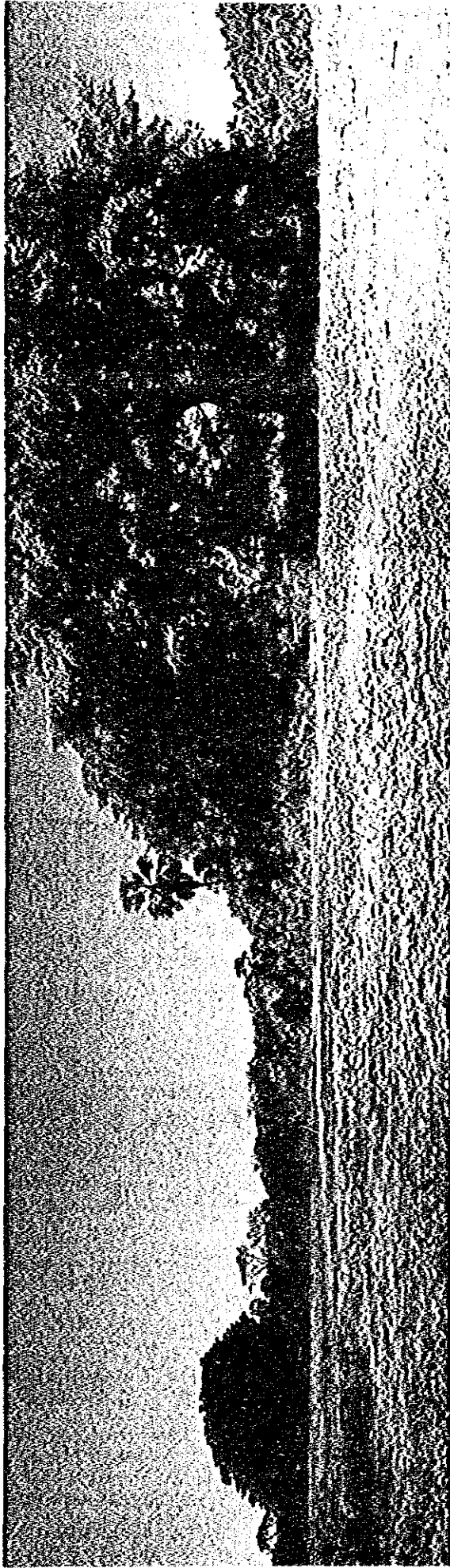
AREA OF CONSTRUCTION FOR INTAKE WORKS





BORING TEST LOCATIONS FOR CONSTRUCTION INTAKE WORKS





AREA OF CONSTRUCTION FOR OFFICE AND EXPERIMENTAL FARM



## **SUMMARY**





## SUMMARY

Since the independence of the country in 1964, the Government of the Republic of Zambia has been making every effort to accomplish self-sufficiency in food production and to diversify the country's industries in order to emerge from the monocultural economic structure that depends on the country's resources of copper. To achieve these goals the Government has established and implemented National Development Plans.

During the period of the First National Development Plan (from 1966 to 1970), the country obtained capital quite easily due to the sufficient amount of revenues brought in by the sale of industrial products related to mining. The contribution of manufacturing industries to the country's Gross Domestic Product (GDP) increased more than the planned rate. As a result, the share contributed by mining decreased and the diversification of the country's industry was comparatively successful. However, the increase in agricultural production was far lower than expected.

During the period of the Second National Development Plan (from 1972 to 1976), the international copper price fell substantially, and the revenues from mining and related industries declined. It then became difficult for the country to acquire capital and industrial output as previously planned.

From 1979 to 1983, the period of the Third National Development Plan, the southern provinces of the country suffered from occasional droughts. With the fall of copper prices, the country's economic and budgetary situations worsened, and the Government could not accomplish the goals set in the Plan.

In November 1984, Japanese Foreign Minister Abe visited the Republic of Zambia. In response to the request from the Government of the Republic of Zambia, he agreed to provide grant aid for constructing grain storage. He also promised further economic cooperation. In 1985, the construction project for the grain storage building was started under

the grant aid programme of the Japanese government. Subsequently, the Government of the Republic of Zambia formulated a rural development programme in order to alleviate drought damage in the southern provinces and to increase food production by installing small-scale irrigation facilities. For implementation of this programme the Government requested grant aid from the Japanese government in August 1985.

In response to the request the Government of Japan decided to conduct a preliminary study to examine the viability of the Rural Development Programme as a Japanese grant aid project and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent the preliminary study team to the Republic of Zambia in November 1986 to obtain information pertaining to the Project.

Based on the results of the preliminary study, the Government of Japan decided to conduct the basic design study for the Project, and JICA dispatched the basic design study team to the Republic of Zambia for a thirty day period (5 April to 4 May 1987). The study team discussed the Project with the officials concerned of the Government of the Republic of Zambia and conducted investigations in the Project area and at Project related facilities. They also gathered information pertaining to the construction situation within the country, and collected other pertinent data necessary for use in evaluating the Project. Upon returning to Japan, further studies were made relevant to the basic design of the Project facilities, the selection of necessary equipment, and the operation and maintenance plan of the facilities. As a result, a Draft Final Report was prepared, and a team explained the basic design study of the Project to the Ministry of Agriculture between 21 August and 1 September 1987.

The main activities of the project will be agricultural research and extension work. The research will cover test croppings on the experimental farm, determining suitable crops for the area, and means to prevent crop disease and insect damage, and to ascertain the best seeding times for a variety of crops. For extension activities, it is

planned to expand the planting of suitable crops throughout the areas, and to show the value of irrigation farming by exhibiting test croppings, providing technical guidance, and providing the farmers with training and practical work experience on the experimental farm. In order to efficiently and effectively proceed with the research and extension activities of the Project, it is desired to send experts and Japan Overseas Cooperation Volunteers to the Republic of Zambia under the technical cooperation programme of the Government of Japan. Further, it is desired that Zambian personnel be trained in Japan on such matters as the operation and administration of the Project.

As for the facilities needed to efficiently carry out the above mentioned Project activities, the construction of the Project Office, and the development of the experimental farm and model farm under the grant aid programme of Japan would be most desirable. The experimental farm is required to perform effective test cropping throughout the year and for evaluating the possibility and aptitude of cropping during dry seasons. Research of experimental cropping using ground water will be conducted on this farm. Under the guidance of extension workers, farmers will actually cultivate the model farm thereby gaining irrigation farming experience.

The executive agency for the Project is the Department of Agriculture, the Ministry of Agriculture and Water Development of the Republic of Zambia. For implementing the Project, a manager and research personnel will be assigned to the Project Office by the Department of Agriculture.

The Project site is located in the Kaunga area, Luangwa District, Lusaka Province.

The Project, which is evaluated as justifiable to implement under the grant aid programme of Japan, includes the construction of the Project Office buildings, and the development of the experimental farm and the model farm as follows:

## 1. Model Farm

The model farm will have a water intake facility, a water conveyance facility, irrigation channels, and distribution ponds. The sizes and functions of these facilities are as follows:

### 1) Model Farm (100 ha):

The model farm will be developed along the irrigation channels. The total area of the model farm is planned to be 100 ha. The size was determined based on the amount of annual rainfall, the amount of river water, crop water requirements, the necessary irrigation period, and the area topography.

