

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

No. 52

MINISTRY OF AGRICULTURE, FOOD AND FISHERIES
THE REPUBLIC OF ZAMBIA

THE FEASIBILITY STUDY
ON
MONGU RURAL DEVELOPMENT PROJECT
IN
ZAMBEZI RIVER FLOOD PLAIN AREA

FINAL REPORT
(MAIN REPORT)

JULY, 1995

TAIYO CONSULTANTS CO., LTD.
KOKUSAI KOGYO CO., LTD.

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国際協力事業団

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PREFACE

In response to a request from the Government of the Republic of Zambia, the Government of Japan decided to conduct a Feasibility Study on Mongu Rural Development Project in Zambezi River Flood Plain Area and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Zambia a study team headed by Mr. ISHIDOYA, Director of Taiyo Consultants Co., Ltd., from February 1994 to March 1995.

The team held discussions with the official concerned of the Government of Zambia, and conducted a field study at the study area. After the team returned to Japan, further studies were made, and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

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

July 1995



Kimio FUJITA

President
Japan International Cooperation Agency

July 1995

Mr. Kimio FUJITA
President
Japan International Cooperation Agency
Tokyo, Japan

Dear Mr. K. FUJITA,

Letter of Transmittal

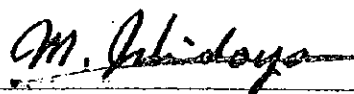
We are pleased to submit to you the final report of the Feasibility Study on Mongu Rural Development Project in Zambezi River Flood Plain Area of the Republic of Zambia. According to contract with JICA, the studies has been carried out for 16 months from February 1994 to July 1995 and we were able to grasp the present condition in the study area in detail. Main objectives of the study is preparation of a development plan that consists of improvement for small scale farmers' living standard and establishment of their stable production in order to upgrade the infrastructure with adequate technologies.

The development plan is an integrated rural development plan which is formed components of Land Use, Water Use, Rural Infrastructure, Irrigation and Drainage, Water Management, Farming and Crop Husbandry, Agro-Processing, Marketing of Agro-Products, Farmers' Group Upbringing, Women in Development, Agricultural Extension, Human Resource Development, Design of Facilities, Operation and Maintenance of the Facilities, Execution of the project and Environmental Consideration and so on.

In view of the urgency of Rural development in Zambia and of the necessity for socio-economic development of Zambia as a whole, small would like to express our sincere gratitude to your Agency and relevant authorities for that we were given this precious opportunity. And in Zambia, we also wish to express our deep gratitude to the Ministry of Agriculture, Food and fisheries, Department of Agriculture in Western Province, the Embassy of Japan and Holland, and JICA Zambia Office for the cordial cooperation and assistance extended to us during our investigation and study.

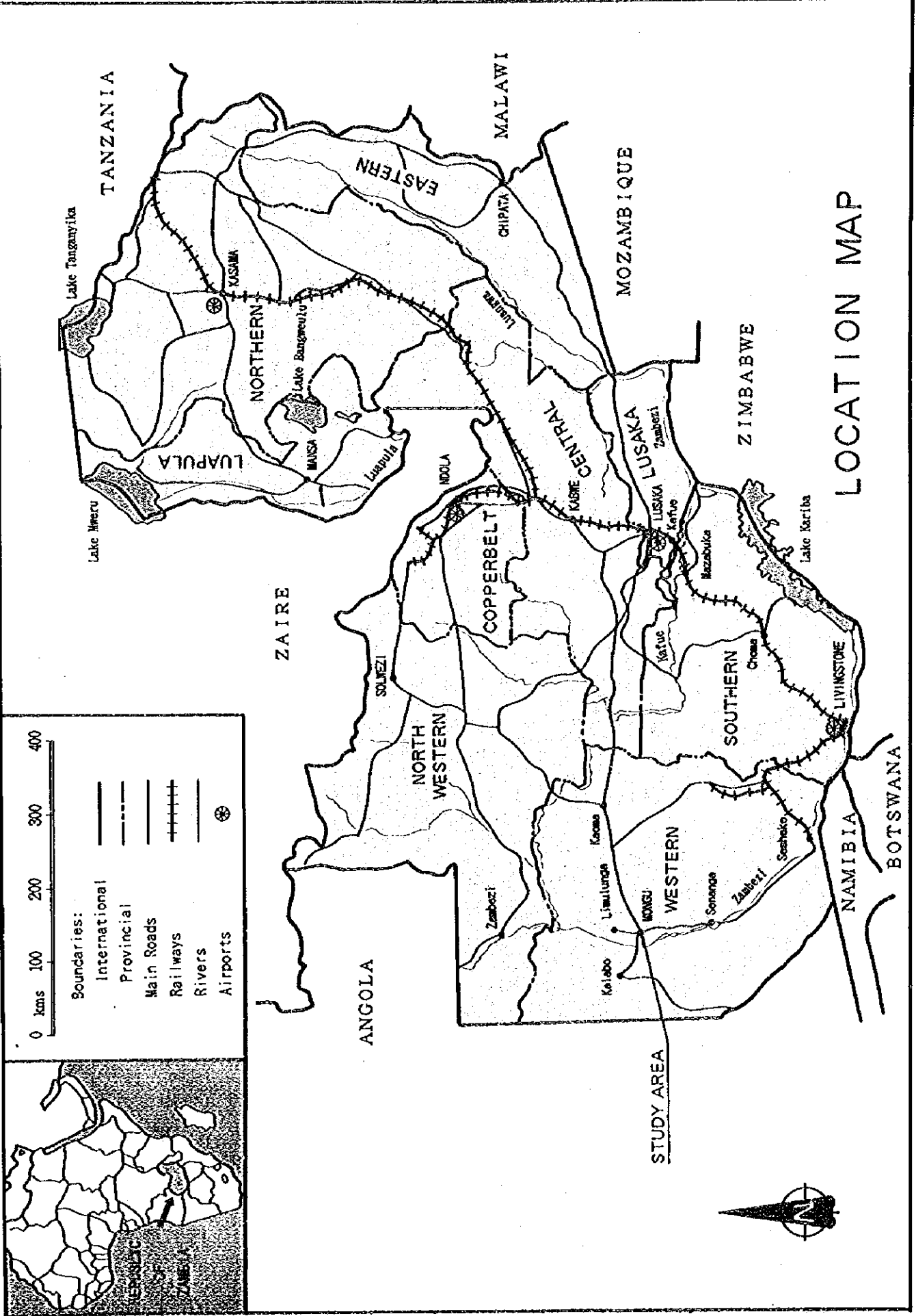
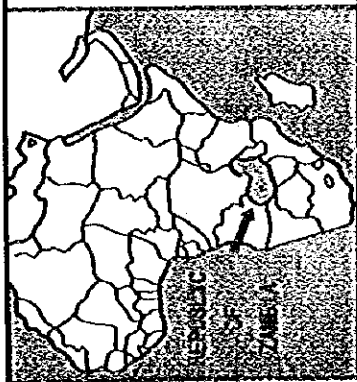
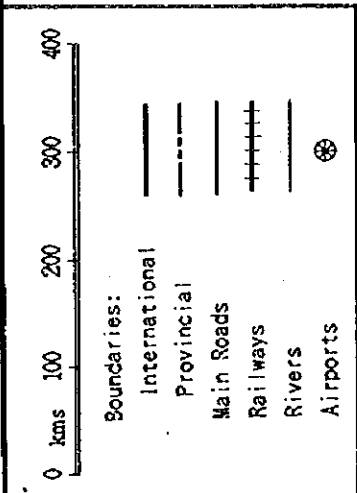
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,



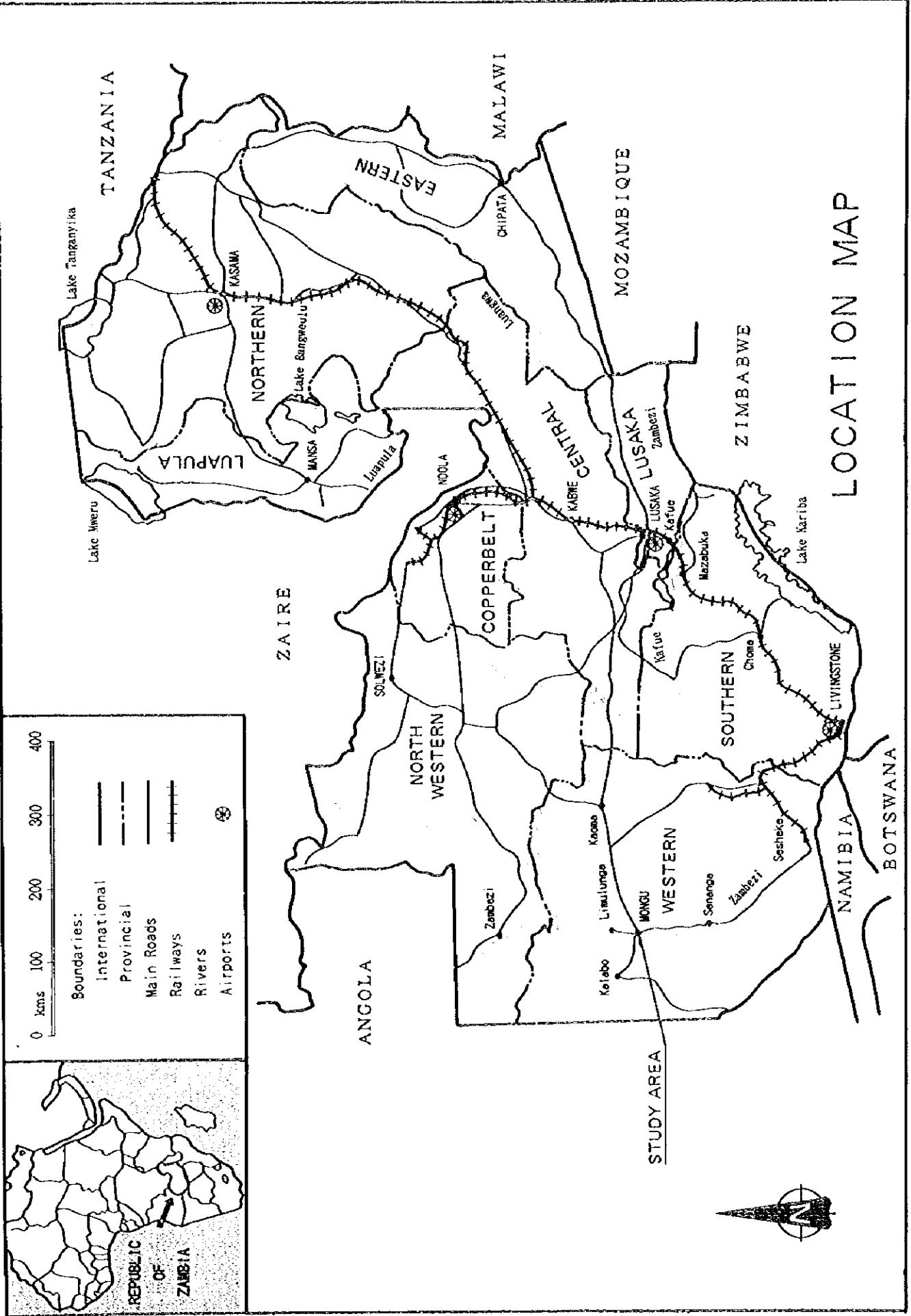
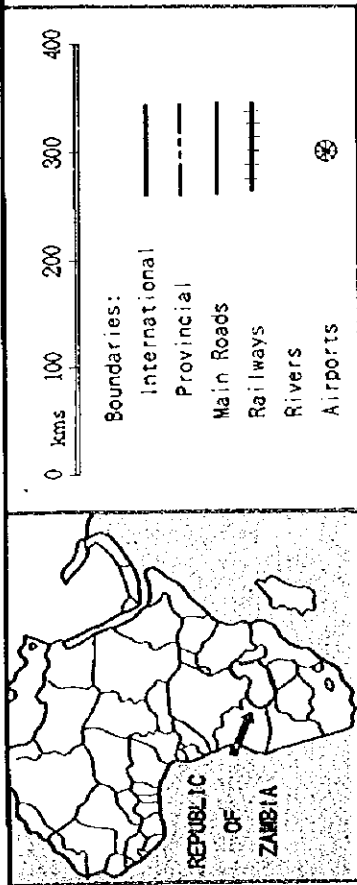
Minoru ISHIDODA

