BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR
THE MULTI-PURPOSE AGRICULTURAL WAREHOUSE CONSTRUCTION
IN
THE REPUBLIC OF MALAWI

JANUARY 1991

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to a request from the Government of the Republic of Malawi, the Government of Japan has decided to conduct a Basic Design Study on the Project for the Multi-Purpose Agricultural Warehouse Construction and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Malawi a survey team headed by Mr. Kazuhisa Matsuoka, Director, 1st Basic Design Study Division, Grant Aid Study & Design Department, JICA, from August 5 to September 4, 1990.

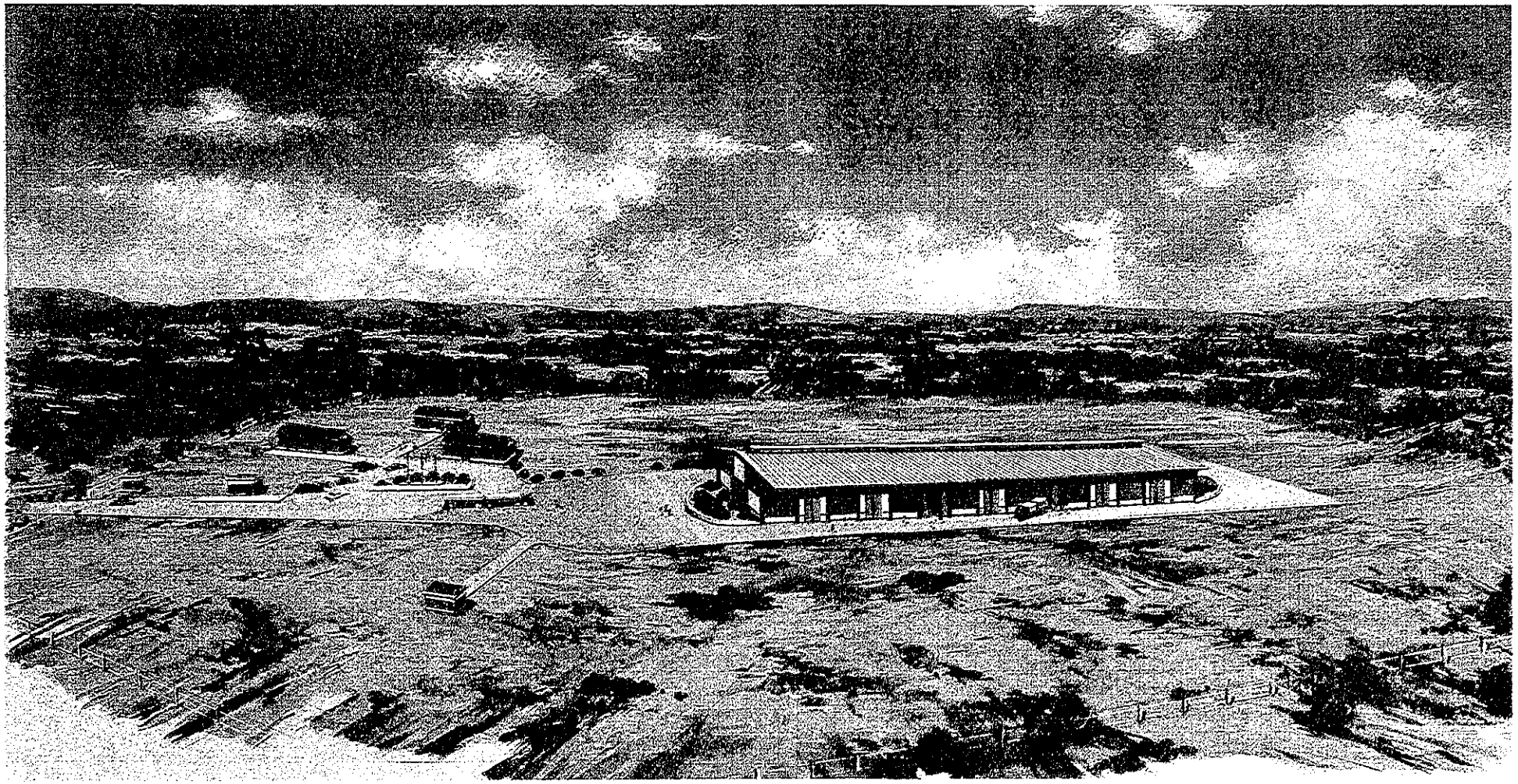
The team exchanged views with the officials concerned of the Government of Malawi and conducted a field survey in the Project area. After the team returned to Japan, further studies were made. Then, a mission was sent to Malawi in order to discuss the draft report and the present report was prepared.

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 sincere appreciation to the officials concerned of the Government of the Republic of Malawi for their close cooperation extended to the teams.

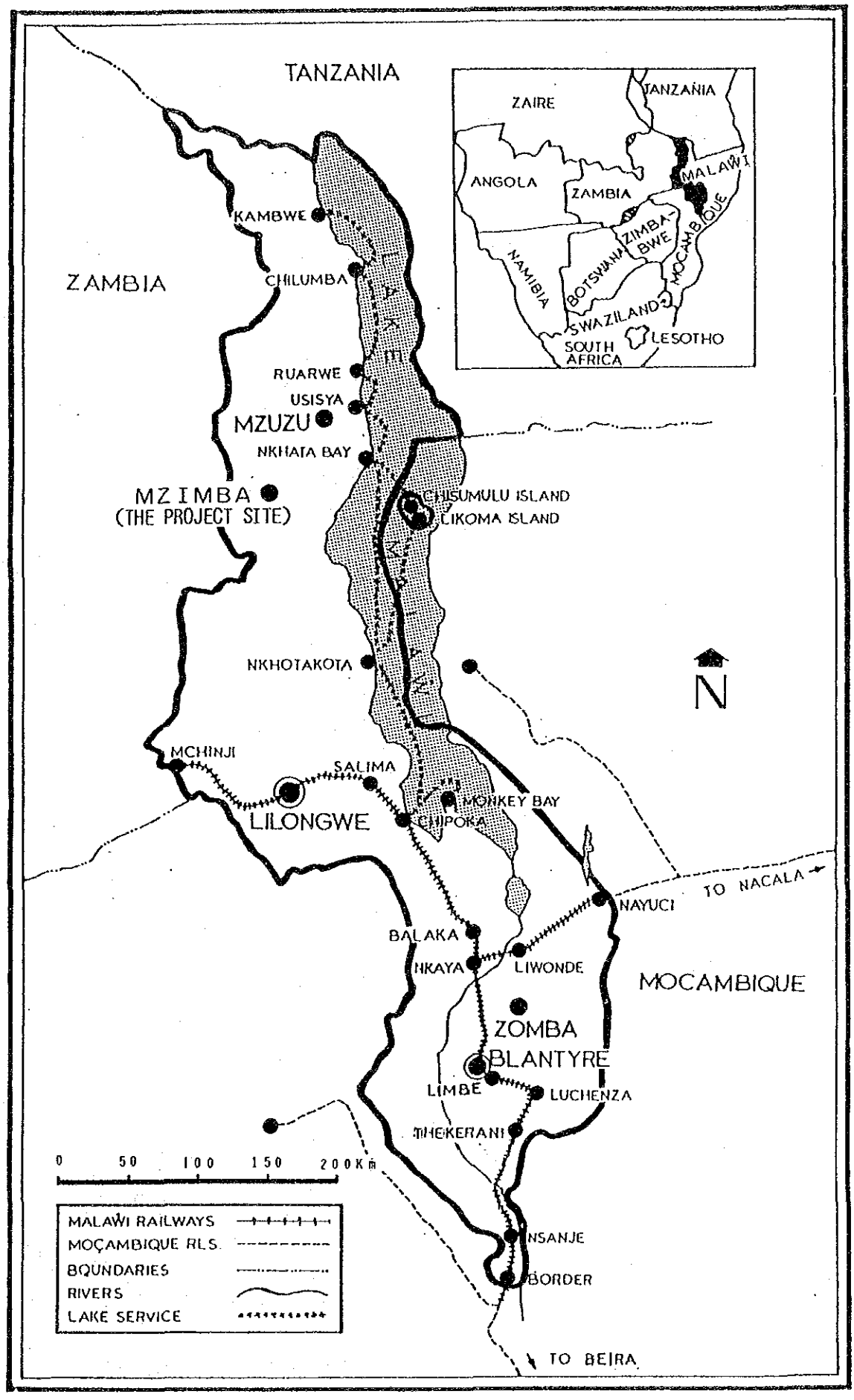
January 1991

Kensuke Yanagiya
President
Japan International Cooperation Agency



AGRICULTURAL WAREHOUSE AT MZIMBA

MAP OF MALAWI



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SUMMARY

The Republic of Malawi is a landlocked country located at the southern end of the Eastern African Great Rift Valley. The country's area is 118,484 km² and approximately 20% of the total area is taken up by Lake Malawi. The southern half of the country is surrounded on three sides by Mozambique, while the northern half borders on Tanzania in the north and Zambia in the west.

Much of Malawi is located on plateaux, with a low-lying area along the Shire River which flows southwards from the southern end of Lake Malawi. In terms of climate, Malawi belongs to the tropical savanna zone and the year is divided into the dry season lasting from May to October and the rainy season from November to April. Mzimba District, the project area, is located on the Viphiya Plateau in the Northern Region. Hills ranging between 1,200 and 1,400 m cover much of the district, which is in a relatively dry area with an annual rainfall of around 850 mm.

Since independence in 1964, efforts for nation-building in Malawi have centred around the expansion of the agricultural sector, the reasons behind this policy being the lack of mineral resources making exportation of cash crops such as tobacco, tea and sugar the only means of acquiring hard currency on the one hand and the need to ensure self-sufficiency in food supplies on the other. Agriculture is the main industry in the country, involving 85% of the total working population.

The Malawi Government has placed emphasis on the development of farming by smallholder farmers, which occupies the central position in the country's economy, and the development plans being implemented centre around improvement of productivity and strengthening of the marketing structure for produce. ADMARC (Agricultural Development and Marketing Corporation), which is supervised by the Ministry of Agriculture and is responsible for the purchase, sale and exportation of the smallholder farmers' produce and for the supply of seeds and fertilisers to them, occupies an important position in the marketing structure for agricultural produce in Malawi and is one of the most important organisations in the implementation of agricultural policies. With the quantities of agricultural produce being purchased by ADMARC increasing every year, however, the shortage of storage facilities and the resultant post-harvest loss have

become a major problem that requires urgent solution.

ADMARC at present owns 18 storage facilities for strategic distribution called "dépôts" throughout the country but in view of the serious shortage of storage capacity in relation to the quantities of crops being handled, it plans to build new warehouses for the storage of 40,000 tons in Mzimba District, as well as facilities to accommodate 10,000 tons each at Karonga (Northern Region), Kasungu (Central Region), Luchenza and Zalewa (Southern Region). Of these, the facilities for Mzimba District have been given the top priority, with the construction of warehouses with a total capacity of 20,000 tons planned in the first phase. A request has been made to the Government of Japan for aid in the construction of a 10,000-ton warehouse, together with related facilities and appropriate equipment.

Upon receiving this request, the Government of Japan decided to implement a basic design study for the project and sent a Field Survey Team through JICA from 5th August to 4th September, 1990, and a Draft Final Report Explanation Team from 9th December to 19th December, 1990.

The Malawian counterparts for the project will be the Ministry of Agriculture for implementation of the grant aid cooperation (construction of the facilities and procurement of the equipment) and ADMARC for the operation of the facilities after the completion of the cooperation.

Mzimba District, the project area, is a granary area typical of Malawi, producing approximately 90,000 tons of maize annually. Of this, approximately 30,000 tons, the amount remaining after local consumption is subtracted, is purchased by ADMARC and sent mostly to the consumer areas to the south.

The Malawi Government has provided an 8 ha site in Kazomba, near Mzimba Boma, as the site for the proposed warehouse. Mzimba District is divided into the two RDP (Rural Development Project) areas of Central and South Mzimba. The proposed site is located in the southern part of Central Mzimba and is a suitable location as a base for the transportation of agricultural produce from Central Mzimba to areas in the south, since transportation of goods via this point will not involve unnecessary detours and also in view of the satisfactory road conditions.

As regards the produce from South Mzimba, however, its transportation south by way of Kazomba will entail unnecessary detours and will be wasteful. In fact, most of the produce from this area is being sent directly from the parent markets to areas to the south, such as Lilongwe,

at present and it was thought more advantageous to consider construction of dépôt-level facilities for this area separately from those at Kazomba. The required capacity of the dépôt serving South Mzimba is estimated at around 10,000 tons. The Malawi side will prepare a separate request for a facility to accommodate produce and agricultural imput in this area in due course.

Items to be stored at the proposed warehouse will be limited to maize and a small amount of seeds. Although crops produced in Mzimba District also include groundnuts, sunflower seeds, beans and tobacco, these will not be handled at the proposed warehouse since most of these items other than tobacco are produced in South Mzimba and are sent directly to areas in the south. Because of its nature, tobacco cannot be stored in the same warehouse as other crops and will therefore be stored in the existing warehouses as before. Agricultural materials requiring storage include fertilisers and seeds. Of these, fertilisers will not be handled at the warehouse as an exclusive warehouse for fertilisers has been constructed at Mzuzu and fertilisers are expected to be sent directly from there to the parent markets.

The required capacity for the proposed warehouse was calculated from the inventory data at the parent markets in Central Mzimba and the existing dépôt at Kazomba. The average annual total shipment of maize from the three parent markets in Central Mzimba over the past five years was 9,122 tons. Monthly shipments begin to exceed 1,000 tons in August with the harvest and commencement of surplus purchases and reach a peak at 2,866 tons in November. The shipments range between 500 and 1,000 tons during the remaining months. The monthly arrivals at Kazomba Dépôt were assumed to be the same as the total shipments from the parent markets. The maize arriving at Kazomba Dépôt was assumed then to leave the dépôt at the same rate as in the past (the rate being more or less steady during the rainy season) and calculations were made for monthly stocks.

As a result, stocks are the largest in November at 5,400 tons. In an area like Mzimba where the rainy season and the dry season are clearly defined, the warehouse capacity normally needs to cover maximum stocks during the rainy season, which the above figure in fact is. Since maize seeds will also be handled at Kazomba Dépôt, the required capacity for the proposed warehouse was estimated at 5,600 tons.

The principal items of the Basic Design are as follows.

1) Warehouse	1	Floor Area	2,346m²
2) Administration Block	1	Floor Area	135m²
3) Canteen and Ablution	total 2	Floor Area	204m²
4) Other Ancillary Buildings	total 4	Floor Area	55m²
5) Warehousing Equipment	Weighbridge, stackers, conveyers, etc.		
6) Others	Internal roads, entrance gate, garden		

The project is expected to take 18 months to implement, 6 months from the Exchange of Notes to detailed design and selection of the contractor and 12 months for the actual construction work. The Japanese Government will be responsible for the costs of the construction of the facilities and the Malawi Government for site preparation and power and water supply up to the site. The costs to be borne by the Malawi Government are estimated at approximately 220,500 MK.

The purpose of the project is to contribute to the establishment of a structure for the stable distribution and supply of foodstuffs in Malawi by constructing an agricultural warehouse at ADMARC's Kazomba Dépôt and its significance and positive impact has been confirmed. It is thought appropriate to implement the project under grant aid from the Government of Japan.

Implementation of the project will greatly raise efficiency in the storage, delivery and transportation of maize produced in Central Mzimba District. The expected quantity of 9,122 tons of maize to be handled at the new warehouse is equivalent to the annual consumption of the staple crop by approximately 54,000 people and it may be said that the completion of the project will ensure a stable supply of this amount of food.

Cooperation projects of this kind are expected to increase in future in Malawi. In view of this, there is a need to take matters a step further and alter the approach in providing cooperation from that concerned merely with the construction of a single facilitiy to a wider one concerned with improvement of the marketing structure and distribution system for agricultural produce over a wide area.

Chapter 1 INTRODUCTION

One of the basic aims of the Second National Development Plan (1987 to 1996) adopted by the Government of the Republic of Malawi in 1987 is the "guarantee of a stable food supply." The Malawi Government has accordingly established a Multi-Purpose Agricultural Warehouse Construction Plan with the aim of ensuring the secure and reliable storage of agricultural produce and agricultural input, as well as a stable supply of these, as a part of its efforts for improvement of the marketing structure for agricultural produce, and has made a request to the Government of Japan for grant aid for implementation of this plan.

In response to this request, the Government of Japan decided to conduct a basic design study for this project and JICA accordingly dispatched a Field Survey Team, headed by Kazuhisa Matsuoka (Director, 1st Basic Design Study Division, Grant Aid Study & Design Department, JICA) from 5th August to 4th September, 1990.

The Field Survey Team explained the workings of the Japanese grant aid system to those concerned in Malawi, confirmed the circumstances and the contents of the request, ascertained the contents of the work and confirmed the implementation structure for the project, the organisations responsible for operation and maintenance after the completion of the cooperation and the conditions regarding the project site. The Field Survey Team then conducted field surveys in the project area, studies on the conditions surrounding the marketing of agricultural produce and field surveys on existing facilities and held discussions with the Ministry of Agriculture and related organisations, which are the counterparts for the implementation of the project in Malawi, concerning the basic premises and other basic items regarding the project.