### 2) Water Intake Facility:

It is planned to intake water at an upstream point of the Kaunga River. Subsurface flow will be shut off by constructing a cutoff wall in the river, and water will be taken through a perforated culvert.

### 3) Water Conveyance Facility:

Intake water will be conveyed to the model farm through a pipeline. It is planned to use 350 mm diameter asbestos cement pipes for the pipeline with several sediment flushing facilities, air relief valves, control valves, and a few river crossing structures. The total length of the pipeline will be approximately 3 km.

### 4) Irrigation Channels:

It is planned to distribute irrigation water to farms using open channels. The cross section of a channel is 0.4 m (base width) x 0.8 m (top width) x 0.4 m (height). The open channels will be lined with soil cement.

## 5) Distribution Ponds:

In order to store and effectively utilize intake water during the rainy season, it is planned to install distribution ponds at the ends of the irrigation channels for irrigation and domestic use. Based on the populations of the villages in the area, ponds having capacities of 50 m<sup>3</sup>, 60 m<sup>3</sup>, 100 m<sup>3</sup>, 110 m<sup>3</sup>, 190 m<sup>3</sup> and 240 m<sup>3</sup> are planned to be installed along the riverside (three ponds on each bank). The ponds at the ends of the two main irrigation channels are to have capacities of 1,000 m<sup>3</sup> each.

## 2. Project Office and Experimental Farm

The construction of the Project Office buildings, development of the experimental farm, and procurement of equipment are required. The total floor area of the main buildings is 874.75 m<sup>2</sup>. The required facilities and equipment are as follows:

### 1) Project Office:

#### - Operation and Management Office Building (flat building, 130 m<sup>2</sup>):

The management office building consists of office rooms for the manager and for the research staff, who will be assigned by the Department of Agriculture; a conference room, and associated facilities.

#### - Training Center Building (flat building, 100 m<sup>2</sup>):

The Training Center Building will have a classroom which can accommodate fifty farmers from the area for training, lectures, and technical guidance. Also, some related facilities will be provided.

#### - Garage and Repair Shop Building (flat building, 275.25 m<sup>2</sup>):

This building will consist of a garage and a repair shop with a fueling facility. The garage is for the extension workers' vehicles and truck. The repair shop will provide repair and maintenance to vehicles and agricultural equipment.

- Lodging Facilities (4 flat buildings, total 239.90 m<sup>2</sup>):

The lodging facilities are planned for use by office personnel and the research staff who will be sent from Lusaka to work on the Project.

- Other Facilities (4 facilities):

A drying area, pump house, power-generating house, and water storage tank, etc.

2) Experimental Farm:

- Experimental Farm (3 ha):

It is planned to conduct test croppings and demonstrate farming methods and cropping conditions to farmers at these facilities.

- Irrigation Facility:

This facility will supply irrigation water to the experimental farm.

- Well:

It is planned that this well will provide irrigation water all year round.

3) Equipment:

- Equipment for Extension Work:

The agricultural equipment needed for cropping in the experimental farm and the vehicles required for extension work are listed in the following:

Tractor with seat	2
Rotarytiller	2
Powered Sprayer	1
Trailer	1
Hand tractor	2
Station Wagon	1
4-wheel drive Car (small)	1
Pickup Truck	1
Motorcycle	3
Repair Machinery	1 set

**- Weather Observation and Hydrological Measuring Equipment:**

It is planned to conduct weather observations in the Kaunga area and take hydrological measurements of the Kaunga and Laungwa rivers.

Weather observation equipment	4 set
Hydrological measuring equipment	4 set

The purpose of the Project is to perform irrigation farming, by building irrigation facilities in light rainfall areas which have unstable rainfall patterns, that do not require sophisticated operating and maintenance techniques.

As an outpost for extension work, the Project will demonstrate test cropping and extension activities of farming techniques. As effects of the Project propagates to the southern provinces, other communities in the areas are apt to build irrigation facilities in an effort to increase and stabilize their agricultural production. The increase of agricultural production will contribute to the development of the Zambian economy. The implementation of the Project will greatly benefit the country.

The facilities and equipment mentioned above will be provided through grant aid of the Government of Japan.

The responsibilities of the Government of the Republic of Zambia include securing the personnel necessary for the Project's implementation and to bear the related expenses; construct necessary facilities and obtain such required equipment, bearing the costs for same, that will not be covered by the grant aid programme of the Government of Japan; and carry out the measures necessary for receiving the grant aid from Japan.

The implementation of the Project will establish a foundation for the introduction of suitable crops, farmers' training and guidance, and the extension of irrigation farming in the southern provinces that occasionally sustain drought damage. The Project will be a model for the rural development programme in the southern provinces, and it is expected to contribute to the enhancement of agricultural production and to stabilizing the harvests in the area. For the above reasons, it is concluded that implementation of the Project with Japan's grant aid is justifiable.

In order to carry out the Project efficiently and effectively, the following recommendations are to be taken into consideration:

- 1) From the outset of the Project, it will be essential to dispatch the Japanese experts and the Japanese Overseas Volunteers to Zambia, and to train Zambian personnel in Japan on matters related to the Project. These things shall be done as part of the technical cooperation programme of Japan.
- 2) The water containing capacity of the Kaunga River basin varies from medium to low. Water intake from the river will be possible up to the middle of the dry season. After that time, the stream flow at the intake point virtually disappears. During this season, it will be very important to inspect and maintain the irrigation facilities. It is recommended that the farmers' committee, who will be in charge of the operation and maintenance of the facilities, be given proper guidance on this matter of concern.
- 3) Weather and hydrological data will provide vital information for the future planning and implementation of the rural development programme in the southern provinces. It is strongly recommended that personnel be assigned as soon as possible to collect reliable weather and hydrological data.
- 4) It will be necessary to assign a responsible person to handle the inspection, repair and maintenance of the agricultural extension activities equipment and the weather observation and hydrological measuring equipment. This person must also establish a program for providing systematic maintenance of the equipment.



## TABLE OF CONTENTS

PREFACE

PROJECT LOCATION MAP

SUMMARY

CHAPTER 1	INTRODUCTION .....	1
CHAPTER 2	BACKGROUND OF THE PROJECT .....	4
2-1	Nature, Society, and Economy of Zambia .....	4
2-1-1	Nature and Population .....	4
2-1-2	Economy .....	6
2-1-3	National Development Plan .....	8
2-2	Overall Condition of Agriculture .....	12
2-2-1	Land use .....	12
2-2-2	Main Cultured Farm Products .....	12
2-2-3	Form of Agriculture .....	17
2-2-4	Irrigation .....	21
2-2-5	Drought Damage Condition .....	25
2-2-6	Agricultural Administrative Organization .....	25
2-2-7	Agriculture Related Organization and Their Rules .....	28
2-2-8	Present Agricultural Development Policy .....	29
2-2-9	International Cooperation in the Agricultural Sector .....	32
2-3	Request for the Project .....	38
2-3-1	Particulars of the Request .....	38
2-3-2	Details of the Request .....	39
CHAPTER 3	OUTLINE OF THE PROJECT SITE .....	43
3-1	Location and Topography .....	43
3-2	Society and Economic Conditions .....	43
3-3	Natural Conditions .....	47
3-3-1	Weather .....	47
3-3-2	Hydrology .....	48
3-3-3	Geology .....	50
3-3-4	Estimate of the Kaunga River's Discharge .....	55

