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Industry

VOLUME ONE:

Introduction
Salt
Textiles
Textile Chemicals

SADCC: MASERU

SOUTHERN AFRICAN
DEVELOPMENT COORDINATION CONFERENCE
Maseru, Kingdom of Lesotho · 27/28 January 1983

Industry

VOLUME ONE:

Introduction
Salt
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SADCC - INDUSTRIAL CO-OPERATION

INTRODUCTION

The main focus of SADCC: Maseru in January 1983, is industrial co-operation. The conference is requested to consider assistance for SADCC industrial projects.

Accelerated economic development and regional self-reliance are the twin objectives of the Lusaka Declaration (April 1980). The Declaration also contains an appeal for external co-operation and international support. Southern African development co-ordination "will be achieved more rapidly and will be more effective if development takes place within the context of global co-operation". Priority sectors have been demarcated and assigned to a co-ordinating country. In respect of Industrial Co-operation, this sector was assigned to Tanzania as the co-ordinating country.

REGIONAL PLAN OF INDUSTRIAL CO-OPERATION

Tanzania, in consultation with the SADCC member states prepared a Regional Plan of Industrial Co-operation which was discussed and finalised at the Meeting of the SADCC Industry Sub-Committee at Dar es Salaam in September 1981.

This Plan was presented to the SADCC 1981 Ministerial Meeting at Blantyre in November 1981 and was approved.

The main thrust of the plan was to develop minimum-needs industries in the areas of:

- Food
- Clothing
- Housing
- Health
- Water Supply
- Power
- Transport
- Education

Development of core industries such as fertilisers, pharmaceuticals, pesticides, iron and steel and capital goods engineering industries also formed an integral part of the Regional Plan.

SECTORAL PROFILES

In pursuance of SADCC 1981 decision on follow-up action on the plan, sectoral profiles on the eight minimum-needs industries identified were prepared and discussed at the SADCC Industry Sub-Committee Meeting at Arusha in April 1982.

INDUSTRY STUDIES

From the perspective of these sectoral profiles, 17 industries were identified for market/industry analysis:

1. Ammonium nitrate plant, Malawi
2. Ammonia Urea plant, Tanzania
3. Potassic fertiliser plant, Botswana
4. Development of fertiliser industries
5. Utilisation of cement plants
6. Cement-based products
7. Development of pulp and paper industry
8. Paper and packaging materials
9. Wool/mohair spinning plant
10. Electrical transmission and distribution equipment
11. Production of synthetic yarn
12. Production of blended textiles
13. Production of textile chemicals
14. Formulation of insecticides/pesticides
15. Production of salt
16. Tractors and farm implements
17. Tractor components

The work involved field investigations, data collections, consultations with relevant Government departments and other agencies in the SADCC member countries.

INDUSTRY MINISTERS MEETING, ARUSHA SEPTEMBER 1982

The Industry studies were discussed at the meeting of SADCC Industry Ministers in Arusha in September 1982. The meeting agreed guidelines and criteria for selection of projects and directed that all projects contributing to the SADCC goal of economic independence in the context of the 1980 Lusaka Declaration and the 1981 Blantyre decisions, as well as meeting criteria relating to utilisation of SADCC resources for regional needs, be considered as SADCC industrial projects. For the purpose of selecting projects for presentation at Maseru, and subsequent donors conferences, the projects should have:

a) a funding gap in foreign exchange
b) bankability and
c) a reasonable implementation period

A list of specific projects was approved for presentation to the SADCC: Maseru to be held in January 1983. This list comprised both projects for implementation and the projects requiring feasibility studies. The Minister also directed that:

i) Member states are to be responsible for executing the projects in co-ordination with donors. The co-ordinating country should be kept informed on progress.

ii) The co-ordinating country is responsible for the general study type of projects. The co-ordinating country was also directed to initiate action for co-operation in the areas of industrial products standardisation, industrial consultancy services, and industrial research and development including appropriate technology.

PROJECT DOCUMENTATION

Of the projects which appear in Volumes I and II the total project funding estimates are:

43 projects for implementation:	US$ 194.31 million
23 projects for study:	US$ 4.38 million

Most of the projects are in the small to medium scale category.

Volume III consists of projects for which detailed documentation was not available until after the first two volumes had been completed. These projects relate to the production of cement, pulp and paper, fertilisers, textiles, electrical items and chemicals.

ASSISTANCE SOUGHT

The assistance sought is thus of two kinds:

i) Towards project implementation

- In the form of technology transfer, project financing, lines of credit, capital goods, training of project personnel, joint ventures, and marketing arrangements

(ii) Towards undertaking studies

- financing of feasibility/project studies.

SUMMARY OF REPORTS

A. SALT

	Projects for Implementation	Country	Cost (US$)
1.	Expansion of Saltworks at Nacala	Mozambique	6.5 m
2.	Expansion of Saltworks at Maputo	Mozambique	8.5 m
3.	Development of Saltworks at Sadani	Tanzania	2.1 m
4.	Development of Saltworks at Kitame	Tanzania	1.64m
5.	Development of Saltworks at Changwahela	Tanzania	600,000
6.	Development of Saltworks at Uvinza	Tanzania	4.9 m
7.	Small-scale Salt Refining Plant	Botswana	50,000
8.	Small-scale Salt Refining Plant	Lesotho	50,000
	Projects for Study		
9.	Upgrading of Existing Saltworks	Angola	76,500
10.	Development of Saltworks at Lindi/Mtwara	Tanzania	170,000
11.	Expansion of Saltworks at Manbone	Mozambique	170,000
12.	Development of Saltworks at Kazangula	Zambia	200,000

B. TEXTILES

	Projects for Implementation		
1.	Establishment of a Knitting Project	Botswana	455,000
2.	Establishment of a Knitting Project	Lesotho	3.1 m
3.	Establishment of a Knitting Project	Malawi	3.1 m
4.	Establishment of a Knitting Project	Mozambique	3.6 m
5.	Establishment of a Knitting Project	Zambia	8.5 m
6.	Establishment of a Powerloom Project	Botswana	3.0 m
7.	Establishment of a Powerloom Project	Lesotho	3.29m
8.	Establishment of a Powerloom Project	Malawi	760,000
9.	Establishment of a Powerloom Project	Swaziland	1.7 m
10.	Establishment of a Powerloom Project	Tanzania	3.8 m
11.	Establishment of a Powerloom Project	Zambia	3.5 m
12.	New P.O.Y./Texturised Polyester Plant	Mozambique	9.0 m
13.	New Polyester/Texturised Polyester Plant	Tanzania	9.0 m
14.	Further extension to the Polyester Blend Integrated Weaving Plant	Zambia	10.0 m
15.	New Polyester (P.O.Y.) Plant	Zimbabwe	9.0 m
16.	Revitalisation of a Polyester Blend Integrated Weaving Plant	Tanzania	20.0 m
17.	New polyester staple fibre plant	Zimbabwe	10.2 m
	Projects for Study		
18.	Polyester Polymerisation and Staple Fibre Plant	Zambia	500,000
19.	Development of a Petro-Chemical Complex	Angola	850,000

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SUMMARY OF REPORTS (cont)

C. TEXTILE CHEMICALS

	Projects for Implementation	Country	Cost (US$)
1.	Textile Processing Chemicals Plant	Tanzania	1.0 m
2.	Textile Processing Chemicals Plant	Zambia	1.0 m
3.	Textile Chemicals Plant	Botswana	5.2 m
	Projects for Study		
4.	Textile Chemicals Plant	Angola	102,000
5.	Textile Chemicals Plant	Mozambique	102,000
6.	Textile Chemicals Plant	Tanzania	102,000
7.	Textile Chemicals Plant	Zambia	102,000
8.	Textile Chemicals Plant	Zimbabwe	102,000