Upon their return to Japan, the Field Survey Team examined the contents of the discussions held in Malawi, the results of the field surveys and other information collected and conducted analyses to clarify the background, purpose and positioning of the project and to investigate the suitability of the project as an object of grant aid in view of its significance, contents and impact. On the basis of these, a basic design for the optimum scale and details of the facilities and grant equipment, estimated project costs, a schedule proposal and a maintenance plan were

drawn up and the project evaluated. The results were compiled in a Draft Final Report on the Basic Design Study and a team headed by Yoshihide Nakai (Resident Representative, Malawi Office, JICA) was dispatched to Malawi to explain the report from 9th December to 19th December, 1990. The Draft Final Report Explanation Team submitted and explained the report to those concerned in the Government of Malawi and a basic agreement was reached between the Governments of Malawi and Japan.

The results of the field study in Malawi and analysis work in Japan are given in this Final Report on the Basic Design Study.

The two teams compiled in Minutes of Discussions the details confirmed with the Government of Malawi during the field survey and the explanation of the report and the representatives of the two parties signed and exchanged the minutes. The Minutes of Discussions, member lists of the two teams and their itineraries and list of persons concerned are given in the Appendix.

Chapter 2 BACKGROUND OF THE PROJECT

2-1 Background of the Project

2-1-1 Present Condition of Agriculture

(1) Agricultural Policies under the Second National Development Plan

Items relevant to the project in the Second National Development Plan (1987 - 1996) (Statement of Development Policies) are given below.

* The security of the food supply will be achieved through self-sufficiency in maize, which is the staple food, and will lead to stabilisation of the people's livelihood. This security will be achieved through establishment of appropriate purchase prices for maize and through storage of surplus food. The Ministry of Agriculture's system for early predictions on the production makes possible calculations of the required stock of maize and efficient trade with the member countries of the SADCC.
* The emphasis will be placed on increased production of maize in agricultural production. Overall improvements will be made in financing, marketing and processing for research, propagation and agricutural materials and implements to this end.
* The system of guaranteed purchase prices for the smallholder farmers will be continued as one of the measures aimed at increased production. With complete self-sufficiency as yet to be achieved, the guaranteed prices will be affected by the prices of the imported grain, but attempts will be made to determine the prices taking into account the domestic demand and stocks. This means that import and domestic prices of maize may differ from each other. Besides being a measure in preparation for bad harvests, storage of surplus food will have the effect of stabilising market prices.
* As regards the marketing of goods, entry of private traders on to the market parallel to ADMARC will be encouraged. In order to encourage private enterprise in markets for smallholders' produce other than cotton and tobacco, several of ADMARC's markets will be closed to

allow private traders to purchase at higher prices than before and to confirm that there is no gap with the government policy intentions. Marketing of produce from farming estates will continue to be entrusted to private traders. Government support may be considered, however, in cases of newly-introduced products involving high production costs and unable to compete on the export market.

* Capacity of agricultural warehouses for storage of produce and materials must be increased. This plan is gradually seeing implementation.
* The National Seed of Malawi and ordinary smallholder farmers will be commissioned to produce seeds for the purpose of propagation of high-quality seeds for maize, cotton etc.
* Early commencement of research will be required for improvements on processing techniques for cotton, rice and stallfeeders. Research will also be conducted on methods for milling and storage of high-yield maize.
* An overland transportation route to the Indian Ocean via Tanzania (the Northern Corridor) will be established within five years to solve transportation problems.

(2) Agricultural Policies in Progress

Malawi has very little mineral resources or medium and small-scale manufacturing industry and creation of infrastructural facilities is of great importance for her socio-economic development. Approximately 85% of the total population are engaged in agriculture, making this the most important industrial sector accounting for 37% of the GDP and 85 to 90% of the hard currency earnings.

The Malawian economy, which has in the past relied heavily on agriculture in this way, faces serious problems today, such as the drop in the trade of agricultural produce in recent years, excess reliance on exportation of tobacco, tea and sugar, whose prices on the international market are subject to fluctuation, high cost of transportation of import/export goods due to closure of the railways passing through Mozambique etc. The Malawi Government has been endeavouring to establish policies to solve these problems and has delineated an ideal for agricutural policies which is summarised below.

"The country's agricultural policy is to:

enhance the social welfare and income of the agricultural community and the prosperity and stability of the nation as a whole by means of both improving self-sufficiency in food products and expanding and diversifying export of agricultural produce. This means making efforts to prevent a drain on Malawi's natural resources, serious maldistribution of agricultural incomes and over-dependence on volatile external trade flows." (Malawi Gov. 1988, p.22)

As can be seen from the above, the development policies of the Ministry of Agriculture are the same as the aims of the National Development Plan and these policies are defined in more concrete terms in the National Rural Development Programme (NRDP) summarised below.

The NRDP has the following three aims.

(a) increase the general level of the income of Malawi smallholder farmers who produce cash crops for export, and production of food crops for the country's agro-industries, and to sustain self-sufficiency, and for feeding the growing urban population;
(b) provide the inputs and services necessary to enable production increases by smallholder farmers with particular emphasis on productivity per unit area;
(c) preserve and maintain the natural resources by
  - encouraging livestock industry effective for soil conservation;
  - conserving the key watershed area; particularly where there is potential for forestry developments;
  - developing the forests through research on replanting of tress on customary and estate land." (Research Highlights, p.6)

The Food and Nutrition Programme also touches storage of crops.

"The food and nutrition programme within The Min. of Agriculture has the participation of all Ministries and organisations dealing with nutrition. The role of the Ministry of Agriculture is to devise food and nutrition programmes through appropriate agricultural planning and wide extension services and to coordinate various works for the purpose of

achieving a long-term solution to the nutritional problems. At the national level coordination of the food and nutrition programme is the responsibility of the Economic Planning and Development Department in the Office of the President and Cabinet.

The main aim of the programme is to improve the nutritional status of the people by increasing and diversifying food production.

One of the concrete targets is to devise plans to reduce food wastage both in storage and usage.

In the foreword to the 1990/91 Guide to Agricultural Production, the Life President Dr. H. Kamuzu Banda says, "For the second season running, private traders have participated in agricultural marketing alongside ADMARC and Press Produce Ltd. I would like to urge these traders to be faithful to farmers and consumers and to cooperate with ADMARC in storing the produce for future sales."

(3) Price Policies for Agricultural Produce

The prices of the produce purchased by ADMARC, or the guaranteed minimum prices for the smallholder farmers, are determined and renewed each year as shown in the following table as a part of the agricultural policies of the Malawi Government. These guaranteed prices published before the sowing season each year are the same throughout the country in principle. The prices for maize are published in September and have a major influence on the enthusiasm of the farmers for production. Recently, for example, a rise of 43.9% in the purchase price of maize resulted in a 5.7% increase in production through increase of cropping acreage and investment on agricultural equipment and the quantity of maize purchased by ADMARC rose by as much as 70%.

PRODUCE PRICES OFFERED TO FARMERS BY ADMARC

(TAMBALA/kg)

CROP	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91
MAIZE	6.6	6.6	11	11	11	12.22	12.22	12.22	16.6	24	26	27
RICE	7.8	7.8	8	9	9	12.5	13.5	15	18	20	22.5	24
G/NUTS	22	22	24	31	31.6	45	46	46	46	56	63	64.5
CASSAVA	3	3		3	3	4	4	4	6	10	12	15
MIXED BEANS	13	13.5	13.5	13.5	20	40	40	40	-	40	55	60
SEED COTTON	17.8	18	22.7	24	32	39	41	43	50	57	60	63.5
COW PEAS	5.5	5.5	5.5	5.5	10	25	25	27	27	30	35	37.5
SUNFLOWER	8.3	8.3	8.3	8.3	8.3	11	11	15	19	31	50	55.5
SOYA	11	11	11	11	11	16.3	17.5	25	45	47	60	65
MDDF	79	39.5	39.5	46	68.5	91.5	91.5	103	103	146	220	220
ORIENTAL TOBACCO	39.1	45	45	49	62	75	75	83	115	166	186	198.5
CASTOR	11	11	11	11	16.5	25.0	30.0	30	33	33	35	35
CHILLIES (Birds Eye)	44	44	44	44	62	90	90	135	165	200	400	400
CASHEW	12	12	12	12	22.5	37.5	41	47.5	52.5	67.9	100	107.5
SESAME	15	15	15	15	22	30	35	38	41.8	45	60	80

NOTE: Crops with several grades have been averaged (Rice, NDDF, Oriental, Sunflower)
Source: MZUZU ADD Office

(4) Trends in Maize Production

Maize is not just one of the agricultural products in Malawi but occupies a central position in the national economy. Since the lives of the majority of the people depend on this single crop, the guarantee of a stable food supply in Malawi is synonymous with self-sufficiency in maize. One characteristic of maize is that it is relatively cheap for its weight and transportation over long distances results in an increased ratio of the transportation costs in the price of maize.

The maize growing areas in Malawi are to be found between altitudes of 600 to 1,300 m above sea level. Although the Central Plateau is the main maize growing area, maize is grown throughout the country. The main variety

of maize grown in Malawi is local flint which is preferred for home consumption. The cultivation area of maize makes up approximately 70% of the total cultivated land. Because fertilisers are relatively expensive, they are not usually applied to maize grown by smallholder farmers. Encouragement of the use of compost and studies in the following areas are required.

- areawise optimum and minimum fertiliser applications;
- areawise recommendations for mixed cropping with grain legumes and other crops;
- development of new maize varieties with flint characteristics;
- establishment of grain storage methods;
- economical use of herbicides by smallholder farmers; and
- research on natural viruses, fungi and parasites to army worm and elegant grasshoppers. (Agricultural Research Highlights, p.14, F.A. Mango, Min. of Agri.)

The average yield for maize is 1,500 kg/ha at present. The future targets for the yields are set out as follows in the Guide to Agricultural Production published by the Ministry of Agriculture.

	Present Yield	Future Targets
Hybrids	2,000 - 3,000 kg/ha	over 6,500 kg/ha
Composites	1,400 - 2,400 kg/ha	over 4,500 kg/ha
Unimproved	880 - 1,300 kg/ha	over 2,700 kg/ha

In the nation as a whole, the aim in maize production is to attain self-sufficiency, that is, to satisfy the demand created by the increasing urban population while maintaining self-sufficiency in rural areas. The Malawi Government also aims to maintain an adequate stock of foodstuffs in preparation for adverse climatic conditions (especially droughts). The means used for this purpose are to increase the yield per unit area without increasing the cropping acreage in accordance with the ideals of the agricultural policies through improvement of cultivation techniques, adoption of compost according to regions, distribution of high-quality

seeds, appropriate fertiliser application and pest control.

(5) Positioning of Smallholder Farmers

The rural population makes up 89% of the total population of Malawi, and over 85% of these are smallholder farmers. The figures indicate the high proportion of smallholder farmers in Malawian society. Although the productivity of these smallholder farmers is low since they rely mainly on manpower for all the work from soil preparation to storage of the produce, they still accounted for 78% of the total agricultural production in 1985. Although there are no clear definitions for smallholder farmers, the following are generally accepted.

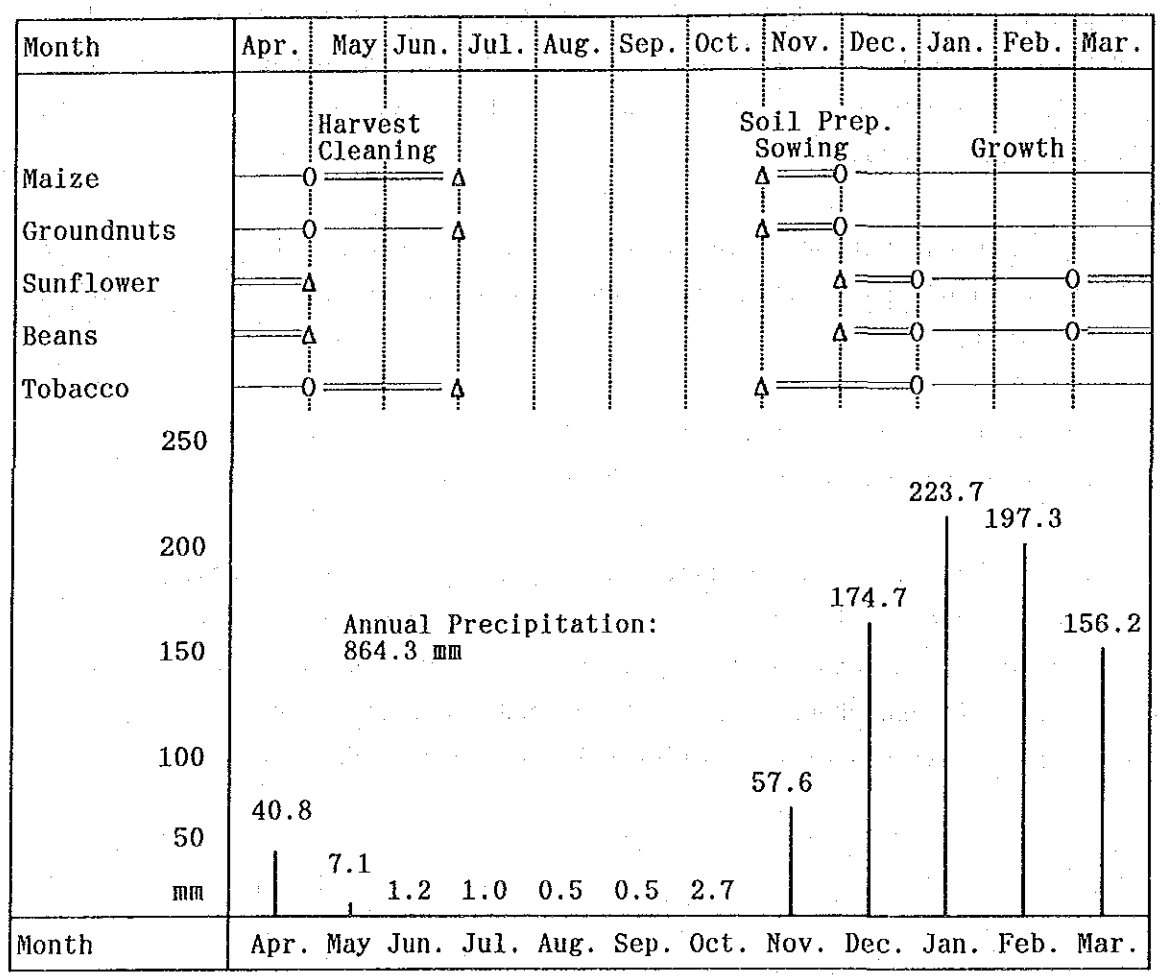
- They own and cultivate customary land and not leased land.
- The area of land owned is 2 ha or less. (84.5% of all farming households)

The operational conditions of smallholder farming households can be summarised as follows according to the size of land owned.

- less than 0.7 ha: cannot attain self-sufficiency using present production techniques
- 0.7 to 1.5 ha: can attain self-sufficiency and produce a certain amount of cash crops if production conditions are good
- over 1.5 ha: can attain self-sufficiency and produce cash crops

(6) Farming Activities

The farming patterns for maize and other crops in the project area are given below. As can be seen from their relationship to the rainy season and the rainfall, all crops are, in principle, sown at the beginning of the rainy season, grow during the rainy season and are harvested after the end of the rainy season.



Farming Activities and Rainfall in the Project Area
(Mzimba District)

(7) Agricultural Production

The changes in the production of crops relevant to the present project (maize, groundnuts, beans, tobacco) are shown below.

Maize

(unit: tons)

RDP/ADD	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90
C. Mzimba	4,436	40,377	30,760	43,340	53,066	56,481
S. Mzimba	36,995	48,916	45,826	49.580	33,426	49,642
Mzuzu	76,979	125,116	104,747	124,874	120,835	149,759
Malawi	1,355,205	1,294,564	1,201,757	1,367,707	1,508,000	1,342,809

Source: "Crop Estimates", Ministry of Agriculture

Groundnuts

(unit: tons)

RDP/ADD	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89
C. Mzimba	2,442	2,741	2,169	2,392	4,352	3,080	
S. Mzimba	723	894	729	590	1,054	683	
Mzuzu	3,722	4,325	3,735	3,638	7,010	4,663	
Malawi							

Source: "Crop Estimates", Ministry of Agriculture

Beans

(unit: tons)

RDP/ADD	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90
C. Mzimba	521	590	403	382	1,014	600	747	480
S. Mzimba	1,041	465	545	819	1,044	1,500	2,952	485
Mzuzu	1,858	1,448	1,435	1,712	2,822	2,679	5,116	2,385
Malawi								

Source: "Crop Estimates", Ministry of Agriculture

Tobacco

(unit: kg)

RDP/ADD	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89
C. Mzimba	205,600	288,900	171,000	82,255	69,390	129,207	287,818
S. Mzimba	55,000	110,500	215,000	45,970	100,550	98,200	191,160
Mzuzu	275,910	422,540	418,400	146,925	207,640	243,387	499,855
Malawi							

Source: "Crop Estimates", Ministry of Agriculture

2-1-2 Outline of Agricultural Sector Development Plan

(1) Budget for the Agricultural Development Plan

As can be seen from the table below, the budget for the Ministry of Agriculture's development plan has been making up 16% of the total government budget, the largest for any sector, indicating the importance laid on agriculture in Malawi. It is to be observed, at the same time, that approximately 86% of the funding comes from overseas aid, indicating the heavy reliance of the agricultural development plan on aid.