3-4	Outlook of Farming Conditions .....	61
3-5	Infrastructure .....	65
3-6	Construction Situation .....	66
CHAPTER 4	PROJECT DESCRIPTION .....	67
4-1	Objectives .....	67
4-2	Evaluation of the Requested Financial Assistance .....	67
4-2-1	Evaluation of the Project .....	67
4-2-2	Selection of the Project Area .....	69
4-2-3	Location of Model Farm .....	69
4-2-4	Water Source for the Model Farm .....	70
4-2-5	Location of the Project Office and an Experimental Farm .....	71
4-2-6	Water Source of the Experimental Field .....	72
4-2-7	Necessary Facilities and Equipment .....	72
4-2-8	Management Plan .....	73
4-3	Description of the Project .....	75
4-3-1	Executive Agency .....	75
4-3-2	The Project .....	75
4-3-3	Testing and Research Plan .....	77
4-3-4	Operational and Management Structure .....	78
4-3-5	Equipment and Facilities .....	80
4-4	Technical Assistance .....	86
CHAPTER 5	BASIC DESIGN .....	87
5-1	Basic Design Policies .....	87
5-2	Design Criteria .....	90
5-2-1	Design Criteria for the Facilities .....	90
5-2-2	Criteria for Equipment Selection .....	101
5-3	Basic Design of Facilities .....	102
5-3-1	Arrangement Plan of Facilities .....	102
5-3-2	Basic Design .....	104
5-3-3	Basic Design Drawings .....	154
5-4	Basic Plan for Equipment .....	177
5-4-1	Equipment Plan .....	177
5-4-2	List of Equipment .....	179

CHAPTER 6	PROJECT IMPLEMENTATION PLAN .....	182
6-1	Project Implementation Schedule .....	182
6-2	The Boundary of Responsibility for the Project ...	182
6-3	Construction Plan .....	184
6-3-1	Construction Method .....	184
6-3-2	Area Conditions and Suggestions .....	184
6-3-3	Detailed Design and Construction Supervision Plan .....	185
6-3-4	Material and Equipment Procurement Plan .....	186
6-3-5	The Project Schedule .....	188
CHAPTER 7	OPERATION AND MAINTENANCE PLAN .....	190
7-1	Operation and Maintenance System .....	190
7-2	Operation and Maintenance Costs .....	190
CHAPTER 8	THE PROJECT EVALUATION .....	192
8-1	Benefits of the Project .....	192
8-2	Justification of the Project .....	193
CHAPTER 9	CONCLUSION AND RECOMMENDATIONS .....	194
9-1	Conclusion .....	194
9-2	Recommendations .....	194
APPENDICES		
1.	Members of the study Team .....	A-2
2.	Schedule of the Study Team .....	A-3
3.	List of Interviewed Personnel .....	A-7
4.	Minutes of Discussions .....	A-10
5.	List of Data Collected in Zambia .....	A-17
6.	Basic Relating Data .....	A-25



## **CHAPTER 1 INTRODUCTION**



## CHAPTER 1 INTRODUCTION

The southern provinces of the Republic of Zambia have suffered from occasional droughts since the late 1970's, substantially decreasing their agricultural production. In addition to drought damage, the fall of the international copper price dealt a serious blow to the Government which had been trying to bolster the country's weakened economy and ailing financial situation by establishing development plans with emphasis being placed on increasing food production and the exporting of agricultural products.

When Japanese Foreign Minister Abe visited Zambia in 1984, the Government of the Republic of Zambia requested technical cooperation from Japan for the development of ground water and for increasing food production in order to overcome the effects of droughts in the southern provinces. In response to the request, Foreign Minister Abe expressed the necessity for constructing a grain storage facility and for the future promotion of technical cooperation to resolve drought related problems.

Based on the Foreign Minister's recommendation, a grain storage facility was built with grant aid provided by the Government of Japan. Further, the Government of the Republic of Zambia established a Kaunga area rural development project consisting of the construction of a project office, the development of an experimental farm, and a model farm in order to make the project area an outpost for the extension of irrigation farming for the purpose of stabilizing crop harvests and increasing farm production in the southern provinces. The Government then requested grant aid for the Project from the Government of Japan.

In response to the request of the Government of the Republic of Zambia, the Government of Japan decided to conduct a preliminary study for the Project. They entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent a preliminary study team, headed by Mr. Sota Iwamoto, Director, the First Survey and Research Department,

of the Japan Institute of Irrigation and Drainage, to Zambia for the period 28 November to 17 December 1986.

The preliminary study team confirmed the objectives of the project and the necessity of facilities and equipment requested, through a series of discussions with officials concerned of the Government of the Republic of Zambia. As a result, the study team reached the conclusion that a basic design study for the Project should be conducted to ascertain what facilities and equipment would be needed for the Project and would be considered eligible to be constructed and procured with grant aid from the Government of Japan.

Based on the results of the preliminary study, the Government of Japan decided to conduct a basic design study on the Project. In response, the JICA sent the basic design study team, headed by Mr. Sota Iwamoto, to Zambia for the period from 5 April to 4 May 1987.

The study team had a series of discussions pertaining to the request for the Project with the officials concerned of the Government of the Republic of Zambia. They investigated the Project area and facilities related thereto, and looked into the construction situation. The team also collected data relevant to the Project.

The major points agreed upon as a result of the discussions were written up as the Minutes of Discussions. On 14 April 1987, this document was signed by F.C. Kawonga, the Deputy Permanent Secretary of the Ministry of Agriculture and Water Development, and Mr. Sota Iwamoto, the team leader of the JICA Basic Design Study Team.

The schedule of the study team and the names of its members are listed in appendices of this report. The names of personnel interviewed in Zambia are also listed.

Upon returning to Japan, the study team, using the data collected in Zambia, examined the possibilities and feasibility of undertaking the Project. They conducted the basic design of Project facilities, determined what equipment would be necessary, estimated the cost of the



Project, and drew up an operations and maintenance plan for the Project's facilities and equipment.

The results of the basic design study were written up in the Draft Final Report by JICA. The report was taken to the Republic of Zambia by Mr. Koichiro Katsurai, Agricultural Development Specialist, Japan International Cooperation Agency (JICA), in order to explain its contents to the Zambian officials connected with the Project. Mr. Katsurai was in Zambia from 21 August through 1 September 1987.

The study team had a series of discussions with the officials concerned of the Government of the Republic of Zambia on matters pertaining to the Draft Final Report. There was mutual understanding and confirmation of the major points of the report. These points were written into the Minutes of Discussions and 28 August, 1987. The Minutes of Discussion was signed by Mr. N. Mukutu the Ministry of Agriculture and Water Development and Mr. Koichiro Katsurai, the Study Team Leader.

The schedule of the study team and the names of its members, the names of those officials of both governments who were interviewed, and a copy of the Minutes of Discussions are attached in the Appendices.