D. PESTICIDES AND INSECTICIDES

	Projects for Study		
1.	Upgradation/expansion of existing pesticide/insecticide formulation plants	Angola	102,000
2.	Upgradation/expansion of existing pesticide/insecticide formulation plant	Mozambique	102,000
3.	Upgradation/expansion of existing pesticide/insecticide formulation plant	Tanzania	102,000
4.	Upgradation/expansion of existing pesticide/insecticide formulation plant	Zambia	102,000
5.	Upgradation/expansion of existing pesticide/insecticide formulation plant	Zimbabwe	102,000
6.	Pesticide/insecticide formulation plant	Malawi	85,000
7.	Pesticide/insecticide formulation plant	Swaziland	85,000
8.	Pesticide/insecticide formulation plant	Zimbabwe	85,000
9.	Pesticide Chemical plant	Tanzania	85,000
10.	Pesticide Chemical plant	Zimbabwe	51,000

E. FARM IMPLEMENTS

	Projects for Implementation		
1.	Expansion of farm implements factory	Zambia	2.0 m
2.	Agricultural implements units	Angola	4.25m
3.	Agricultural implements units	Botswana	3.0 m
4.	Agricultural implements units	Lesotho	3.0 m
5.	Agricultural implements units	Malawi	3.0 m
6.	Agricultural implements units	Swaziland	3.0 m
7.	Agricultural implements units	Tanzania	10.0 m
8.	Agricultural implements units	Zambia	1.0 m

SUMMARY OF REPORTS (cont)

		Country	Cost (US$)
9.	Artisan units for the manufacture of farm implements	Botswana	120,000
10.	Artisan units for the manufacture of farm implements	Lesotho	120,000
11.	Artisan units for the manufacture of farm implements	Tanzania	975,000
12.	Extension of continucus casting facility	Zimbabwe	10.4 m
13.	Manufacture of tool steel	Zimbabwe	2.4 m
	Projects for Study		
14.	Rationalisation and development of Farm Equipment Testing Facilities		500,000

F. TRACTORS AND TRACTOR COMPONENTS

	Projects for Implementation		
1.	Tractor Manufacture	Swaziland	2.0 m
2.	Tractor Manufacture	Tanzania	15.5 m
	Project for Study		
3.	Rationalisation of Tractor Production		500,000

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SUMMARY OF REPORTS (cont)

		Number of Reports	
	Projects for Implementation		
A.	Salt	8	
B.	Textiles	17	
C.	Textile Chemicals	3	
E.	Farm Implements	13	
F.	Tractors and Tractor Components	2	43
	Projects for Study		
A.	Salt	4	
B.	Textiles	2	
C.	Textile Chemicals	5	
D.	Pesticides & Insecticides	10	
E.	Farm Implements	1	
F.	Tractors and Tractor Components	1	23
			66

Total project costs

Projects for Implementation		US$ 194,310,000
Projects for Study		US$ 4,377,000
	Total	US$ 198,687,000

SECTION II:
Salt

PRODUCTION OF SALT IN THE SADCC REGION

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1. INTRODUCTION

Production of salt in the SADCC region currently exists in several of the member countries, but is still far below the total demand requirement of the region. Non-producing SADCC countries are therefore dependent on sources outside the region which is a serious drain on their scarce foreign exchange reserves. Foreign exchange scarcities have meant that the salt available for human consumption has been insufficient to meet minimum nutritional requirements in various parts of the region.

Very good potential exists, however, for the SADCC region to become not only self-sufficient in salt, but also a net exporter. The regional plan of action incorporating specific projects for achieving these goals is included in the report.

The total investment required to implement the regional salt plan is US$ 32.74 million, with an estimated foreign exchange requirement of US$ 24.59 million

Field investigations are in progress, particularly towards assisting in the implementation of the SADCC projects indicated in this plan. In the progress of this work, the data presented in the plan will be updated and modified, as may be required. The plan is therefore an indicative one, containing preliminary estimates of demand and requirements and of the project parameters.

2. OVERVIEW AND SUMMARY OF RECOMMENDED PROJECTS

The development of the salt industry in the SADCC Region is economically viable and can be achieved at relatively low cost with consequent high returns. This is because:

- the industry is already well established and in instances only requires upgrading and expansion of existing salt pans;

- the technology of solar salt production is well understood by certain key personnel.

The benefits to the SADCC Region would be:

- trading linkages within SADCC with several salt producing countries supplying the salt requirements of the other;

- industrial linkages as salt is an essential raw material for a number of basic industries such as - food processing - textiles - hide - tanning - paper and pulp - heavy chemicals such as soda ash, caustic soda and chlorine;

- self-sufficiency in an essential foodstuff that is currently imported from the Republic of South Africa or is in short supply, and therefore a diversion of foreign exchange earnings to within SADCC;

- earn foreign exchange by exports outside the region;

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- increase size and diversity of the industrial sector and so add to national and regional output, employment opportunities and the development of new skills and technology.

- minimisation of costs by avoiding very large transport costs.

An essential requirement for the development of the salt industry is acceptance by the SADCC salt importing countries of salt produced within SADCC. This will necessitate the following from the producing countries:

- adequate production capacity to be a reliable source of supply;
- production of high quality salt in good packaging;
- prompt response to the orders;
- prompt delivery;
- competitive pricing;
- negotiation of long term contracts for supply and prices.

In order to meet the above will require:

- commercial approach by the producers;

- better communications than currently exist;

- expansion of the salt production capacity of the salt producing countries;

- introduction of new techniques, in particular mechanical harvesting and washing of the salt in order to control costs and to ensure production of salt with a consistently high quality;

- an efficient railway system with better haulage capacity and service than that currently provided;

- an acceptable common unit of exchange within SADCC to avoid reliance on hard currencies.

2.1 RECOMMENDATIONS

The salt industry can be developed to be a highly viable industry within the SADCC Region. Therefore the salt industry should be progressed to a Group A Project (project requiring inputs for implementation) at the Maseru SADCC meeting.

The following projects should be studied for immediate implementation:

Tanzania
- Extension services and financial assistance to existing private salt pans.
- Upgrading Stamico's Changwahla salt pan.
- Construction of the Sadani salt pan.
- Production of solar salt in conjunction with the proposed PDV salt plant at Uvinza.

Mozambique - Construction of Stage I of Nacala salt pan.
- Upgrading of the Maputo salt pans.
- Extension services and financial assistance to the private and co- operatively owned salt pans.

Angola - Upgrading of existing salt pans

The above projects would ensure the SADCC Region had a viable salt industry which would give self- sufficiency for the Region in the production of salt.

Key particulars of the proposed projects are presented in Table 2.1.

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Table 2.1 - SUMMARY PARTICULARS OF RECOMMENDED PROJECTS

COUNTRY	PROJECT	LOCATION	CAPACITY (tonnes)	INVESTMENT COST (US$ million)	EMPLOYMENT GENERATION	IMPLEMENTATION PERIOD (years)
Angola	Upgrading/rehabilitation of existing saltworks		Feasibility study recommended			
Botswana	Small-scale salt refinery	?	1,500	0.200	20	1
Lesotho	Small-scale salt refinery	?	1,500	0.200	20	1
Mozambique	Expansion of saltworks	Maputo	50,000	3.600	50	2
	Expansion of saltworks	Nacala	30,000	6.550	150	3
	Expansion of saltworks	Manbone	Feasibility study recommended			
	Iodisation plant & refinery	Maputo	15,000	4.85	60	2
Tanzania	Modernisation and expansion of Nyanza salt works	Uvinza	40,000	8.490	200	5
	Development of saltworks	Changwaheia	5,000	0.600	40	1982
	Development of Sadani saltworks	Sadani	40,000	2.100	200	2
	Development of Kitami saltworks	Kitami	25,000	Feasibility study recommended	200	4
	Development of saltworks at Lindi/Mtwara	Lindi/ Mtwara	30,000	Feasibility study recommended	105	5
	Iodisation plant	Dar es Salaam	12,000	0.300	25	1
Zambia	Development of saltworks project	Kazangula	Feasibility study recommended			

3. DEMAND FOR SALT IN THE SADCC REGION

3.1. GENERAL

Salt is an essential food item required for both human and animal consumption. It is also used in a diverse range of industrial activities, particularly as an economy industrialises. The market for salt may, therefore, be classified into three main segments:

1. Human (dietary) consumption.
2. Agricultural consumption
3. Industrial consumption.

3.2 HUMAN CONSUMPTION

In tropical countries it is estimated that a per capita human consumption of 5 kg per year would be a reasonable figure for a healthy person. Consumption of salt in most African countries, however, is well below this; perhaps 3 kg or even lower which is well below minimum nutritional standards.