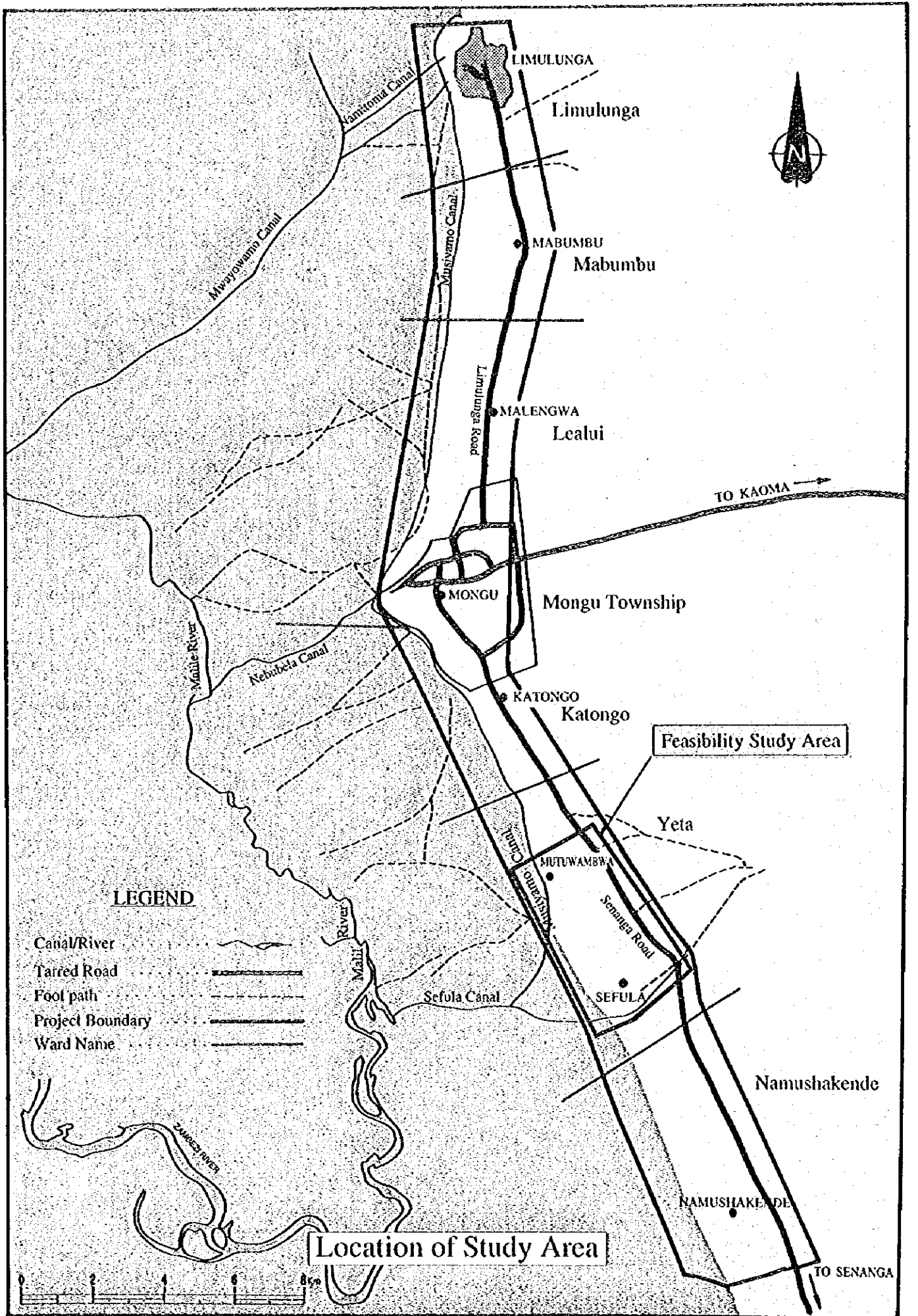
Team Leader,
The Feasibility Study on
Mongu Rural Development Project in
Zambezi River Flood Plain Area
Taiyo Consultants Co., Ltd.