As a result of the above mentioned basic design study, this report, the "BASIC DESIGN STUDY ON THE RURAL DEVELOPMENT PROGRAMME IN KAUNGA AREA," has been prepared.



## **CHAPTER 2 BACKGROUND OF THE PROJECT**



## CHAPTER 2 BACKGROUND OF THE PROJECT

### 2-1 Nature, Society, and Economy of Zambia

#### 2-1-1 Nature and Population

Zambia, a landlocked country in south central Africa, is surrounded by eight countries: Tanzania and Zaire to the north, Malawi and Mozambique to the east, Angola to the west, and Botswana, Zimbabwe and Namibia to the south.

Zambia, with an area of about 752,610 m<sup>2</sup> is approximately two times larger than Japan.

The country is mostly a plateau savanna that rises to 1,000 - 1,300 meters. In the northeastern part, the Muchinga Mountain Range rises above 2,000 meters. The low land in the valley that flanks the Zambezi River which courses the western to southern boundaries, is less than 600 meters above sea level.

Zambia is located in the tropical climate zone. The climate is roughly divided into three seasons: the cool dry season, from May to August, with temperatures ranging between 9.7°C - 25.8°C; the hot dry season, from September to November, with temperatures ranging between 14.8°C - 31.7°C; and the hot rainy season from December to April, with temperatures ranging between 15.2°C - 26.7°C. The temperature shown were recorded in Lusaka. Minimum temperatures are 7°C - 10°C in the western part of the country, and 10°C - 13°C in the eastern and northeastern parts. In the western region, frost occurs in June and July when temperatures lower than -7°C are recorded. Most of the precipitation occurs during the rainy season, November through March. It seldom rains during the dry season. As shown in Fig. 2-1 the mean annual precipitation increases from the south to the north. In the southern part it ranges from 700 mm to 900 mm per year -- certain areas having less than 700 mm. In the northern part, precipitation ranges from 1,300 mm to 1,500 mm per year.

Table 2-1 Population and Population Density

Province	Male	Female	Total	Area (1,000 km <sup>2</sup> )	Population Density (Person/km <sup>2</sup> )
Central	257,434	254,411	511,905	94	5.4
Copperbelt	642,431	608,747	1,215,178	31	40.4
Eastern	304,143	346,759	650,902	69	9.4
Luapula	200,674	220,292	420,966	51	8.3
Lusaka	352,005	339,049	691,054	22	31.4
Northern	319,703	355,047	674,750	148	4.6
North-Western	144,079	158,589	302,668	126	2.4
Southern	323,342	343,581	671,923	85	7.9
Western	221,184	265,271	486,455	126	3.9
Total	2,769,995	2,891,806	5,661,801	753	7.5

(Source): Monthly Digest of Statistics May/August, 1986.

Soil in Zambia consists of weathered granite, sandstone, limestone, Barotse sand, and Dambo peat. The soil has a high acid content and is generally not fertile.

The population in 1980 was 5,661,801: 48.9 percent males and 51.1 percent females. Forty-nine percent (49%) of the population is below fourteen years old. About forty percent (40%) of the population is concentrated in the city areas of Copperbelt and Lusaka Province. The population density in the Copperbelt State is 40.4 persons per sq.km, and 31.4 persons per sq.km in Lusaka Province. The nation's average density is only 7.5 persons per sq.km.

The population growth rate was 2.5 percent during 1963-1969, and 3.1 percent during 1969-1980. The estimated population for 1985 and 1990 are 6,725,000 and 8,073,000 respectively.

Zambia is a multitribe country, having approximately 73 tribes. The predominant tribes are the Lozi in the Western Region, the Tonga in the Southern Region, the Benba in Northern Region and the Ngoni in the Eastern Region. Each tribe has its own language, but English is widely used as one of the official

languages. Benba, Tonga, Nyanja, Kaonde, Lozi, Luvale and Lunda are also used as official languages.

#### 2-1-2 Economy

Since the Northern Rhodesian era, the economy of Zambia has been supported by copper which is produced abundantly in Copperbelt. Copper-related industries represented about thirty percent (30%) of the nation's gross domestic product (GDP) in 1974. In 1975, world copper prices fell sharply. Since that time, the price has not recovered, and the copper-related industry has fallen to fifteen percent (15%) of the GDP. The export of copper and cobalt reached a maximum in 1970 (ninety-seven percent (97%) of the nation's total export value) and then gradually declined. However, in 1984, it was still high at eighty-eight percent (88%), and the country remains a monoculture based on copper.

The country's economy relies largely on international trade. The main export items are minerals, such as copper, lead, zinc, and cobalt. Tobacco is also exported to a small extent. Various items are imported, including machinery, trucks, industrial products, chemical products, crude oil, and food items. Zambia's major trade partners are Japan (23% of total exports and 3.5% of total imports), the United States (9.6% of total exports, 6.7% of total imports), other European Communities (29% of total exports and 25.1% of total imports) socialistic countries (3.5% of total exports and 0.5% of total imports), and all other countries (28.5% of total exports and 51.2% of total imports). Until 1984 the trade balance was in excess of exports, but, in 1985, it became in excess of imports. During the past three years the production of minerals (copper, lead, and zinc), other than cobalt, has decreased because the world-wide demand for these metals has declined as the result of newer types of materials being used. Thus, there also has been a decrease in the country's mineral exports. Furthermore, exports of industrial and agricultural products have not increased as planned.

From October 1985 and through October 1986, the Government of Zambia devalued the country's currency 693 percent. As the result, investment deficits and transportation costs increased sharply. The increase was inversely proportional to the devalued currency. In spite of the currency devaluation, the exports of industrial and agricultural products did not increase as initially planned. Therefore, the trade deficit has become worse than for the 1984-85 period when there was already an imbalance. Furthermore, Zambia's trade has suffered negative effects from the retrenchment economic policy and the establishment of the currency exchange rate by auction system. Thus, consumer prices increased forty percent (40%) in 1986.

There was a favorable increase in the growth rate of the GDP until 1973 (+6.0 percent for 1965-1970, +7.1 percent for 1972, and +12.6 percent for 1973), after which there was a turnaround. In 1974 the growth rate dropped to -0.7 percent. Again, in 1975, with the fall of the copper price, it sagged to -24.6 percent. It recovered to +3.0% - 6.2% in the late 1970's through 1981, but slid to -2.8% to -0.3% during 1983 and 1984. The nominal growth rate of the GDP increased significantly to +42.9% in 1985, and, in 1986, jumped to +71.6%. This growth was brought on by the sudden fall of the currency value due to the establishment of the exchange rate by international auctions. The real growth rates in those years were only +1.5% and +0.5%.