In general, the preferred salt for human consumption in the SADCC region appears to be white, dry and crushed salt supplied in polythene bags. Only a small proportion of refined table salt is required for hotels and restaurants and for the better-off households.

3.3 AGRICULTURAL REQUIREMENTS

Animals also require a minimum of salt intake. Traditional livestock raising in African countries does not generally involve the feeding of salt to animals, and animals in the traditional sector obtain a minimum of salt by eating roots and grass, drinking saline and brackish water, or by licking salt-bearing soils. In the commercial farming sector, such as in Zambia, salt is fed to cattle in the form of cattle feeds and licks.

3.4 INDUSTRIAL REQUIREMENTS

The major types of industry in the SADCC region using salt include the following:

- Curing of hides and skins
- Salting of meat
- Bakeries, cheese, butter and margarine processing - Water softening plants
- Metal industry
- Caustic soda plants
- Miscellaneous other industries (soap processing, dyeing, scouring powders, bath salts, fertilisers, medical uses, fungicides, ceramic glazing etc.)

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3.5. SADCC MARKET POSITION

There is very little trading of salt between the SADCC member countries. Small quantities are exported by Mozambique to Malawi and Zimbabwe.

The production and movement of salt is set out in Table 3.1. This shows that about 125,000 tonnes per annum of salt is imported by the SADCC countries. Most is from Namibia via South Africa with a further 20,000 tonnes per annum from South Africa itself. Total demand requirement in 1982 is estimated at 380,300 tonnes, rising to 551,700 tonnes by 1990.

3.6. COUNTRY ANALYSIS

Estimates of salt requirements were made for each country in the SADCC region. Due to lack of up-to-date data on actual consumption, or to the presence of factors restricting the satisfaction of demand, estimates of demand requirements can only be very approximate. The following method has been used in the demand estimates:

(i) Minimum salt requirement for human consumption is taken to be 5 kg. per capita per year.

(ii) Salt is assumed to be fed to 5% of the cattle population in each country of the region at the rate of 2 oz. per head per day. This is purely a nominal figure and is assumed constant to 1990.

(iii) Estimates of industrial requirements for salt for some of the countries are based on data collected in a detailed survey of Zambia's requirements of salt for industrial use in 1975/76, which has then been adjusted to take into account the different population sizes of the member countries. A growth factor of 5% has been applied from 1982 to 1990.

3.6.1. Mozambique

The present demand for salt in Mozambique is estimated by the Government to be about 60,000 tonnes. No salt is imported into the country.

The main market for salt is for human consumption. Industrial requirements, such as canning, biscuits, pasta, and tanning, amounts to an estimated 12,000 tonnes per annum. This will increase significantly with the development of two caustic soda plants, one in the vicinity of Manbone and the other possibly at Nacala.

Salt is sold in 50 kg. polythene bags which are manufactured in Beira. Small merchants break these 50 kg bags as required by customers. The manufacturer also packs refined salt according to market requirements: e.g. ½ kg, 1 kg, etc.

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Table 3.1 SALT PROJECTED DEMAND REQUIREMENTS IN THE SADCC REGION

(In 000 tonnes)

COUNTRY	Population Estimates (000)			Present Production	Imports	Exports	Projected Demand Requirements											
							Dietary			Industrial			Agricultural			Total		
	1982	1985	1990				1982	1985	1990	1982	1985	1990	1982	1985	1990	1982	1985	1990
Angola	7,409	7,956	8,958	22			31.0	39.8	44.8	8.1	9.4	12.0	0.5	0.5	0.5	45.6	49.7	57.3
Botswana	825	880	982	2.5	2.5		4.1	4.4	4.9	0.9	1.0	1.3	2.6	2.6	2.6	7.6	8.0	8.8
Lesotho	1,405	1,509	1,699	0	6		7.0	7.5	8.5	1.5	1.8	2.3	0.5	0.5	0.5	9.0	9.8	11.3
Malawi	6,338	6,905	7,966	0	27		31.7	34.5	39.8	1.0	1.2	1.5	0.8	0.8	0.8	33.5	36.5	42.1
Mozambique	10,983	11,827	13,382	85	0	5	54.9	59.1	66.9	12.0	14.0	65.6	1.4	1.4	1.4	68.3	74.5	133.9
Swaziland	584	631	717	0	2.5		2.9	3.2	3.6	0.6	0.8	1.0	0.7	0.7	0.7	4.2	4.7	5.3
Tanzania	19,388	21,434	25,334	55	3.0	3.0	96.9	107.2	126.7	5.5	22.6	29.0	12.5	12.5	12.5	114.9	142.3	168.2
Zambia	6,115	6,701	7,807	0.1	30		30.6	33.5	39.0	6.7	7.8	9.9	5.7	5.7	5.7	43.0	47.0	54.6
Zimbabwe	7,880	8,686	10,218	0	54.2		39.4	43.4	51.1	8.6	10.0	12.8	6.2	6.2	6.2	54.2	59.6	70.1
Total	60,927	66,529	77,063	164.6	125.2	8	304.5	332.6	385.3	44.9	68.6	135.4	30.9	30.9	30.9	380.3	432.1	551.7

Mozambique has a long history of supplying salt to its nearer SADCC neighbours, in particular, Malawi and Zimbabwe. In recent years this has been confined to small quantities in spot sales. The recent expansion in production has meant that Mozambique now has an exportable stockpile of salt and efforts are being made to expand export sales and to re-establish Mozambique's former position as a long term supplier.

Mozambique is in a most favourable position to be the major supplier of salt to the SADCC region in the immediate future. Not only is Mozambique producing an exportable surplus but, more importantly, its two major salt production centres at Maputo and Nacala are immediately adjacent to these ports and two major railways that link into Malawi, Swaziland, Zimbabwe and Zambia.

3.6.2. Zambia

Due to foreign exchange problems, salt consumption is well below demand requirements. Based on an average requirement of 5 kg per capita per year, the dietary requirement for salt would be 30,600 tonnes in 1982, 33,500 tonnes in 1985, and 39,000 tonnes in 1990, the bulk of which would be unrefined salt.

Agricultural requirements are mainly for cattle on commercial farms. The demand estimate is based on 275,000 cattle receiving 2 oz. of salt per day.

Industrial requirements for salt are for curing of hides and skins, salting meat, bakeries, cheese, butter and margarine processing plants, water softening plants, metal industry, and miscellaneous other industries. Estimates of salt consumption requirements were made for each of these industrial branches in 1975/76 and a 5% average annual growth rate applied to 1990.

The main sources of supply for fine salt are Aden, Israel and West Germany and South Africa for coarse salt. The routes for transport of salt are via Dar es Salaam and via Zimbabwe.

