

**Basic Design Study Report  
on  
The Construction Project  
of  
Food Grain Storagehouses  
in  
The Republic of Zambia**

**December, 1987**

**Japan International Cooperation Agency**



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**December, 1987**

**Japan International Cooperation Agency**

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## PREFACE

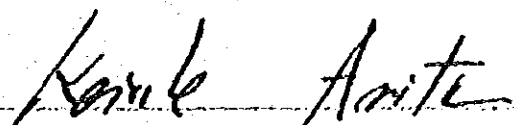
In response to the request of the Government of the Republic of Zambia, the Government of Japan has decided to conduct a basic design study on the Construction Project of Food Grain Storehouses and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Zambia a study team headed by Mr. Hajime Ishii, Senior Officer for Storage Technique, Food Agency, Ministry of Agriculture, Forestry and Fisheries from September 16 to October 10, 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 and the present report has been prepared.

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

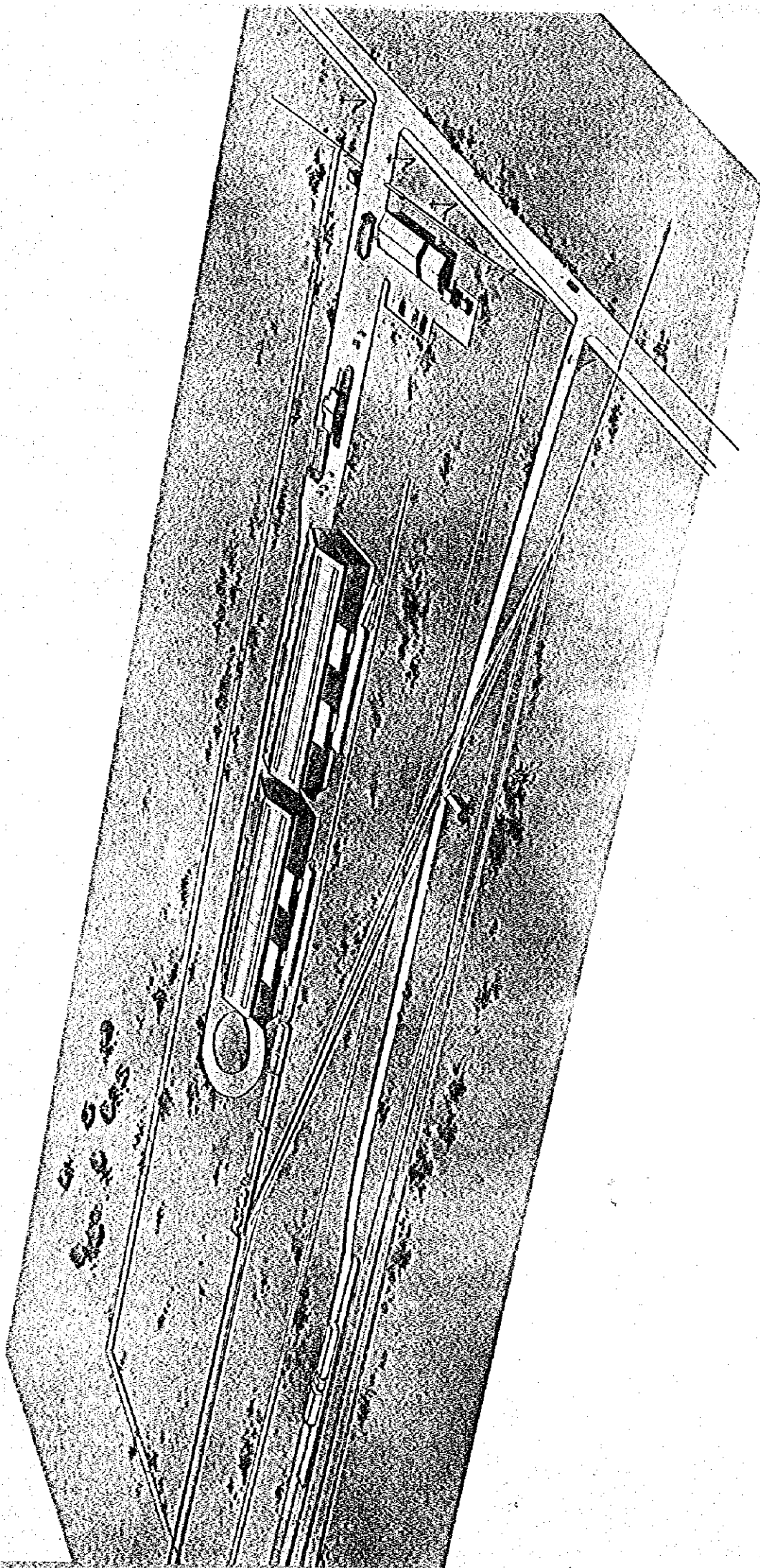
I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Zambia for their close cooperation extended to the team.

December, 1987

A handwritten signature in dark ink, appearing to read 'Keisuke Arita', is written over a horizontal line.