Agricultural Development Plan Budgets

Unit: MK

Year	Ministry of Agriculture			Government Development Budget
	Overseas Aid	Mal.Gov.Fund	Total	
1988/89	-	-	38,989,581	261,942,659
1989/90	40,792,520	7,835,609	48,628,129	294,551,818
1990/91	55,260,753	7,396,865	62,657,618	

Source: "Approved Estimates of Expenditure on Development Account for the Fiscal Year 1989/90 & 1990/91"

(2) Agricultural Development Plans in Progress

The following activities have been reported under the development plan during 1988/89 (Economic Report 1990).

* Continuation of the National Agricultural Research and Development Plan financed by IDA/USAID
* Enforcement of the block propagation system development
* Preparation of a research masterplan with emphasis on activities for increased maize production
* Strengthening of Ministry of Agriculture's capacity for planning, propagation and research, along with continuation of NRDP
* Effective and efficient implementation of the pilot communication project
* Implementation of agricultural and regional propagation activities in accordance with the national 5-year propagation plan

The following comments are made in the Economic Report 1990 concerning the agricultural development plan for 1990/91.

Agriculture forms the basis of Malawian economy and 15.21% of the total 1990/91 development budget is allotted to agriculture, with a 28.9% increase on the 1989/90 budget.

Among the various plans, the National Rural Development Plan (NRDP) continues to be given the highest priority. The principal new projects are as follows.

* World Bank co-financed Agricultural Sector Adjustment Credit (ASAC)
* National Livestock Development Project
* National Agriculture Research Project
* SADCC Regional Tsetse and Trypanosomiasis Control Project
* Malawi Agriculture Extension and Planning Services Project
* Zomba Rural Development Project
* Various Rural Development Projects in the Agricultural Development Regions

The principal donors (organisations and countries) of aid for these projects are IDA, EEC/IFAD, ADB, USAID and UK.

2-1-3 Present Condition of Agricultural Marketing

(1) National Marketing of Agricultural Produce

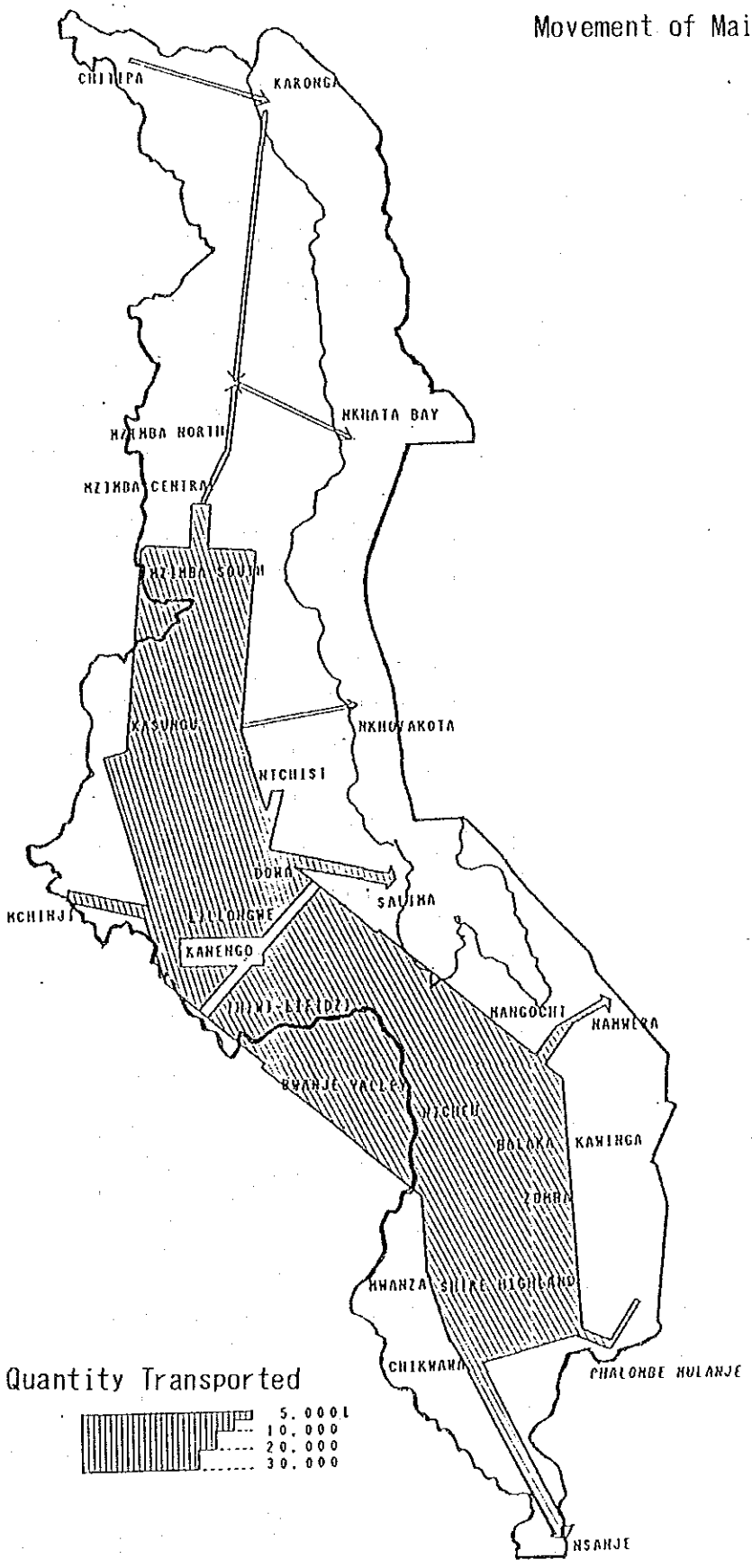
The directions and the quantity of the flow of maize, the most important agricultural produce in Malawi, are shown conceptually on the following page.

This drawing may be explained as follows.

* The basic structure for demand and supply of maize in Malawi as a whole is that in which the surplus maize produced in the granary area consisting of the hills stretching from the Central to the Northern Region are collected and transported for consumption in the urban areas in the Southern Region such as Zomba and Blantyre.
* Conditions are not good for agricultural production in the areas along Lake Malawi and these areas are subject to food deficit in normal years. Surplus maize from the hills to the west is also supplied to these lakeshore areas.
* The main flow of maize is, therefore, from north to south, but there is also a flow from the hills to the lakeshore areas to the east.
* Almost all the maize produced in the Northern and Central Regions and transported through ADMARC distribution route is stored temporarily in the Alimaunde Dépôt (storage capacity: 63,300 tons) at Kanengo on the outskirts of Lilongwe or the adjacent storage silos (180,000 tons) before being transported to the Southern Region by rail or by lorries.

Crops other than maize, such as groundnuts, sunflower, beans and tobacco, require grading and processing. Most of the facilities for this are concentrated around the cities of Blantyre and Limbe in the Southern Region. The basic pattern for distribution of these crops too is the same one going from the Northern and Central Regions to the Southern Region.

Movement of Maize within Malawi



Source : ADMARC Storage Facilities
Development Plan 1987 – 96
Ministry of Agriculture, Sep. 1987

(2) Export of Agricultural Produce

As mentioned above, Malawi has little natural resources and her main exports are agricultural products. The records of import and export are given in the table below. Agricultural produce account for 85 to 90% of the total export. Tobacco is the most important export item, accounting for 60% of the total, and much of it is exported to Japan. This is followed by tea and sugar which make up about 10% each. Small amounts of groundnuts and beans are also exported but the export of these is sometimes suspended to satisfy domestic demand.

Maize has not in recent years been exported but has been purchased by international organisations such as the WFP for refugees living in Malawi.

Principal Import and Export Items (1987 Estimate)

(Unit: 1 million SDR)

Export		Import	
Tobacco	142.9	Industrial Input	78.1
Tea	21.5	Consumer Goods	34.9
Sugar	19.7	Plants, Machinery	31.7
Coffee	7.1	Transportation Machinery	31.0
Groundnuts	7.1	Petroleum Products	27.2
Beans	5.7	Construction Materials	12.9
Cotton	1.3	Parts, Tools	7.9
Others	14.4	Textile Products	5.0
		Others	1.6
Total	219.6	Total	230.3

Note: Exports do not include reexports. (Source: IMF)

(3) Food Demand

According to the Ministry of Agriculture's "Guide to Agricultural Production 1989/90", farming households need to store the following quantities of produce for home consumption.

"* In areas where the main crop is cereal, such as maize or millet, families need to keep 250 kg to 300 kg of grain per head per year to meet staple food needs.
* Families need to keep 20 kg of pulses per head per year.
* Where groundnuts are grown families should keep at least 10 kg per head per year for home consumption."

Since the population of Malawi is approximately 8 million (1987), 2 to 2.4 million tons are required in terms of maize according to the above standards. The production, however, only reached 1.51 million tons even in a year with a good harvest (1988/89) as shown in Table - on page --. FAO analyses this situation as follows.

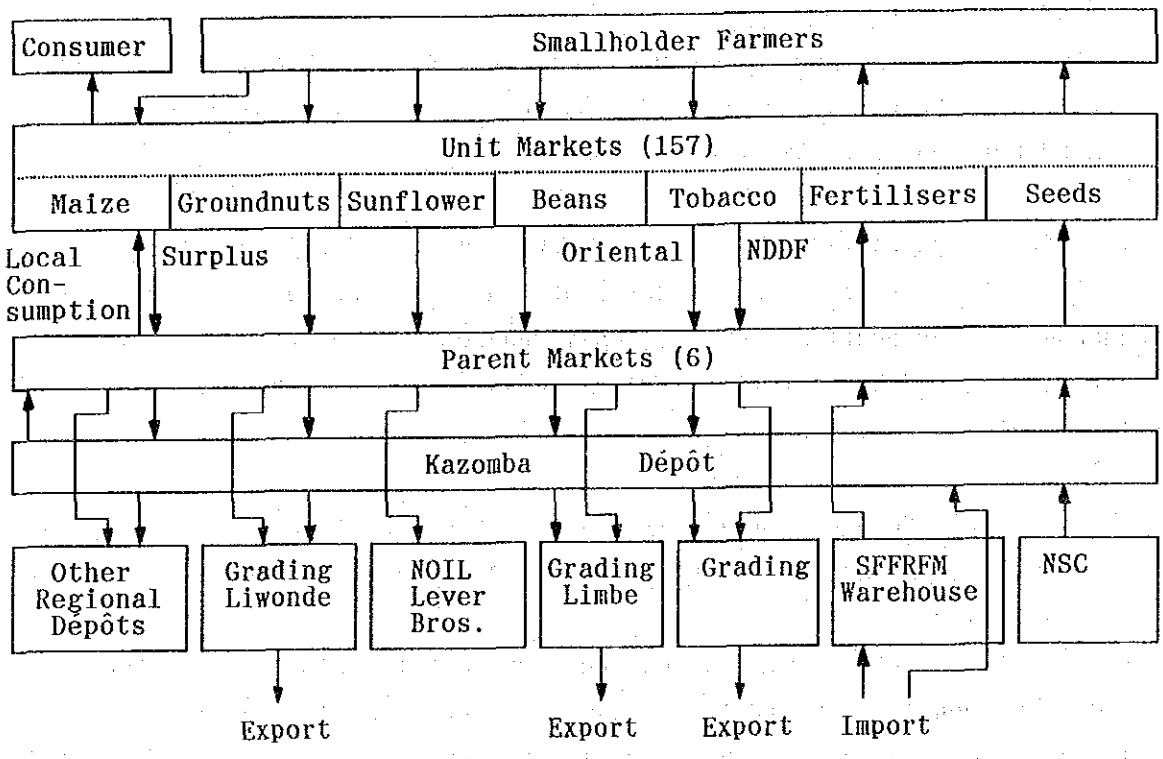
* The deficit in production in years of deficit between 1965 and 1977 was 6.6% (average in Africa: 6.4%) against the actual per capita consumption.
* The ratio of the supply to the required calorie intake per person per day between 1972 and 1974 was 104% (average in Africa: 94.1%).
* The proportion taken up by the grain import in the total import between 1965 and 1977 was 2.4% (Africa: 2.8%) on average and 8.3% (Africa: 13.6%) at its maximum, while that taken up by the export of grain in the total export was 3.7% (Africa: 9.5%) on average and 13.7% at its maximum.
* The quantity of grain actually imported in the years of deficit between 1956 and 1977 was 151,000 tons, while the estimated deficit of grain was 446,000 tons, meaning that the proportion of the deficit to the actual import was 295.3% (average in Africa: 37.7%).

(4) ADMARC Marketing Routes for Agricultural Produce and Materials

ADMARC buys agricultural produce from smallholder farmers at ADMARC markets in cash. The produce is normally brought to these markets by the

farmers themselves. Although trading through intermediaries was approved in 1987, the quantity of grain handled by them is small because the prices of maize is controlled.

ADMARC's marketing routes for agricultural produce and materials in Mzimba District, the project area, are given below. The basic flow is the same in other districts.



ADMARC Marketing Routes
for Agricultural Produce and Materials in Mzimba District

(5) ADMARC's Activities

1) Quantities Purchased by ADMARC according to Products

The annual purchase of agricultural produce by ADMARC ranges from 163,000 to 373,000 tons in terms of quantities or 65.8 to 94.3 million MK (1985 to 1989) in monetary terms. ADMARC purchases 10 to 20% of all the maize produced in Malawi.

As can be seen from the table below, the maize purchased in Mzimba District accounts for 10 to 30% of the total maize purchase by ADMARC.

Purchase of Maize by ADMARC

ADMARC Office	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1988/89	1989/90
Mzimba Division (1)	29,629	30,404	28,503	44,765	30,584	19,719	28,128	34,779	n.a.
R.O. North (2)	46,308	46,284	46,553	68,049	48,830	n.a.	n.a.	n.a.	n.a.
R.O. Central (2)	152,993	168,899	151,775	159,658	54,508	n.a.	n.a.	n.a.	n.a.
R.O. South (2)	45,617	67,940	98,075	38,058	7,993	n.a.	n.a.	n.a.	n.a.
Headquaters (2)	244,916	283,123	296,403	265,764	113,331	(3) 59,466	(3) 135,301	(3) 233,098	(4) 280,000

Source: (1) ADMARC Regional Office North
(2) Guide to Agricultural Production 1989/90
(3) Monthly Bulletin of Statistics, National Statistical Office
(4) Economic Report 1989

Purchase of Groundnuts by ADMARC

(unit: tons)

ADMARC Office	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90
Mzimba Div. (1)			519	1,479	3,592	471	24
R.O. North	1,130	676	731	1,825	4,111	527	27
R.O. Central	13,860	19,911		-	-		
R.O. South	150	300		-	-		
Headquaters	15,140	20,887	18,251	53,050	44,825		

Source: (1) ADMARC Regional Office North
Guide to Agricultural Production 1989-1990

The export of groundnuts was suspended in 1988/89 to secure sufficient quantities of seeds because of the marked drop in production.

Purchase of Sunflower Seeds by ADMARC

(unit: tons)

ADMARC Office	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91
Mzimba Div. (1)			70	37	72	201	25	408
R.O. North	5	14	73	40	74	202	26	410
R.O. Central								
R.O. South							959	
Headquaters		515	190	172	155			

Source: (1) ADMARC Regional Office North
Guide to Agricultural Production 1989-1990

Purchase of Beans by ADMARC

(unit: tons)

ADMARC Office	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91
Mzimba Div. (1)			305	731	1,640	1,551	202	147
R.O. North	-	421	820	1,738	1,875	1,582	234	179
R.O. Central	-	4,411	4,966	5,265	-			
R.O. South		10,272	9,928	19,073			708	
Headquaters	2,186	15,104	15,714	26,076	10,054			

Source: (1) ADMARC Regional Office North
Guide to Agricultural Production 1989-1990

Note: The purchase of beans by ADMARC has dropped sharply because of private traders buying them at higher prices than the guaranteed minimum prices and the government continues to impose a ban on their export.

Purchase of Oriental Tobacco by ADMARC

(unit: kg)

ADMARC Office	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91
Mzimba Div. (1)				94,622	159,898	163,090	279,979	168,767
No. of farms	12,215	10,196	9,838	2,500	3,500	7,312	8,261	
National production (kg)	614,600	184,828	387,522	96,981	163,019			

Source: (1) ADMARC Regional Office North
Guide to Agricultural Production 1989-1990

2) Sales of Agricultural Materials by ADMARC

ADMARC is the principal seller of pesticides in Malawi and monopolises the sales of fertilisers imported by SFFRFM. ADMARC estimates the demand for and sells seeds through its markets so that the smallholder farmers may be certain of obtaining high-quality seeds. The sales of seeds has been increasing every year as can be seen from the table below and Mzuzu ADD expects an annual increase of 10% in future.