Salt is imported in 50 kg bags. No salt has been available from neighbouring countries in recent years.

3.6.3. Tanzania

The current and projected industrial demand for salt is based on the following factors:

(i) Based on field surveys, industrial demand for salt was 5,500 tonnes in 1982.

(ii) A pulp and paper mill under construction will require 15,000 tonnes of salt when it commences production in 1983.

(iii) Industrial use is assumed to grow at 5% after 1983.

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Current demand is estimated to be 114,900 tonnes rising to 168,200 tonnes by 1990.

The principal grade of salt consumed is unrefined crude salt. Small quantities of refined and PDV salt are consumed in the cities as table salt and industrial salt. Most of the salt sold is not iodised.

At present there is a serious shortage of salt on the domestic market. However, due to its reserves of underground brine and favourable coastal conditions for the production of solar salt from sea water, Tanzania has the potential to be a major supplier of salt in the region.

3.6.4. Zimbabwe

Imports of common salt into Zimbabwe in 1980 amounted to 54,000 tonnes at an FOB/FOR cost of Z$ 1.33 million.

A variety of grades of salt are imported with washed unrefined salt making up about 85% of the total. This salt is purchased at Z$ 10-20 free on rails with a landed cost of Z$ 45-50 per tonne. The product is generally packed in 50 kg polypropalene bags.

The washed unrefined salt is consumed as follows:

- 7,000 - 12,000 tonnes per annum for curing hides
- 25,000 - 30,000 tonnes per annum for repacking for domestic consumption. This corresponds to about 4 kg per capita per annum.

The refined and pure vacuum dried salt is consumed as follows:

- 2,000 to 3,000 tonnes per annum by the food processing industry
- 2,000 tonnes per annum as table salt
- 3,000 tonnes for stockfeed manufacture and salt licks

Salt consumption is expected to grow with population growth and the establishment of new industries requiring salt as a raw material. The market is moving towards greater consumption of refined grades of salt as consumer awareness increases.

Zimbabwe has in the past imported large quantities of salt from other SADCC countries.

The most significant imports were Angolan which were shipped in through Beria. This salt was carried from Angola as ships ballast and as a consequence was shipped at very low freight rates. Ships no longer have to come around Africa in ballast and normal rates of sea freight now make this source of salt too expensive.

Small quantities have been imported from Maputo in Mozambique for use in hide curing. The last significant shipment was of low quality and the user switched back to South African supplies.

Enquiries have been made on importation of salt from Tanzania as rope and twine are imported from Tanzania. However, road transportation costs made this impossible and transportation by rail was extremely difficult due to delays and lack of suitable rail wagons.

The logical SADCC suppliers of Zimbabwe's salt requirements are Mozambique and Botswana. This is due to close proximity and the existence of adequate rail links.

Botswana reserves of rock salt are close to Zimbabwe but as yet they are largely undeveloped. Therefore, Mozambique is the logical supplier in the near term.

3.6.5. Malawi

Malawi is currently importing 22,000 - 25,000 tonnes of salt per year. The main grade of salt imported is washed, coarse, non-iodised salt, packed mostly into 20 kg bags. Landed cost is about K 155 per tonne. Small quantities are imported from Mozambique.

3.6.6. Angola

Estimated salt requirement in 1982 is 45,600 tonnes rising to 57,300 tonnes by 1990.

3.6.7. Lesotho, Botswana and Swaziland

These three countries with a total demand requirement for salt in 1982 of 20,800 tonnes are relatively small markets for salt in comparison with the rest of the SADCC region.

4. PRODUCTION CAPACITY

4.1. EXISTING CAPACITY

The existing capacity of the salt industry within SADCC is set out in Table 4.1.

It is estimated that existing capacity amounts to 270,000 tonnes per annum. This is less than the current estimated requirement for salt. In addition nearly half the capacity is only the southern coast of Angola and therefore is in an unfavourable logistical location to supply the SADCC region, being far away from any direct rail link.

The balance of the capacity is in Tanzania and Mozambique with only the latter having capacity in excess of its own requirements.

The current requirement for salt with SADCC is about 300,000 tonnes per annum, of which about 275,000 tonnes is required for domestic consumption and the balance for industrial purposes, principally food processing and hide tanning.

The domestic salt consumed is practically all unrefined coarse salt. Small quantities of refined and pure vacuum dried salt are consumed as table salt and in food processing.

The SADCC region is not self-sufficient in the production of salt, only producing about 135,000 tonnes per annum or 45% of its current requirements.

The balance of the current salt requirement is imported from the Republic of South Africa or there is an actual shortage. Current imports from South Africa are about 120,000 tonnes per annum. The actual shortage is estimated at about 40,000 tonnes and occurs principally in Tanzania. There is some smuggling of salt and in some areas a black market.

Most of the salt produced and imported is not iodised. Therefore there is also the opportunity to iodise the salt produced and so help in the control of goitre. Zambia has just commissioned a mixing plant to add iodine to the salt being sold for domestic consumption in that country.

The addition of iodine is a simple mixing process and can be carried out at the point of production or at the time the salt is repacked for domestic consumption.

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Table 4.1 SALT : SUPPLY CAPACITIES IN THE SADCC REGION

Country	CURRENT PRODUCTION Total tonnes	Available for export tonnes	Current installed capacity tonnes	Proposed additional capacities tonnes	Available for export or increased local demand	Remarks
Angola	22,000	NIL	125,000		100,000	Almost impossible to supply SADCC region and therefore should be exported to Zaire and W Africa.
Botswana	2,500	NIL				Eventual ability to produce 1,300,000 tonnes per annum if Lina Ran Project is developed
Lesotho	NIL	NIL				
Malawi	NIL	NIL				
Mozambique	55,000	30,000	90,000	110,000	140,000	This will exceed requirements of Malawi, Zambia and Zimbabwe. Possible exports outside Africa.
Swaziland	NIL	NIL				
Tanzania	55,000	NIL	55,000	110,000	75,000	Could supply Zambia and export to N-W Africa
Zambia	1,000	NIL				
Zimbabwe	NIL	NIL				
SADCC Totals	185,500	30,000	270,000	220,000	515,000	

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4.2. COUNTRY ANALYSIS

4.2.1. Mozambique

4.2.1.a. Present Production

Total estimated production of salt in Mozambique in 1981/82 amounted to 85,000 tonnes, of which 5,000 tonnes consisted of refined salt. A production plan to 1985 is currently being prepared. It is estimated that a maximum of 120,000 tonnes could be achieved by 1985.

There are 164 salt production units in Mozambique. The Government has three units which account for 30% of total production. 115 units are organised as co-operatives and are the main salt producers. The remaining units are private producers. Expansion of production by the co-operative and private sectors is controlled by the Government.

Existing technology of salt production is highly labour intensive, with all extraction of crude salt being done by hand. There is an old salt refinery with an installed capacity of 2½ to 3 tonnes per hour located near Maputo. Production of refined salt is 5,000 t.p.a.

4.2.1.b. Salt Industry Development

Basic objectives of the Government in this sub-sector are to improve salt quality and reduce production costs by mechanising extraction and amalgamating the units located near Nacala, Maputo and Manbone.

The potential to expand salt production in Mozambique is almost unlimited and in the medium term future production can be increased by the expansion of existing salt pans to meet increased requirements for industrial use. This demand will be generated as the textiles, paper, tanning and food industries expand and a chlor-alkali industry is established.

4.2.2. Tanzania

4.2.2.a. Existing Capacity

Total salt production in Tanzania is 50,000 tonnes per annum, of which 30,000 tonnes are produced by the Nyanza Salt Mines (T) Ltd, a subsidiary of STAMICO, and 20,000 tonnes of raw salt are produced by 14 small scale private producers, mainly on the coast.