The main reason by the 1985-1986 GDP growth rate was lower than the +3.5% annual rate planned on was because of the difference between the estimated and actual foreign exchange rates. The government anticipated that, by devaluating the kwacha 295 percent against the U.S. dollar (6.5 kwacha per 1.0 U.S. dollar), the exchange rate would stabilize. However, the kwacha took a nose dive with the introduction of auction system to establish the currency exchange rate. In December 1986, the kwacha fell to the rate of 14.93 kwachas per 1.0 U.S. dollar. From 4 January 1986 to 19 December 1986, the average rate had been 8.9 kwachas per 1.0 U.S. dollar. In early 1987, the President of Zambia stopped the auction system. However, to meet the actual



circumstance of foreign trade, he permitted it to restart. On 27 April 1987, the kwacha fell to the rate of 21.0 kwachas per 1.0 U.S. dollar. Hence, the President once again halted the auction system and fixed the exchange rate at 8.5 kwachas per 1.0 U.S. dollar.

Consumer prices started to increase since the beginning of the auction system to establish foreign exchange rates. The consumer price index (100 in 1975) for high income people in October 1985 was 503.1, and 774 in October 1986; an increase of 47.9 percent. During the same period, the consumer price index for low income people increased from 569.7 to 822; an increase of 43 percent.

### 2-1-3 National Development Plan

Since the independence of Zambia, it has been the government's objective to get away from the monocultural economic condition which is strongly influenced by international copper prices and the nation's copper production. The government, therefore, established and implemented various development plans: the Urgency Plan in 1964-65, the Tentative Plan in 1965-66, the First National Development Plan (FNDP) in 1966-70, the Second National Development Plan (SNDP) in 1972-76, and the Third National Development Plan in 1979-83. Each year the government planned and implemented the Economic Review and Annual Plan while preparing the Fourth National Development Plan.

The main objective mentioned in the three development plans were to extricate the country from the monocultural economic condition and to diversify the nation's economy as follows:

- (1) To establish various new industries to meet domestic needs.
- (2) To develop other types of mining in addition to copper mining.
- (3) To establish industries that utilize domestic raw materials.
- (4) To increase employment.

- (5) To direct the nation's rural activities towards economic and social self-development, thus eliminating the economic imbalance between rural and urban areas.
- (6) To raise educational standards in order to develop the country's human resources.
- (7) To supply facilities necessary for upgrading the standard of living.
- (8) To recognize infrastructures, the foundations of economic development.

By achieving the objectives of 2 through 8 listed above, the objective of 1, to develop agriculture and industry, can be realized.

During the period of the FNDP, copper prices were kept relatively high; fund procurement was a simple matter. The average annual growth rate of GDP during the period was +10.6 percent which was only 1.1 percent less than the planned rate of 11.7 percent. The composition of the GDP in 1966 was 49.7 percent for mining, 9.0 percent for industries, 7.4 percent for agriculture, and 33.9 percent for other sectors. In 1970, the composition changed to 32.5 percent for mining, 10.0 percent for industries, 7.9 percent for agriculture, and 49.6 percent for other sectors. From this it can be seen that there was a reduction in the mining rate and that the diversification of other industries was successful.

In the industrial sector, the average annual growth rate was 17 percent (the original target was set at 14 percent). There were 412 industries in 1965, increasing to 535 in 1969. The industrial output satisfied 38 percent of the nation's demand.

In the agricultural sector, however, the average annual growth rate was only +3.3 percent. This was 9.0 percent lower than the figure aimed for. The main reasons causing the lower percentage are as follows:

- White farm owners abandoned agriculture.

- Farmer's selling prices were restrained while investment costs and consumer prices skyrocketed, thus marketing conditions for agricultural products deteriorated.
- The semi-government cooperative that monopolized the marketing system for handling agricultural products was inefficient; investments and transportation arrangements were not administrated properly.
- It was difficult to accomplish the development of small scale farming by reorganizing the farmers.

During the SNDP period, income from copper related industries decreased substantially due to the fall of copper prices. As a result, only 70 percent of the monetary funds planned on for actual investments was forthcoming. The average annual growth rate of GDP was 3.4 percent and was much less than the target rate set at 7.4 percent. The average growth rate of industrial output was 4.5 percent compared to the desired goal of 14.7 percent. The growth rate for agriculture was 3.6 percent against the 6.0 percent hoped for. Agricultural development during the SNDP period was mediocre, but in comparison with other sectors, especially after the fall of copper prices, it maintained the same rate as for the FNDP period. Thus, the agricultural policy was not a complete failure.

The long term objectives of the TNDP were to extricate the country from the monocultural economic condition based on copper mining, and to eliminate the economic imbalance between rural and urban areas, being fundamentally the same as set forth in the FNDP and SNDP. However, the TNDP was based on the premise that the international copper prices would not recover within a short period of time. The TNDP emphasized agricultural development. In this period, the average annual growth rate for agriculture was 5.5 percent, almost the same rate as for the SNDP (6.0%). The average annual growth rate for industry and mining fell to 8.0 percent from the SNDP's rate of 14.7 percent, and to 1.0 percent from the 6.1 percent SNDP's rate, respectively. The TNDP put first priority on agricultural development as described below:

- a. Not only to achieve the self-sufficiency of main crops, but to develop an export oriented agriculture.
- b. To reorganize infrastructures by establishing rural reconstruction centers and state farms.
- c. To reorganize existing rural areas and to establish new ones.
- d. To promote the establishment of small scale industries in rural areas that will contribute to rural development.
- e. To reorganize infrastructures necessary for the social and economic development of urban areas by introducing electric and water supply systems, constructing roads and houses, raising the educational level, and improving medical facilities.
- f. To make investment and production plans that would benefit manufacturers of daily necessity items and small scale farmers, and to establish marketing and promotion centers.

## 2-2 Overall Condition of Agriculture

### 2-2-1 Land Use

The total area of Zambia is approximately 752,610 km<sup>2</sup>. In accordance with the FAO's 1982 Annual Report of Agricultural Production, cultivated farm (5,150,000 ha) and permanent crop land (8,000 ha) occupied 6.9 percent of Zambia's total land area. Grasslands (35,000,000 ha), used for more than five years for planted and wild feed grass, took in 46.5 percent of the country's total land area. 20,250,000 ha of forest land covered 26.9 percent. Other areas (13,664,000 ha) occupied 18.2 percent of the country's land.

Table 2-2 Land Use Classification

Item	1982		1969 - 71	
	Area (1000ha)	Percentage (%)	Area (1000ha)	Percentage (%)
Total Area	75,261	100.0	75,261	100.0
Land Area	74,072	98.4	74,072	93.4
Arable Land	5,158	6.9	4,957	6.6
Cultivated Land	5,150	6.8	4,950	6.6
Permanent Crop Land	8	-	6	-
Permanent Grass Land	35,000	46.5	35,000	46.5
Forest	20,250	26.9	21,430	28.5
Other	13,664	18.2	12,685	16.9

Source: FAO Annual Report of Agricultural Production, 1981 & 1982

### 2-2-2 Main Cultured Farm Products

Zambia's main cultured farm products are maize, rice, wheat, millet, sorgham, and cassava; these are staple crops. Cash crops include sugarcane, cotton, coffee, groundnuts, sunflower, soybeans, and tobacco. Agricultural production increased 9.3 percent in the 1984-85 season and 11.2 percent in the 1985-86 season.