Sales of Maize Seeds by ADMARC

(tons)

Year	Mzimba District	Mzuzu ADD	Total Malawi
1980/81	158		
1981/82	165	266	
1982/83	252	380	
1983/84	204	310	
1984/85	211	315	
1985/86	263	416	
1986/87	164	258	
1987/88	275	431	
1988/89	292	378	
1989/90	536	696	
1990/91		834	
1991/92		918	
1992/93		1,009	
1993/94		1,110	
1994/95		1,220	

Sources: ADMARC Regional Office North, Aug. 7, 1990
Mzuzu ADD, Aug. 10, 1990

3) Sales of Fertilisers by ADMARC and Smallholder Farmers' Fertiliser Revolving Fund of Malawi (SFFRFM)

ADMARC had previously been responsible for handling of fertilisers from importation to sales but SFFRFM was set up with funding from the Malawi Government, the World Bank and ADMARC in 1983. Since then it has been responsible for importation, buffer stock and allotment to regions,

while ADMARC has continued to handle their sales activities.

SFFRFM is a trust body of the Malawi Government and its chairman is the permanent secretary of the Ministry of Agriculture. Its funding has increased every year and was 90 million MK in 1989/90.

The aim of SFFRFM is to ensure stable supply of fertilisers by creating buffer stocks of fertilisers to counter the delays in procurement and especially in importation and blockades during transportation to this landlocked country. The target amount for the buffer stock is 70,000 tons (Northern Region: 25%, Central Region: 50%, Southern Region: 25%) at present, which is about the same as the annual sales of fertilisers by ADMARC. SFFRFM has built and operates three large fertiliser warehouses with a total capacity of 160,000 tons (Blantyre: 40,000 tons, Lilongwe: 80,000 tons, Mzuzu: 40,000 tons) with aid from the EC.

Much of the fertilisers handled are obtained with aid from Canada, the U.K., Australia, West Germany and Japan. Japan has been supplying Malawi with fertilisers every year as a part of the aid for increased production of food (KR2) since 1983.

Although the quantity of fertilisers imported has been increasing every year as shown in the following table, the amount of fertilisers applied per unit area remains low. According to SFFRFM, the estimated annual demand for fertilisers is 140,000 tons (1990/91), which is twice the amount actually sold but there are problems with regard to SFFRFM's capacity for procurement and the purchasing power on the part of the farmers.

The main fertilisers in use in Malawi are 20:20:0, CAN, S/A, DAP and urea, all of which are imported. The product with which fertilisers are most often used is maize and the Guide to Agricultural Production gives directions to apply additional fertilisers two to three weeks after germination. The period during which demand occurs for fertilisers at the level of the farmers is brief and this gives rise to a need for a structure ensuring smooth distribution, as well as for stability in importation.

The fertilisers should in principle be delivered directly from SFFRFM's large-scale warehouses to ADMARC's parent markets. In the Northern Region, however, because the Mzuzu Warehouse is not yet in operation and because of its length from north to south, fertilisers imported via Tanzania are stored at ADMARC's Karonga, Mzuzu and Kazomba Dépôts and delivered from there to the parent markets.

In the long-run, the transportation routes for imported fertilisers are expected to change, especially with the reopening of the railway between Malawi and Mozambique.

Import and Sales of Fertilisers by SFFRFM and ADMARC

(tons)

Year	Import(1)	Sales			
		Year	Malawi	R.O.North	Mzimba District(4)
1980	80,800	80/81	64,448(5)		
1981	114,172	81/82	56,589	11,611	7,010
1982	118,338	82/83	57,763	11,336	7,140
1983	114,384	83/84	57,009(3)	12,251	7,444
1984	136,223	84/85	69,222	14,372	8,499
1985	103,223	85/86	63,977	13,610	8,110
1986	98,064	86/87	67,303	12,218	6,954
1987	122,870	87/88	73,500	13,287	8,378
1988	134,561	88/89	82,885	14,119	8,786
1989	184,720	89/90	97,998(2)	19,283	9,932

Sources: (1) Monthly Statistical Bulletin, Feb. 1990
(2) ADMARC and SFFRFM Reports
(3) Guide to Agricultural Production 1989-90
(4) ADMARC Regional Office North, Aug. 8. 1990
(5) ADMARC and SFFRFM

4) Loss of Fertilisers during Storage

According to a study by ADMARC's Regional Office North dated 2nd June 1989, 241 tons of fertilisers had been damaged during storage, 134 tons at Chilumba Dépôt, 66 tons at Kazomba Dépôt and 33 tons at Nthilire. Of the fertilisers damaged, 76 tons were CAN, 47 tons urea and 45 tons DAP. Outdoor storage of fertilisers had resulted in heavy losses at Kazomba Dépôt too. Urea is particularly unsuitable for long-term storage because it absorbs water easily. The chemical fertilisers kept as buffer stock needs to be exchanged every year or so.

5) Provision of Credits by ADMARC

ADMARC provides two types of credits to smallholder farmers.

* Seasonal Credit

These are farm inputs given to farmers on credit and repayable within the same season. These items include seed, fertiliser, pesticides and stallfeeders. (annual interest: 12%)

* Medium-Term Credit

This is the credit issued and repayable in a 2 to 7 years depending on the initial value. These include ox-carts, ox-drawn implements, oxen, dairy cows etc.

6) ADMARC's Storage Facilities

The total capacity of dépôts owned by ADMARC was 307,400 tons (Northern Region: 21,000 tons, Central Region: 143,300 tons, Southern Region: 143,100 tons) as of August 1990. Other large-scale storage facilities include the 180,000-ton silo at Lilongwe, owned by the Government. The details are given below.

ADMARC Dépôt List and Storage Capacity in Ton

Northern Region	
Kazomba (Mzimba Market Shed)	3,000
Mzuzu	10,000
Nkhata Bay	3,500
Chilumba	4,500
Sub-total	21,000
Central Region	
Lilonwe	30,000
Alimaunde	50,000
Salima	45,000
Nkhotakota	2,500
Sub-total	127,500
Southern Region	
Bangula	20,200
Luchenza	25,000
Liwonde	30,000
Balaka	20,000
Lambulira	1,500
Lirangwe	500
Midima	700
Charterland	40,000
Transit	30,000
Livilidzi	1,000
Sub-total	168,900
Grand Total	317,400

2-1-4 Present Condition and Future Plans for Storage Facilities

(1) Warehouse Construction Plan

The national-level public investment plans are delineated in the five-year Public Sector Investment Programme (PSIP), which is modified every year. The plans are devised for each project by the ministries concerned and the sources of funding (i.e. the donor organisation or country) is normally decided by the time the projects are approved in the PSIP.

Agricultural projects are devised by the Planning Division of the Ministry of Agriculture and submitted to the Department of Economic Planning Development (EPD) and the PSIP prepared by the EPD.

According to the PSIP for 1988/90-1992/93, the following budgets are set aside for "ADMARC Storage - Construction of Multipurpose Strategic Storage" but the concrete details for the work for each year are not published.

1988/89	2,500,000 MK
1989/90	5,500,000
1990/91	5,500,000
1991/92	5,400,000
1992/93	-

The plans for construction of warehouses by the Ministry of Agriculture and ADMARC can be divided into those for dépôts and market facilities. The plans for construction of dépôts were as follows at the time of the field survey.

Priority

1	Mzimba (N.R.)	40,000 tons (1st phase: 20,000 tons)
2	Karonga (N.R.)	10,000 tons
3	Kasungu (C.R.)	10,000 tons
4	Luchenza (S.R.)	10,000 tons
5	Zalewa (S.R.)	10,000 tons

As regards the stages which the above projects have reached, the construction plans for Mzimba (Kazomba) Dépôt has already been submitted to

the EPD by the Ministry of Agriculture and will be included in the next PSIP. The plans for Karonga, Luchenza and Zalewa were adopted in meetings between the Ministry of Agriculture and ADMARC in August this year (1990) and have not yet been submitted to EPD.

The project sites according to the ADMARC Storage Development Plan for 1987 were Mzuzu, Mzimba, Bangula and Kasungu. Of these the dépôts at Mzuzu (10,000 tons) and Bangula (3,700 tons) were completed in 1989 and 1990, respectively, with aid from the Governments of the Netherlands and Japan.

The construction of ADMARC's market facilities is being implemented as a part of NRDP. The construction cost for the unit market at Namkokwe (Dedza ADD), completed in August 1990, was reported to be 112,000 MK.

The construction plans for market level warehouses were given as follows in the Project Plan prepared by the Planning Division of the Ministry of Agriculture in December 1986. The progress since then is not known.

Details of the Implementation Schedule
for Market Warehouse Construction

Item		Year 1	2	3	4	5	Total
Ware-houses	Warehouses	2	1	1	-	-	4
	MK VII	10	5	4	-	-	19
	MK V	15	20	10	5	4	54
	Sedi Sheds	20	20	20	20	12	92
	MK I Houses	45	45	34	25	16	165
	MK II Houses	10	5	4	-	-	19
	MK II Compounds	10	5	4	-	-	19
	MK I Compounds	20	20	20	20	12	92
Equip-ment	Stackers	2	1	1	-	-	4
	Platform Scales	2	1	1	-	-	4
	Bag-Sewing Machines	2	1	1	-	-	4
	Barrows	47	46	35	25	16	169
	Moisture Meters	47	46	35	25	16	169
	Folk Lifts	2	1	1	-	-	4
	Weighbridges	2	1	1	-	-	4

Source: Agricultural Produce and Input Multipurpose Storage Facilities Project Plan, Ministry of Agriculture, Planning Division, 19th December, 1986

(2) Silos at Lilongwe

Concrete grain silos with a total capacity of 180,000 tons (main silos: 5,000 tons x 36, fumigation silos: 1,250 tons x 12, driers: 90

tons/hour x 2) were constructed at Kanengo on the outskirts of Lilongwe under aid from the Government of South Africa between 1979 and 1982. The main function of these facilities is the storage on a national scale of emergency food. Although the old maize is exchanged with newly-harvested maize each year, since their main purpose is storage of emergency food supply, these silos are not used to raise the efficiency in marketing through faster turnover which is the main characteristic of silos. Those at the site were of the opinion that maintenance costs, such as electricity charges, were higher than those at normal warehouses. Bulk storage of maize, besides making it difficult to obtain accurate figures on the stock at times of inspections, creates extra work for opening the grain bags and taking the maize out of the bags on arrival at the silos and weighing the maize and putting it back into grain bags when they leave the silos, rendering the silos unsuited to the realities of storage control and marketing. One major advantage is that the use of grain bags can be dispensed with during storage.

The normal practice is not to accept maize with moisture contents above 12.5% (WB). The driers are only used in cases of necessity and their use is avoided as much as possible because of the high costs of fuel (paraffin oil).

Pest control for maize at the silos is practised through fumigation with aluminium phosphide tablets about twice a year. Methyl bromide used at the single-storeyed warehouses is not applied here.

(3) Mini-Silos

The Government of West Germany has provided ADMARC with an equipment aid for 181 prefabricated mini-silos (diameter: 15 m, height: 7 m, capacity: 500 tons). These silos consist of steel frames, sheet side walls with heat insulation materials, tarpaulin sheet roofs and corrugated iron sheets for repelling rats. The mini-silos are located mainly at the parent markets in the Northern Region. The locations and numbers of mini-silos in Mzimba District are given in the table on p. 2-3-3(1). The mini-silos are very often used for temporary storage at the parent markets most of which lack storage facilities. These mini-silos, however, are designed for bulk storage, making stacking, loading and unloading of maize in grain bags difficult. Ordinary stackers are used for loading and it takes 20 men 4

days to fill a 500-ton silo. Furthermore, the 60-cm high rat stopper sheets are inadequate both for their materials and heights. This is the third year since the mini-silos were introduced and patches could be seen at many of them where tears in the tarpaulin sheets for the side walls and roofs had been repaired. The sheets will need to be replaced within the next 2 to 3 years. The bends in the frames and separation of welded joints indicate that these mini-silos are basically not permanent facilities.

In conclusion, in view of the materials they are made of, the service life of mini-silos in tropical climates is estimated at between 3 and 5 years.

(4) Storage Facilities at the Level of Smallholder Farmers

Maize for home consumption is normally stored in the form of dried ear maize (maize still attached to cobs) in thatched cylindrical huts called "nkhokwes." In order to avoid "selling low and buying high," farmers need to store sufficient maize for home consumption but they sometimes sell too much too early when they are in need of cash. Although conventional and composite varieties of maize are less prone to damage by pests such as sitophilux, farmers are given directions to spray 40 g of actellic (actellic-pirimphos methyl 2%) for every 90 g of maize in case of vermin being observed.

(5) Pest Control

Vermin subject to pest control include triblium, sitophilux, lasioderma serricorn, sitotroga moths, cadre centellic, rats and ants. ADMARC has a Pest Control Division to deal with these pests, with a pest control supervisor in each of the Northern, Central and Southern Regions and pest control assistants at its dépôts.

The Pest Control Division is responsible also for inspections at times of purchase, storage and sale of agricultural produce. For fumigation work and disinfection of warehouses, the division staff are called upon to travel to the site with the necessary equipment, such as fumigation sheets, chemicals (methyl bromide, phostoxin, actellic, malathion, pyrethrum etc.) and sprayers loaded on to pickup lorries. Fumigation is practised once every 3 to 6 months.

Since the chemicals used for fumigation at warehouses (methyl bromide gas and phostoxin tablets, as well as actellic, malathion and pyrethrum used to disinfect warehouses) are toxic, they must be kept in proper containers in safe rooms which can be locked up. In order to maintain their efficacy, they need also to be kept in dry stores unexposed to the sun. The situation at present, however, is that only a few of the dépôts have chemicals stores and fumigation chemicals are often kept in dangerous locations in corners of warehouses.

(6) Research on Grain Storage

Research on postharvest treatment of maize is being conducted in Malawi by Chitedze's Crop Storage Unit. It has been said that further extension of techniques for grain storage is required in addition to promotion of hybrid varieties in order to curtail the loss of maize during storage. The overall postharvest loss of maize in Malawi is estimated at 10 to 20%.

2-2 Outline of the Request

2-2-1 Circumstances of the Request

In view of the shortage of agricultural storage facilities mentioned above, the Ministry of Agriculture, Malawi, and ADMARC have the following plans for dépôt construction. In the Northern Region, new facilities are required for a total capacity of 50,000 tons, 40,000 tons of it in Mzimba District and 10,000 tons in Karonga. Besides these, in the country as a whole, new warehouses are planned for storage of 10,000 tons each at Kasungu in the Central Region and at Luchenza and Zalewa in the Southern Region.

Of the above, the Government of Malawi has given priority to the project at Mzimba and warehouses with a capacity for storage of 20,000 tons are to be built in the first phase of this project. The Government of the Republic of Malawi has made a request to the Government of Japan for aid in construction of the warehouses with a capacity of 10,000 tons out of the 20,000, together with the related facilities and equipment. A request has been made for an aid with respect to the remaining 10,000 tons to the Government of the Netherlands.

The Ministry of Agriculture and ADMARC have ordered the priorities for warehouse construction in areas other than Mzimba District as follows.

1. Karonga (located on the Northern Corridor route)
2. Kasungu (lack of facilities despite location in a granary area)
3. Luchenza (food deficit in a heavily-populated area)
4. Zalewa (cotton-producing area, subject to food deficit, on the route to Tete in Mozambique)

2-2-2 Contents of the Request

A summary of the request from the Government of the Republic of Malawi is given below.

1) There is a serious shortage of agricultural storage facilities in Mzimba District.
2) Facilities for storage of 20,000 tons in terms of maize are to be built in the first phase of the project. A request is made to the Japanese

Government for grant aid in construction of warehouses for storage of 10,000 tons out of the 20,000, together with the related facilities and equipment.

3) A request is to be made to the Dutch Government for aid with regard to the remaining 10,000 tons.
4) The project site is in Mzimba in northern Malawi. The land has already been expropriated.
5) According to the records for the past five years, the average quantity of maize purchased by ADMARC is 31,000 tons per annum and that of other crops 6,000 tons. The quantities sold are 7,000 tons of maize for local consumption, 8,000 tons of fertilisers and 300 tons of maize seed per annum. On the basis of present ADMARC activities, the total storage capacity required in Mzimba is 42,000 tons. The figure will be altered, however, if population and agricultural growths are taken into account.

No other concrete figures are given in the request form and no mention is made of the bases for calculation of the required capacity or details of the equipment required.

Confirmation was made on the following points with regard to the request at the Ministry of Agriculture and ADMARC.

* The capacity of the warehouses is to be 10,000 tons in terms of maize. The ancillary buildings will include the administration block, chemicals store, canteen and shower room.
  Items to be stored are as follows (main items in square brackets).
  For purchase: [maize], groundnuts, tobacco, beans, sunflower
  For sales : [maize], [fertilisers], seeds, pesticides, agricultural machinery and implements
* Warehousing equipment requested include the following: tractor x 1 (with 2 trailers) folk lift x 1, stackers x 4, bag-sewing machines x 4, lorry scales x 2, platform scales x 4, moisture meters x 2, balance x 1, fumigation sheets x 12, fog machine x 1, fire extinguishers, thermometers and ladders.