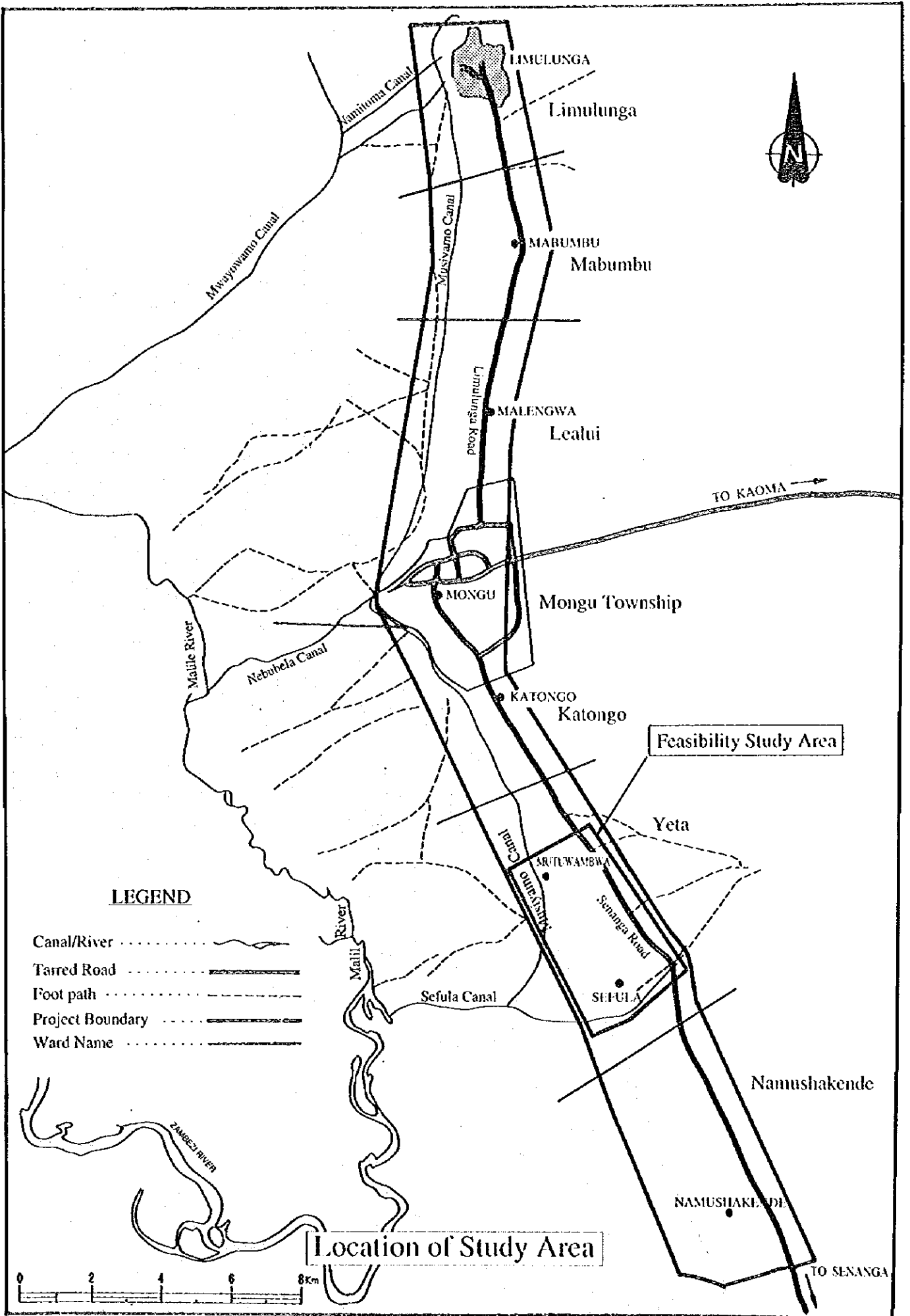


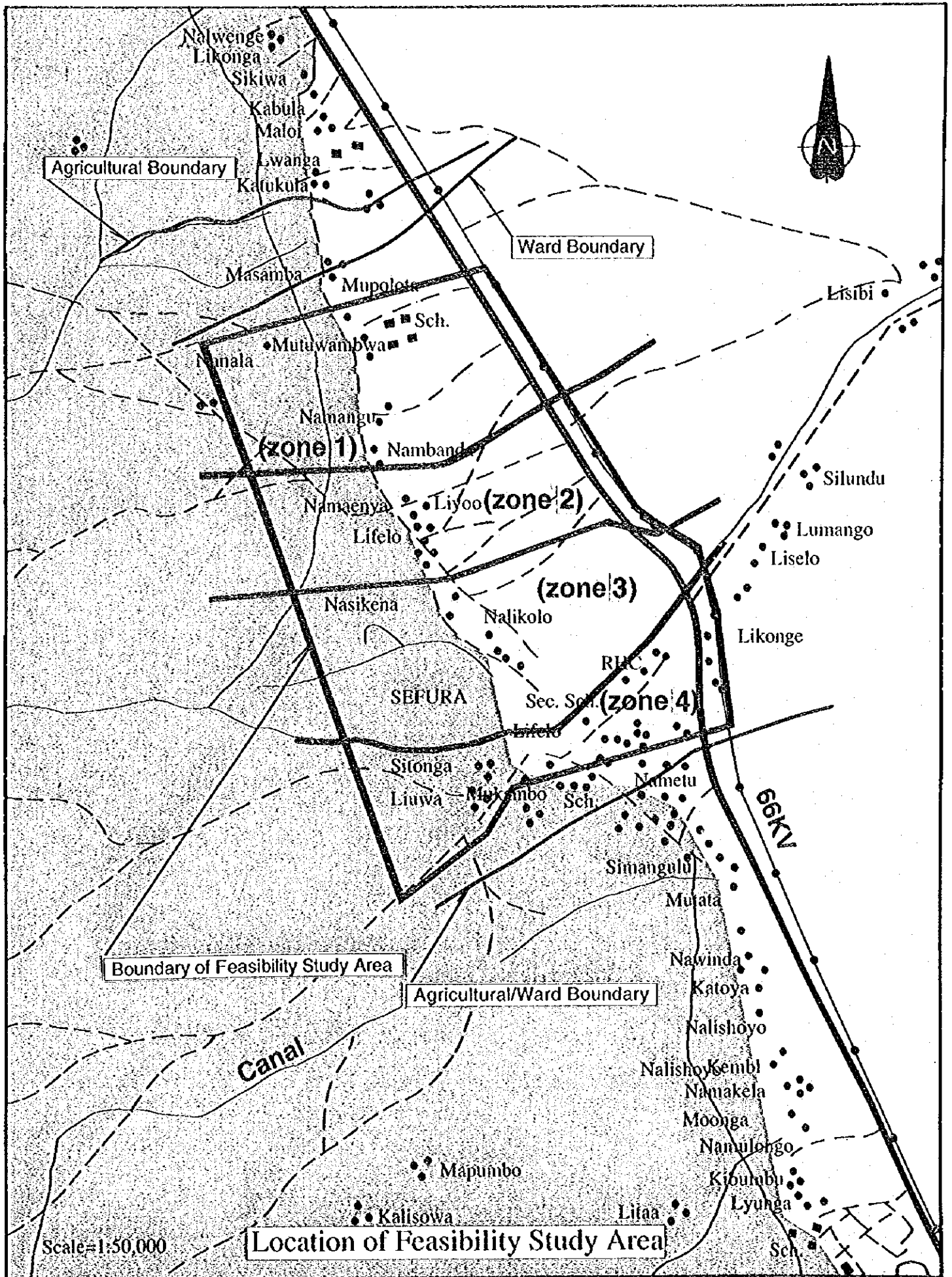
LOCATION MAP

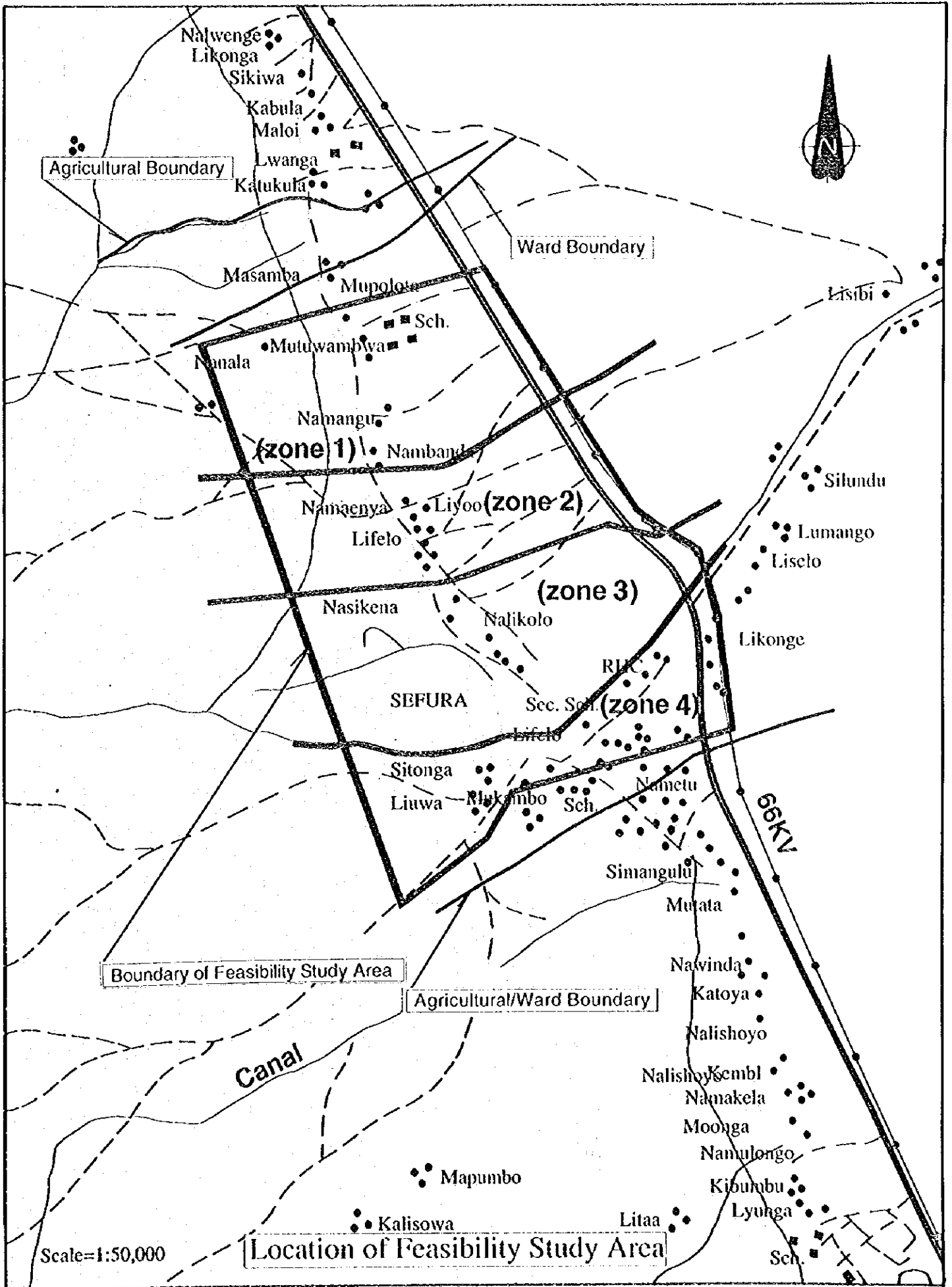


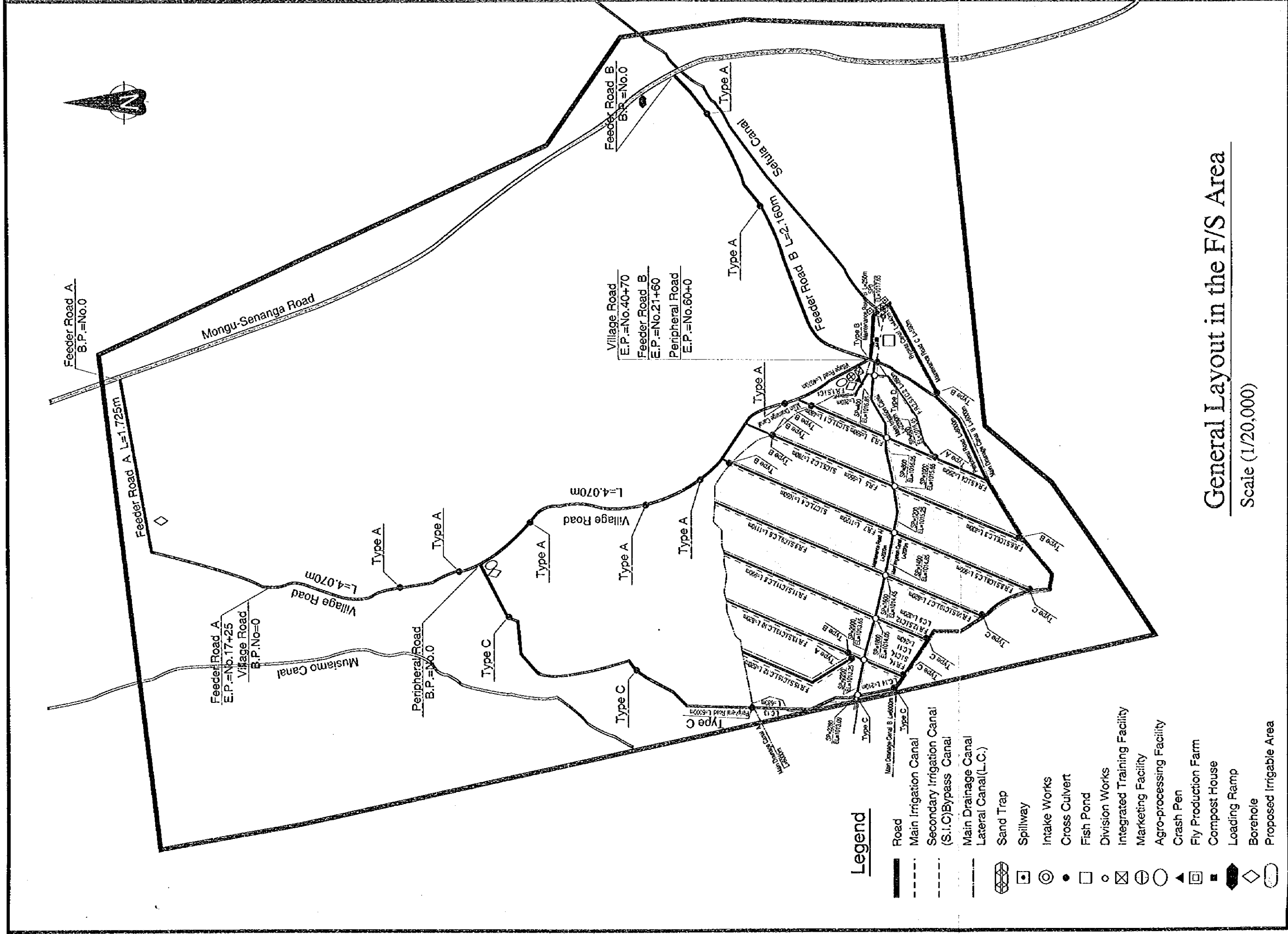








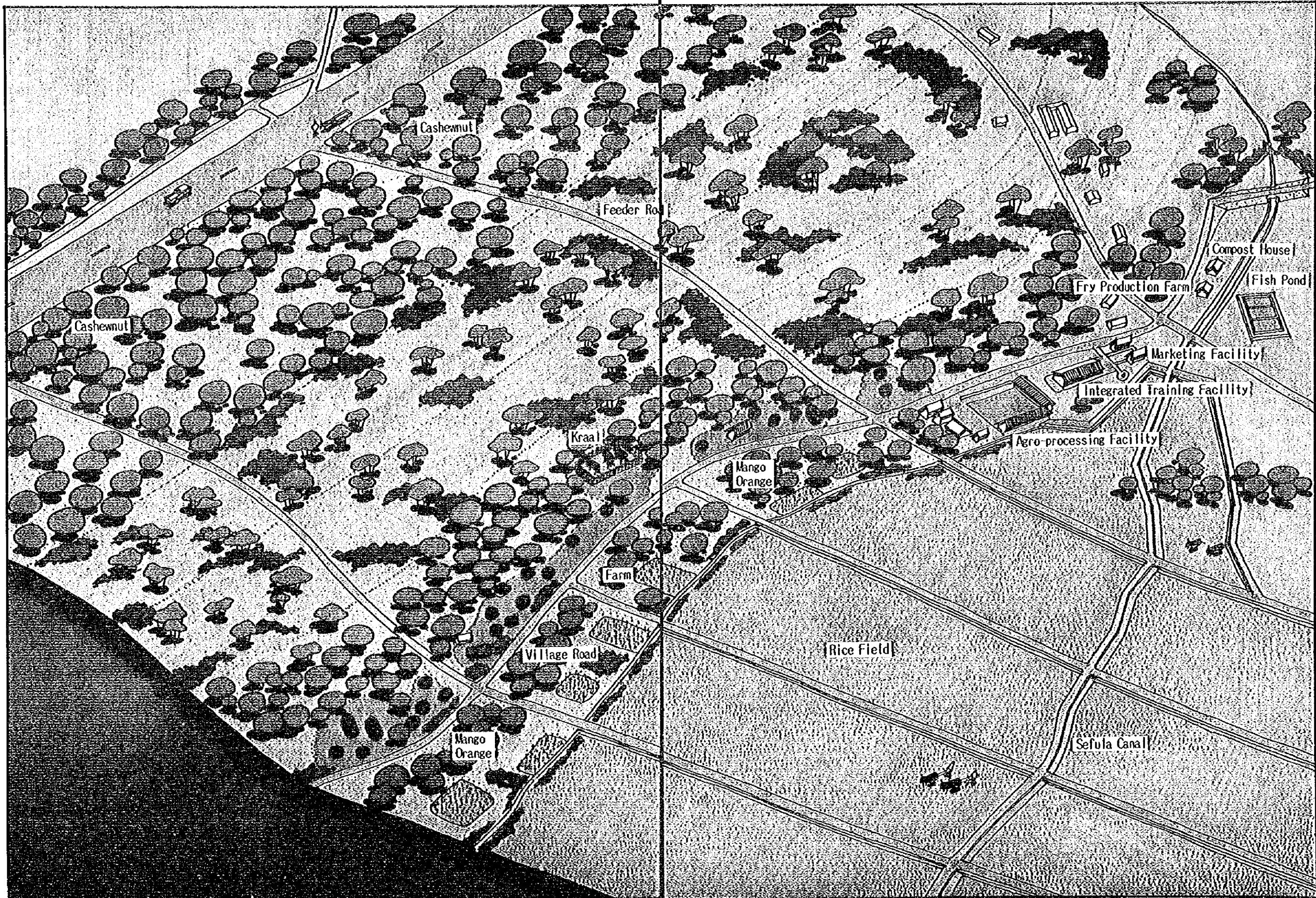




Legend

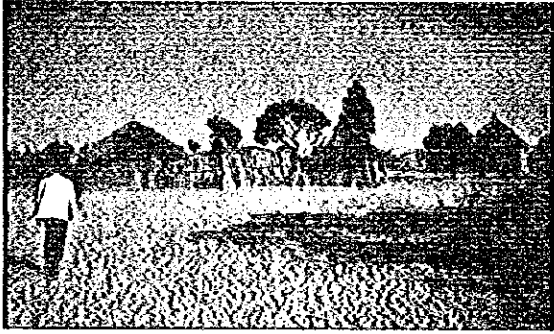
- Road
- - - Main Irrigation Canal
- - - Secondary Irrigation Canal (S.I.C.)/Bypass Canal
- - - Main Drainage Canal
- - - Lateral Canal(L.C.)
- ◻ Sand Trap
- ◻ Spillway
- ◉ Intake Works
- Cross Culvert
- ◻ Fish Pond
- ◻ Division Works
- ◻ Integrated Training Facility
- ◻ Marketing Facility
- ◻ Agro-processing Facility
- ◻ Crash Pen
- ◻ Fly Production Farm
- ◻ Compost House
- ◻ Loading Ramp
- ◻ Borehole
- ◻ Proposed Irrigable Area

General Layout in the F/S Area
Scale (1/20,000)

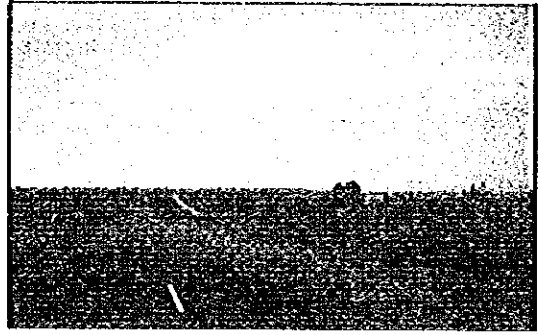


AERIAL VIEW OF PROJECT GENERAL IDEA

STUDY AREA



Village in the Study Area



Tarred Road (Mongu - Senanga Road)



Ploughing by Draught Power



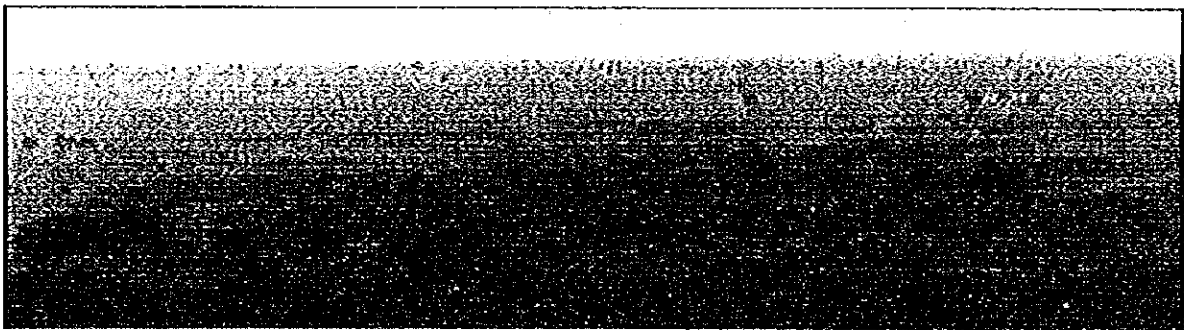
Kraaling



Rice Harvesting (panicle cutting by knife)



Vegetable Garden in Wet Litongo



Flood Plain Area in the Study Area

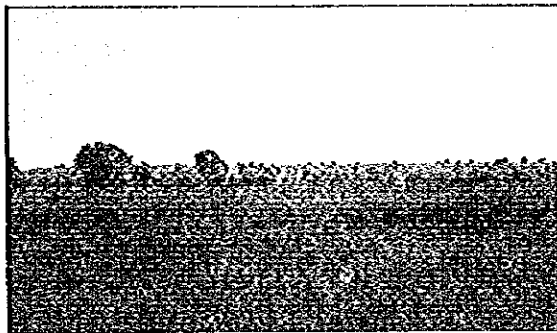
FEASIBILITY STUDY AREA



Sefula River (Proposed Intake Point)



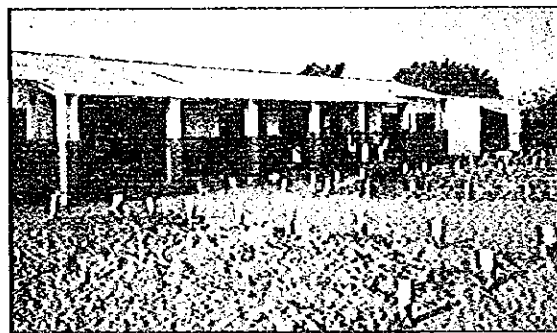
Sefula River (Proposed Irrigation Area)



Present Condition of
Proposed Irrigation Area



Present Condition of Village Road



Mutuwanbwa Primary School



Sefula Market



Meeting of Project Explanation to Farmers



Exchange of Minutes of Meeting

SUMMARY

1. INTRODUCTION

1.1 Preface

Since its independence from England in 1964, Zambia had enjoyed the economic prosperity for about a decade with enormous copper mining properties which was inherited from the British colonial government. But after the worldwide economic recession of copper industries occurred in 1975, Zambia's economy which mainly depended on the copper began to decline.

The United National Independent Party (UNIP), under Kenneth Kaunda, and which had been getting into power since the independence, could not cope with the economical situation, then the party handed over its power to the Government of Movement for Multi Party Democracy (M.M.D) headed by Frederick Chiluba. This present government has taken the policy of administrative decentralization to provincial level instead of central command policy taken by the former government, and promoted boldly privatization and administrative reform for rebuilding the national economy by encouraging agricultural sector to replace the copper industries.

In the National Plan of 1992, the policy on agricultural development aiming at the achievement of self-efficiency of food-grains, the formation of an agriculture based on the utilization of domestic resources, the farm income-generation through a free market economy, the promotion of agro-industries and the creation of job-opportunities, the export-promotion of agricultural products etc. was notified in emphasis.

Western Province, where the Study Area locates in, has few mineral resources among 9 provinces in Zambia and traditionally depends mainly on agriculture. The agriculture in Western Province is characterized by a small scale subsistent family-typed farming system with unstable and low productivity due to the lack of infrastructures.