Keisuke Arita  
President  
Japan International Cooperation Agency



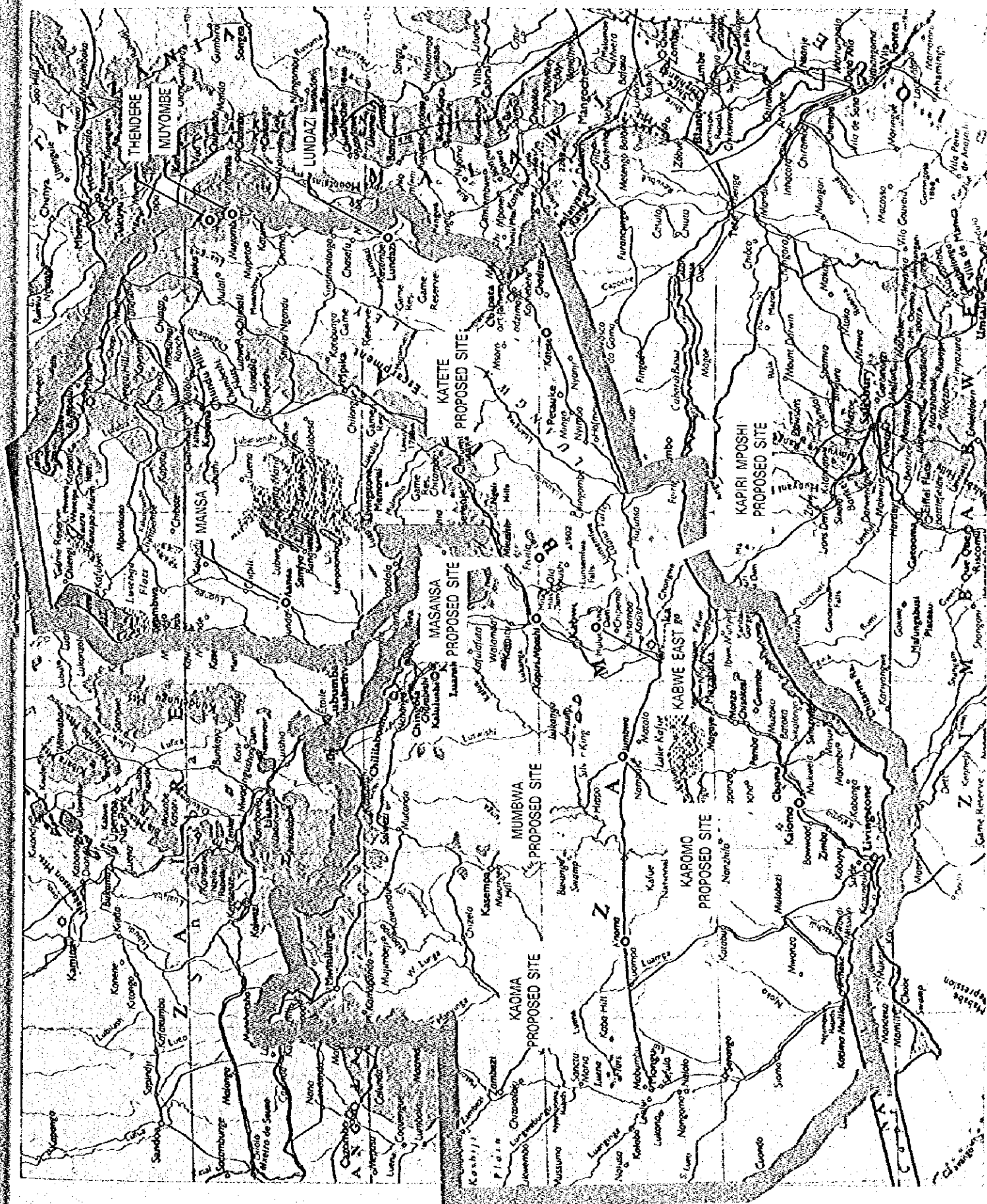


BIRD'S EYE VIEW





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## SITE MAP

# LOMO DEPOT



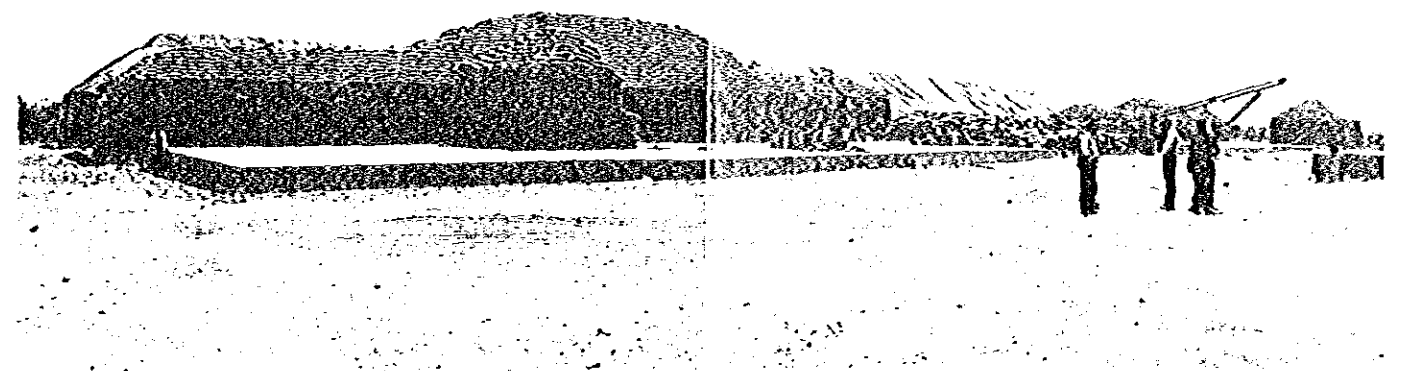
PROJECT SITE, SOUTHEAST SIDE VIEW



PROJECT SITE, NORTHEAST SIDE VIEW

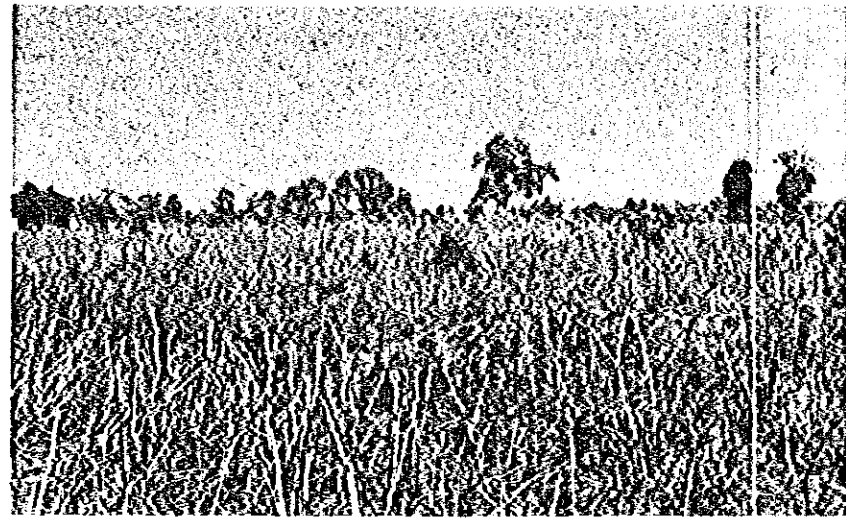


PROJECT SITE, NORTHWEST SIDE VIEW



EXISTING OPEN HARDSTANDINGS

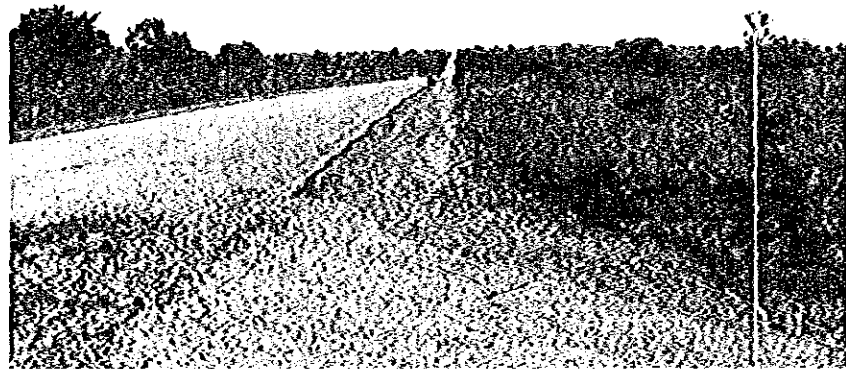
# JMBWA DEPOT



PROJECT SITE, WEST SIDE VIEW-1



PROJECT SITE, WEST SIDE VIEW-2



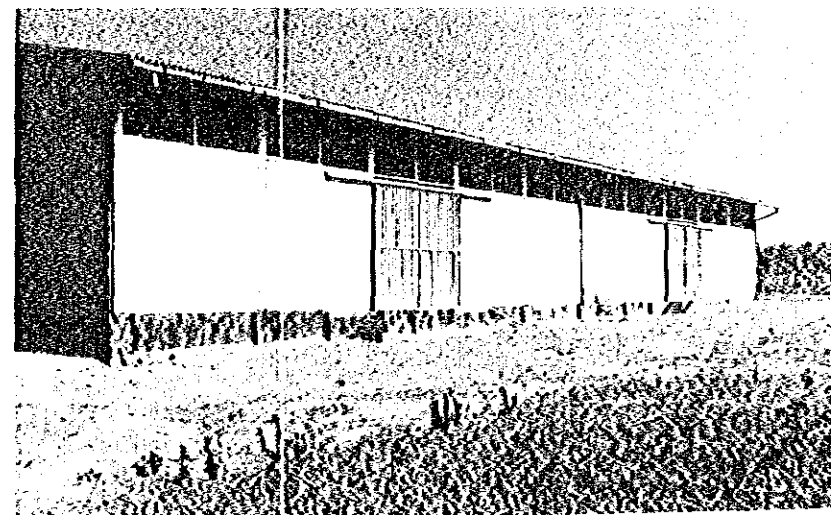
THE FRONT ROAD VIEW



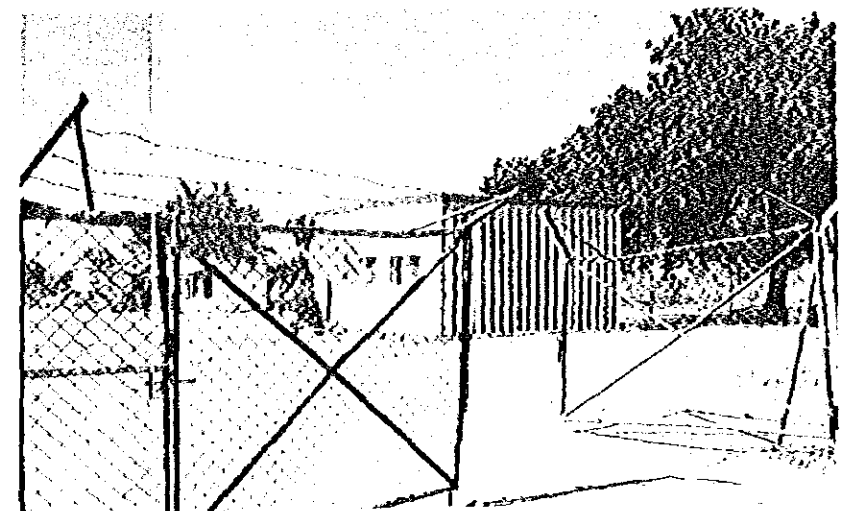
PROJECT SITE, VIEW FROM THE FRONT ROAD



EXISTING STORAGEHOUSES-1



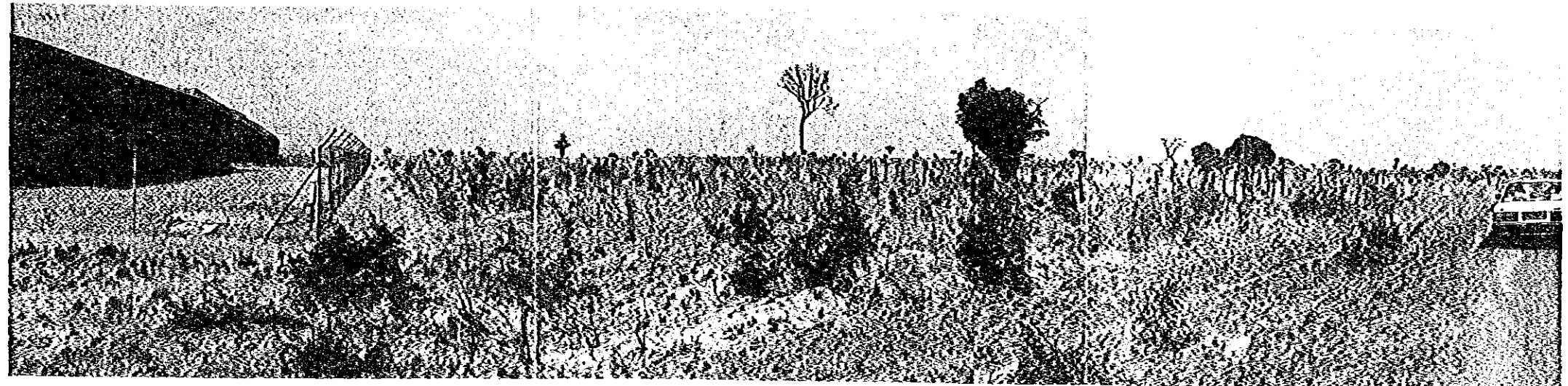
EXISTING STORAGEHOUSES-2



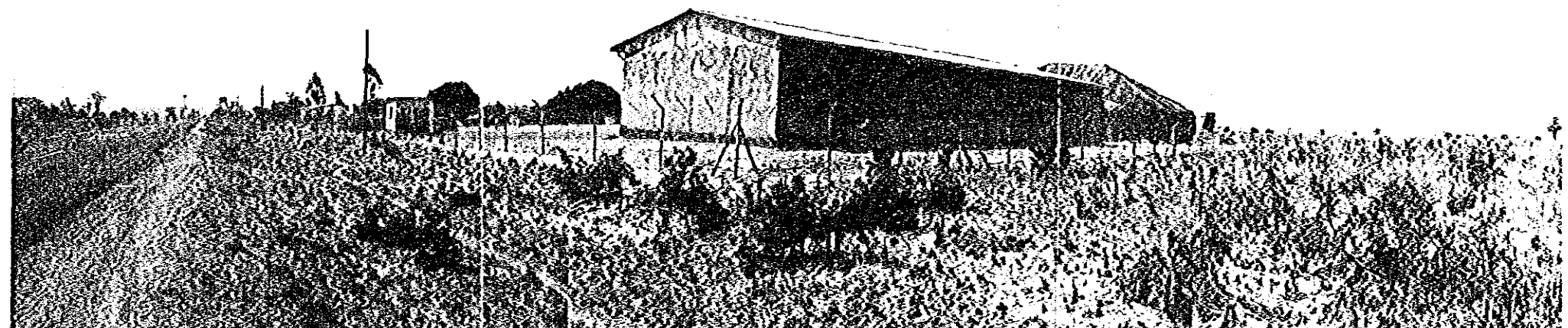
EXISTING BUILDINGS



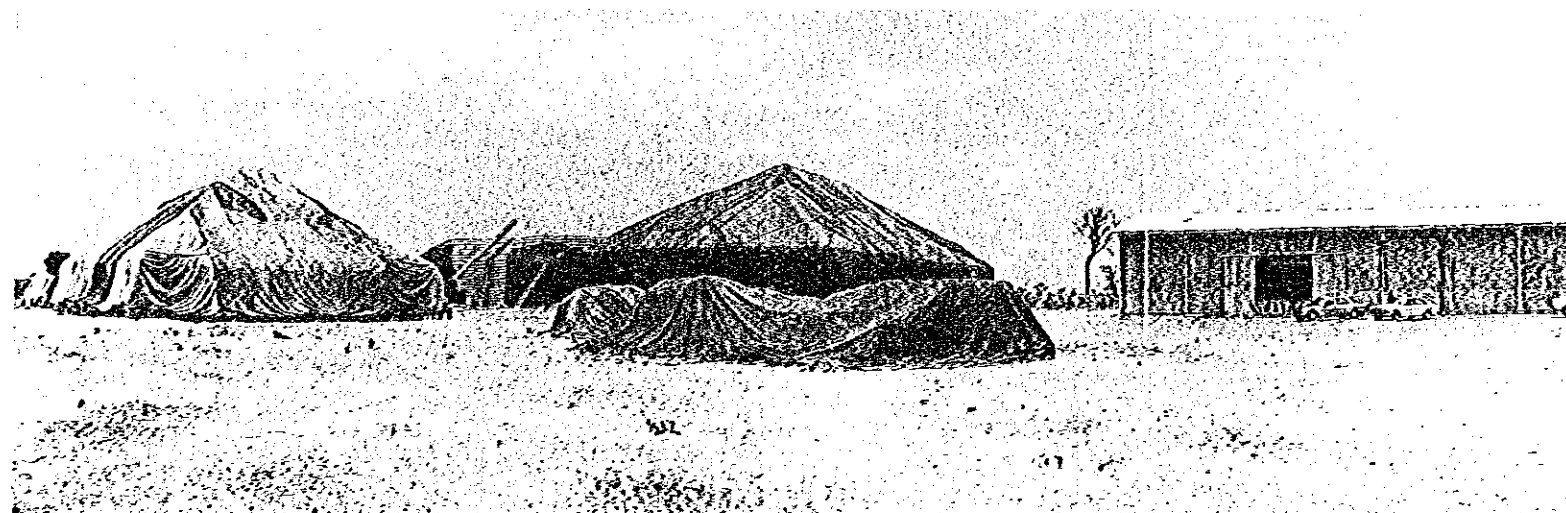
# OMA DEPOT



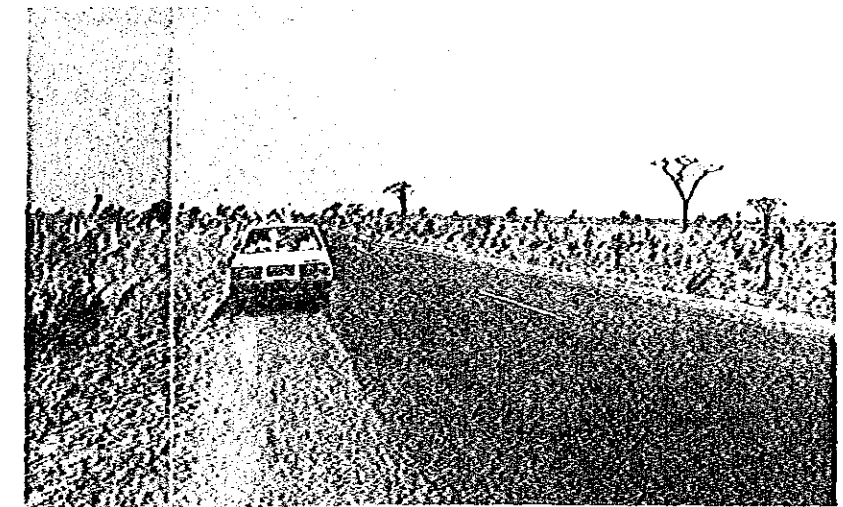
PROJECT SITE, NORTH WEST SIDE VIEW



PROJECT SITE AND EXISTING DEPOT, WEST SIDE VIEW

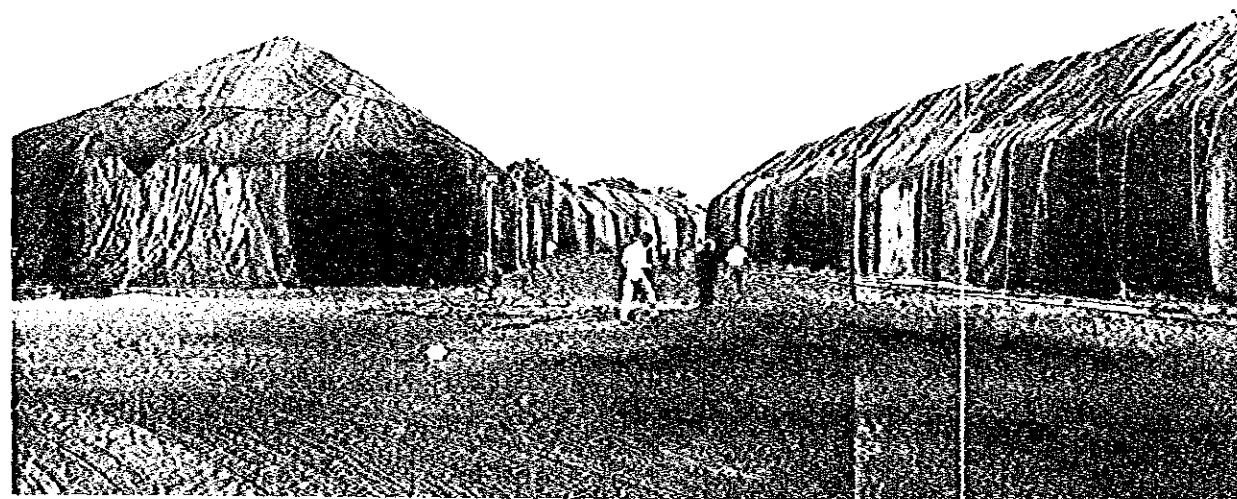


EXISTING DEPOT



THE FRONT ROAD VIEW

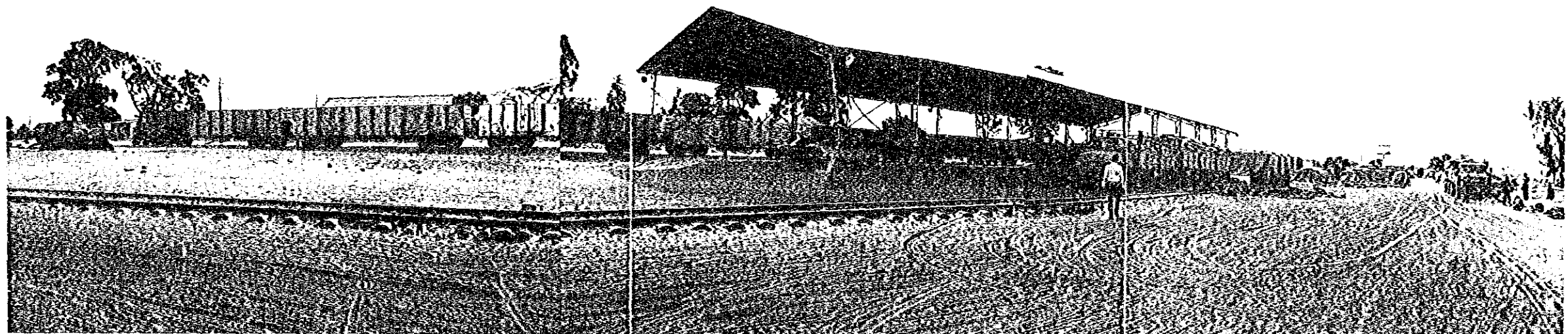
# IRI-MPOSHI DEPOT



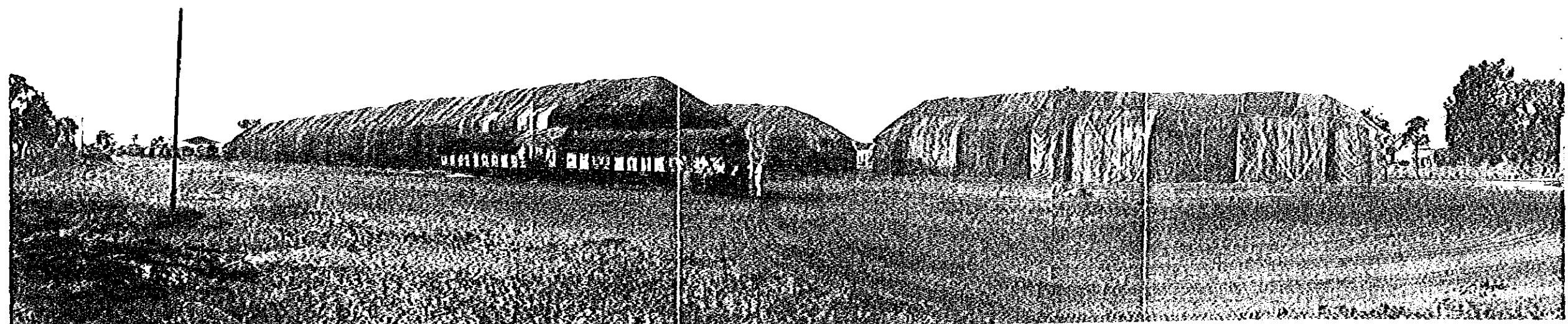
EXISTING DEPOT-1



EXISTING DEPOT-2



RAILWAY SIDE TRACKS AND EXISTING BUILDINGS



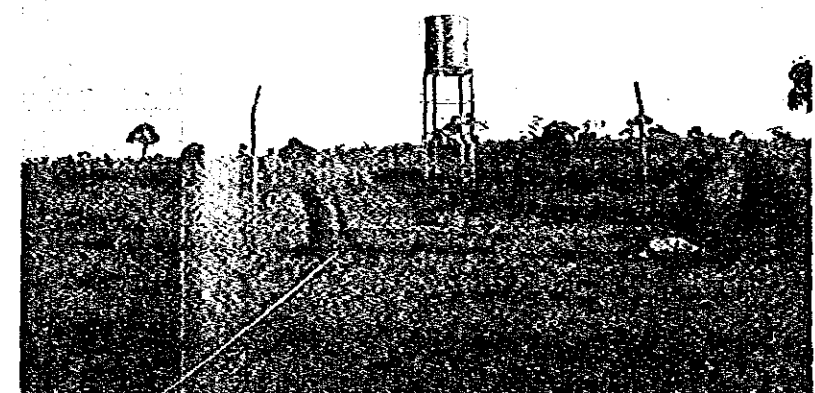
EXISTING DEPOT



ETE DEPOT



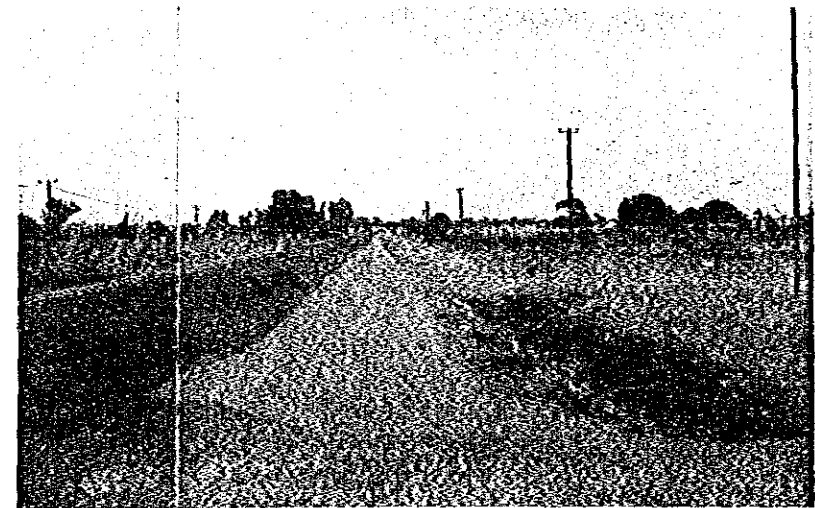
PROJECT SITE, EAST SIDE VIEW



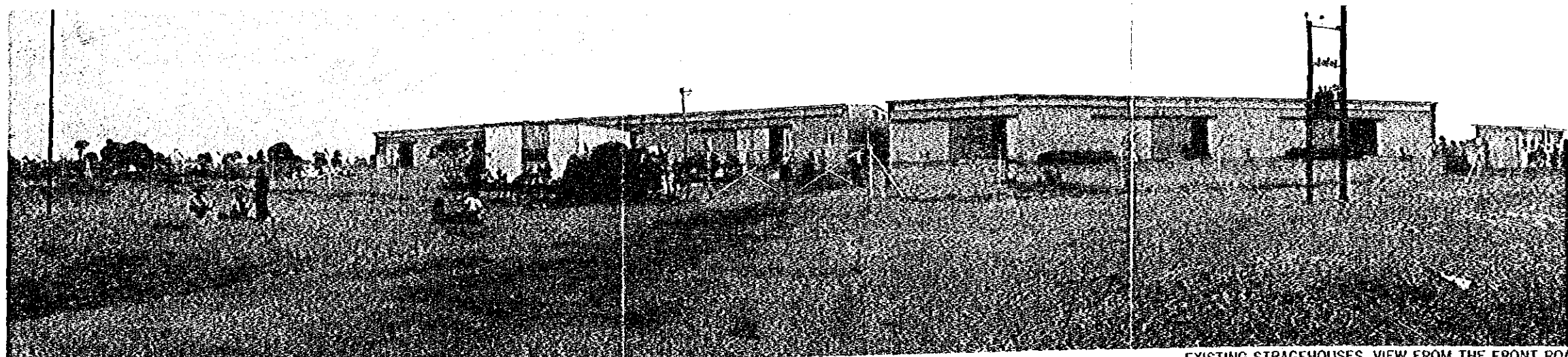
EXISTING HIGH TANK



PROJECT SITE, NORTH SIDE VIEW



THE FRONT ROAD VIEW



EXISTING STRAGEHOUSES, VIEW FROM THE FRONT ROAD