4.2.2.b. Salt Industry Development

Present demand for salt exceeds present production by almost 50,000 tonnes. The basic aim of the Government is to develop the salt industry to the point where the country becomes a net exporter of salt. Current plans include the following:

(i) Modernisation and expansion of Nyanza Salt Mines.

(ii) Development of coastal salt works to produce salt from sea water by solar evaporation at Changwahela, Sadani, Kitane and Lundi/Mtwara.

Implementation of these plans will give the following projected output of salt:

Projected Production of Salt in Tanzania, 1982-1990 (tonnes)

Year	Nyanza	Changwahela	Sadani	Kitame	Mtwara	Others	Total
1982	32000	400	2000	-	-	20000	54400
1983	37000	2000	10000			22000	71000
1984	42000	4000	20000	5000		25000	96000
1985	87000	5000	30000	10000		25000	152000
1986	97000	5000	40000	20000	700	25000	194000
1987	102000	5000	40000	30000	12000	25000	214000
1988	102000	5000	40000	30000	20000	25000	222000
1989	102000	5000	40000	30000	25000	25000	227000
1990	102000	5000	40000	30000	30000	25000	232000

4.2.2.c. Refining Capacity

Refined salt (non-iodised) and raw salt are produced in both the large scale and small scale sectors.

The large scale plant at Uvenza, Kigoma is currently producing 20,000 tonnes of refined salt and an expansion programme is being implemented to increase output to 60,000 tonnes.

A salt refining plant proposed for Dar es Salaam will produce 70,000 tonnes of refined salt per annum, using solar pan salt (raw salt) from the salt pans at Sadani, Kitami and Changwahela.

Total production capacity for refined salt, including existing capacity and proposed additional capacity, will amount to 130,000 tonnes per annum.

4.2.2.d. Iodisation Capacity

There are no iodisation plants and no iodised salt is imported.

4.2.3. Angola

According to information available, salt production capacity in Angola is 125,000 tonnes per year. This would appear to be sufficient for the country's needs to 1990 while also leaving a surplus for export. The major need at present is for rehabilitation/reactivation of existing capacity.

4.3. OTHER POSSIBLE SALT PRODUCERS

4.3.1. Zambia

The bulk of Zambia's salt requirements are met by imports. Local salt manufacture from saline water in the Luapula, Northern and North-Western provinces is on a very small scale. Salt/earth is collected and the salt leached out and boiled. This source is not capable of any significant development on a commercial basis. Perhaps 10-20 tonnes of very poor quality salt is produced per year.

4.3.1.a. Refining Capacity

There is no salt refining capacity in Zambia.

4.3.1.b. Iodisation Capacity

An iodisation plant has recently been constructed in Lusaka with equipment provided by UNDP and will process imported non-iodised salt. Capacity is 12,000 tonnes per annum.

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5. SUPPLY/DEMAND BALANCE

As shown in Table 5.1, total demand for salt in the SADCC region is estimated to be 380,300 tonnes in 1982, rising to 551,700 tonnes by 1990. The current capacity for salt production is 264,000 tonnes, giving a shortfall of 116,300 tonnes in relation to regional demand. The additional capacities being considered, once implemented, will increase regional salt production to 397,000 tonnes by 1985 and 557,000 tonnes by 1990.

Three countries are projected to have a surplus of salt production over domestic requirements. These are Angola, Mozambique and Tanzania, whose salt surpluses by 1990 will be roughly similar, falling between 60-70,000 tonnes per year.

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Table 5.1 SALT : PROJECTED SUPPLY/DEMAND BALANCE IN THE SADCC REGION

COUNTRY	Present Capacity	Current Planned Capacity		Total Projected Demand			Projected Capacity Surplus/(Deficit)		
	1982	1985	1990	1982	1985	1990	1982	1985	1990
Angola	125	125	125	45.6	49.7	57.3	79.4	75.3	67.7
Botswana	0	0	0	7.6	8.0	8.8	(7.6)	(8.0)	(8.8)
Lesotho	0	0	0	9.0	9.8	11.3	(9.0)	(9.8)	(11.3)
Malawi	0	0	0	33.5	36.5	42.1	(33.5)	(36.5)	(42.1)
Mozambique	90	120	200	68.3	74.5	133.9	16.7	45.5	66.1
Swaziland	0	0	0	4.2	4.7	5.3	(4.2)	(4.7)	(5.3)
Tanzania	55	152	232	114.9	142.3	168.2	(60.5)	9.7	63.8
Zambia	0	0	0	43.0	47.0	54.6	(43.0)	(47.0)	(54.6)
Zimbabwe	0	0	0	54.2	59.6	70.1	(54.2)	(59.6)	(70.1)
Total	270	397	557	380.3	432.1	551.7	(115.9)	(36.1)	(5.3)

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6. RAW MATERIAL SITUATION

There are three major supply sources of raw materials within the SADCC region for the development of the salt industry.

These are sea water, underground brines, and inland salt pans or lakes.

Sea water is an unlimited raw material source and is available to the coastal SADCC countries of Angola, Mozambique and Tanzania.

Strong underground basins exist at Uvinza in Tanzania and are said to be unlimited. The strength of brines is 19° baume which is over five times the strength of sea water. For this reason Uvinza is currently the main salt production centre in Tanzania.

Weak underground basins are known to exist in Zambia but they are weaker than sea water and the flow rates of the springs or boreholes are low. Therefore they are not considered a source for the production of commercial quantities of salt but rather only a basis for village type production of small quantities of salt. If strong brines can be found in significant quantities by drilling, particularly at Kazungula, this could provide the basis for commercial production of solar salt.

There are two major inland lakes or pans which contain major quantities of salt (sodium chloride) along with other salts or chemicals such as sodium carbonate. The first is the Sua Pan in Botswana where a 1974 SWECCO Study estimated the possibility of mining 1.3 million tonnes of salt per annum.

The second is Lake Natron in Tanzania where there are large deposits of sodium carbonate and sodium chloride. Both have no existing infrastructure and the production of salt would have to be a by-product of the recovery of the other chemicals. Therefore while these are a future source of salt they are not considered to be available for the immediate development of the salt industry.

Therefore the major sources of salt available for the development of the salt industry are the underground brines at Uvinza and the coastal sea water of Tanzania, Angola and Mozambique.

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7. SADCC TRADING LOGISTICS

The bulk of the alimentary salt requirement and industrial salt requirement of the region can be supplied from within the region by Tanzania, Angola, and Mozambique, which already have existing salt industries and have plans for salt industry development.

Tanzania needs to develop its own salt industry to overcome its domestic shortage and to be able to provide an exportable surplus. However, it does not have good transport links with the rest of the SADCC countries. The TANZAM railway gives access to the Zambian market but the haulage distances from the salt production centres are considerable. Therefore, it would seem more logical for Tanzania to export principally to its traditional markets in Burundi, Rwanda, Zaire and to develop new markets in other countries to its north.