Noting potentiality its of agricultural development of the flood plain and the adjacent area of Zambezi tributary, the Government of Zambia had requested the Government of Japan for Technical Cooperation to establish a basic guideline for agricultural development of this flood plain. In response to the request, JICA had implemented the Agricultural Verification Study from 1987 to 1992 to establish a guideline of farming technology for small scale farmers and also infrastructure improvement, identifying the potential of agricultural development in this area.

Following the above development, in November 1992, the Government of Zambia requested Japanese Government to carry out a feasibility study of the Mongu Rural Development Project for which JICA sent a pre-study team and exchanged a scope of works of the study on 31st August 1993.

Based on the S/W, the study was carried out for formulating the integrated rural development plan in Zambezi River Flood Plain Edge Area.

1.2 Study Objectives

The study is aimed at raising the agricultural productivity and living conditions of small scale farmers inhabiting the area of Mongu district in the Zambezi River Flood Plain.

2. PRESENT CONDITIONS OF THE STUDY - AREA

2.1 Natural Conditions

The Study Area covers an area of 12,000 ha including Mongu township in the middle, laying on the edge of the flood plain and along the national road Limulunga-Mongu-Senanga of about 40 km long in the north-south direction. It makes a bone-shaped area with approximately 3 km wide, covering partly 6 wards with a population of about 16,000 inhabitants excluding Mongu township - population.

Regarding its topography, the Study Area, has 2 types, in general, those are flood plain (lowlands) and uplands which belong to the Central African Plateau. From geologic characteristics, it consists of the land form of alluvial and laterite soils in the flood plain and the land form of Karahali group originated from Seif dunes in the Tertiary.

Regarding climatic conditions, although the Study Area belongs to the tropical region, the elevation is approximately 1,000 m, and its climate is relatively cool through the year. A long dry season (May - October) and a short wet season (November - March) have been observed. The mean annual rainfall is 916 mm, and the mean annual temperature is 21.5 °C.

In the Study Area there are 2 natural streams, Namitome canal which is a tributary of Zambezi River and Sefula River running from the uplands towards the flood plain of Zambezi River. Regarding the flood-ratio of Zambezi River, there would be 69% of the flood plain in the Study Area to be flooded in an interval of 3 years.

Soils in the Study Area are mainly consisted of Gleysols, Sandy Soils, Sedimentary Loam with partly Peat Soil. The soil acidity, in general, is high. As a result of it, the underground water in the area has a low acidity but no considerable effect to the water quality for irrigation.

Between the flood plain and uplands, the edge area forms a slope where soil-erosion is observed at some parts.

2.2 Socio - Economic Conditions

Two paved trunk roads from Limulunga to Mongu and from Mongu to Senanga pass along the ridge of the Plateau throughout the Study Area from north to south. The feeder roads connecting those paved roads and the plain edge and village roads connecting villages which are studded along the edge, however, are in very poor conditions. Due to these circumstances, the economic activities of the Area are remarkably disturbed.