## SUMMARY





## SUMMARY

The economy in the Republic of Zambia relies heavily on its copper industry and so it worsened rapidly in 1975 due to the drastic fall in the international copper price. The Government of Zambia therefore had to change its policy of basing the economy on copper and has been following a policy which places great importance on agriculture. In recent years, however, the food self-sufficiency rate has been decreasing owing to such unfavorable conditions as the rapid increase in urban population, insufficient investment in agriculture due to lack of foreign currency, drought, etc. As a result, though originally a grain exporting country, Zambia became a grain importing country in 1979. To improve the situation, the government announced the "Operation Food Production Program" in 1980, making food self-sufficiency the most important policy. In Zambia food grain is produced by traditional peasant farmers who are engaged in subsistence agriculture, medium-size farms which produce some cash crops, and commercial farms which produce farm products on a large scale. Of the grain produced in Zambia, maize is the nation's staple food and accounts for about 80% of domestic grain consumption. It is mainly produced in Central, Eastern, and Southern Provinces.

Grain distribution used to be handled by the NAMB (National Agricultural Marketing Board) under the Ministry of Agriculture and Water Development. However, the Ministry of Cooperatives took it over from November, 1986. For the distribution processes involving transportation and storage, the indoor facilities for food grain are insufficient. As a result, most grain is stored outdoors piled up in fields. This