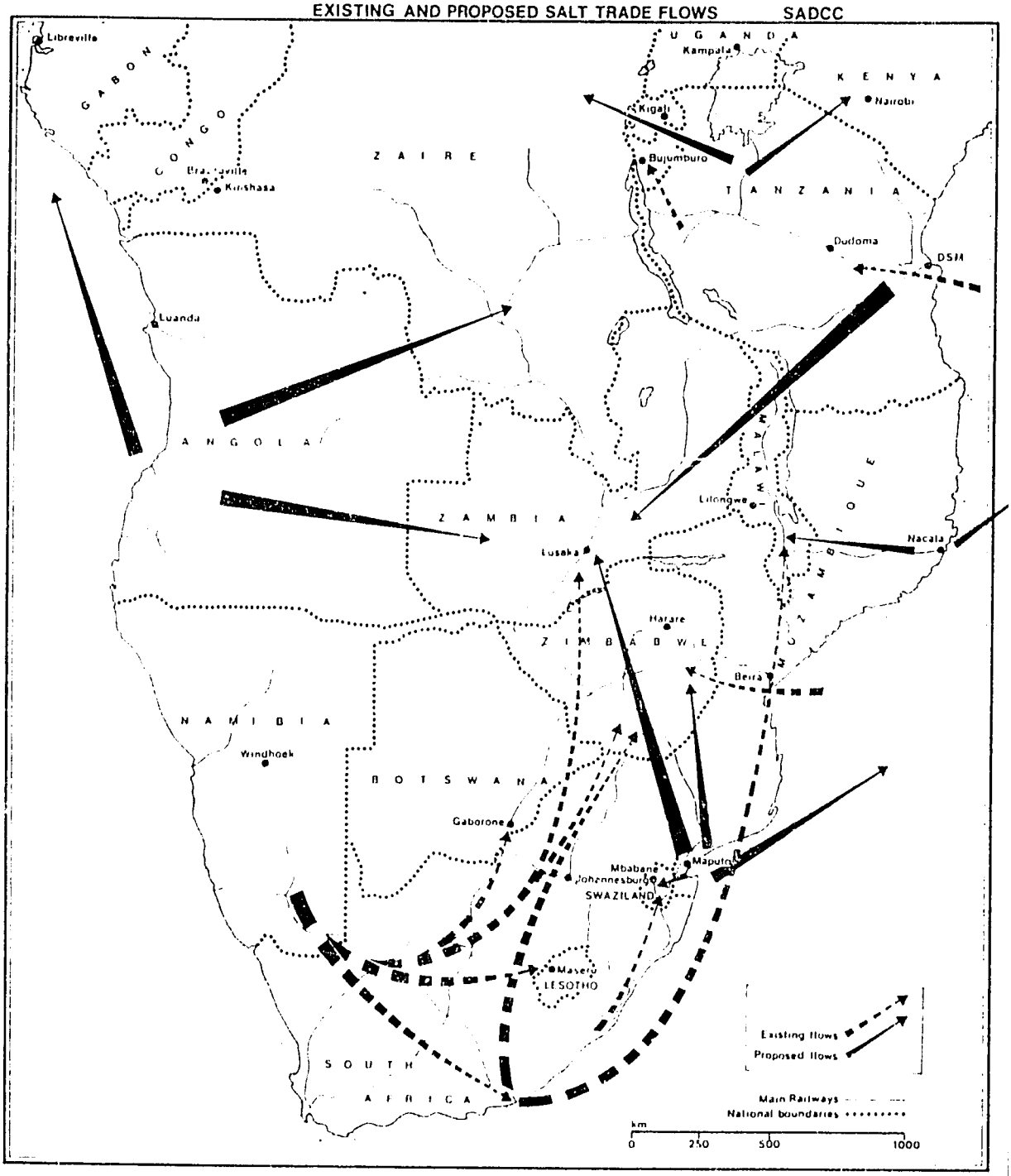
The Angolan salt industry has even greater problems in supplying other SADCC countries as the only rail link is through Zaire and is currently close.

Therefore, the major supplier of salt to the SADCC salt importing countries is logically Mozambique because of its good rail lines. The Mozambique rail system was designed to service the inland neighbouring countries and there are three railways running west from the ports of Nacala, Beira and Maputo. These lines give good links with Malawi, Zimbabwe, Zambia, Swaziland and Botswana. Consequently Mozambique is in an excellent position to competitively supply salt to the above importing countries. In fact Mozambiquan salt should be landed in those countries at a cheaper cost than South African salt because of Mozambique's natural advantage on rail freights.

Therefore, there is an excellent opportunity to develop important trading linkages between the SADCC countries with regard to the salt industry.

The adjoining map indicates the existing and proposed salt trade flows within the SADCC region. The major feature is a reorientation of trade away from South Africa.

EXISTING AND PROPOSED SALT TRADE FLOWS SADCC



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In order for Mozambique and Tanzania to replace South Africa as a major supplier it will be necessary for the following to occur:

- Mozambique and Tanzania to expand production so as to provide assured supply.

- improvement in communication and speedy response to orders

- improvements to the railway lines from Mozambique and Tanzania. Salt is a low value product with freight forming a major part of its landed cost, so efficient rail transport is essential

- strong packaging for salt

- attainment of quality requirements.

8. TECHNOLOGY OF SALT PRODUCTION

8.1. SOLAR EVAPORATION

For the SADCC countries with a coast line, solar evaporation is the most appropriate technology for separating salt from water. The raw material is inexhaustible and the climate conditions are such to make the solar technique the cheapest way of producing salt for the region.

Marshland areas are the ideal sites for construction of solar evaporation salt works. The real estate value of these areas are low and they are usually very close to sea level, thus facilitating the flow of sea water over their surface.

The solar evaporation process briefly involves the following sequence of activities:

1. Pumping of saline water into reservoirs;

2. Movement of the water through a system of shallow concentrating ponds so that the salt concentration increases through the action of sun and wind;

3. Transport of the concentrated saline water to crystallising ponds where the salt settles in a uniform layer;

4. Harvesting of the salt, either manually or mechanically.

Valuable chemical by-products are produced by the solar evaporation process, such as magnesium sulphate, potassium chloride, bromides, magnesium chloride. Scope may exist for economic extraction of these by-products in the larger salt works and this may be considered as a possible SADCC project once the proposed salt extraction projects come on stream.

8.2. VACUUM PAN PROCESS (PVD)

Where a highly refined and purified salt is required, the vacuum pan process can be used. Coarse salt or brine is treated for removal of extraneous impurities such as calcium and magnesium salts. The filtered material is then concentrated under vacuum in a pan for rapid removal of water followed by crystallisation and centrifuging. This results in a product of high purity. However, this process is expensive in fuel and, in general, the sold evaporation method is the most appropriate technology for the SADCC region.

9. PROPOSED SADCC SALT PROJECTS

The development of the salt industry should take place in a number of stages. The first stage is to achieve self-sufficiency within SADCC to meet the current requirements for salt. Future stages would be to expand the industry as demand for salt grows, particularly with the establishment of new industries that are large consumers of salt such as soda ash and chlorine manufacture and paper and pulp manufacture.

As stated previously the major development should occur in Angola, Mozambique and Tanzania.

9.1. ANGOLA

In Angola the production capacity is large but it is understood to be run-down. Therefore, the development in Angola must be in the revitalisation of existing salt pans. This can be achieved through advisory services, training of operation and management, improvements to the original design and new equipment such as pumps, harvesters, etc.

9.2. MOZAMBIQUE

There is considerable scope to expand production from existing salt pans by the application of improved techniques, redesign of certain features and new equipment. The main input required is skilled personnel to visit most of these salt pans and advise on improvements. The resultant increased production would then be used to supply local and regional markets so allowing the production from the large privately-owned and state-owned salt pans to be exported.

9.3. TANZANIA

In Tanzania the responsibility for salt production and distribution rests with the State Mining Corporation (STAMICO).

STAMICO has a number of projects in the course of construction including the FVD project at UVINZA being constructed in co-operation with the Government of Italy.

The recommendations are aimed at expanding production by increasing output from existing salt pans by redesign and improved operating methods and accelerating the completion of the projects currently in the course of construction.

It is also recommended that feasibility studies be carried out for further increases in productive capacity to follow-on after the completion of the first projects.

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10. SUMMARY OF PROPOSED PROJECTS

10.1. NACALA - MOZAMBIQUE

Description

Development of a major salt field with an initial capacity of 50,000 tonnes per annum and final capacity of 100,000 per annum. Secondary washing and bagging plant.