(1) Maize:

Maize is the country's main food item. It has been planted on more than half of the total cultivated land. The maize harvest is normally sufficient to meet the country's need. However, in dry years it is necessary to import in order to meet demands. In the 1985-86 season, maize production increased 12.2 percent over the 1984-85 season, because of favorable weather conditions. In accordance with Namboard and Provincial Co-operative Unions, the total maize production in the 1985-86 season amounted to 10.6 million bags (90 kg per bag). Most of the harvest came from the eastern, central, and southern provinces. Sixty percent of the maize reaching the market was harvested in these provinces by small-scale emergent farmers. The highest increase in maize sales took place in the Southern Province where it rose from 1.6 million bags in the 1984-85 season to 2.7 million bags in the 1985-86 season; this represented a 68.8 percent increase. On the other hand, the Northern Province recorded lower sales than for a normal year; this was possibly due to excessive rainfall at the start of the rainy season.

(2) Rice:

Rice is grown in limited areas of the northern, western eastern, and northeastern provinces where rainfall and soil conditions permit. More than ninety percent of the country's rice is grown in these provinces. Most of the rice is planted in upland fields or in rain fed paddies by small farm holders. In the 1985-86 season, rice sales of 69,576 bags (80 kg per bag) were recorded.

(3) Wheat:

Demand for wheat has been increasing yearly. It is difficult to grow wheat during the rainy season when the temperatures are high. On the other hand, because of high irrigation costs, it becomes too expensive to grow wheat during the dry season when temperatures are relatively low.

Therefore, as imported wheat can be obtained at lower prices, domestic wheat production has increased only slightly. Lusaka province, and other provinces to the north and south are the major wheat producing areas, supplying almost all of the marketed wheat. Most of the wheat is planted in irrigated fields.

(4) Sorghum, Millet, and Cassava:

Sorghum, millet, and cassava are traditional staple crops, yet are only grown in areas having poor soil and limited rainfall by small-scale farmers for their own consumption. It appears that the main reasons for this condition are low production rates per unit area and the difficulties encountered in harvesting. Sorghum is mostly produced in the Southern, Western, Central, and Lusaka Provinces. In the 1985-86 season, sorghum sales amounted to 9,935 bags (90 kg per bag). 475 bags (90 kg per bag) of millet were sold in the 1984-85 season, increasing to 3,186 bags in the 1985-86 season. Most of the cassava is produced in the Western and Northwestern Provinces; total 1985-86 sales were 1,378 bags (90 kg per bag).

(5) Sugarcane:

Modern agricultural management and irrigation methods are employed in the production of sugarcane; therefore, drought related problems do not exist. Annual sugarcane production is extremely stable and meets domestic needs. In the 1985-86 season the production of raw sugar amounted to 163,000 tons.

(6) Cotton:

There has been a tremendous increase in planned cotton production since being introduced in 1975 by small-scale planters. In the ten years following 1975, the number of planters increased ten times, while plantation areas expanded by six (6) times. As a result, by 1979 the country's demand for cotton was fulfilled and more than

fifty percent (50%) of the total was exported, whereas, by the mid 70's a full two-thirds of the cotton needed for domestic use was imported. The success of the cotton production can be attributed to the Lint Company of Zambia who provided guidance to cotton growers, improved the marketing system, and established cotton processing industries. 83 percent of the total cotton production comes from these provinces. More than ninety percent of marketed cotton is produced by small-scale growers. In the 1985-86 season, cotton production reached 33.3 million kg compared to the 30.3 million kg in the previous season.

(7) Coffee:

377 tons of coffee were produced in the 1984-85 season. This increased to 600 tons in the 1985-86 season. Commercial growers produce about 52 percent of the coffee, while the remaining amount is produced by small-scale growers. The largest coffee producer in the country is the Coffee Development Project under the Zambia Coffee Company Limited (ZCCL). The Project was established in 1979 with the purpose of producing coffee for export. Currently, Zambian Coffee meets here export quota (set at 450 tons per year) and has requested the International Coffee Organization (ICO) to authorize a larger quota.

(8) Tobacco:

In the year of the country's independence (1964), tobacco production was more than 10,000 tons. However, it gradually decreased to about 2,000 tons annually by 1981. It is said that the main reason for the decrease was because many of the European tobacco producers who monopolized its production abandoned their plantations, while others, who were apprehensive about becoming involved in labor disputes with their workers, converted their plantations into farms for growing more lucrative crops.



The soil and climate of Zambia are ideal for growing tobacco. As tobacco is a very important product for the country which has been attempting to diversify its export items, the Government of Zambia has been encouraging farmers to increase their tobacco production. In the 1984-85 season tobacco production fell to 2,300 tons. However, it increased to 3,570 tons in the 1985-86 seasons. This increase was due to the efforts of the newly established National Tobacco Company of Zambia whose purpose is to improve tobacco related industries.

(9) Sunflower:

Sunflower is grown mostly by small-scale and emergent farmers in the Eastern, Southern, and Central Provinces. Sunflower sales totalled 509,918 bags (50 kg per bag) in the 1984-85 season and 537,199 bags in the 1985-86 season.

(10) Soybeans:

Soybeans are mainly grown in rotation with irrigated wheat by commercial farmers. However, the number of small-scale farmers involved in soybean planting has been increasing yearly, resulting in increased production. Soybean sales increased from 117,795 bags (50 kg per bag) in the 1984-85 season to 278,335 bags in the 1985-86 season; this represents an increase of 136.3 percent. Most of the soybeans produced in Lusaka, Central, and Southern Provinces, accounting for 95 percent of total production.

(11) Groundnuts:

Groundnuts are traditionally grown for domestic consumption. The marketed amount of groundnuts fluctuates yearly. During 1975-77, the marketed amount doubled due to favorable weather conditions and higher sales prices. However, during the late 70's to 80's the marketed amount decreased drastically as a result of drought. This situation could have been averted if modern irrigation techniques had been in use.

In Table 2-3, staple crops, commercial farm products, planted areas, and unit area yields are shown.

Table 2-3 Crop Outputs, Planted Area, Unit Area Yield

Name of Crop	1984			1983		
	Amount (1000 t)	Unit Area		Amount (1000 t)	Area (1000 ha)	Unit Area Yield (t/ha)
		Area (1000 ha)	Yield (t/ha)			
<b>Staples:</b>						
Maize	872	506	1.7	935	547	1.7
Rice	9.2	3.7	1	9.6	7	1.4
Wheat	12	3.6	3.3	18	4.5	4
Sorghum	15	22	0.7	13	17	0.8
Millet	14	19	0.7	13	20	0.7
<b>Commercial:</b>						
Sugarcane	141	9.7	14.5	132	9.5	13.9
Tobacco	2.6	2	1.3	2.3	2.2	1.1
Sunflower	40	538	0.7	33	47	0.7
Groundnuts	13	30	0.4	11	31	0.4
Soybean	11	9.4	1.2	7	5	1.4
Other beans	5.4	7.6	0.7	6	17.7	0.4

Source: Agricultural Statistics Bulletin, July - September 1985 MAWD

### 2-2-3 Form of Agriculture

The Government of Zambia owns the country's land. Each farmer may rent land for 0.75 kwacha per one hectare a year for 99 years. In Zambia, farmers are classified into the following categories:

- a. Traditional Subsistence Farmers
- b. Large Scale Commercial Farmers
- c. Emergent Farmers

The majority of farmers fall into category "a". There are approximately 460,000 families in this group and they occupy 78 percent of the nation's total farmland. Most of the farmers in this category cut branches from large trees during the months of May and June, and, from September to November burns them in order to collect the ash for use as fertilizer. They sow seeds during

the rainy season. These farmers rely on family labor, but, because of the use of traditional small-scale farming methods, their productivity is low. Mainly they grow maize, cassava, and sorghum for their own consumption; selling only excess amounts when they have a good harvest.