method allows major losses in quality due to exposure to direct sunlight, rainwater, and moisture from the ground, and in quantity due to pests such as insects and rats, as well as broken bags, etc. This accelerated the fall in the food self-sufficiency rate.

Under such circumstances, the Government of Zambia has actively constructed food grain storehouses to achieve smooth grain

distribution and to reduce loss of grain. As part of this project, the Government of Zambia has requested grant aid from the Government of Japan to construct food grain storehouses. In response to the request, the Government of Japan constructed food grain storehouses in 1985 with a total storage capacity of 19,000 tons at 3 sites: Chambishi in Copperbelt Province, Masansa in Central Province and Mtirizi in Eastern Province. In addition to the above, the Government of Japan constructed grain storehouses in 1986, in Chingola in Copperbelt Province with a storage capacity of 10,000 tons, making the total capacity of storehouses constructed by Japan 29,000 tons, an important contribution to grain distribution in Zambia. After the completion of Japanese-government-assisted construction of storehouses with a total storage capacity of 29,000 tons of grain, indoor storage facilities for food grain in Zambia reached the remarkable total capacity of 414,700 tons, including the 110,000 tons of silo capacity constructed before Zambia achieved independence. Based on this remarkable achievement, the Government of Zambia is continuing its efforts to achieve its goal of storing all marketed grain in indoor storage facilities. The Government of Zambia has further requested the Government of Japan to construct food grain storehouses with a total capacity of 90,000 tons at ten proposed sites over a period of five years through grant aid.