It was also confirmed that, for the project site, there are approx. 8 ha of land owned by the Government of Malawi on the national highway approx. 2.5 km to the south of Mzimba Town.

2-3 Outline of the Project Area

2-3-1 Socioeconomic Conditions

The population of the Northern Region, at 907,121 (1987) accounts for only 11% of the total population of Malawi. Its population density is 34/km² and it is the least populous of the three regions in Malawi.

The Northern Region is divided into 5 administrative districts. The project area makes up about two thirds of the Mzimba Administrative District (The remaining one third includes Mzuzu City.) and consists of Central Mzimba and South Mzimba RDPs in terms of the divisions used by the Ministry of Agriculture. The population of the project area accounts for 29.6% of the total population of the Northern Region.

Population of Northern Region (1987)

	Population	Area (km²)	Population Density (per km²)	Average Annual Population Growth (1977-1987)
Total Malawi	7,982,607	94,276	85	3.71
Northern Region	907,121	26,931	34	3.41
Admin. Districts				
Chitipa	96,842	3,504	28	2.96
Karonga	147,136	2,955	50	3.24
Nkhata Bay	136,044	4,090	33	2.55
Rumphi	94,702	5,952	16	4.25
Mzimba	432,437	10,430	41	3.68
Project area	268,533	7,070	37	2.96
Other area	163,904	3,360	51	4.99

Source: Malawi Statistical Yearbook 1987

The Northern Region has the highest percentage of school attendance out of the three regions (national average: 45%, Northern Region: 68%). The percentage of school attenders in Mzimba District is 62%. (1987 figures)

The principal industry in Mzimba District is agriculture with maize as the main product and 84.9% of the population of the district are engaged in agriculture (1977 census). It is a typical granary area in Malawi and plays an important rôle in supplying food to the deficit areas in the south.

Mzimba Boma, the largest settlement in the project area, is no more than a small town, but is the administrative centre of the district and has offices of the Ministries of Agriculture, Labour and Education, as well as the offices of the District Commissioner, lawcourt, prison, district hospital, police station, post office, cattle market, secondary school, bank, radio station and government resthouse.

The population of Mzimba Boma was 7,735 according to the 1987 census. There were 4,089 persons between the ages of 15 and 64, 4,285 who had received primary education (67% of those aged above 5) and 871 who had received secondary or further education (14%). The annual rate of population growth since the previous census in 1977 was 3.62%.

2-3-2 Agricultural Produce Market in the Project Area

(1) Agricultural Land in Mzimba RDP Areas

Areas of land suitable for cultivation in each of the RDP areas in Mzimba are as follows according to the soil maps.

Land Suited to Cultivation in Mzimba RDP Areas (km^2)

RDP	Total Area	Suitable			Unsuitable
		High	Medium	Low	
South Mzimba	3,224	1,240	153	280	1,551
Central Mzimba	3,846	98	1,495	428	936
Total	7,070	1,338	1,648	708	2,487

Source: NRDP Background Study Report, General Land Use and Physical Constraints

From viewpoint of soil conditions, the South Mzimba area has higher development potential. While the average area of cultivated land per household is 2.1 ha, larger than the national average of 1.7 ha as can be seen from the table below, only 13% of the total arable land was under cultivation in Mzimba RDP area in 1983, indicating the great potential for expansion of cultivated land.

Areas of Land Cultivated by Smallholder Farmers

RDP	(1) Cultivated Area (ha)	(2) No. of Farming Households	Average Family Size	(3) Average Cultivated Area (ha)	(4) No. of Blocks
S. Mzimba	17,200	23,246		1.35	227
C. Mzimba	60,000	35,713	5.3	1.81	341
Mzimba Dis.				2.1 (5)	
Mzuzu ADD	129,694	115,281			931

Sources: (1)-(4) Mzuzu ADD 1990
(5) NSA 1980/81 figures

(2) Agricultural Production by Smallholder Farmers in Mzimba District

As in other districts, agricultural development for the smallholder farmers in Mzimba District is being promoted under the Government's NRDP and the district has been under Mzuzu ADD since 1978. The smallholder farmers consume most of their produce in their own homes and sell the surplus to ADMARC.

The principal crop in Mzimba District is maize, followed by groundnuts. Others crops include tobacco, sunflower and beans. While maize and groundnuts are produced more or less throughout Mzimba District, tobacco, sunflower and beans are produced mainly in Mzimba South.

(3) Marketing of Maize in Northern Region

RDP areas producing surplus maize in the Northern Region are Chitipa and Mzimba. Most of the surplus from Chitipa RDP is consumed in Karonga. While most of the surplus from Mzimba RDP is transported via the Central

Region to the Southern Region and consumed there, a part of it finds its way to Nkhata Bay, Likoma Island, areas subject to food shortage on the shores of Lake Malawi, as well as to Mzuzu City and consumed there.

In any case, the unfavourable road conditions in the rural areas make it particularly difficult for ADMARC and other intermediaries to purchase and transport the produce over long distances.

(4) Activities of ADMARC in Mzimba District

ADMARC buys agricultural produce and sells agricultural materials at its 6 parent markets and the 157 unit markets located around the parent markets.

The quantities purchased and sold at each market are given according to items in the tables below. The following remarks should be made concerning these figures.

* The quantities of maize purchased vary from year to year according to the crop conditions but the maize purchased in Mzimba District accounts for 15% of the total purchased by ADMARC.
* The quantity of groundnuts purchased has shown a sharp drop since its peak in 1987/88 and was as little as 24 tons in 1989/90. Besides the drop in production, the purchase by private traders at prices above ADMARC's purchase prices is said to be the main cause for the decrease in the quantity handled by ADMARC. The same point may be made for beans.
* There is little variation in the quantities of fertilisers sold each year. There is a small increase in the long run. The total annual sales of fertilisers for Mzimba District as a whole is just under 10,000 tons.
* Maize seeds account for approximately 90% of the total sales of seeds. The Government has been making efforts to promote the use of hybrid and composite varieties of maize and the sales of these have been showing an annual increase of around 10%.

Purchase of Maize

(According to Parent Markets in Mzimba District)

(tons)

Parent Market	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90
Emfeni	-	-	-	-	14,441	8,441	7,646	8,171	6,104
Champhira	-	-	-	-	-	5,508	5,382	4,951	4,176
Mbawa	13,039	16,962	16,764	17,645	13,506	5,927	3,823	7,554	7,378
Mzimba	11,497	12,667	13,640	10,858	11,170	7,224	2,363	3,271	5,041
Kamchocho	-	-	-	-	-	-	-	2,781	6,868
Euthini	-	-	-	-	5,648	3,484	505	1,400	5,212
Total	24,536	29,629	30,404	28,503	44,765	30,584	19,719	28,128	34,779

Source: ADMARC Regional Office North, Aug. 7, 1990

Purchase of Groundnuts

(According to Parent Markets in Mzimba District)

(tons)

Parent Market	1985/86	1986/87	1987/88	1988/89	1989/90
Emfeni	159	388	942	146	17
Champhira	-	111	257	60	2
Mbawa	128	350	1,021	148	2
Mzimba	106	315	690	13	-
Kamchocho	-	-	-	36	1
Euthini	126	315	682	68	2
Total	519	1,479	3,592	471	24

Source: ADMARC Regional Office North, Aug. 16, 1990

Purchase of Sunflower Seeds

(According to Parent Markets in Mzimba District)

(tons)

Parent Market	1985/86	1986/87	1987/88	1988/89	1989/90
Emfeni	32	1	4	1	2
Champhira	-	23	55	180	17
Mbawa	36	12	11	20	5
Mzimba	1	1	2	-	1
Kamchocho	-	-	-	-	-
Euthini	-	-	-	-	-
Total	70	37	72	201	25

Source: ADMARC Regional Office North, Aug. 16, 1990

Purchase of Beans

(According to Parent Markets in Mzimba District)

(tons)

Parent Market	1985/86	1986/87	1987/88	1988/89	1989/90
Emfeni	1	440	966	878	93
Champhira	-	182	395	424	91
Mbawa	292	30	84	154	49
Mzimba	12	73	186	93	14
Kamchocho	-	-	-	1	2
Euthini	-	6	9	1	5
Total	305	731	1,640	1,551	254

Source: ADMARC Regional Office North, Aug. 16, 1990

Purchase of Tobacco

(According to Parent Markets in Mzimba District)

(tons)

Parent Market	1985/86	1986/87	1987/88	1988/89	1989/90
Emfeni	40	34	38	85	66
Champhira	26	15	10	20	9
Mbawa	43	38	36	60	92
Mzimba	57	68	47	60	108
Kamchocho	-	-	-	24	66
Euthini	38	11	2	9	15
Total	204	166	133	258	356

Source: ADMARC Regional Office North, Aug. 16, 1990

Sales of Maize

(According to Parent Markets in Mzimba District)

(tons)

Parent Market	1985/86	1986/87	1987/88	1988/89	1989/90
Emfeni	15	111	2,174	355	518
Champhira	-	82	66	1,775	713
Mbawa	189	165	2,165	154	464
Mzimba	1,444	776	4,360	714	217
Kamchocho	-	-	-	68	90
Euthini	8	51	1,228	375	173
Total	1,656	1,185	9,993	3,441	2,175
Regional Office North	14,889	37,845	30,914	12,537	13,216

Source: ADMARC Regional Office North, Aug. 11, 1990

Sales of Fertilisers

(According to Parent Markets in Mzimba District)

(tons)

Parent Market	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90
Emfeni	-	-	-	-	2,377	1,973	2,113	1,765	2,183
Champhira	-	-	-	-	47	1,124	1,472	961	1,377
Mbawa	3,874	3,530	3,674	4,731	2,154	1,473	1,639	1,764	1,541
Mzimba	3,163	3,610	3,770	3,768	2,406	1,321	2,129	1,643	762
Kamchocho	-	-	-	-	-	-	-	1,095	2,055
Euthini	-	-	-	-	1,126	332	1,023	1,403	1,678
Kazomba Depot	-	-	-	-	-	231	2	155	336
Total	7,010	7,140	7,444	8,499	8,110	6,954	8,378	8,786	9,932

Source: ADMARC Regional Office North, Aug. 8, 1990

Sales of Maize and Other Seeds

(According to Parent Markets in Mzimba District)

(tons)

Parent Market	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90
Emfeni	-	-	-	-	-	81	48	77	44	111
Champhira	-	-	-	-	-	-	43	61	35	61
Mbawa	75	57	97	84	104	68	32	54	53	95
Mzimba	83	108	155	120	107	75	24	59	60	111
Kamchocho	-	-	-	-	-	-	-	-	47	86
Euthini	-	-	-	-	-	39	8	15	43	70
Kazomba Depot	-	-	-	-	-	-	9	9	10	2
Total	158	165	252	204	211	263	164	275	292	536

Source: ADMARC Regional Office North, Aug. 7, 1990

(5) Consumption of Maize within Mzimba District

Although Mzimba District, the project area, produces surplus maize, farmers will buy maize from ADMARC's markets if their fields are too small for them to produce sufficient maize for their own consumption and when they have sold their produce to obtain cash and then run short, as well as in cases of bad harvest due to drought.

The quantities of maize sold at each of the parent markets are given in 2-3-2(5). The average quantity sold (3,690 tons) is approximately 12% of the average annual purchase (31,594 tons) but there is great variation from year to year.

ADMARC Regional Office North has given directions to the parent markets to set aside a total of 9,000 tons of maize for sale within the district for 1990/91 as shown in the table below. This amount is almost equal to the past record sales of 9,993 tons in 1987/88.

Quantities of Maize Set Aside for Sale
at Parent Markets within Mzimba District (1990/91)

Emfeni	1,000 tons
Champhira	1,500 tons
Mbawa	1,000 tons
Mzimba	500 tons
Kamchocho	500 tons
Euthini	1,000 tons
Kazomba Dépôt	3,500 tons
Total	9,000 tons

Source: ADMARC Regional Office North, July 18, 1990

Besides the above, ADMARC Regional Office North plans to store 4,000 and 8,000 tons of maize at Chilumba and Mzuzu Dépôts, respectively, to cover the deficit areas in the Northern Region.

(6) Timing for Marketing of Agricultural Produce and Materials

The planting patterns for various crops grown in Mzimba District are given in the figure in 2-1-1(6). The produce are naturally placed on the

market after harvest. Since this will be in the dry season, there are no problems caused by high water content in the produce. The routes for distribution of agricultural produce and materials are shown in the figure in 2-1-3(4). Since the basic route for maize goes from the unit market to the parent market and then to the dépôt, it takes time for the maize to reach the dépôts.

In the following tables, the figures from the weekly reports on the movement of maize at the parent markets and Kazomba Dépôt have been converted into monthly movements. The figures are also shown in a graph.

The following remarks may be made concerning these figures.

* The delivery of maize to the parent markets is concentrated around August and September immediately after the harvest season, indicating that it does not take long for the maize to be transferred from the unit markets to the parent markets. This is because of the high costs of storing small quantities of maize (average: 200 tons) at unit markets, as well as the need for speedy transfer because the maize is stored out in the open at these unit markets.
* Although there is little difference between the times of shipment from the parent markets and reception at Kazomba Dépôt, the time of their delivery to Kazomba Dépôt is slightly early. Since the parent markets are located within 100 km of Kazomba Dépôt, the maize will reach the dépôt on the same day as it leaves the markets.
* The maize is normally stored at the parent markets for 2 to 3 months.
* Although the shipment from Kazomba Dépôt decreases during the preharvest season, there is maize leaving the dépôt throughout the rest of the year. The duration of storage may, therefore, be as long as 8 to 9 months.

In any case, the movement of maize within Mzimba District mostly takes place during the dry season. In other words, the maize needs to be transferred to the dépôt before the beginning of the rainy season because of the road conditions and the lack of storage facilities at the markets.

Percentage of Maize Reaching Parent Markets
in Mzimba District according to Months (%)

Month	Mzimba South				Mzimba Central				Mzimba District
	Emf.	Cham.	Mbawa	Ave.	Mzimba	Kamch.	Euth.	Ave.	Ave.
Apr.	0.1	0.3	0.5	0.3	1.9	0.0	0.3	0.7	1.0
May	0.1	0.0	0.2	0.1	1.5	0.0	0.0	0.5	0.6
Jun.	0.5	0.0	0.1	0.2	1.0	0.0	0.0	0.3	0.5
Jul.	10.3	8.2	13.2	10.6	5.7	5.3	11.1	7.4	6.0
Aug.	46.8	47.6	43.5	46.0	40.2	35.7	49.2	41.7	43.8
Sep.	30.7	30.9	24.0	28.5	23.3	32.6	23.3	26.4	27.5
Oct.	9.3	12.2	11.9	11.1	8.1	16.4	4.0	9.5	10.3
Nov.	1.2	0.5	2.2	1.3	6.8	9.9	7.5	8.1	4.7
Dec.	0.0	0.0	0.9	0.3	1.9	0.0	1.2	1.0	0.7
Jan.	0.5	0.0	1.1	0.5	2.7	0.0	1.4	1.4	1.0
Feb.	0.4	0.1	1.6	0.7	2.9	0.0	1.2	1.4	1.0
Mar.	0.1	0.3	0.7	0.4	4.0	0.0	1.0	1.7	1.5

Note: The above are average figures for 1985/86 - 1989/90.
Source: ADMARC Regional Office North

Percentage of Maize Leaving Parent Markets
in Mzimba District according to Months (%)