Agriculture is the most important industry and almost no manufacturing industries are seen in the Area. Commercial activities are prosperous in the Mongu township and various consumer' goods such as foods, clothes and sundries are sold in the central market.

Ethnic groups in the Study Area are roughly divided into two groups, the dominant Lozi group and the minor non-Lozi group. As the distribution of lands are ruled by Lozi traditionally, non-Lozi people are restricted to get land for cultivation.

The proportion of the Female Headed Households (FHHs) is extremely high in the Study Area. The ratio of FHHs is 37% in the Study Area compared to that of all over mean of Mongu District 21%. FHHs form the poorest group in the subject area, they are restricted to access and manage the factors and measures concerning to production such as labour, land, draught power, operating funds, necessary information and so on, and they are placed as the social disadvantaged.

2.3 Present Conditions of Agriculture

(1) Farming and Cropping

Farmers in the Study Area are practicing a farming system of mix cropping, livestock raising and fishery as their traditional agriculture for mainly self-supporting purposes.

Main crops are maize, cassava, sorghum, millet, paddy, rape, white cabbage and leek, and other crops like onion, potato, tomato, cabbage are imported from outside (other provinces). Vegetables produced locally are Simdambi, Sishunga and so on as sub-crops.

Due to their primitive farming practice, crop yields are very low, 0.8 ton/ha for maize, 1.2 ton/ha for paddy. Only cow dung is applied on the field as manure with no application of agro-chemicals such as fertilizers and pesticides.

Results obtained from the farm survey are as follows :

- 1) Unstable agricultural production due to rainfed agriculture.
- 2) Insufficient number of trained oxen.
- 3) Lack of the proper agricultural credit system.

- 4) Insufficient agricultural inputs and high prices of these articles.
- 5) Inadequate drainage of Musiyamo Canal.
- 6) Unproper road network and insufficient facilities for marketing distribution of agricultural products.
- 7) Insufficient production techniques and knowledge.

(2) Agricultural Economy and Farmers' Organization

The average size of cultivating area is 1.36 ha and 80% of cropping area is covered by maize and rice. According to the results of the Farm Economic Survey, the ratio of agricultural cash income in the agricultural gross income is only 37% and more than half of the household expenses are used for procuring foodstuffs. The yields of rice and maize per unit area fluctuate a great deal among farmers and fields, and the reason of the fluctuation is considered to be unstable water supply.

There are almost no production oriented groups excepting for some of People's Participating Project Groups which are carried out by the hands of FAO sponsored by the Netherlands Government, in spite of promotion of cooperative activities by organizations concerned. At least one Village Extension Group is officially organized in each zone of every extension camp as the interface between the extension programme and farming community. However, those have nothing to do with the production oriented cooperative activities at this moment except for the case of the Namaenya Camp in which the Feasibility Study Area is included.

There are six Primary Cooperative Societies (PCSs) in the Study Area and three of them are located in the rural area. Only the PCS in Limulunga is active and carrying on excellent businesses, but the other two are inactive. Although market places are prepared in Mongu, Limulunga, Namushakende and Sefula, commodities dealt are mainly primary products because of poor transportation facilities and underdeveloped manufacturing industries.

Zambia Cooperatives Federation-Financing Service, Lima Bank and Credit Union & Saving Association of Zambia, the three principal agricultural financing organization, have their branches in Mongu. However, farmers especially small scale farmers are facing difficulties in borrowing and in repaying even if they could borrow as the interest rate is not only extremely high but also fluctuates a great deal in short period.

(3) Land Tenureship

The land tenure in the Study Area can be classified into family land, public land, church land and tenant land. The major part belongs to the category of family land. In general, its individual form is rectangular and in perpendicular with the flood plain. In the category of family-land, land-holding owner(s) and families can dwell and use it with guaranteed land right.

Main problems in land-issue, however, are 1) No clear boundary which causes land conflicts very often, 2) No land title which results in impossible land mortgage and 3) No survey of land suitability classification for clarifying possibilities in land transferring and using of unused land.

(4) Agro-Processing

Milling plants for rice and maize are mainly found in Mongu-township but very rare in the rural side, resulting in manual practices at home for these works.

Especially on rice milling, due to no proper processing application, the ratio of broken-rice is high, causing low quality of products.

(5) Rural Infrastructures

Regarding roads, there are asphalt paved roads (tarred roads), gravel roads and foot paths in the Study Area. In general, road conditions are not proper with the ratio of approximately 1950 m per sq. km and only 16 percents of tarred roads. Apart from tarred roads and gravel roads, the transportation is possible only by 4 wheel drive vehicles in the Study Area.

Regarding irrigation and drainage, due to no proper works of irrigation and drainage up to now, these related facilities are not observed except for the Musiyamo canal constructed before the independence, but it is not functioning in total at present due to unproper operation and maintenance practices.

For other social infrastructures, there are 69 water supply wells for public use. Electrical power is 66 KV transforming to 240 V in the Study Area but the electrification-ratio to farmers' households is very low.

For posts and telecommunication, there are services of postal business, telephone, telegraph, money order, pension etc. at PTC(Posts and Telecommunications Corporation). Radio and television waves from Zambia National Broadcasting Corporation could be received in the Study Area.

Regarding health care facilities, there are RHCs(Rural Health Care) at each ward and an UHC(Urban Health Care) in Mongu township. The present ratios of diseases are 57% for malaria, 17% for respiratory troubles, 12% for skin diseases, 7% for eye-troubles and 7% for diarrhea. Main problems in the aspect of health care are inadequate facilities, insufficient physicians and unproper conditions of roads for patients' transportation.

Regarding education facilities, there are 12 primary schools, 3 secondary schools, and primary teacher's training college. For primary schools, there are 222 classes, 7,458 students and 288 teachers (in 1993). Educational problems are deficient facilities, insufficient houses for teachers and related operation and lack of maintenance costs.

2.4 Environmental Aspects

The administration on environmental aspects belongs to the Ministry of Environment and Natural Resources of Zambia.

In the Study Area, there are only two concerns on the environmental aspects which are how to formulate the development plan properly adjusting with traditions and customs of the Lozi, and how to control the sources of malarial mosquitoes in the area.

3. BASIC DEVELOPMENT PLAN OF THE STUDY - AREA

3.1 Basic Concept for Development Plan

The Study Area located in Western Province covers the most densely populated Mongu township but, due to the improper utilization of land and water resources in the Zambezi flood plain, the traditional farming practice in small scale and based on rainfed has been mostly applied up to now.

From these conditions, the development plan aiming at improving farming practices of small scale farmers for increasing their living conditions and enhancing regional economic activities is formulated.

Basic concepts for the development plan are as follows:

- (1) Practicing the market economy in agriculture and achieving the self-efficiency of staple foods in the Study Area.
- (2) Aiming at improving living conditions of small scale farmers.
- (3) Promoting a stable farming system with proper farm-management and utilization of natural resources based on improvement of infrastructures such as rural roads, irrigation and drainage facilities etc. in order to improve the fragile rainfed agriculture.
- (4) Aiming at a diversified farming system with food crops, horticulture, inland-fishery and animal husbandry etc.
- (5) Aiming at group farming by rationalization of farming works, harmonization of regional community and promotion of agricultural extension.
- (6) Improving social relations between male and female inhabitants as well as distributing project-benefits to socially inferior inhabitants including women.
- (7) Executing improvement works for following rural infrastructures :
Social infrastructures : rural roads, water supply and integrated training facilities

Agricultural production infrastructures : farm roads, irrigation and drainage facilities

Farm management infrastructures : facilities for agro-processing, inland fishery, animal product, vaccination and marketing

- (8) Setting norms for improvement works for rural infrastructures with proper management, operation and maintenance system as well as for related improvement-works capable by farmers in the future.
- (9) Promoting the farmers' participation in the Project.
- (10) Using ASIP formulated by Zambian Government in 1994 as a directive for this project formulation.

3.2 Farming Plan

(1) Farming System

The following 2 types of farming systems are contemplated, based on agricultural land types, cropping patterns, potential labour forces and farmers' intentions in the Area.

Farming System 1 : Rice double cropping with vegetable and fruits
(with water resources) For 3 blocks : Limulunga, Mabumbu and Yeta

Farming System 2 : Rice single cropping (wet season) with vegetable and fruits
(without water resources) For 3 blocks : Namushakende, Katongo and Lealui

With the introduction of different crops, the Farming System 2 is furtherly divided into 2 sub types for Katongo-Lealui Block and Namushakende Block which are located near to consumption-places of Mongu and Limulunga.

With the introduction of animal draught power, works such as plowing, harrowing as well as transportation by animals will be promoted in large scale. In this framework, the management of animal power and its utilization will be elaborated, based on incorporated functions with other related projects.

(2) Plan of Crop Production and Estimated Yields

Based on the project implementation with a stable supply of irrigation water and an improvement of cropping techniques, yields of projected crops will be increased accordingly. Estimated yields, therefore, are envisaged as follows :

Table 3.1 The Projected Yield Level

Crop	Present (t/ha)	Without Project (t/ha)	With Project (t/ha)
Paddy rice			
Rainy season	1.2	1.32	4.0
Rainfed	1.2	1.32	3.5
Dry season	-	-	4.5
Upland crop			
Maize	0.84	0.92	2.5
Cassava	0.78	0.86	1.5
B/millet	0.62	0.68	1.0
Sorghum	0.64	0.70	1.0
Sweet potato	1.0	1.1	1.5
Vegetable	- depends on crops -		
Tree crop			
Mango*	0.173	0.19	0.22
Cashew	0.15	0.16	0.50
Orange*	0.015	0.017	0.04

Note: Mango & orange refer to yields(ton) per tree, not per ha.

The plan of crop production after implementing the irrigation scheme is mentioned in Table 3.2.

Table 3.2 Crop Production Plan

Crop	Area (ha)	Yield (t/ha)	Produce (ton)
Paddy rice	Dry season	180	810
	Rainy season (included Rainfed)	535	2,140
Upland crop	Maize	565	1,412
	Cassava	645	967
	B/millet & Sorghum	220	220
Vegetables	Onion	105	2,100
	Cabbage	75	1,875
	Chinese Cabbage	30	600
	Rape	60	240
	Tomato	45	900
Fruit tree	Mango*	12,100	2,662
	Cashew	270	135
	Orange*	460	18
Total	2,730		14,079

Note: Asterisk fruits refer to the numbers of trees and yield per tree, not per hectare.