In response to this request, the Government of Japan decided to carry out a Basic Design Study for this project and the Japan International Cooperation Agency dispatched a Basic Design Study Team to the Republic of Zambia from September 16 to October 10, 1987.

As a result of a preliminary study of the grain distribution conditions and construction conditions of ten construction sites proposed by the Government of Zambia, the Study Team decided not to carry out surveys of Muyombe and Thendere in Northern Province, Masansa in Luapula Province, and Lundazi in Eastern Province. Furthermore, construction of a storehouse in Kabwe-East of Kabwe District in Central Province, for which a survey was carried out, has been decided to be excluded this time owing to its location and grain distribution conditions. Although Kabwe District in Central

Province is one of the leading maize producers in Zambia, its ratio of storehouses is low. Therefore, as an alternative to Kabwe-East, Kapiri-Mposhi in Kabwe District, which was surveyed along with the other five proposed sites, was proposed instead. The results were analyzed as follows:

- (1) Kalomo - Located along the Zambia Railways line connecting Lusaka and Livingstone, Kalomo is an important place for grain collection since it acts as a base for production and distribution in Southern Province, the major maize producing province. At present, there are no grain storehouses in Kalomo and all the harvested maize is stored outdoors. Thus, construction of a maize storehouse is urgently required.
- (2) Kaoma - The NAMB is eager to construct a new base here as a depot to collect grain in Kaoma District, one of the major producers of grain in Western Province, and as a receiving depot since it is a major transit point of traffic from Central and Eastern Provinces. Presently, the need for a storehouse is not large enough to justify the requested storage capacity of 10,000 tons, but if the construction scale is reduced to a capacity of 5,000 tons, construction of a storehouse is evaluated highly.
- (3) Mumbwa - Facing a major trunk road connecting Lusaka and Western Province, Mumbwa is important as a base for production and distribution in Central Province, a major maize producer. There already exist storehouses with a capacity of 10,000 tons, constructed with the financial assistance of the Government of Canada. However, the construction of a storehouse with a 5,000 ton capacity instead of the requested 10,000 tons is considered to be urgently necessary, due to the grain distribution and location conditions.
- (4) Masansa - A depot for production areas in Mukushi District of Central Province, Masansa is a major maize production area in Zambia. At this depot, there is a storehouse with a capacity of 5,000 tons constructed with grant aid from the Government of

Japan. Because of the volume of maize expected to be collected at this depot, construction of storehouses with a capacity of 10,000 tons is necessary. However, as the proposed site is located some distance from a trunk road and is close to the production areas, its need for a storehouse is below that of Kapiri-Mposhi in the same Central Province.