Large-scale commercial farming was started by European settlers who came in during colonial days. Most of their farms are located along the railroad that crosses the country from south to north. In this area conditions are favorable for farming, and the tsetse fly is not common here. In 1964, there were approximately 1,200 to 1,300 large scale commercial farms. At the present time, however, there are only about 730 of them and they produce grain, eggs, chickens, tobacco, and cotton. They use large equipment for farming. Their products are marketed overseas as well as domestically.

Emergent farmers fall into a class between traditional subsistence farmers and large scale commercial farmers. They are the middle-sized farmers who, for the most part, do commercial farming. The "emergent farmer" category may further be broken down as follows:

- 1 Improved village farmers
- 2 Organized small-scale farmers
- 3 Middle-sized emergent farmers

The emergent farmers' productivity is relatively high and they have the potential for supplying the country's food demand. In their National Development Plan, the Government of Zambia indicated that their aim was to increase food production and to add to the number of emergent farmers. In TNDP, the Government has plans for increasing the number of emergent farmers so that they will represent 43 percent of the total number of farmers.

By classifying the country's farmers by location and category, it can be determined that all large scale commercial farmers are to be found in the Southern, Central, Lusaka, and Eastern Provinces.

Adding middle and small-scale farmers to that of large scale commercial farmers, the four mentioned provinces have about 80 percent of the country's total commercial farmers. Table 2-4 and Table 2-5 as show the number of farms, farmland sizes, and number of farmers during different years and at various locations.

Table 2-4 Farmland Area by Category

Item	1974		1983		Change 1974-83	
	Estimate Area		Estimated Area		Change	
	(1,000ha)	(%)	(1,000ha)	(%)	(1,000ha)	(%)
Traditional Farms	1,578	78	1,136	51	-442	-28
Emergent Farms	356	18	944	43	+588	+165
Improved Village	215	11	637	29	+422	+196
Organized Small-scale	68	3	130	6	+62	+91
Middle-sized Emergent	73	4	177	8	+104	+142
Large Scale Commercial Farms	81	4	136	6	+54	+67
Total	2,115	100	2,215	100	+200	+9.9

Source: Third National Development Plan.

Table 2-5 Farms by Province, Size Population and Total Numbers

Province	Commercial Farming										Traditional Farming			Total		
	(40 ha less)		(10-40 ha)		(1-10 ha)		Subtotal									
	Farms	Pop.	Farms	Pop.	Farms	Pop.	Farms	Pop.	Farms	Pop.	Farms	Pop.	Farms	Pop.	Farms	Pop.
Southern	320	16	8,000	76	49,900	374.1	( 58,220)	( 466.1)	7,500	33.9	65,720	500				
Central	300	15.2	7,630	72.5	21,400	160.5	( 29,330)	( 248.2)	18,400	82.8	47,730	331				
Lusaka	90	4.3	1,910	18.1	4,300	32.3	( 6,300)	( 54.7)	13,400	60.3	19,700	115				
Copperbelt	-	-	490	4.7	2,000	14.9	( 2,490)	( 19.6)	17,900	80.4	20,390	100				
Eastern	20	1	3,100	29.5	27,000	202.7	( 30,120)	( 233.2)	80,900	363.8	111,020	597				
Western	-	-	-	-	5,450	40.8	( 5,450)	( 40.8)	85,400	384.2	90,850	425				
Northwestern	-	-	80	0.8	2,900	21.9	( 2,980)	( 22.7)	53,600	241.3	56,580	264				
Luapura	-	-	50	0.5	2,050	15.3	( 2,100)	( 15.8)	73,600	331.2	75,700	347				
Northern	-	-	90	0.8	7,400	55.5	( 7,490)	( 56.3)	111,900	503.7	119,390	560				
Total	730	36.5	21,350	202.9	122,400	918	(144,480)	(1,157.4)	462,600	2,081.6	607,080	3,239				
Percentage (%)	0.1	1.1	3.5	6.3	20.2	28.3	( 23.8)	( 35.7)	76.2	64.3	100	100				

Source: National Commission for Planning, Agricultural Base - Line Data for Planning, 1983

#### 2-2-4 Irrigation

1 There are approximately 19,000 ha of irrigated land in Zambia; this is less than one percent of the country's total farmland. However, it is estimated that between one to ten million hectares is potentially irrigable land. It is necessary to increase the amount of land being irrigated in order to meet the increasing demand for wheat and rice. The principles outlined in the TNDP for the development of irrigated land are as follows:

- a. Small-scale irrigation systems requiring small capital investments shall be developed by farmers on a self-help basis. The main objective for introducing small-scale irrigation systems is to improve irrigation skills within the farming community in order to increase the production of beans and vegetables for local market consumption.
- b. Medium-scale irrigation systems shall be introduced in the farming community wherever feasible. Rural reconstruction centers will act as focal points from which the farmers from surrounding villages can learn irrigation techniques by actual demonstrations.
- c. Large-scale irrigation systems shall be constructed and utilized for export oriented farming, specializing in sugarcane, rice, wheat, fruit, vegetables, and tea. The areas of special studies and development of major irrigation systems are as follows:

- Mpongwe Scheme:

An area of 22,000 ha is entailed in this scheme. The area will be further developed during TNDP for planting wheat and other crops.

- The Big Concession:

This scheme is in the Mumbwa District. The area of the scheme will be developed during TNDP.

- Luena Area on the Kalungwishi River:

Consultants have surveyed and studied the area. An area

of 30,000 ha will be irrigated by pumping water from the river.

d. Other areas of possible development are as follows:

- The Chambesi River:

Development of 75,000 ha of Chambeshi Flats.

- Zambezi River near Sesheki:

It is possible to irrigate 30,000 of land.

- Kafue Flats:

20,000 ha of the flats can be developed.

- Lake Bangweulu:

The possibilities of growing rice in this area will be studied.

e. The construction of dams and weirs shall be encouraged.

The above mentioned programs shall be studied based on administrative and technical points of view. It is also necessary to investigate basic irrigation potential, underground water resources, and the economic feasibility of various irrigation schemes by taking into account the following aspects:

- Information on crop water requirements, soil condition, crops suitable for irrigated farming, fertilizers, pesticides, and the need for demonstrating new techniques to farmers.

- Chapula Irrigation Center to be improved to handle the training of farmers, extension workers and members of cooperatives.

- Studies on irrigation methods in some other African countries.

## 2. Irrigated Land:

Total irrigated land in the country amounts to approximately 19,000 hectares. Most of this land is occupied by large scale commercial farming, such as growing sugarcane in Nakambala, coffee in Naoli and Kateshi, tea in Kwaba, and

wheat in Mpongwe. The total irrigated area is only 400 ha in the entire country that each small farm less than 20 ha.