3.3 Facilities-Planning

Outlines of facilities envisaged in the Development Plan are as follows :

Table 3.3 Outlines of the Facilities Envisaged in the Study Area (1/2)

Development Plan	Purpose	Component
Rural Road	<ul style="list-style-type: none"> a) Conveyance of agricultural production, materials and necessities b) Promotion of extension and community activities c) Improvement of access to public services d) Maintenance of irrigation facility and access to farm land 	<ul style="list-style-type: none"> 1) Improvement of the Feeder Roads connecting villages and the main road 2) Improvement of the Village Road connecting villages located on the plain edge line 3) Construction of a Peripheral Road in the plain
Irrigation	<ul style="list-style-type: none"> a) Improvement of agricultural productivity and stability b) Promotion of sustainable agriculture 	<ul style="list-style-type: none"> 1) Installation of irrigation facilities such as canal, division works, sand trap and so on in order to utilize the water of Namitome Canal, Sefla River and catch drain etc. for rice growing by gravity irrigation 2) Installation of levee and implementation of land leveling owing to proper distributing water in the proposed gravity irrigation area 3) Bucket irrigation system for upland crop cultivation by shallow well in wet-Litongo and Mazulu area
Soil Erosion Control	<ul style="list-style-type: none"> a) Farm land and environment conservation 	<ul style="list-style-type: none"> 1) Carrying out of surface water control such as catch drain or collection canal 2) Installation of gully control or sedimentation tank in natural stream
Animal Husbandry	<ul style="list-style-type: none"> a) Nutrition improvement in rural area b) Saving labour c) Extension for vaccination 	<ul style="list-style-type: none"> 1) Installation of meat-processing facility in the proposed integrated training facility 2) Installation of loading ramp near the tarred road 3) Installation of crush pen
Inland Fisheries	<ul style="list-style-type: none"> a) Promotion of diversified agriculture b) Nutrition improvement , increase of cash income, and extension 	<ul style="list-style-type: none"> 1) Installation of fry production farm and fish pond by using water source from natural stream or ground water

Table 3.3 Outlines of the Facilities Envisaged in the Study Area (2/2)

Development Plan	Purpose	Component
Agro-Processing	a) Improvement of the quality and marketability of rice and corn products b) Saving labour for milling	1) Installation of rice mill, hammer mill, inspection office, warehouse, drying yard, market facilities, and so on
Integrated Training Facility	a) Extension/training of skills and technical know-hows for agriculture, animal husbandry, and inland fisheries b) Promotion of farmer's groups/organization and women's activities	1) Installation of multipurpose conference room, training room, camp officer's room, women's training room, vaccination room, and so on 2) Combination of agro/fish/livestock processing facility, storage facility, and marketing facility
Guidance Farm	a) Supporting of farming and extension works for small scale farmers	1) Multiplication and supply of paddy seeds, and distribution of vegetable seeds 2) Training of camp extension officer, and display of demonstration field

4. SELECTION OF FEASIBILITY STUDY AREA

The main objective of this study is to improve living conditions of small scale farmers inhabiting the edge area of Zambezi River Flood Plain.

As the understanding on project works by local farmers as project beneficiaries is an important factor in case of project implementation, the selection of the Feasibility Study Area is necessary to be based not only on conditions of the subjected area but also on conditions of other areas with similar conditions for making a model project of rural development with multiple effects to encourage areas in order to obtain quick project benefits at first.

Based on the above concept, selection criteria of the Feasibility Study Area are as follows:

- Number of beneficial farmers who have a stable access to arable land
- Possibility of crop diversification
- Potentiality of rural infrastructure improvement
- Number of existing agricultural organizations and farmer's groups
- Number and ratio of female headed households
- Applicability of appropriate technology level
- Possibility to serve as model for water management practice
- Availability of adequate water resources
- Topographic condition to apply gravity irrigation system

According to the above selection criteria, the Study Team and the Steering Committee evaluated each block in the Study Area in cooperation. As the result, Yeta Block was given the top priority of the Feasibility Study Area.

The topographic mapping of an area of 3,000 ha covering Yeta Block was carried out in 1: 5,000 scale. Based on these materials, discussions between the Study Team and M. Chiinda, PAO, who was staying in Japan as counterpart-trainee, were held in Tokyo and the subject area of 1,900 ha was selected as the Feasibility Study Area.

5. DEVELOPMENT PLAN OF FEASIBILITY STUDY AREA

5.1 Outlines of the Feasibility Study Area

(1) Natural Conditions

1) Location and Land Form

The F/S Area is situated in Yeta ward about 10 km south of Mongu township. Its total area covers 1,900 ha with the village of Mutuwambuwa on its northern part and Sefula River in the south. The present distribution of land facets in the F/S Area is as follows :

Table 5.1 Land Facets

Land type	Facet	Area (ha)
Upland	Plateau	876
	Escarpment	147
Seepage	Dry litongo	39
	Wet litongo	41
	Sishanjo	205
Flood Plain	Matapa/Sitapa	592
Total		1,900

2) Meteorology, Hydrology and Water Quality

Despite the Study Area is located in the tropics, the heat is not so severe because of its high altitude(1,000m), and monthly average temperatures are 25.3°C in October and 16.7°C in June. According to the temperature records at the Namushakende Agricultural Verification Farm of JICA, the highest is 38.0°C (November 1990) and the lowest is 2°C (June 1991). Frost falls once in an interval of three years. For the last 30 years, the average annual rainfall is 916 mm. Wet season starts from October and lasts until April, and monthly average rainfall through the season is 190 mm.

Values of Drought discharge and flood discharge by two years return period of Sefula River are 0.29 m³/s in dry season and 1.80 m³/s in wet season, and those of 10 years are 0.25 m³/s and 2.70 m³/s respectively.

Although the running water of Sefula River shows an acidity of pH 5.8, it does not have any specific problems for utilizing as irrigation water for rice. Its electro-conductivity is 17.7 μ S/cm and its value of dissolved oxygen is 5.5 ppm.

3) Soil

Soils in the F/S Area consist of Podzol, Acrisols, Arenosols, Histsols and Gleysols.

(2) Social Conditions

1) Population and Household Structure

The population, number of households and the household-structure in the F/S Area are as follows:

Table 5.2 Population and Household Structure in F/S Area

A. Population		No. of HHs	Population
Rural Area	Farmer	333	2,010
	Farmer with fishing	123	738
	Others	113	666
	Sub Total	569	3,414
Church Area	Teacher	98	588
	RHC *	11	66
	Church	20	120
	Dormitory **		432
	Sub Total		1,206
Total			4,620

* Rural Health Center,

** Secondary School and Blind School

B. Household Structure

	Zone 1	Zone 2	Zone 3	Zone 4	Total
No. of Village	19	11	10	21	61
No. of HHs	196	119	98	156	569
MHHs	86	63	34	62	245 (43%)
FHHs	110	56	64	94	324 (57%)
Farmland (ha)	170	178	188	211	747

2) Social Infrastructures

Main social infrastructures are as follows :

- Road : Main road 6.0 km Tared
Feeder road 3.8 km Gravel, Sand
Village road 4.1 km Sand
Foot path 20.0 km Sand
- Electrification : Electric power line with capacity of 11 KV along tarred roads and 400V power line in Sefula church area.
- Water supply : Shallow well Windlass 4 (2)
Others 14
Borehole Hand pump 10 (1)
Electricity 2 (1)
Diesel 1 (1)
Total 31 (5)

* () shows number of not in use

- Health : One rural health center is in operation at Sefula church area with 3 clinical officers, 5 nurses and 3 employees.
- Post Office : 1 place
- Schools

Primary school	3	teachers	59	pupils	1,560
Basic blind school	1		15		80
Secondary school	1		24		850
- Market and others : Sefula Market (for crops, vegetable, fish, meat, daily goods)
Small slaughter 1

3) Land Tenureship

The land tenureship in the F/S Area is classified in traditional practice of the Lozi. According to the Lozi tradition the land tenure can be classified into King's own land, land of official titles, family land and unused land under the control of the King.

However, apart from family lands, the land boundaries of other categorized lands are not clearly demarcated.

In the F/S Area the average agricultural land per household is approximately 1.3 ha. Also 35 households who are landless farmers and 99 households of land tenants are observed in the F/S Area.

5.2 *Outlines of the Development Plan*

(1) Development Purposes

The development plan in the Study Area aims at formulating a model project promoting effective improvement works in the subject area with multiple effects to encourage areas of similar conditions.

(2) Basic Concept of Development Plan Formulation

The selection of the F/S Area for implementing project works was not simply based on its high potentials for development but also concerns on the socially disadvantaged groups i.e. female headed households, landless farmers for responding to their needs.

The endurance of project benefits through the project life is also considered important in order to formulate an effective development plan. Endurance related to economic, technical, environmental and social aspects, therefore, are considered as subjects of the project formulation. Among those, social aspect has to be emphasized for the purpose of distributing impartial benefit to the social inferiors.

5.3 Outlines of Main Facilities of the Development Plan

Outlines of main facilities in the development-plan are as follows;

Table 5.3 Outlines of the Facilities in the FIS Area

Development Plan	Item	Description
Road	Feeder road	2 Lines, L = 3.9 km, Gravel pavement
	Village road	1 Line, L=4.1 km, Gravel pavement
	Peripheral road	1 Line, L=6.0 km, Gravel pavement
	Maintenance road	3 Line, L=2.9 km, Gravel pavement
	Field road	15 Lines, L=10.7 km, Sand pavement
	Others	Cross culvert N=27
Irrigation	Main canal	1 Line, L = 2.3 km, Cement block lining
	Secondary canal	15 Lines, L=10.4 km, Cement block lining
	Sand trap	Embankment, Intake works, Spillway N=2, Connection canal
	Bypass canal	L = 0.4 km, Earth canal, Cross culvert N=1
	Others	Division works N=8
Drainage	Main canal	2 Lines, L=12.0 km, Earth canal
	Lateral canal	15 lines, L=9.9 km, Earth canal
Agro-Processing	Type A (Sefula)	Hammer mill, Rice mill, Harvesting / Transportation Equipment, Others
	Type B (Namaenya)	Hammer mill, Rice mill, Harvesting / Transportation Equipment, Borehole, others
Inland Fisheries	Fish culture facility	Fry production farm, Fish pond, Others
Animal Husbandry	Loading ramp	Near the beginning point of Feeder B
	Crush pen	In the Integrated training facility
Extension	Integrated training facility	Multipurpose conference room, Training room Camp officer's room, Women's training room vaccination room, Meat-processing facility, Stuff Room, Borehole, Others
Marketing	Marketing facility	Market house, Warehouse

5.4 Farmers' Training Programs

Even with the completion of facilities-construction, the Project will not function well if programs of management and operation and maintenance are not applied. Training programs for functioning these facilities, therefore, are envisaged as follows :