- (5) Kapiri-Mposhi - Located at the junction of Zambia Railways and the Tanzan Railway, Kapiri-Mposhi is an important distribution base adjacent to a national highway connecting Lusaka and Copperbelt, both large consumption areas. At present, the site does not have a grain storehouse, and all the maize is stored outdoors. Maize storehouses are therefore urgently necessary.
- (6) Katete - Eastern Province ships more than 95% of the grain handled by the NAMB to other provinces. Consequently, an ideal receiving/shipping model shows that the required storage capacity will be smaller than the volume handled. In consideration of the inventory level determined during the site survey, despite there being a 5,000 ton storehouse at this depot constructed with the financial assistance of the Government of Canada, construction of an additional 5,000 ton storehouse is deemed necessary.

From the above, the urgency and capacity of the proposed construction sites have been established as follows:

Urgency	Proposed construction site	Requested capacity	Decided capacity
1	Kalomo	10,000 t	10,000 t
2	Mumbwa	10,000	5,000
3	Kapiri-Mposhi	-	10,000
4	Kaoma	10,000	5,000
5	Masansa	10,000	10,000
6	Katete	5,000	5,000

As the results of the above study, a Basic Design has been prepared for the construction of grain storehouses at the above six location, however, the execution schedule and estimation of project cost are prepared only for Kalomo and Mumbwa in the project, which are deemed to have higher urgency. The Study Team proposes that grain storehouse be constructed in order of the urgency of each proposed site as described above.

After the Exchange of Notes and specified procedures, execution of this project will require about 3 months for detailed design and about 12 months for the construction work.

The cost borne by the Government of Zambia for the Project is estimated to be approximately 19,800,000 yen.

Construction of grain storehouses in the requested locations outlined above will improve grain distribution conditions in Zambia and bring about the following effects:

- (1) Reduction in qualitative loss of grain through indoor storage --- Supply of quality grain to the consumers.
- (2) Reduction in quantitative loss of grain through indoor storage --- Establishment of food self-sufficiency.
- (3) Improvement of planned control over distribution from grain production to transportation and consumption.

An understanding of the production and distribution conditions of the areas in which grain storehouse will be located is important for selecting the construction sites for grain storehouses and for determining their scale. Through such understanding, the distribution system can be predicted. However, at present the compilation of statistical data and information necessary to understand production and distribution conditions is not thoroughly done in Zambia. The Study team proposes that, together with the construction of grain storehouses, a planned system of control over distribution including production, transportation, and consumption be established and that the statistical data and information necessary for such control be prepared.



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## CHAPTER 1. INTRODUCTION



## CHAPTER 1. INTRODUCTION

The economy in Zambia, which was largely dependent on the production and export of copper, sharply declined in 1975 when the international price of copper dropped. The Government of Zambia was forced to change course, and has been implementing a policy which emphasizes agriculture since then. In addition, the drought that has hit African nations in recent years combined with the low productivity of Zambian agriculture has resulted in shortages of food. Zambia, unfortunately, formerly a grain exporting country, became an importing country.

Under the above circumstances, the government announced the "Operation Food Production Program" in 1980 which makes food self-sufficiency the most important priority for the nation. As one of the most important agricultural policies, and in order to minimize losses of food grain in both quality and quantity during distribution as well as to establish a smooth distribution of food grain, storehouses are being constructed with the aid of foreign countries including Japan and Canada. In 1985, the Government of Japan constructed grain storehouses with a total storage capacity of 19,000 tons in three locations: Chambishi (consumption area), Masansa and Mtirizi (production areas), and further constructed grain storehouses with a storage capacity of 10,000 tons in Chingola in 1986 through grant aid. As a result, the economic cooperation of Japan is valued highly.

Such successful results have led the Government of Zambia to request the continuing cooperation of the Government of Japan in providing grant aid for a period of five years to construct grain storehouses at ten locations with a total storage capacity of 90,000 tons.

The request for construction of storehouses was for six production provinces among the nine provinces of Zambia, excluding Lusaka Province and Copperbelt Province, grain consumption provinces, and Northwestern Province where grain production is the lowest. The Government of Zambia is making efforts to achieve its goal of storing all the distributed grain indoors. Thus, the government expects that construction of

storehouses, whose distribution is well balanced between all regions, will be completed through its policy of placing importance on agriculture and increasing the production.

Details shown in the Request are for the following grain storehouses:

Location	Number of storehouses	Storage capacity (t)
Mumbwa (Central Province)	2	10,000
Masansa (Central Province)	2	10,000
Kabwe-East (Central Province)	1	5,000
Katete (Eastern Province)	1	5,000
Lundazi (Northern Province)	2	10,000
Kaoma (Western Province)	2	10,000
Kalomo (Southern Province)	2	10,000
Thendere (Northern Province)	2	10,000
Muyombe (Northern Province)	2	10,000
Mansa (Luapula Province)	2	20,000
Total	18 storehouses	90,000 t

Note: Storage Capacity of each storehouse: 5,000 t

In response to the request of the Government of Zambia, the Government of Japan dispatched a Basic Design Study Team, headed by Mr. Hajime Ishii, Senior Officer for Storage Technique, Food Agency, Ministry of Agriculture, Forestry and Fisheries, to the Republic of Zambia through the Japan International Cooperation Agency from September 16 to October 10, 1987 in order to conduct a site survey.

The details of the Survey are as follows:

- 1) Confirmation of the requested details.
- 2) Study of the background of the project such as the conditions of grain distribution, etc.
- 3) On-site survey of existing grain storage and construction condition in the proposed sites.

- 4) Study of the present state of the grain storehouses and future plans.
- 5) Study of the local conditions of construction and procurement and transportation of construction materials.

Based on the above studies, discussions were held with the officials of the Government of Zambia concerned.

The Minutes of the Discussions, the organization of the Study Team, the officials of the Government of Zambia concerned, and the survey schedule are included in the appendix.