The main irrigated crops are sugarcane (13,400 ha), grain (1,500 - 1,750 ha), vegetables (800 - 900 ha), pasture land (700 - 800 ha), tea (400 - 450 ha), and coffee (300 - 400 ha). Green maize is produced through irrigation on the line of rail, for sale to urban centers and also it is reported that maize seeds are produced in irrigated land in order to be prepared for possible drought conditions.

Irrigated land and irrigation methods are shown in Table 2-6.

Table 2-6 Irrigated Land and Irrigation Method

Irrigation Method	Area (ha)	Crops
Flooding	50-80	Rice
Furrow Irrigation	15,000-16,000	Sugarcane, Coffee, Tea
Sprinkler	4,000-5,000	Vegetables, Wheat
Others (Dripping, etc.)	100	Vegetables

The water sources of irrigated land are listed in Table 2-7.

Table 2-7 Water Source and Irrigated Land

Source	Area	Remarks
Rivers	13,400 ha	Kafue River
	3,530 ha	Other Rivers
Lakes	400-500 ha	Lake Nampamba
Ground Water	1,720 ha	Mainly Lusaka Province
Marsh	20-50 ha	
Dams	44 ha	



Land irrigated by river water totals 16,930 ha. 13,400 ha of the irrigated land is used for the sugarcane fields in Nakambala. In this area, water is pumped from the Kafue River. Pumped water is also used for irrigation in other areas.

As for small-scale irrigation farming, a nationwide survey has not as yet been made; therefore, the facts are not known. In 1980, thirty-one farms in the Numbwa District were studied by an organization of the Agri Plan. The results of the study are listed in Table 2-8.

Table 2-8 Farm Sizes in Numbwa District

Farm Size	No. of Farms	Average Area	Average Irrigated Area
Small (0-2 ha)	2	1.5 ha	0.1 ha
Medium(2-8 ha)	11	4.4 ha	0.3 ha
Large (more than 8 ha)	18	13.5 ha	0.5 ha

- 2.0 ha of land irrigated by the use of pumped water is the maximum limit for one farm. 0.4 ha of land irrigated without the use of pumps is the maximum limit for one farm.
- One sixth of the studied farms were irrigated by pumping water from rivers or wells.
- All pumps studied were operated by gasoline engines. Their attempts to purchase a diesel engine pump were unsuccessful.
- They irrigate vegetables at the beginning (May - July) and ending (August - November) of the rainy season.
- Shallow wells and small rivers dry up by September; therefore, maize must be harvested by July.

#### 2-2-5 Drought Damage Condition

Traditional farming in Zambia is completely dependent upon the weather. The amount of rainfall during the rainy season determines the size of the harvest. From the late 1970's until the early 1980's, five southern provinces (there are nine provinces in Zambia) sustained drought damage. A five hundred thousand people suffered as a result of the drought. In the southern provinces, the country's main grain producing area, maize production in the 1975-76 season was 6.4 million bags (1 bag weighing 90 kg), and 8.4 million bags in the 1978-79 season. However, production decreased to 3.733 million bags in the 1979-80 season, and 4.247 million bags in the 1980-81 season. Until 1978 the country exported maize. The annual amounts exported varied widely, with 110,000 tons being the largest amount ever exported. After 1978, because of drought damage. The country was unable to export maize.

#### 2-2-6 Agricultural Administrative Organization

The administration of the nation's agriculture is controlled by the Ministry of Agriculture and Water Development. The average annual budget for agriculture was 3.1 percent of the total budget during 1981-84. In 1985, however, the government increased the figure to 6.8 percent in order to restructure the country's economy by developing agriculture. Furthermore, the government has plans to increase the budget to 32 percent of the country's total budget.

The budget for agriculture in 1985 was 20,848,000 kwachas. Eighty-six percent of the budget was for personnel expenses. Most agricultural development projects rely upon foreign aid. The Ministry of Agriculture and Water Development has approximately 8,000 employees - 4,500 are in the Agricultural Sector. There are two Divisions in the Agricultural Department: the Extension Division and the Research Division. In provincial areas, there are nine Provincial Agricultural Offices. The organization of the Agriculture Department is shown in Fig. 2-1.



The Research Department was subdivided into the Plant Breeding, Pathology, and Entomology Divisions. However, the government reorganized the department into Commodity Research Teams (CRT), Specialist Research Teams (SRT), and Adaptive Research Planning Teams (ARPT).

During the 1985-86 season, both the Research and Extension Departments faced many problems in implementing their programs. This was primarily due to the overall stringent financial condition the country was facing. However, in spite of this situation, some notable progress was made.

The Research Department has been studying cereals, oilseeds, fibers, grain legumes tree crops, vegetables, root crops, tea, coffee, tobacco, cattle breeding and the development of the minimal inputs and management practices best suited for the traditional small-size farmer. For instance, ARPT imported a variety of seeds, mainly maize, sunflower, groundnuts, soybeans, and other beans, and distributed them for seed multiplication; maize hybrids to replace SR52 and maize composites for traditional small-size farmers for production during drought conditions in the Southern Province and in areas having high rainfall. For higher oil yielding, ARPT has released a variety of sunflower seeds.

The Extension Department has intensified its activities in the areas of crop and livestock production. Attention should be paid to the Area Development Projects in which transport problems for extension workers has partially been alleviated.

The increase in the country's production of food crops, and cattle and milk products from the Dairy Settlement Scheme and Cattle Development Area is partly due to these intensified activities.

Linkage between the Research and Extension Divisions continued and several workshops were held. By establishing the Research-

Extension Liaison Office, the linkage has been tightened and the exchange of information between farmers and the extension workers has been increased.

The Provincial Agricultural Office (PAO) established in each province has been continuing extension activities to farmers. The District Agricultural Office (DAO) is established under the PAO. The DAO is subdivided into six Blocks. Each Block has camps. The extension activities of PAO are conducted by camp officers, block supervisors, and district agricultural officers who are under supervision of a Provincial Agricultural Officer.

#### 2-2-7 Agricultural Related Organization and Their Rules

The Government of Zambia established a country-wide Zambia Cooperative Federation (ZCF) and a Provincial Cooperative Venture in each province. Agricultural Cooperatives assist small size farms in modernizing their farming by improving product marketing systems, and by supplying investment money to individual farms.

The Agricultural Finance Corporation (AFC) was established in 1970 as a subsidiary of the Rural Development Cooperatives (RDC). The Zambia Agricultural Development Bank (ZADB) was established in 1982. The AFC and the ZADB were merged in May 1987 to form, the Lima Bank.

The AFC merged with the Cattle Financing Company (CFC), a company that has been operating at a deficit. The CFC was established for financing commercial stock breeders. The control of the AFC was transferred from RDC to Zambia Industrial and Mining Cooperation (ZIMCO). Agricultural cooperatives have acted as intermediates to finance individual farmers with funds from the government, AFC, and ZADB. They also have used their own funds for financing individual farmers. In 1972, the Zambia Cooperative Federation (ZCF) established its fund department, the Zambia Cooperative Financial Federation, and began financing individual farmers. Large scale commercial farms can receive loans from private banks.