Project Rationale

Incorporate existing saltfields with annual production of 20,000 tonnes per annum thereby increasing production by 30,000 tonnes per annum. Project can be expanded as demand increases.

Product Range

Bagged washed/unrefined and iodised salt.

SADCC Market Position

Create ability to supply Malawi's current requirements which is estimated at about 30,000 tonnes per annum.

Existing Capacity

Existing capacity of 20,000 tonnes per annum absorbed into northern Mozambique market.

Technology Package

Production of salt using solar evaporation. Project Engineering has been completed.

Raw Material

Seawater - unlimited

Project Cost - Initial stage

US$ 6.5 million - foreign content US$ 3.0 million
- local content US$ 3.5 million

SADCC Trading Logistics

Supply Malawi with salt at lower cost than present imports from Republic of South Africa. Nacala is the port at the head of the northern railway into Malawi and therefore is well placed to supply that market.

Financing Structure

Loans and grants to Mozambique Government.

Promotion Institution

SADCC donor countries.

Equity participation

Could be considered on the invitation of the Mozambique Government.

Outstanding Gaps Regarding Information

Detailed feasibility study required. Cost $130,000.

Implementation Schedule

Feasibility study	3 months
Plant engineering	3 months
Earthworks	12 months
Plant construction	9 months

Inputs required from donors

Feasibility study
Engineering design
Technology transfer and training
Finance

Terms of Reference

1. Study existing project engineering drawings and specifications and determine what will be included in initial stage.

2. Prepare revised cost estimates of initial stage.

3. Prepare preliminary engineering drawing and cost estimates for secondary washing and bagging plant.

4. Conduct economic feasibility study including costs of distribution and landed costs of salt in Malawi. Calculate projected rates of return.

5. Set out implementation schedule.

6. Investigate funding alternatives.

10.2. MAPUTO - MOZAMBIQUE

Description

Upgrade and consolidate existing saltpans increasing production from 20,000 to 80,000 tonnes per annum. Introduction of mechanical harvesting and washing of harvested salt. Secondary washing and bagging plant. Upgrade and expansion of existing refinery to 15,000 tonnes per annum. Iodine mixing plant. Production of animal salt licks.

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Project Rationale

Expand production capacity and product range to meet Mozambique, Zimbabwe and eventually part of Zambia market requirements.

Product Range

Bagged washed/unrefined and iodised salt
Refined salt
Animal salt licks

Technology Package

Production of crude salt using solar evaporation. Washing of crude salt in saturated brine, drying, grinding and packing. Compression of salt to produce salt licks.

Raw Materials

Sea water - unlimited. Packaging materials. Lime-stone and molasses and animal nutrition chemicals.

Project Cost

US$ 8.5 million - upgrade of field US$ 2.5 million - harvest and washing plant - US$ 2.5 million. Upgrade of refinery US$ 3.5 million. Foreign expenditure US$ 6.5 million. Local expenditure US$ 2.0 million.

SADCC Trading Logistics

Supply Swaziland, Zimbabwe and Zambia with unrefined and refined salt products and salt licks at costs competitive with imports from Republic of South Africa.

Financing Structure

Loans and Grants to Mozambique Government

Promoting Institution

SADCC donor countries

Equity Participation

Could be managed on joint venture basis.

Outstanding Gaps Regarding Information

Detailed feasibility study required - estimated cost US$ 170,000.

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Implementation Schedule

Feasibility Study	3 months
Plant Engineering	5 months
Earthworks	12 months
Plant Construction	18 months

Inputs required from Donors

Feasibility study
Engineering design
Technology transfer and training
Finance

Terms of Reference

1. Survey existing salt pans.

2. Prepare preliminary drawings for the revised layout of the consolidated salt pan.

3. Specify civil works and mechanical equipment.

4. Prepare cost estimates for civil works and mechanical equipment.

5. Prepare preliminary engineering drawings and cost estimates for secondary washing and bagging plant.

6. Determine specification and project demand for refined salt and prepare preliminary engineering drawings and cost estimates for new refinery and iodising plant incorporating as much of the existing equipment as possible.

7. Determine specification and projected demand for animal salt licks and prepare preliminary engineering drawings and cost estimates for salt lick pans.

8. Conduct economic feasibility study including costs of distribution and landed costs of salt in Swaziland, Zimbabwe and Zambia.

9. Investigate funding alternatives.

10. Set out implementation schedule.

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10.3. CHANGWAHLA - TANZANIA

Description

Upgrade existing saltfield and expand capacity to over 5,000 tonnes per annum. Install bagging facilities.

Project Rationale

Salt field is not yet developed to full capacity due to lack of funds. Capacity can be increased by re-design, improved techniques and more equipment.

Expand production to assist in meeting current domestic shortfall.

Product Range

Bagged unrefined salt.

Technology Package

Production of salt using solar evaporation.

Raw Materials

Sea water - unlimited.

Project Cost

US$ 0.6 million. Foreign expenditure US$ 0.4 million. Local expenditure US$ 0.2 million.

SADCC Trading Logistics

Contribute to eventual exportable surplus.

Financing Structure

Loan to Tanzanian Government

Promoting Institution

SADCC donor countries

Outstanding Gaps Regarding Information

Detailed Study and Engineering Design - cost US$ 15,000.

Implementation Schedule

Feasibility study	1 month
Earthworks	6 months
Plant Installation	6 months

Inputs required from Donors

Feasibility study and design
Technology transfer and training
Finance

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Terms of Reference

1. Study existing layout and operating methods.

2. Specify revised methods.

3. Prepare preliminary engineering drawings and cost estimates for new earthworks and mechanical plant.

4. Prepare preliminary engineering drawings and rest of estimates for bagging plant.

5. Set out implementation schedule.

10.4. SADANI - TANZANIA

Description

Completion of project to construct new saltfield with annual capacity of 40,000 tonnes. Install washing and bagging plant.

Plant Rationale

Construction has commenced but completion necessary to meet anticipated growth in domestic and industrial requirements.

Product Range

Bagged/bulk unrefined salt

Technology Package

Production of salt using solar evaporation

Raw Materials

Sea water - unlimited

Project Cost

US$ 3.3 million of which US$ 1.2 million has been incurred. Balance of expenditure US$ 2.1 million. Local expenditure US$ 0.5 million. Foreign expenditure US$ 1.6 million.

SADCC Trading Logistics

Contribute to eventual exportable surplus

Financing structure

Loan or Grant to Tanzanian Government

Promoting Institution

SADCC donor Countries

Outstanding Gaps Regarding Information

Detailed study and Engineering Design - Cost US$ 45,000.

Implementation Schedule

Feasibility study	2 months
Earthworks	15 months
Plant Installation	6 months

Inputs required from donors

Feasibility Study
Technology transfer and training
Finance

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Terms of Reference

1. Review existing design and construction to date.

2. Specify changes to design that will improve quality and lower unit costs of production.

3. Prepare revised cost estimates to complete construction and commission the project.

4. Prepare preliminary engineering drawings and cost estimates for washing and bagging plant.

5. Set out implementation schedule.

10.5. KAZANGULA - ZAMBIA

Feasibility study for the establishment of a solar salt plant in the Kazungula area.

A large swamp exists in the Kazangula area of the Southern Province, about 40 miles from Livingstone and near the border of Botswana. The composition of the water in the wells of the upper reaches of the swamp is similar to that of sea water. The geology of the area and salt manufacturing activity from brine across the Zambesi in Botswana would suggest that sub-soil brine may exist in the area and should be investigated.

A systematic programme of drilling exploratory holes is initially required in order to determine the approximate quantities of sub-soil brine available. Should this investigation establish the existence of subterranean brine in sufficient quantities salt could be extracted by the solar evaporation process as climate and land conditions for solar evaporation in the area appear favourable.