The contents of discussions and of the field survey as well as the collected information and materials have been analyzed, and the ability of this project to improve grain distribution conditions in Zambia has been evaluated. A proposed Basic Design has been prepared with the most appropriate scale and conditions for the facilities.



## **CHAPTER 2. BACKGROUND OF PROJECT**





## CHAPTER 2. BACKGROUND OF PROJECT

### 2-1 GENERAL CONDITIONS

#### 2-1-1 Land and Population

Landlocked Zambia, located in the southern part of the African continent, is bordered by Zimbabwe and Botswana to the south, Tanzania and Zaire to the north, Malawi and Mozambique to the east, and Angola and Namibia to the west. The country lies from longitude  $22^{\circ}\text{E}$  to  $34^{\circ}\text{E}$  and from latitude  $9^{\circ}\text{S}$  to  $18^{\circ}\text{S}$ . The country's total area of  $750,000 \text{ km}^2$  makes it about twice the size of Japan.

The land is roughly divided into the lowland areas 500 m or less above sea level in the basin of the Zambezi River, which flows along the southern border, and of its branch, the Luangwa River; the flood plain in the upper reaches of the Zambezi River in the west; the basin of the Kafue River; and the plateau which comprises most of the nation's land. Except for the lowlands along the Zambezi and Luangwa and for the mountains lying on the Tanzanian and Malawi borders, most of the land consists of a gently rolling plateau 1,000 to 1,500 m above sea level. It is a savannah where tall grass and bushes grow.

The country has a tropical savannah climate. It is comparatively cool throughout the year except in the lowlands. The year in Zambia is divided into the cool dry season from May to August, the hot dry season from September to November, and the hot rainy season from December to March. The temperature seldom exceeds  $30^{\circ}\text{C}$ . The lowest temperature in July is sometimes  $5^{\circ}\text{C}$  or  $6^{\circ}\text{C}$ . The northern part of the country gets more rainfall than the southern part. Rainfall ranges from 800 to 1,600 mm, well capable of supporting the country's agriculture. However, the country is sometimes hit by droughts. The rain, which is indispensable for successful crops, is brought by the north-westerly trade wind from the Zaire Basin, while the south-easterly trade wind prevails in the dry season.

Zambia is very sparsely populated with about 6 million people (5,680,000 in 1980 6,220,000 in 1983 and 6,660,000 in 1985 according to government statistics) inhabiting an area which is about twice the size of Japan. The country consists of 9 provinces: Lusaka, Copperbelt, Central, Eastern, Southern, Western, Northern, Northwestern, and Luapula Province. 34% of the population lives in Lusaka Province where the capital is located and in Copperbelt Province where there are a cluster of copper mines.

#### 2-1-2 National Economy

The Zambian economy depends on the export of mineral products, mainly copper. Thus, the economy has been severely affected by fluctuations in the copper market in the past. In particular, the decreased demand for copper, because of the recession in the world economy due to the oil crisis in 1974, and the fall in copper prices in 1975 decimated the Zambian economy. Copper production reached a peak in 1976 with the annual production of 700,000 tons, but dropped to 479,446 tons in 1985 and 459,172 tons in 1986.

Meanwhile, to free the nation's economy from its dependence on copper, a policy which emphasizes agriculture and aims at food self-sufficiency and at an increase in the production of agricultural products for export to acquire foreign currency has been in effect from the initial stage of the First National Development Plan, which was followed by the Second and Third National Development Plans (1979 - 83). However, contrary to the expected growth of 4.8% during the five years of the Third National Development Plans, the growth rate was only 0.06%. During the same period, agricultural production grew only by 1.5% against the target of 5.5% due to drought in every year except 1981.

The Government of Zambia signed IMF standby credits, totalling 436.5 million SDR, in April 1983 and July 1984 to cope with the rapid increase of external debt. Zambia also executed various policies to rebuild the domestic economy following the conditions laid down by the IMF at the time each agreement was signed.

In response to IMF suggestions, the introduction of an auction system has been in effect since Oct. 11th, 1985.

This auction system, however, exerted a negative effect on the national economy, causing inflation. Inflation of 20% in 1984 rose to 60% in 1986, thus increasing the number of unemployed, especially among the young generation, and impairing the purchasing power of middle to low income classes. Zambia's external debt, amounting to 0.75 billion dollars in 1976, increased to 2.6 billion in 1984 and to 5.1 billion in 1986.

The Government of Zambia abandoned the tight fiscal policy which was primarily guided by the IMF, and adopted its own Interim National Development Plan, a policy of self-support.

#### 2-1-3 National Development Plan

The Government of Zambia has established the National Commission for Development Planning under the supervision of the President's Office to prepare economic plans. After the completion of the Third National Development Plan of 1979 to 1983, the government announced the Interim National Development Plan in July this year for the implementation of its economic policy of self-support. In this new policy, a goal was set to establish a policy of self-support by fixing the foreign exchange rate of the Kwacha at 1 US dollar to 8 Kwacha and by restraining inflation while restricting items for importation, limiting the amounts of repayment of the external debt, and diversifying into items for export other than copper. The theme of this plan is "Growth from Own Resources."

Table 1 Gross Domestic Product (Based on prices in 1977)

(K million)

	1984	1985	1986	1987-88 Target Interim Plan	Growth Rate (%) for INDP
Aggregate GDP	2,012	2,041	2,051	2,120	3.3
Agriculture, Forestry and Fisheries	332	344	364	380	4.4
Mining	200	185	174	176	1.1
Manufacturing	389	420	420	440	5.7
Electricity, Gas and Water	71	73	74	76	2.7
Construction	89	77	81	85	4.9
Wholesale and Retail Trade	169	175	169	175	3.5
Hotels, Bars and Restaurants	49	51	49	52	6.0
Transport and Communications	116	109	107	112	4.5
Financial Institutions and Insurance	63	61	60	61	1.7
Real Estate and Business Services	180	179	186	193	2.4
Community, Social and Personal Services	355	365	362	370	2.2

Source: CSO and NCDP

Table 2 Investment Plan in the Interim National Development Plan

(K million)

	Government	Parastatal	Private	Total	Per cent Distribution
Agriculture, Forestry and Fisheries	250	100	165	515	16
Lands and Natural Resources	98	35	30	163	5
Mining	100	525	35	660	20
Manufacturing and Trade	80	315	235	630	19
Tourism	16	35	68	119	4
Energy	66	100	35	201	6
Transport and Communications	165	170	30	365	11
Education	130	-	20	150	5
Housing and Real Estates	65	100	35	200	6
Health	65	-	17	82	2
General Administration	85	-	-	85	3
Provinces	130	-	-	130	3
Total	1,250	1,380	670	3,300	100

Source: NCDP