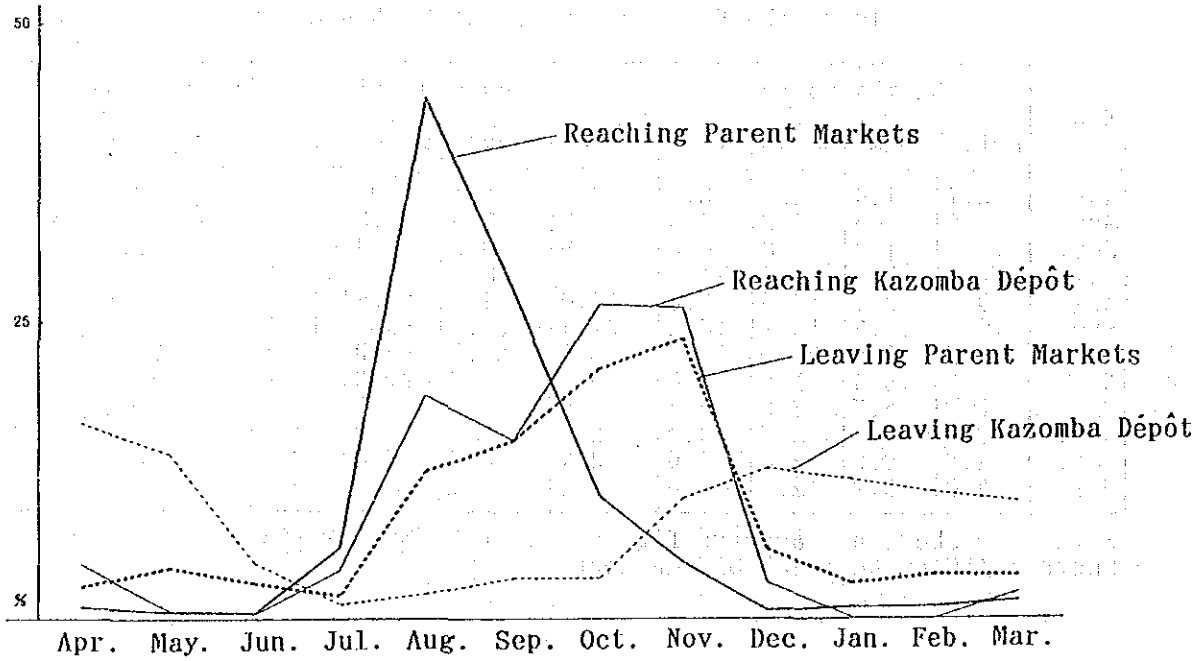
Month	Mzimba South				Mzimba Central				Mzimba District
	Emf.	Cham.	Mbawa	Ave.	Mzimba	Kamch.	Euth.	Ave.	Ave.
Apr.	2.7	1.4	2.6	2.2	3.2	4.1	2.7	3.3	2.7
May	9.5	0.5	7.8	5.9	3.0	1.8	3.3	2.7	4.3
Jun.	11.5	1.7	1.3	4.8	1.9	0.8	1.0	1.2	3.0
Jul.	2.0	0.2	2.9	1.7	2.3	0.6	3.2	2.0	1.9
Aug.	9.4	8.4	19.0	12.3	14.0	4.7	18.8	12.5	12.4
Sep.	10.0	11.2	18.1	13.1	21.7	13.5	15.7	17.0	15.0
Oct.	24.7	28.5	23.8	25.7	18.2	18.5	12.9	16.5	21.0
Nov.	6.6	18.4	11.6	15.6	19.1	47.8	27.3	31.4	23.5
Dec.	5.1	8.7	3.2	5.7	4.9	5.6	7.1	5.9	5.8
Jan.	2.7	5.8	3.6	4.0	2.8	1.1	1.9	1.9	3.0
Feb.	2.8	9.0	3.3	5.0	3.7	0.9	2.6	2.4	3.7
Mar.	3.0	6.2	2.8	4.0	5.2	0.7	3.7	3.2	3.6

Note: The above are average figures for 1985/86 - 1989/90.
Source: ADMARC Regional Office North

Percentage of Maize and Fertilisers
Reaching and Leaving Kazomba Dépôt according to Months (%)

Month	Maize		Fertilisers	
	In	Out	In	Out
Apr.	4.6	17.9	4.0	0.0
May	0.7	15.1	2.9	0.5
Jun.	0.4	5.1	6.2	0.4
Jul.	4.1	1.3	3.1	3.6
Aug.	18.8	2.3	22.6	6.3
Sep.	15.0	3.6	10.9	4.2
Oct.	26.4	3.7	25.9	24.0
Nov.	26.1	11.0	16.3	27.7
Dec.	3.0	13.6	2.1	19.9
Jan.	0.1	12.7	7.1	7.4
Feb.	0.0	3.4	0.3	4.7
Mar.	2.2	10.6	0.4	2.4

Note: The above are average figures for 1986/87 - 1989/90.
Source: ADMARC Regional Office North



Percentage of Maize Reaching and Leaving
Parent Markets and Kazomba Dépôt according to Months (%)

Percentage of Fertilisers Reaching Parent Markets
in Mzimba District according to Months (%)

Month	Mzimba South				Mzimba Central				Mzimba District
	Emf.	Cham.	Mbawa	Ave.	Mzimba	Kamch.	Euth.	Ave.	Ave.
Apr.	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
May	1.4	0.2	0.3	0.8	0.0	0.0	0.0	0.0	0.3
Jun.	11.0	5.3	6.8	7.7	6.2	2.3	10.1	6.2	7.0
Jul.	16.9	12.7	14.2	14.8	9.0	2.4	20.4	10.6	12.6
Aug.	6.1	7.3	9.2	7.5	14.6	13.6	14.3	14.2	10.9
Sep.	12.2	17.6	12.6	14.1	14.1	19.2	12.0	15.1	14.6
Oct.	6.7	29.3	11.6	15.9	20.1	17.3	14.4	17.3	16.6
Nov.	10.3	14.6	23.5	16.1	15.2	35.2	21.8	24.1	20.1
Dec.	18.5	5.4	13.5	12.5	7.3	3.2	4.0	4.8	8.7
Jan.	5.1	3.3	6.3	4.9	4.1	5.1	2.0	3.7	4.3
Feb.	10.1	3.7	2.0	5.3	6.7	1.7	0.7	3.0	4.2
Mar.	1.6	0.6	0.1	0.8	2.6	0.0	0.3	1.0	0.9

Note: The above are average figures for 1985/86 - 1989/90.
Source: ADMARC Regional Office North

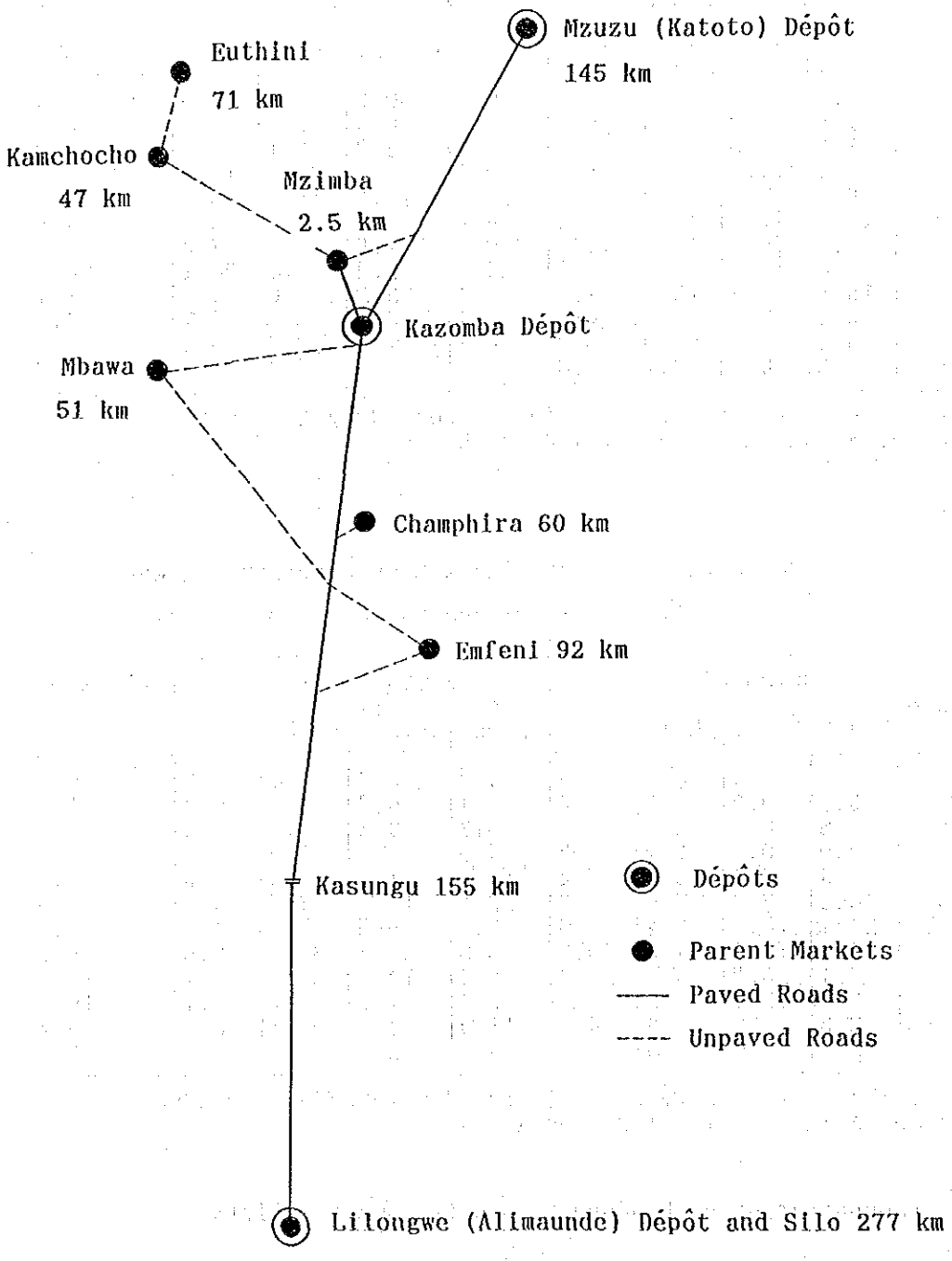
Percentage of Fertilisers Leaving Parent Markets
in Mzimba District according to Months (%)

Month	Mzimba South				Mzimba Central				Mzimba District
	Emf.	Cham.	Mbawa	Ave.	Mzimba	Kamch.	Euth.	Ave.	Ave.
Apr.	2.7	0.0	0.1	0.9	0.2	0.0	0.4	0.2	0.6
May	9.5	0.0	0.6	3.4	0.4	0.2	0.3	0.3	1.8
Jun.	11.5	0.1	4.0	5.2	6.3	0.6	1.0	2.6	3.9
Jul.	2.0	0.5	1.1	1.2	4.5	0.3	0.5	1.8	1.5
Aug.	9.4	7.4	5.4	7.4	7.8	1.5	5.8	5.0	6.2
Sep.	10.0	8.3	7.5	8.6	12.4	13.4	7.6	11.1	9.9
Oct.	24.7	28.9	8.2	20.6	12.8	15.5	5.5	11.3	15.9
Nov.	16.6	17.8	27.9	20.8	20.8	35.5	32.6	29.6	25.2
Dec.	5.1	20.2	23.8	16.4	9.9	14.3	22.1	15.4	15.9
Jan.	2.7	10.7	11.9	8.4	8.6	11.5	15.1	11.7	10.1
Feb.	2.8	4.2	6.9	4.6	11.9	4.7	7.7	8.1	6.4
Mar.	3.0	2.0	2.5	2.5	4.7	2.5	1.7	3.0	2.7

Note: The above are average figures for 1985/86 - 1989/90.
Source: ADMARC Regional Office North

(7) Transportation of Produce to and from Mzimba District

The distances from Kazomba Dépôt to the parent markets within Mzimba District and the transportation bases to places outside the district are given below.



Distances from Kazomba Dépôt to Parent Markets within Mzimba District and Other Dépôts

Following points may be drawn from the positional relationships shown above.

* Since all the parent markets are located within 100 km of Kazomba Dépôt, goods can be transported within one day from them to the dépôt.
* The main first destination of the commercial maize is Lilongwe, located to the south. Transportation costs (0.3 MK/ton/km) can be reduced, therefore, by transporting the maize leaving the markets located further south than Kazomba Dépôt directly south without making it pass through Kazomba Dépôt.

  If the maize from the parent markets in Emfeni, Champhira and Mbawa in Mzimba South is transferred to and stored at Kazomba Dépôt before being transported south, there will be unnecessary detours of approximately 70 km in case of the maize from Mbawa, 120 km in case of Champhira and 180 km in case of Emfeni. If we take the average of the three at 130 km, the costs of these detours will amount to 15% of the price of the maize (26 tambala/kg). There are the costs for loading and unloading in addition.
* Kazomba Dépôt is more or less en route for maize travelling south from the parent markets at Mzimba, Kamchocho and Euthini in Mzimba Central and en route to Mzuzu in case of that from Kamchocho and Euthini and their transportation via Kazomba Dépôt will not involve unnecessary long detours. Kazomba Dépôt is located in a suitable position for a dépôt covering Mzimba Central.

(8) Agricultural Development in Project Area

Mzimba District, the project area, is an important granary area in Malawi. Development projects are in progress to further increase the production in this area. There are two projects in progress as a part of the National Rural Development Programme (NRDP) at present in Mzimba District as shown in the table below. As mentioned elsewhere, the aim of the NRDP is to raise the standards of living in rural communities through increasing agricultural production and productivity. These two projects were begun in 1986/7 and due to delays in implementation are expected to be extended to 1991/92. The parts of the projects relevant to the warehouse

construction project include the increased production of maize, groundnuts and beans, as well as improvement of marketing services.

Agricultural Development Projects in Progress in Mzimba District

Project	Estimated Cost	Farm Families	Construction of ADMARC Sheds as scheme market
Central Mzimba RDP	3,007,566MK	31,310	5 (constructed)
South Mzimba RDP	5,928,519MK	23,490	4 (constructed)

Source: Development Proposal, 1991/92, Mzuzu ADD Office, July 1990

2-3-3 Existing ADMARC Facilities in the Project Area

(1) Facilities in Project Area

There are 6 ADMARC parent markets in Mzimba District. The storage facilities at these markets are listed below.

Storage Facilities at Parent Markets and Dépôt in Mzimba District

Market/Dépôt	Number of Warehouses	Warehouse Capacity (ton)	Mini-Silo Capacity (ton)	Number of Unit Markets
Emfeni	2	1,000	3,000	27
Champhira	1	500	3,000	24
Mbawa	0	0	4,500	34
Mzimba	1	1,000	0	25
Kamchocho	0	0	2,500	20
Euthini	0	0	0	27
Kazomba Dépôt	2	3,000	2,500	-
Total		5,500	15,500	157

The names of the unit markets under each parent market and their distances from the parent markets are given in the following tables.

Distances from Parent Markets to Unit & Seasonal Markets

(km)

Emfeni		Champhira		Mbawa		Mzimba		Kamchocho		Euthini	
1. LIZIWAZI	24	1. LAVIJERE	11	1. EWOMBENI	22	1. MACHECHETA	19	1. CHISASA	21	1. LUKWELUKWE	23
2. CHIBANDAUKA	18	2. LODJWA	14	2. CHIKANDE	23	2. MANYAMULLA	24	2. MJINGE	32	2. MADEDE	32
3. KAMANDO	18	3. CHAFISI	21	3. EMCHAKACHAKENI	10	3. ZUBA YUMO	11	3. KAMTETEKA	18	3. CHAMALIBA	45
4. UNYOLO	28	4. CHADIZA	14	4. ZONGENDEWA	28	4. MVAKULE	8	4. CHISENGEZI	8	4. AGRIPA	50
5. KHOSOLO	41	5. KAMARAMBO	10	5. KABAZA	6	5. BAPHANI	48	5. PHALA	25	5. MCHIMKHUCA	57
6. PHAZI	7	6. ETHUNGUNDENI	24	6. NDABA	22	6. EMSWAZINI	40	6. KAMWALA	18	6. KASENGA	66
7. KALUWE	36	7. HOHO	14	7. KAKOMA	10	7. MZALANGWE	67	7. BASOPO	14	7. MCHINTHA	75
8. MAFUNDEYA	32	8. TAMBALA	34	8. ETCHIYENI	12	8. KABILUWILU	66	8. MALIMYETE	19	8. MTANTHA	26
9. KANYIKA	56	9. KAZINGILIRA	16	9. DIMI	12	9. CHIWENBE	37	9. ENMNDENI	23	9. KAMBANGA	20
10. KAMIMBA	52	10. KAMALAZA	18	10. MHALAUNDA	14	10. MTUZA	14	10. VISENTHE	25	10. YAKWATA	14
11. KAPITA/CHASEFU	25	11. LUVIBI	21	11. MABOBO	25	11. LUNJIKA	43	11. CHINDINDINDI	24	11. KAPANDO	16
12. MKAZIMASIKA	9	12. KASAMBANKHOLE	16	12. MWITHA	22	12. KAMANGADAZI	14	12. KAKOMBWE	27	12. KAFUKULE	39
13. MKOMA	40	13. KAULUSI	35	13. KALIKUMBI	26	13. EMOMENI	47	13. MUTHONJE	15	13. NTHUMBA	30
14. CHIWEMBE	9	14. EHEHLENI	19	14. MCHILAPUNDU	12	14. KALWEYA	11	14. SASA	31	14. KANYANKHANDE	13
15. MILENJE	20	15. MSESE	22	15. CHIWONDWE	23	15. MBWIRIWIZA	7	15. KAWONEKELA	41	15. MTENDE	16
16. NGOLI	24	16. MPHALISHI	19	16. VIBANGALALA	18	16. EZONDWENI	9	16. MALATA	24	16. MKWANGWALI	21
17. KANJUGI	38	17. MKHAKAMA	21	17. MABIRI	25	17. MATHANDANI	19	17. CHASISI	16	17. ZOWE	12
18. KABIZA	32	18. CHIPATA	24	18. MAKHOSIKAZI	18	18. JANDALALA	56	18. LUBEBYA	21	18. CHANWNGUMA	38
19. CHISAMBE	37	19. KAMATOWO	14	19. KAPOPO	19	19. KAMZOMERA	34	19. CHABOLA	3	19. CHANYAMA	15
20. PHEMBE	36	20. CHAMAJI	8	20. MQUOCHA	32	20. KAKOMBO	11	20. BULALA	5	20. MANTHULU	38
21. KAMILABANTHW	16	21. NGUNGULU	32	21. MZOMA	17	21. KAVIKULA	4			21. MSAMBA FUMU	39
22. CHAMKORO	48	22. MAKUMBO	45	22. KAMBEWA	28	22. KAMATUNDU	2			22. MATALA	58
23. MSAMBAMYIFWA	36	23. KAUFIPA	5	23. EDINGENI	17	23. MONGO	35			23. MALIDADE	60
24. MCHILAWENGO	28	24. KATETE	1/2	24. EMBANGWENI	2	24. CHIHAUHAU	3			24. CHANKHALAMU	35
25. KAMUWARE	49			25. THOZA	15	25. BOKOLA	10			25. CHIBEKU	28
26. MAGUSU	7			26. KANYANJE	13					26. CHAYIBWA	25
27. KACHERE	46			27. KAPATA	55					27. KAMHLUZI	8
				28. CHAMPHOYO	35						
				29. KAMALIBWE	29						
				30. KAKA	22						
				31. NJOKA	20						
				32. MAPANJIRA	27						
				33. KADORA	13						
				34. CHITACA							

Source: ADMARC Mzimba Divisional Office

(2) Existing Facilities at Kazomba Dépôt

Kazomba Dépôt is the name of the dépôt at Kazomba from which the project site takes its name. As of August 1990, there is no warehouse at the project site and fertilisers are stored in the open yard.