Table 5.4 Farmers' Training Programs

Field	Item	Contents	Subject
Water Use & Management	Irrigation & Drainage	<ul style="list-style-type: none"> • Importance of Irrigation and Drainage • Function of Paddy Fields • Substance and Utilization of Irrigation Facilities 	Beneficiary Farmers in the F/S Area
	Water Management	<ul style="list-style-type: none"> • Meaning of Water Management and method of Enforcement Practice • Growing Rice and Seasonal Water Requirement • Countermeasure against Drought 	
Farming	<ul style="list-style-type: none"> • Cultivating Method • Working Method • Animal Husbandry • Inland Fisheries 	<ul style="list-style-type: none"> • Improved Technologies and Profitability for Rice, Maize, Vegetables and Orchard crops cultivation • Improved Technologies and Profitability of Animal and Machinery Use • Extension of Vaccination • Technical Extension of Fish Culture 	Farmers in the F/S Area
	Agro-Processing	<ul style="list-style-type: none"> • Post - Harvesting Machinery Use • Machinery Use for Threshing and Winnowing 	
WID/GAD	Social Life	<ul style="list-style-type: none"> • Women's Social Status and Role 	<ul style="list-style-type: none"> • Leaders of both sexes in the F/S Area
	<ul style="list-style-type: none"> • Farming Methods • Improvement of Living Standard • Agro-Processing 	<ul style="list-style-type: none"> • Utilization of Animal Power on Farming • Nutritional Improvement and Cooking • Manufacturing and Sale of Dry Mango 	<ul style="list-style-type: none"> • Members of Women's Production Group • Women in the F/S Area • Members of Women's Group
	Water Use	<ul style="list-style-type: none"> • Necessity, Role and Function of Organization • Management of Organization • Management of Water Use 	Beneficiary Farmers in the F/S Area
Farmers Organization	Cooperative Production	<ul style="list-style-type: none"> • Significance of Cooperative Activities and Orientation of Organizing Groups • Way of Promoting Activities 	Members of VEGs and Expectant
	Primary Cooperative Societies (PCS)	<ul style="list-style-type: none"> • Meaning of PCS and Reactivation - Procedure • Method of Management and Operation including Relief Management Produce 	<ul style="list-style-type: none"> • Leaders of VEG • Candidates for the Leading Members

5.5 Plan of Crop Production

Table 5.5 Crop Production Plan

Crop		Area (ha)	Yield (t/ha)	Produce (ton)
Paddy	Dry season(Irrigated)	100	4.5	450
	Rainy season(Irrigated)	200	4.0	800
	Rainy season(Rainfed)	90	3.5	315
Upland crop	Maize (Mazulu)	25	2.5	62.5
	(Sitapa)	75	2.0	150
	(Sitapa w/bucket)	25	2.5	62.5
	Cassava	240	1.5	360
	B/millet & Sorghum	40	1.0	40
Vegetables	Onion(Bucket irrigation)	10	20.0	200
	Cabbage(Bucket irrigation)	10	25.0	250
Fruit tree	Mango(t/tree) 2479 trees	29	0.29	719
	Guava(t/tree) 2000 trees	7.2	0.025	50
	Orange(t/tree) 1250 trees	2	0.04	50
Total		844.2		

Note: Fruit refers to a yield per tree. Total yield refers to the food crops only. Cassava is harvested on every three years.

5.6 Project Implementation Organization

The implementing organization of this project will be mainly carried out by the Project Executive Committee organized by the Department of Agriculture in Western Province under the supervision of MAFF.

Table 5.6 Composition of the Project Executive Committee

Component	Component Leader	Responsibility
Committee Leader	PAO	a) Management of the Committee
Extension	Farm Management	a) Management of the Integrated Training Facility b) Management of training programmes c) Technical extension activities for farmers
Irrigation/Drainage	Provincial Engineering	a) Organization of advisory committee of water user's group b) Establishment and guidance of water user's group
Animal Husbandry	Animal Production and Health	a) Technical extension activities for farmers b) O.M. of crush pen, loading ramp, and meat-processing facility
Inland Fisheries	Fishery Department / Farm Management	a) Technical extension activities for farmers b) O.M. of fry production farm and fish pond
Agro-Processing	Provincial Engineering	a) O.M. of agro-processing facilities
WID/GAD	Women Youth Development Section	a) Upbringing and training activities for women's group b) O.M. of women's training room
Supporting for Farmer's Groups	Farm Management	a) Upbringing of PCS b) Upbringing of production oriented groups c) O.M. of the marketing facility

5.7 Project Cost Estimates

Based on notified conditions of cost estimation, the initial cost including consulting services at prices of December 1994 is MK(Million Kwacha) 4,300 (650 million Japanese yen). In which the local portion is MK 2,400 (360 million yen) and the foreign portion is MK 1,900 (290 million yen). Exchange rate is 1 US\$: K670. Besides, the operation and maintenance cost is estimated at MK 26 per annum.

Table 5.7 Project Cost and O.M. Cost

Item	Initial Investment Cost	O.M. cost	Reference
Roads	1,323,040	3,297	
Irrigation	602,406	2,635	
Drainage	296,764	180	
Agro-processing	864,168	18,715	
Integrated training facility	328,072	1,477	
Marketing facility	44,100	44	
Rural water supply	12,750	135	
Inland fisheries	73,091	-	
Animal husbandry	14,732	-	
Construction cost (Sub-total)	3,559,123	26,483	
Consulting services	355,911	-	
Physical contingency	391,502	-	
Total	4,306,536	26,483	

5.8 Project Evaluation

(1) Project Benefits

This multi-functional project has the characteristics of a model project. Its economic benefits, however, are limited in the F/S Area of 1,900 ha with a population of 4,620 inhabitants (698 families; 6.6 persons/family) in which 458 families are farming households (2,750 persons) with 747 ha of agricultural land.

Project-benefits from cropping, livestock raising, applications of storage, agro-processing and marketing distribution were calculated, based on conditions of "With Project" and "Without Project".

The annual value of economic benefits from this project is as follows:

Cropping Benefits	:	178.50 Million Kwacha
Livestock Benefits	:	1.05 "
Value Added Benefits	:	87.80 "

Total		267.35 Million Kwacha
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(2) Economic Analysis

From the annual cash flow of economic costs and benefits, the EIRR of this project in basic case is calculated at 5.21 %. This implies the economic viability of this project.

(3) Social Impacts

This rural development project offers benefits on various aspects. Apart from its positive result from the economic analysis, this project will have various significant social impacts which can be summarized as follows.

- Alleviation of the rural poor and raising rural living standards.
- Expansion of agricultural land and absorbing more rural labor force.
- Creation of cooperative opportunities for local farmers and inhabitants.
- Formation of basic knowledges on farming techniques and living manners for local inhabitants through agricultural extension programs etc.
- Creation of accessibilities to daily consuming goods for inhabitants.
- Promotion of working motivation to the local population.
- Enhancement of the development for other related industries.
- Reducing the migration of family-members for outside jobs.
- Grading up living conditions and social status for women through WID programs.
- Improving the fundamental living factors (foods, hygienic living conditions, health care etc.) of Basic Human Needs(BHIN) in total.

6. CONCLUSION AND RECOMMENDATION

6.1 Conclusion

- (1) This Mongu Rural Development Plan is formulated based on ASIP (Agricultural Sector Investment Program) for aiming at raising living conditions and agricultural production of small scale farmers through the effective utilization of regional resources and improvement-works of rural infrastructures. On this basis, the plan is carefully elaborated in order to allocate relevant project-benefits to local small-scale farmers. Proper techniques to be applied to local farmers and the administration functions and PAO, W.P. of MAFF as well as the traditional social system of the Lozi are reflected on this development plan.
- (2) The F/S Area with 1,900 ha was selected out of the Study Area covering 12,000 ha where the M/P was drawn up, the Feasibility Study was carried out. The results of the project-works in the F/S Area will be utilized as a model in the areas not only in Zambia but also in neighbouring countries with similar conditions.
- (3) Regarding the economic analysis of the F/S Area, the related economic indices seem to be a little lower than other agricultural development projects such as irrigation projects.

This project, however, will be able to expect following social effects besides the increase of agricultural production.

- 1) Improvement of living standards of small scale farmers through the integrated rural development framework.
- 2) Improvement of women's rural life and the crucial malnutrition of their infants.
- 3) Acquisition of the basic conveniences through the implementation of various social facilities.

6.2 Recommendation

- (1) Zambian Government has recently notified the agricultural development as one of the most important sectors in the national economic recovery program. Taking the notification into consideration, the followings are recommended :
 - 1) To form a sustainable agricultural production system for self-efficiency of food grains in the whole country.
 - 2) To establish a farming system utilizing domestic resources intensively .
 - 3) To generate farm-incomes and job-opportunities based on the free market economy
 - 4) To enhance agro-industries and related businesses in the rural area.

From the macro-economic viewpoint, this Mongu Rural Development Plan also recommends to implement proposed facilities in order to obtain direct project benefits and socio-economic effects quickly.

- (2) As this development plan is formulated as an integrated project with incorporated multi-functions, the implementation of a sole component of the project-works will not reveal significant corresponding project-benefits as expected.

Besides, even if the implementation of project facilities is completed, the project-benefits will not be smoothly obtained when the programs of management and O.M. are not simultaneously applied. In Zambia, as techniques and technicians relevant to proposed programs are considered very insufficient, the technical cooperation from donor-countries and international technical cooperation agencies, is essential for the project-implementation. Regarding the matter of transferring various techniques to the Zambian side, the establishment of a systematic organization is recommended because the fields of technical cooperation are versatile according to the various development components and the final targets of the transferred technologies are farmers.

ABBREVIATIONS

ADP	Animal Draught Power
ADPP-WP	Animal Draught Power Programme, Western Province
ARPT	Adaptive Research Planning Team
ARPT-WP	Adaptive Research Planning Team, Western Province
ASIP	Agricultural Sector Investment Programme
BHN	Basic Human Needs
BS	Block Supervision
CARO	Chief Agricultural Research Officer
CEO	Camp Extension Officer
CSO	Central Statistical Office
CUSA	Credit Union and Saving Association
DANIDA	Danish International Aid Agency
DAO	District Agricultural Officer
DBZ	Development Bank of Zambia
DCU	District Cooperative Union
DOA	Department of Agriculture
DVTCS	Department of Veterinary and Tsetse Control Service
DWA	Department of Water Affairs
E.L.	Elevation above sea Level
EIRR	Economic Internal Rate of Return
ET	Evapotranspiration
FAO	Food and Agriculture Organization of the United Nations
FHH	Female Headed Household
FSR	Farming Systems Research
FSRT	Farming Systems Research Team
GAD	Gender and Development
GDP	Gross Domestic Product
GNP	Gross National Product
GP	Group Promoter
GRZ	Government of the Republic of Zambia
HH	Headed Household
H.W.L.	High Water Level
I.E.A.	Initial Environmental Assessment
INDECO	Industry Development Company
IRD	Integrated Rural Development Project
IUCN	International Union for Conservation in Nature
JICA	Japan International Cooperation Agency
KIT	Royal Tropical Institute, Netherlands
LWMP	Land and Water Management Project
L.W.L.	Low Water Level
M & E	Monitoring and Evaluation
MAFF	Ministry of Agriculture, Food and Fisheries
MDCU	Mongu District Cooperative Union