Adjacent to Mzimba Market, 2.5 km away from Kazomba, there are 2 warehouses (capacities: 2,000 and 1,000 tons) and 5 mini-silos (total capacity: 2,500 tons) administratively under Kazomba Dépôt. The floor area of the 2,000-ton warehouse is 1,425 m^2 (18.1 m x 79.3 m), while that of the 1,000-ton warehouse is 440 m^2 (12.2 m x 36.4 m). The 2,000-ton warehouse is used for storage of oriental tobacco, which cannot be stored in the same warehouse as other agricultural produce and materials because of its nature. These warehouses had previously been attached to Mzimba Market but were transferred to the jurisdiction of Kazomba Dépôt in 1986. It is necessary to investigate and evaluate functions of these existing facilities in determining the scale of the warehouse to be constructed under the present project.

The quantities of goods handled at Kazomba Dépôt since its opening are as given in the following tables. Since there are only provisional, small-scale warehouses at this dépôt as mentioned above, much of the maize gathered from South Mzimba are transported directly to areas outside of the Mzimba District from the parent markets. There is a need, therefore, to investigate and forecast how the marketing structure will be altered by the completion of the warehouse under the project.

Quantities of Maize and Fertilisers Handled at Kazomba Dépôt

Maize (tons)

Year	In	Out	Stock Minimum	Stock Maximum
1986/87(*)	4,154	2,279	1,690 (Jun.)	4,191 (Jan.)
1987/88	7,308	8,524	12 (Mar.)	6,422 (Nov.)
1988/89	5,418	1,599	184 (Apr.)	4,468 (Dec.)
1989/90	4,406	7,644	15 (Jun.)	4,077 (Apr.)
Total	21,286	20,046	-	-

* From 12th Week (June) to the end of the year

Fertilisers (tons)				
Year	In	Out	Stock Minimum	Stock Maximum
1986/87(*)	8,693	9,223	224 (Feb.)	4,301 (Oct.)
1987/88	282	85	25 (Jun.)	239 (Mar.)
1988/89	8,967	8,265	65 (Apr.)	2,834 (Nov.)
1989/90	4,531	5,061	31 (Jun.)	2,200 (Oct.)
Total	22,473	22,634	-	-

* From 11th Week (June) to the end of the year
Tonnage not converted into maize terms
Source: Weekly Movement Report, Kazomba Dépôt, ADMARC Regional Office North

2-3-4 Conditions at the Proposed Construction Site

The proposed site for the construction of the warehouse is located about 2.5 km south of ADMARC Mzimba Market. The site is joined to the National Road M9 (width: 8 m) by a 480 m access road, and the elevation of the site is about 10 m above that of the main road.

The site is mostly flat, but the edges are 3 to 8 m lower than the centre. There is a small rise with a height of about 5 m at the northeastern end of the site and there is a brick-masonry hut at this point (48 m^2). The site is surrounded by a barbed-wire fence with a steel-pipe gate at the entrance. The total area of the site is approximately 79,500 m^2, with a minor axis of 260 m and a major axis of 425 m. There is one telephone line to the existing hut and four to the telegraph pole in front of the hut. There are no power lines or water supply pipes at the site itself, but there is a single-phase 2-line 230 V commercial power supply (3-phase 4-line 380 V up to the telegraph pole) and a water supply pipe (diameter: 2 inches, running from the water tank at Mzimba Boma) at the RDP Office about 400 m away in a straight line from the site.

The soil at the site is a reddish soil typical of northern Malawi. Because of its location on raised ground the drainage in the site is good and there seems to be no special problem regarding the construction of the warehouse. This reddish soil, however, is difficult to compact again once it becomes powdery and care needs to be taken over this point during construction.

Chapter 3 OUTLINE OF THE PROJECT

3-1 Objective

The objective of the project is to solve the problem of the shortage of warehousing facilities for the storage of agricultural products in Mzimba District in Malawi and so contribute to a stable supply of food in Malawi, through construction of a warehouse and related facilities, and provision of the warehousing equipment.

3-2 Study and Examination of the Request

3-2-1 Appropriateness of the Project

The present conditions regarding agricultural storage facilities in the project area are discussed in 2-1-4. There are simply not enough storage facilities at the level of parent markets and those that do exist, the mini-silos and log sheds, are unsatisfactory from the viewpoint of work efficiency and durability.

The dry and rainy seasons are clearly defined in the project area. In such places, the normal practice is to have the produce piled up out in the open during the dry season. During the rainy season, however, the rising humidity and temperature lead to possibilities of spoilage and generation of vermin and the lack of sheds means that handling of the goods during the rainy season will cause deterioration of the merchandise, while loading and unloading is not possible in the rain with mini-silos.

There is a need, therefore, to transfer the produce which has been harvested and collected to safe warehouses where it can be handled regardless of weather conditions before the beginning of the rainy season. There are very few warehouses of this sort in the project area. The maximum efforts possible are being made at present to take the necessary measures before the beginning of the rainy season in the face of adverse conditions, such as the difficulty of securing lorries and lack of tarmac roads, sending some of the produce to Kazomba, keeping some of it in the mini-silos at the markets and sending the rest directly to Lilongwe.

Although Kazomba is supposed to be one of ADMARC's 38 dépôts, it does not have a proper warehouse and is forced to make do with 2 buildings and 5 mini-silos at Mzimba Market. It is clear that there is a need to construct a warehouse with an appropriate capacity to allow the dépôt to discharge its functions as a base for the storage and marketing of agricultural produce from the area and implementation of the project is judged to be appropriate.

3-2-2 Operation Capabilities

The organisation directly responsible for the operation of the project warehouse after its completion already exists and its personnel composition is given below. The dépôt office is located at present within the premises of Mzimba Market. The plan is to transfer the office with an enlarged staff to a new site upon completion of the warehouse. The only new job required upon completion of the facilities will be that of the weighbridge operator and it is thought possible to expand the number of personnel without any problems by having other new staff trained by the present staff members.

Dépôt Supervisor	1
Asst. Dépôt Supervisor	1
Cashier	1
Dépôt Clerk	1
Tally Clerks	2
Messenger	1
Capitao	1
Security Guards	4
Temporary Workers(May to Sep.)	30

The 1989/90 operation budget for Kazomba Dépôt (to 31st March 1990) was 122,600 MK, while the actual expenditure was 116,875 MK. The largest proportion of the expenditure was taken up by wages for temporary workers, which amounted to 52,778 MK or 45%. This was followed by wages for permanent workers (16,429 MK), staff salaries and emoluments (7,338 MK) and gratuities (2,851 MK). The total of these four items of direct personnel

expenses accounted for approximately 68% of the total expenditure.

The maximum number of temporary workers employed at one time was about 30 (May to September). According to Mzimba Divisional Office, there is no problem procuring up to 20 permanent and 60 temporary workers. The pay for temporary workers is 2.09 MK per day (7.30 to 17.00, lunch provided).

As regards transportation capacity, the divisional office only owns 4 lorries at present. There are no lorries owned at the level of parent markets and transportation of most of the produce is commissioned to small private firms. The fee is 0.3 MK/ton/km (including payment for driver and fuel). Since this fee does not vary according to road conditions, lorry operators prefer commissions for long-distance travel on national roads to places like Lilongwe and are reluctant to accept those on regional roads which involves dangers and damage to the lorries. Whatever the case, completion of the project warehouse will remove the restriction on handling of the produce at the dépôt during the rainy season and render it easier to devise transportation plans and allocation of vehicles.

3-2-3 Similar Projects and Aid Programmes by Other International Organisations

(1) Request to Dutch Government for Funding for Grain Warehouse

As mentioned in 2-2-1, simultaneously with the request to the Japanese Government, the Malawi Government made a request to the Government of the Netherlands for funding for the construction of 10,000-ton warehousing facilities in the same Mzimba District. When inquiries were made at the Dutch Embassy in Zambia, however, the reply given was that, although they had received the request, they were not intending to comply at present. There will be, therefore, no need for adjustment of the present project with the Dutch Government.

(2) Fertiliser Warehouse Construction with EC Funding

The large quantities of fertilisers imported by Malawi are handled by SFFRFM (See 2-1-3(5)(c)). The EC has provided funding for the construction of warehouses for fertilisers at Blantyre (40,000 tons), Lilongwe (80,000 tons) and Mzuzu (40,000 tons) in line with SFFRFM's marketing plans and all

these have now been completed. The warehouse at Mzuzu was completed as recently as September 1990 and this will affect the operations of the present project. Investigations concerning this point will be dealt with in 3-3-2.

3-2-4 Need for Technical Cooperation

Under the Agricultural Produce Marketing Project begun in February 1987 under funding from UNDP, technical cooperation is being provided by FAO specialists to ADMARC, the organisation responsible for implementation of this warehouse construction project. The objective of this project is to raise the standards of knowledge concerning the quality of agricultural products and of the management capacity related to marketing of agricultural products. The fields of cooperation include crop marketing, export marketing, operation management, accounting systems and procedures, transport operations, internal auditing procedures, storage and quality control and introduction of a computer system. The initial funding for the project was $ 1,129,799 over a period of two years and another $ 125,000 has been provided for the purchase of materials and equipment.

Fruits of the cooperation so far include publication of the "Manual on Storage Management and Quality Control" and "Export Marketing Manual of Agricultural Products". As regards the computer system, the ADMARC Headquarters and its three regional offices have been put on line and the system is used for gathering information for the weekly reports. All the 1,200+ unit markets in the country have been codified and market numbers are being printed on all the grain bags as a part of their effort to establish a system for quality control.

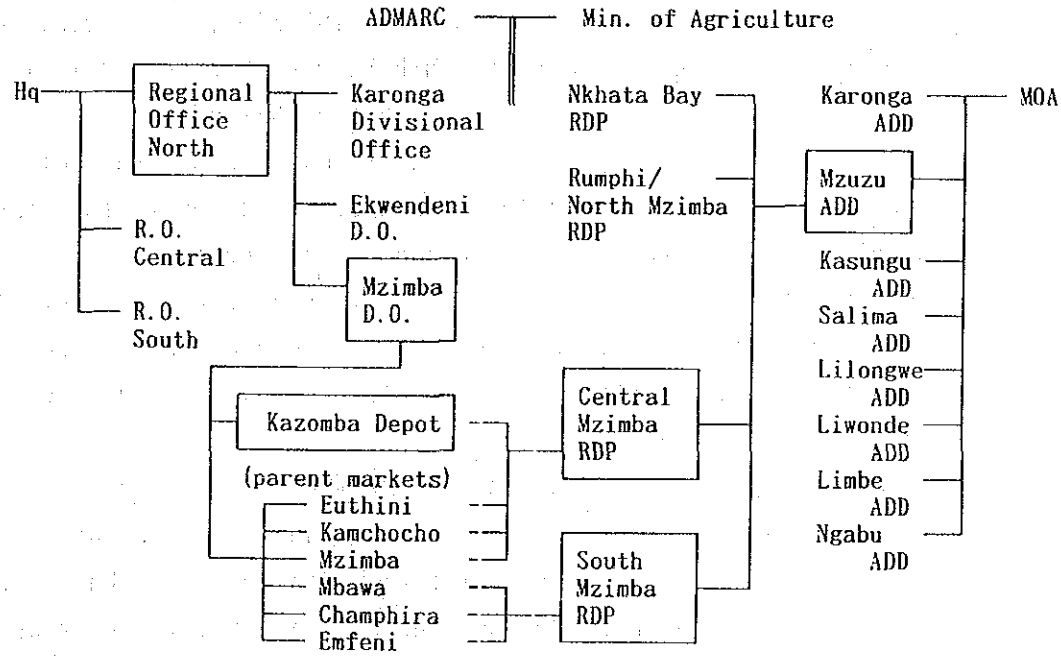
There is a need to keep an eye on the progress of the technical cooperation project described above.

As regards the use and maintenance of the grant equipment, adequate operation training should be implemented at the time of the handing-over, taking account of the conditions at the Bangula Dépôt, constructed and equipped with aid from Japan.

3-3 Project Description

3-3-1 Executing Agency and Operational Structure

The organisation responsible for implementation after the completion of the grant aid cooperation is ADMARC. Its structure is given below, together with its relationship to the Ministry of Agriculture which is responsible for the supervision of ADMARC.



ADD: Agricultural Development Division x 8

RDP: Rural Development Project x 24

There are six parent markets and one dépôt in the project arca under the jurisdiction of Mzimba Divisional Office, which in turn is supervised by the ADMARC Regional Office North. The counterparts in the Ministry of Agriculture are the RDP Offices for Central and South Mzimba.

3-3-2 Plan of Activity

(1) Items to be Stored at the Project Warehouse

As shown in the drawing of the marketing routes (2-1-3-(4)), items to be considered include maize, groundnuts, sunflower seeds, beans and tobacco among agricultural produce and fertilisers and seeds among agricultural input. Items to be actually stored at the project warehouse will, however, be limited mainly to maize for the following reasons.

* The quantities of groundnuts purchased by ADMARC have been decreasing rapidly in recent years (24 tons in 1989/90), and most of what purchases there are are made in South Mzimba. Groundnuts will not be handled at the project warehouse in Central Mzimba.
* Of the sunflower seeds purchased in Mzimba, 99% are collected at Champhira and other markets in South Mzimba and only 1% comes from Central Mzimba. Furthermore, NOIL and Lever Brothers, who are the buyers of the sunflower seeds, have their factories at Blantyre in the Southern Region. Most of the sunflower seeds are sent directly from Champhira to these factories and it will be more rational to maintain this marketing structure.
* Over 90% of the beans purchased in Mzimba are collected in South Mzimba and the beans for consumption in urban areas in the south and for export are sent directly from markets in South Mzimba to Blantyre and Limbe in the Southern Region. There is no point in transporting them via Kazomba Dépôt.
* Of the tobacco, only the Oriental variety has been handled at the existing warehouse at Mzimba Market. Since, in view of its nature, tobacco cannot be kept in the same warehouses as other items such as maize, it will be stored in the existing warehouse as before.
* The SFFRFM fertiliser warehouse at Mzuzu has now been completed (end of September, 1990). As a result, even in the case of fertilisers being imported via the Northern Corridor (Tanzania), the amount unloaded at the project warehouse is expected to decrease. One can expect the fertilisers to be transported directly to the markets from the warehouse at Mzuzu without passing through the project warehouse in accordance with SFFRFM's distribution plan.

Although the fertiliser warehouse at Mzuzu is meant to be for buffer stock, because of their nature, fertilisers need to be replaced every year and the capacity of the Mzuzu warehouse at 40,000 tons is over 4 times the amount of fertilisers sold in Mzimba District every year. When we also consider that there are no decisive differences in the distances from Mzuzu and Kazomba to the parent markets, it will not be realistic to transport the fertilisers from Mzuzu to the markets via Kazomba. Fertilisers will not, therefore, be handled at the project warehouse.

* The amount of seeds sold in Mzimba District annually is approximately 300 tons, of which about 90% are maize seeds. The seeds are stored at the dépôts after being purchased from the seed companies and delivered to the markets from the dépôts in time for the sowing season.

(2) Restriction of Project Area

As mentioned in 2-1-3(1), the basic flow of agricultural produce in Malawi is from north to south. If the commercial grain from the 3 parent markets in South Mzimba (20,498 tons per year on average) is sent to Kazomba before being transported south, this will involve an unnecessary detour of 130 km on average. At the present transportation charges (0.3 MK/km/ton), this will mean an annual loss of 800,000 MK (approx. ¥ 47.20 million, ≃ 0.3 MK x 130 km x 20,468 tons). When we consider the transportation route, it is clear that Kazomba is not a suitable site for a warehouse for the produce from South Mzimba. The warehouse covering South Mzimba should be located either within South Mzimba or between South Mzimba and Kasungu to the south.