MHH	Male Headed Household
MNG	Mongu Nutrition Group
MRS	Mongu Research Station
MOCFI	Ministry of Commerce, Trade and Industry
MT	Metric tonnes
NCDP	National Commission for Development Planning
NEAP	National Extension Action Plan
NFNC/NNC	National (Food and) Nutrition Commission
NGO	Non-Governmental Organization
NHP	National Hammermill Programme
NORAD	Norwegian Agency for Development
N.P.V.	Net Present Value/Net Production Value
O.M.	Operation and Maintenance
PAO	Principal Agriculture Officer
PCHO	Provincial Crop Husbandry Officer
PCS	Primary Cooperative Society
PCU	Provincial Cooperative Union(s)
PEO	Provincial Extension Officer
PETO	Principal Extension Training Officer
PEM	Protein Energy Malnutrition
PHC	Primary Health Care
PPP	People's Participation Project
PPU	Provincial Planning Unit
PS	Permanent Secretary
PTC	Posts and Telecommunications Corporation
RD	Roads Department
RHC	Rural Health Center
RPP	Rice Promotion Programme
SCSSB	Service Center for Small Scale Enterprises
SIDA	Swedish International Development Agency
SIDO	Small Industries Development Organization
SPSS	Statistics Package for Social Sciences (a computer software programme)
SSIAZ	Small Scale Industries Association of Zambia
S/W	Scope of Work
T and V	Training and Visit Method
TM	Turning and Metals Ltd.
UHC	Urban Health Center
UNICEF	United Nations Children's Emergency Fund
UNIDO	United Nations Industrial Development Organization
UNITA	Union for appropriated Technical Assistance, Belgium
USAID	United States Agency for International Development
VA	Veterinary Assistant
VEG	Village Extension Group
VIS	Village Industry Service
WEST COOP	Western Province Cooperative Union
WID	Women in Development

WP	Western Province
WPCU	Western Province Cooperative Union (i.e. West Coop)
ZACCI	Zambia Chambers of Commerce and Industry
ZADL	Zambia Agricultural Development Ltd.
ZAMS	Zambia Agribusiness Management Support Project
ZAMHORT	Zambia Horticultural Products limited
ZAREP	Zambia Agricultural Research and Extension Support Project
ZATCO	Zambia Agricultural and Trading Cooperative Society
ZATPID	Zambia Agriculture Training, Production and Institutional Development
ZCF	Zambia Cooperatives Federation
ZCF-AB	Zambia Cooperatives Federation Agribusiness
ZCF-FS	Zambia Cooperatives Federation Finance Services
ZCS	Zambia Cold Storage
ZCSC	Zambia Cold Storage Corporation Ltd.
ZCCL	Zambia Cashew Company Limited
ZNFU	Zambia National Farmers Union

MEASURES

mm	millimeter
cm	centimeter
m	meter
m ³	cubic meter
m ³ /s	cubic meter per second
v/s	velocity per second
km	kilometer
km ²	square kilometer
g	gram
kg	kilogram
V	volt
KV	kilo volt
ton	metric ton
ℓ	liter
ha	hectare
inh	inhabitant
°C	degree Centigrade
°F	degree Fahrenheit
p.p.m.	parts per million
%	percentage
K	kwacha
ZK	Zambian Kwacha
MK or MZK	Million (Zambian) Kwacha
US\$	U.S.dollar
μ S	micro siemens

THE REPUBLIC OF ZAMBIA
THE FEASIBILITY STUDY
ON
MONGU RURAL DEVELOPMENT PROJECT
IN
ZAMBEZI RIVER FLOOD PLAIN AREA

FINAL REPORT
(MAIN REPORT)

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LOCATION MAP AND AERIAL VIEW OF PROJECT GENERAL IDEA

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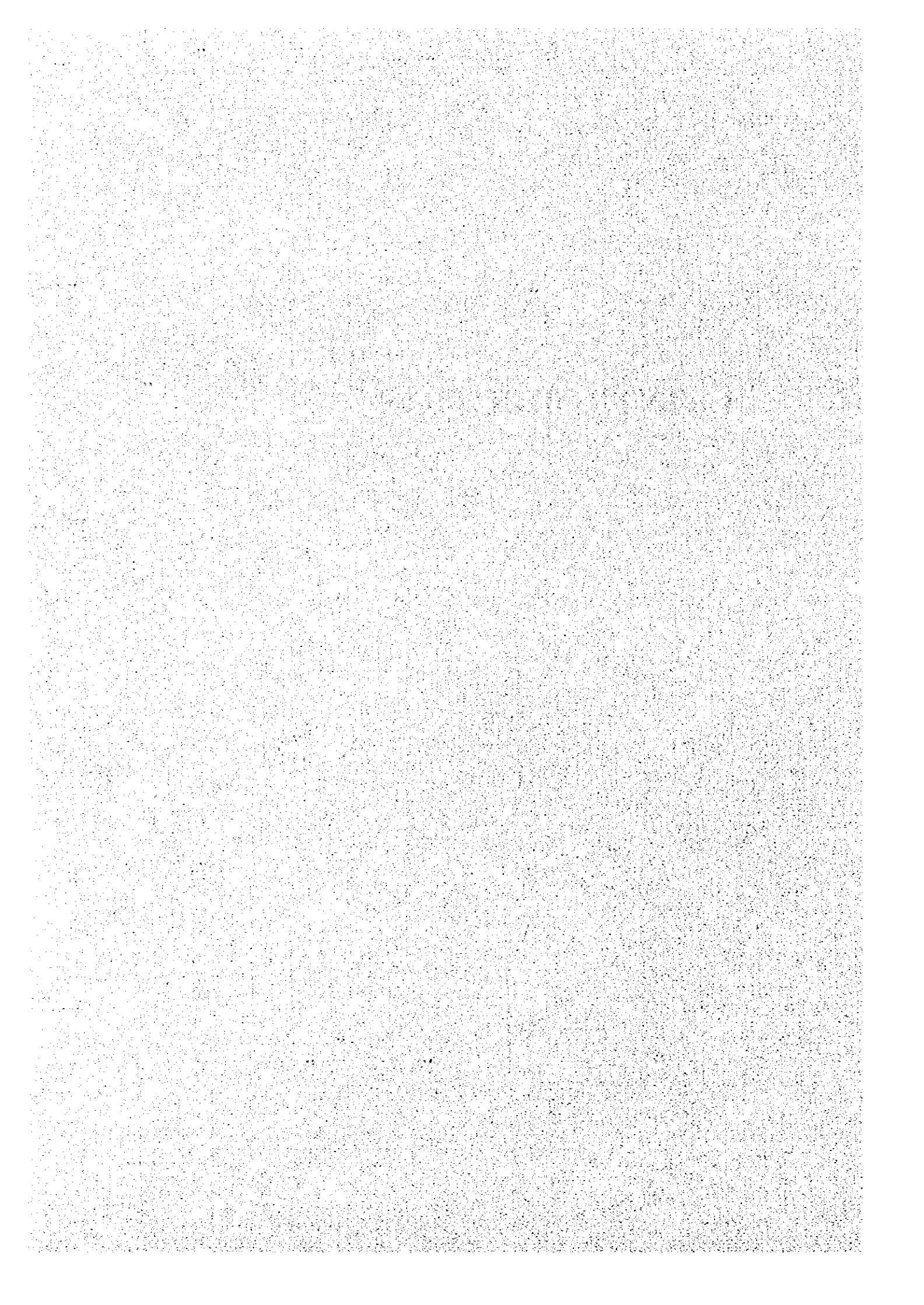
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1. INTRODUCTION



1. INTRODUCTION

1.1 Preface

Since her independence from England in 1964, Zambia had enjoyed the economic prosperity for about a decade with enormous copper mining properties which was inherited from the British colonial government. But after the worldwide economic recession of copper industries occurred in 1975, Zambia's economy which mainly depended on the copper began to decline.

The United National Independent Party (UNIP), under Kenneth Kaunda, which had been getting in power since the independence, could not cope with the economical situation, and then the party handed over its power to the Government of Movement for Multi Party Democracy (M.M.D) headed by Frederick Chiluba. This present government has taken the policy of administrative decentralization to provincial level instead of central command policy taken by the former government, and promoted boldly privatization and administrative reform for rebuilding the national economy by encouraging agricultural sector to replace the copper industries.

Western Province, where the Study Area locates in, has few mineral resources among 9 provinces in Zambia and traditionally depends mainly on agriculture. The agriculture in Western Province is characterized by a small scale subsistent family farms with unstable and low productivity due to the lack of infrastructure.

Noting the potential of agricultural development of the floodplain and the adjacent area of Zambezi tributary, the Government of Zambia had requested the Government of Japan for Technical Cooperations to establish a basic guideline for agricultural development of this floodplain. In response to the request, JICA had implemented the Agricultural Verification Study from 1987 to 1992 to establish a guideline of farming technology for small scale farmers and infrastructure improvement, identifying the potential of agricultural development in this area.

Following above development, in November 1992, the Government of Zambia requested Japanese Government to carry out a feasibility study of the Mongu rural development project for which JICA sent a pre-study team and exchanged a scope of works of the study on 31st August 1993.

In the S/W, the study is consisted of two phases, of which the first phase is to make a master plan for whole study area and at the second phase a feasibility study to be carried out in a selected area by priority. The whole term of the study is scheduled as 18 months.

The first phase of the study was carried out with two stages, the first stage, from 8 February to 27 March, and the second stage from 22 May to 8 July in 1994.

1.2 Objective of the Survey

This survey aims at making a master plan on rural development in the Zambezi Floodplain Edge area and then making a feasibility plan choosing a priority zone out of the master plan area, in order to improve the agricultural productivity and living standard of small farmers. The results obtained from the survey and the technologies transferred to Zambian Government officials through the survey practices are, at the same time, applied and extended not only to the surveyed area but also to all over the country. In 1992, Zambian Government published the development programme consisted of following main components, 1) achievement of staple food self sufficiency, 2) establishment of agriculture utilizing domestic resources, 3) betterment of farm income based on the farming adapted to the free marketing economy, 4) promotion of rural industries and employment, 5) financial stabilization by export of agricultural products. All of these items are matters for investigation or the target of development of this survey.

1.3 Scope of the Study

(1) Study area

The master plan study area is about 12,000 ha on the edge of the floodplain left bank of Zambezi from Limulunga to Namushakende along the national road for about 40 km.

(2) Schedule of the study

The study is to be carried out in phase I and phase II as shown in the following :

1) Preparatory home work

- Data collection, information arrangement and assessment and planning of the study execution
- Preparation of the inception report
- Arrangement of the materials and apparatus for the study

2) Phase I field study (1)

- Explanation and mutual discussion of the inception report
- Preparation of the technology transfer plan of each study field
- Field works and collection, assessment and analyses of the existing materials, and information
- Review of the ongoing studies, plans and related projects
- Field works and surveys reentrusted to the local agency
- Preparation, explanation and mutual discussion of the field report

3) Phase I field study (2)

- **Field works and collection, assessment and analyses of the existing materials and information**
- **Review of the ongoing studies, plans and related projects**
- **Field works and surveys entrusted to the local agency**
- **Preliminary analyses of developing potential and constraints for development**
- **Studies for the basic development plan**
- **Selection of prioritized proposed sites**
- **Preparation, explanation and mutual discussion of the progress report (I)**

4) Phase I home work

- **Arrangements and analyses of the field study**
- **Decision of the basic development plan**
- **Selection of the prioritized site**
- **Preparation of the interim report**

5) Phase II field study

- **Explanation and mutual discussion of the interim report**
- **Supplement studies and surveys for field works and collected data**
- **Precise surveys for prioritized sites**
- **Provisional decision of the prioritized site**
- **Preparation, explanation and mutual discussion of the progress report (II)**

6) Phase II home work

- **Decision of the development plan for the prioritized sites**
- **Preparation of the draft final report**

7) Explanation and mutual discussion of the draft final report

8) Preparation of the final report and technology transfer report