It has been mentioned in the section on confirmation of the contents of the request that the area to be covered by the project warehouse comprises South and Central Mzimba. For the reason given above, however, it is judged more appropriate to construct a warehouse covering only Central Mzimba at Kazomba.

(3) Assumption of Project Scale

The monthly deliveries to and from the project warehouse and the monthly stocks are calculated according to the following method. The total quantity of produce leaving the parent markets in Central Mzimba is used as the monthly arrival at the project warehouse. It is assumed that all the produce leaving the parent markets will travel to Kazomba before being transferred elsewhere. Since all the parent markets are within a single day's travel from Kazomba, the times of departure from the parent markets and arrival at Kazomba can be assumed to be the same.

The monthly delivery from the project warehouse is calculated by multiplying the percentages of the average monthly departures from Kazomba since its establishment 4 years ago by the total amount handled. The produce begins to leave Kazomba in significant quantities in November at the beginning of the rainy season and the monthly departures remain steady throughout the rainy season (10 to 15% per month). It was judged appropriate to use the same percentages for estimation of figures after the completion of the project warehouse.

The required storage capacity for the project warehouse will be equal to the maximum stock during the rainy season. This is because temporary storage of maize in the open during the dry season involves relatively small storage loss and is considered unavoidable in view of the nationwide shortage of storage facilities.

Future increases in the quantities handled due to increases in production and population will not be taken into account in the calculation of the project warehouse capacity. The turnover of the stock at the project warehouse will be once a year, as is the case with most warehouses in production areas. In other words, there is no need for storage of maize carried over from the previous year as at warehouses in consumer areas and for storage for emergencies. Under the project, therefore, the maize arriving at the warehouse will leave it within one year.

The itemwise quantities handled annually in Central Mzimba are given in the following table. The total amount of maize handled at the project warehouse will be 9,122 tons and that of maize seeds 133 tons.

Itemwise Annual Quantities Handled in Central Mzimba

(tons)

Market/ Dépôt	Maize				Seeds (Maize)				Total
	Purchase	Consumption within District (89/90)	Percentage Handled (%)	Quantity Hnadled	Sales	Storage Space in Terms of Maize	Percentage Handled (%)	Quantity Hnadled	
Mzimba	4,350	1,416	100	8,934	50	250	100	250	3,184
Kanchocho	4,825	79	100	4,746	51	255	100	255	5,001
Euthini	1,788	348	100	1,442	26	130	100	130	1,572
Kazomba	-	-	-	-	6	30	-	30	30
Total	10,963	1,841	-	9,122	133	665	-	665	9,787

Notes

* Purchase of maize: annual average for 1985/86 to 1989/90
* Consumption of maize within district: annual average sales for 1985/86 to 1989/90
* Sales of seeds (maize): annual average sales for 1985/86 to 1989/90
* Storage space of seeds (maize) in terms of maize: according to stacking methods of seed bags

Source: ADMARC Regional Office North, Aug. 1990

The monthly percentages of the movement of produce at the 3 parent markets in Central Mzimba District and the existing Kazomba Dépôt are shown in the tables in 2-3-1(7). From the above data, the planned deliveries of maize to and from and the stock at the project warehouse will be as shown below. The peak stock, reached at the beginning of the rainy season in November, is 5,401 tons. This will be used as the design capacity.

Inventory Calculation for Kazomba Dépôt

	Month	In (%)	In (tons)	Out (%)	Out (tons)	Stock
Dry Season	Apr.	3.3	301	16.5	1,505	1,342
	May	2.7	246	13.9	1,268	320
	Jun.	1.2	109	4.7	429	0
	Jul.	2.0	182	1.2	110	72
	Aug.	12.5	1,140	2.1	192	1,020
	Sep.	17.0	1,551	3.4	310	2,261
	Oct.	16.5	1,805	3.4	310	3,458
Rainy Season	Nov.	31.4	2,866	10.1	921	5,401
	Dec.	5.9	538	12.6	1,149	4,790
	Jan.	1.9	173	11.7	1,067	3,896
	Feb.	2.4	219	10.6	967	3,148
	Mar.	3.2	292	9.8	894	2,548
	Total	100	9,122	100	9,122	-

Note
In (%) : percentages of maize leaving parent markets in Central Mzimba (average for 1985/86 to 1989/90)
Out (%): percentages of maize leaving Kazomba Dépôt (average for 1985/86 to 1989/90)

The annual average sales of maize seeds, the other item to be stored at the project warehouse, at parent markets in Central Mzimba is 133 tons ('85 to '90) as can be seen from the table in 2-3-2(5). In order to maintain high rates of germination, seeds cannot be stacked much higher than 1.3 m and they need at the same time to be kept away from edible maize because they are sprayed with toxic pesticides. The capacity for storage of maize seeds will be approximately 0.5 tons per square metre of floor area and 1 ton of maize seeds will occupy the same amount of floor space as 5 tons of edible maize. The project warehouse will be given storage capacity for 40 tons of maize seeds, the expected stock in November, which is equivalent to 200 tons in terms of edible maize.

From the above, the project warehouse will be given a capacity of 5,600 tons in terms of of maize.

(4) Handling of South Mzimba and Required Storage Capacity

As mentioned in 2-3-2(2), the project warehouse will be designed to cover only Central Mzimba and South Mzimba will not be included in the

project area. As can be seen from the table showing the records of produce purchase by ADMARC in 2-3-2(5), the purchases made in South Mzimba are approximately twice those in Central Mzimba and the need for new warehouse in Mzimba District will remain even after the completion of the project warehouse at Kazomba Dépôt.

According to the ADMARC dépôt construction plan of the Ministry of Agriculture dated 19th December, 1986, there were plans to construct separate dépôt for Central and South Mzimba. The dépôt for South Mzimba was to be combined with that for the adjoining Kasungu District and was to be constructed at Nkhamenya. This plan can be regarded as being the same as the construction plan for Kasungu Dépôt in progress at present. South Mzimba can, therefore, be covered by the construction of this dépôt but there are dangers of creating confusion in the organisational structure by having South Mzimba, which is a part of the Northern Region, covered by Kasungu Dépôt, which will come under the jurisdiction of ADMARC Regional Office Central. The same can be said concerning administrative and ADD divisions. Careful considerations must be made for problems concerning operational structure, in addition to investigations on the marketing structure of agricultural produce in Kasungu District, in planning the construction of the warehouse at Kasungu Dépôt.

An alternative plan will be to plan a dépôt covering only South Mzimba at Nkhamenya or Champhira. This will more or less eradicate the unnecessary detours in transportation and at the same time will be in a convenient location for transportation north should the need arise. The annual purchase of maize and the maximum stock under this plan will be 18,782 tons and 9,097 tons, respectively, as shown in the table below. The disadvantage of this plan for ADMARC will be the problem of acquiring a new construction site and the increase in fixed expenses generated by having an extra dépôt.

Quantities of Produce Handled by ADMARC in South Mzimba

(tons)

Parent Market	Maize				Groundnuts				Sunflower				Beans			Total
	Purchase	Consumption within District	Percentage Handled	Quantity Handled	Purchase	In Terms of Maize	Percentage Handled	Quantity Handled	Purchase	In Terms of Maize	Percentage Handled	Quantity Handled	Purchase	Percentage Handled	Quantity Handled	
			%				%				%			%		
Emfini	7,984	598	100	7,385	320	384	100	384	3.7	5.5	—	—	435	100	435	8,204
Champhira	5,029	659	100	4,370	107	128	100	128	68.8	103.2	—	—	273	100	273	4,771
Mbawa	7,618	591	100	7,027	320	384	100	384	7.9	11.8	—	—	112	100	112	7,523
Total	20,631	1,849	—	18,782	747	896	—	896	80.4	120.5	—	—	820	—	820	20,498

Notes

* Purchase of each produce: annual average for 1985/86 to 1989/90

* Consumption of maize within district: annual average sales for 1985/86 to 1989/90

* Sunflower will be handled at Champhira Market and not at the dépôt, since the overall quantity of sunflower handled is small and most of it is handled at Champhira.

Monthly Movements and Stocks at Dépôt Constructed in South Mzimba

(tons)

	Month	Maize			Groundnuts			Sunflower			Beans			Total Stock at End of Month
		In (%)	Out (%)	Stock	In (%)	Out (%)	Stock	In (%)	Out (%)	Stock	In (%)	Out (%)	Stock	
Dry Season	4	(2.2) 413	(16.5) 3,099	1,503	—	—	—	—	—	—	(8) 66	—	66	1,569
	5	(5.9) 1,108	(13.9) 2,611	—	—	—	—	—	—	—	(10) 82	(10) 82	66	66
	6	(4.8) 902	(4.7) 883	19	(1) 9		9	—	—	—	(4) 33	(10) 82	17	45
	7	(1.7) 319	(1.2) 225	113	(32) 287	(21) 188	108	—	—	—	(13) 107	(10) 82	42	263
	8	(12.3) 2,310	(2.1) 394	2,029	(49) 439	(40) 358	189	—	—	—	(17) 139	(20) 164	17	2,235
	9	(13.1) 2,461	(3.4) 639	3,851	(14) 125	(20) 179	135	—	—	—	(13) 107	(10) 82	42	4,028
	10	(25.7) 4,827	(3.4) 639	8,039	(3) 27	(10) 90	72	—	—	—	(21) 172	(20) 164	50	8,181
Rainy Season	11	(15.6) 2,930	(10.1) 1,897	9,072	(1) 9	(9) 81	—	—	—	—	(12) 98	(15) 123	25	9,097
	12	(5.7) 1,071	(12.6) 2,366	7,777	—	—	—	—	—	—	—	—	—	7,777
	1	(4.0) 751	(11.7) 2,197	6,331	—	—	—	—	—	—	—	—	—	6,331
	2	(5.0) 939	(10.6) 1,991	5,279	—	—	—	—	—	—	—	—	—	5,279
	3	(4.0) 751	(9.8) 1,841	4,189	—	—	—	—	—	—	(2) 16	(5) 41	—	4,189
Total		(100.0) 18,782	(100.0) 18,782	—	(100.0) 896	(100.0) 896	—	—	—	—	(100.0) 820	(100.0) 820	—	—

Notes

* Percentages of maize arriving at dépôt: percentages of monthly departures from parent markets in South Mzimba (average for 1985/86 to 1989/90)
* Percentages of maize leaving dépôt: percentages of monthly departures Kazomba Dépôt (average for 1985/86 to 1989/90)
* Percentages of groundnuts and beans arriving at dépôt: monthly purchases by ADMARC (Storage Facilities Development Plan, Ministry of Agriculture, 1987)
* Percentages of groundnuts and beans leaving dépôt: estimates

Chapter 4 BASIC DESIGN

4-1 Design Policies

The basic policies outlined below will be followed in implementing the design for the project, while taking adequate account of the natural and social conditions at the site, conditions surrounding the construction and procurement of materials and the characteristics of the project. The details of the investigations on these points are discussed in 4-3 and 4-4.

1) The scale of the facilities will be in line with the contents of the project. The facilities must satisfy the contents of the project but must not on the other hand be made too large.
2) The facilities plan will be made rational and such as to ensure well-balanced, easy-to-use facilities through careful considerations on the layout within the site, circulation and allotment of areas. Adequate attention will also be paid to possibilities of future extension of the facilities and future use of the site.
3) The facilities must have the capacity to fulfil their functions under the natural conditions at the site and the conditions of their use. They must also be in line with local customs, religious practices, etc.
4) The design standards and criteria generally used in Malawi will be used for reference. The facilities must be given adequate strengths and durability. Economic considerations must be taken at the same time to avoid specifications which go too far.
5) The types and quantities of the warehousing equipment provided will be limited to those required in view of the contents of the project and will be suited to the working conditions and methods at the site.
6) In the selection of the types and levels of warehousing equipment, the emphasis will be laid on easy and economical maintenance, structural simplicity, durability and facility of obtaining spare parts and expendable components.
7) The design will be implemented taking into considerations the restrictions placed on schedules under grant aid cooperation and on the assumption that construction materials and labour will be procured

locally as far as is possible technically and in view of the schedule.

4-2 Study on Floor Space Required

Since the main object of storage is maize, the warehouse building size will be calculated on the basis of the measurement data for maize stacking.

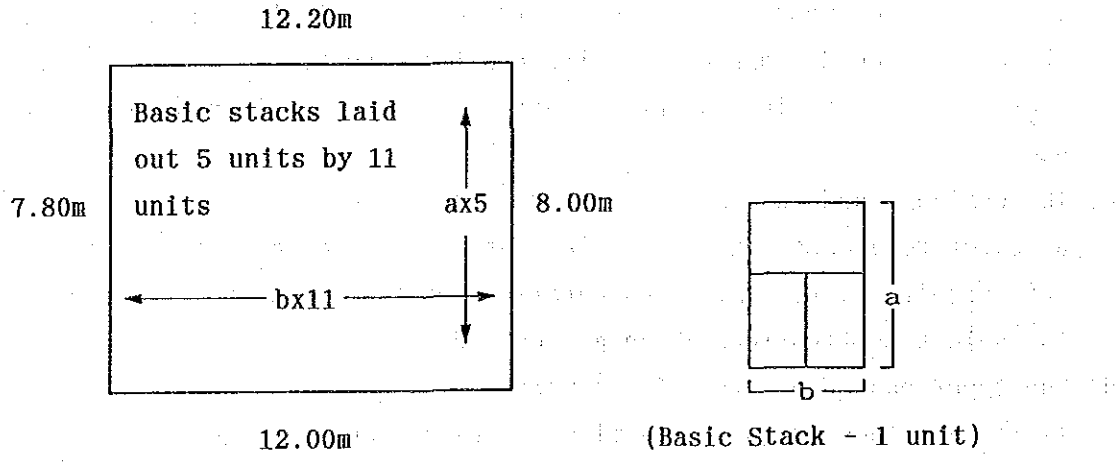
* Stacking Method

"Three-bag stacking", a method now being introduced at dépôts in Malawi, will be employed. In this method, three-bag units are stacked in alternate directions in odd and even-numbered layers. The number of layers will be 23, which again is the standard generally used by ADMARC.

* Size of Basic Stacks

The size of the basic stack was calculated from a local maize bag (90 kg) and has been set at 1.58 m x 1.10 m from the measurement data shown below.

Measurement Data



The lengths of sides "a" and "b" are calculated from the average lengths of the sides of the bags as follows:

a = (7.80 + 8.00) ÷ 2 ÷ 5 = 1.58 m

b = (12.20 + 12.00) ÷ 2 ÷ 11 = 1.10 m

* Number of Maize Bags per Unit Area

Since the area taken up by a basic stack (3 bags) is 1.58 x 1.10 =

1.738 m^2,

3 ÷ 1.738 = 1.726 ≃ 1.73 bags/m^2

* Storage Capacity per Unit Area (with 23 layers)

0.09 tons/bag x 3 bags x 23 layers = 6.21 tons/1.738 m^2

Therefore, for storage of 5,600 tons,

5,600 ÷ 6.21 = 901.8

The total area required will be that which will be enough for laying out at least 902 units of basic stacks.

According to the standards of the Japanese Food Agency, the proper widths of passages when stackers and horizontal conveyers are used for handling are approximately 2.0 m for main passages, 1.5 m for side passages and 1.0 m for passages along walls. These widths have been worked out on the assumption that the passages will be used for the operation of stackers and as spaces for fixing the fumigation sheets. The passages in Malawi are generally wider than these, some of them being 3 to 4 m wide to allow lorries to enter the warehouses and to allow operation with folk lifts.

Although lorries and folk lifts will not be used in the project warehouse, the widths of the main passages will be set at 2.5 to 2.6 m, in the light of the fact that the stackers used in Malawi are generally larger than those used in Japan. The same widths as in Japan can be adopted for the side passages and passages along walls.

The floor plan for the warehouse will be determined using the above criteria.

4-3 Basic Design

4-3-1 Site and Layout Plan

(1) Layout Plan

An outline of the project site was given in 2-3. It is a more or less level piece of raised ground with more than ample area for the purposes of the project. There are no problems regarding transportation, bearing capacity of the soil or drainage and it is a suitable site for construction of a warehouse.

The layout plan will be prepared in such a way as to ensure overall efficiency of work within the site and to allow for future extension of the facilities. There is a difference of approximately 3 to 5 m in the ground level within the site, but the amount of earth work required can be reduced by setting the elevations for the various buildings at different levels in line with the ground levels. The layout plan will also be drawn up making allowances for future extensions.

Essentially, it is desirable that the long side of the buildings be situated on an east-west axis to avoid the sun shining on them from the west. Because of the differences in the ground level and in order to allow for effective use of the site in future, however, the warehouse will be located along an axis 40° off the east-west line at the centre of the project site. The ancillary buildings (administration block, chemicals store, canteen, etc.) will be constructed in the northern part of the site near the entrance to the site in view of their functions and in order to avoid them hindering future extensions. Their location here will also help reduce the costs to be borne by the Government of Malawi for the laying of power lines and water supply pipes.

(2) Exterior Plan

1) Landscaping

The Malawian people are patriotic and cherish their national flag. It seems that walls and fences were painted black, red and green, the colours of the national flag, for decoration during the celebrations for the 25th anniversary of Malawi's independence. The colours still remained on a large