The Kazangula belt area is located near the main Livingstone-Lusaka road, and there is a railroad from Livingstone. Thus all the main salt consuming markets could be served from Kazungula.

The broad terms of reference for the study are as follows:

1. Prepare a large scale topographical map of the Kazangula area.

2. Selected about 12 drill hole sites over an area of about 16-20 sq kilometres.

3. Carry out a programme of drilling exploratory drill holes.

4. Measure the existence, discharge and salinity of the brine from the drill holes.

5. Determine the quantities available of sub-soil brine.

6. If the results of 5 are positive, conduct a detailed technical and economic feasibility study for recovery of salt.

The cost of the study would be approximately £200,000.

10.6. SALT REFINERY - BOTSWANA/LESOTHO

The object of these refineries would be to refine crude salt imported from other countries.

It is expected that the demand for refined grades of salt will increase as consumer awareness increases.

Establishing a salt refinery would create a small scale industry that would provide value added benefits.

10.7. OTHER PROJECT POSSIBILITIES

Other project possibilities identified, to be considered for a later stage of development are as follows:-

10.7.1. Kitame Saltworks - Tanzania

Planned capacity	30,000 tonnes raw salt p.a.
Technology	Solar evaporation
Technical knowhow	Available locally for solar evaporation
Estimated investment	Shs 26 million

Investment breakdown (Solar evaporation)	Local	Foreign
Surveying equipment & work	200,000	195,000
Plant & Machinery	2,400,000	7,670,000
Saltwork construction	3,000,000	
Infrastructure	10,000,000	
Personnel & supervision	345,000	
10% contingency	1,594,000	786,000
Total	17,539,000	8,651,000
	26,190,000	

Funds required:

Local	Shs 17.5 million
Foreign	Shs 8.6 million
Planned completion date	1984

Feasibility Study recommended.

10.7.2. Lindi/Mtwara - Tanzania

Planned capacity	30,000 tonnes raw salt p.a.
Technology	Solar evaporation
Technical knowhow	Available locally
Estimated investment (Breakdown as above)	Shs 26 million

Funds required:

Local	Shs 17.5 million
Foreign	Shs 8.651 million
Commencement of Project	1983/84
Planned completion date	1984/85

Feasibility study recommended

10.7.3. Manbone - Mozambique

Present salt production at Manbone is 10,000 tonnes per annum. This can be expanded to 40,000 tonnes p.a. for a relatively low capital investment. A pulp mill is also planned for the Manbone area which will require salt for caustic soda.

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Funds required:

Local	Shs 17.5 million
Foreign	Shs 8.6 million
Planned completion date	1984

Feasibility Study recommended.

10.7.2. Lindi/Mtwara - Tanzania

Planned capacity	30,000 tonnes raw salt p.a.
Technology	Solar evaporation
Technical knowhow	Available locally
Estimated investment (Breakdown as above)	Shs 26 million

Funds required:

Local	Shs 17.5 million
Foreign	Shs 8.651 million
Commencement of Project	1983/84
Planned completion date	1984/85

Feasibility study recommended

10.7.3. Manbone - Mozambique

Present salt production at Manbone is 10,000 tonnes per annum. This can be expanded to 40,000 tonnes p.a. for a relatively low capital investment. A pulp mill is also planned for the Manbone area which will require salt for caustic soda.

EXPANSION OF SALTWORKS AT MACALA, MOZAMBIQUE

1. INTRODUCTION

Salt production for industrial and other usage has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. The regional plan of action incorporates specific projects which are now being elaborated for implementation.

The benefits to the SADCC Region of industrial co-operation in salt production would be:-

- trading linkages within SADCC with several salt producing countries supplying the salt requirements of the other;
- industrial linkages as salt is an essential raw material for a number of basic industries such as food processing, textiles, tanning, paper and pulp and heavy chemicals such as soda ash, caustic soda and chlorine;
- self-sufficiency in an essential foodstuff that is currently imported from the Republic of South Africa or is in short supply due to foreign exchange shortages;
- earn foreign exchange by exports outside the region;
- increase size and diversity of the industrial sector and so add to national and regional output, employment opportunities and the development of new skills and technology;
- minimisation of costs by avoiding very large transport costs.

2. PROPOSED PROJECT

2.1 DESCRIPTION OF PROJECT

Development of a major salt field at Nacala, Mozambique with an initial capacity of 50,000 tonnes per annum and final capacity of 100,000 per annum. Secondary washing and bagging plant.

2.2 PROJECT RATIONALE

Incorporate existing saltfields with annual production of 20,000 tonnes per annum thereby increasing production by 30,000 tonnes per annum. Project can be expanded as demand increases. The product could form the basis for a chloralkali plant or be exported to Malawi or other countries.

2.3 PRODUCT RANGE

Bagged washed/unrefined and iodised salt.

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3. BACKGROUND

Mozambique traditionally has been an exporter of salt and has a well established salt industry along its entire coastline. There are nearly two hundred salt pans in operation with the two main production centres being Maputo and Nacala. The spread of salt pans along the coast means that most regions are self-sufficient in salt and there are few distribution problems.

After independence some of the larger salt pans were taken over by the Government. The smaller pans which are often a part of village agricultural activities are generally operated as co-operatives.

The state-owned pans are operated by the Ministry of Industry and Energy where salt is one of seventeen industries operating within that Ministry. The Ministry has set out about a policy of expanding production by improving its own pans and by providing advice and guidance to the other producers. This policy has been successful with production expanding by about 50% in the last four years entirely due to improvements to existing pans.

In 1981, production was estimated at 85,000 tonnes. Of this 30% was produced on State-owned pans, 50% on privately-owned pans and 20% on co-operatively-owned pans.

The current requirement for salt in Mozambique is estimated at about 50,000 tonnes per annum. This is almost entirely for human consumption with only small quantities being used for industrial purposes. Most of the salt consumed is unrefined crude salt with small quantities of refined salt being consumed as table salt.

The distribution of salt is the responsibility of the Ministry of Internal Commerce who purchases the salt from the Ministry of Industry and Energy. The private and co-operative pans can sell their output to private distributors or to the Ministry of Industry and Energy. Export sales of salt are the responsibility of the Ministry of External Commerce.

4. SADCC MARKET POSITION

Mozambique has a long history of supplying salt to its nearer SADCC neighbours, in particular, Malawi and Zimbabwe. In recent years this has been confined to small quantities in spot sales. The recent expansion in production has meant that Mozambique now has an exportable stockpile of salt and efforts are being made to expand export sales and to reestablish Mozambique's former position as a long term supplier.

Mozambique is in a most favourable position to be the major supplier of salt to the SADCC region in the immediate future. Not only is Mozambique producing an exportable surplus but more importantly its two major salt production centres at Maputo and Nacala are immediately adjacent to these ports and two major railways that link into Malawi, Swaziland, Zimbabwe and Zambia.

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4. SADCC MARKET POSITION

Mozambique has a long history of supplying salt to its nearer SADCC neighbours, in particular, Malawi and Zimbabwe. In recent years this has been confined to small quantities in spot sales. The recent expansion in production has meant that Mozambique now has an exportable stockpile of salt and efforts are being made to expand export sales and to reestablish Mozambique's former position as a long term supplier.

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The regional salt plan at Annex 1 estimates that the total requirement of salt in the SADCC region was 380,000 tonnes in 1982, as compared with the existing regional production capacity of 264,000 tonnes. There is, therefore, considerable scope to expand existing production capacity in Mozambique for export sales within the SADCC market.

5. EXISTING CAPACITY

The existing capacity of the salt industry in Mozambique is well over 80,000 tonnes per annum given reasonable weather conditions. There is also the capacity to produce about 6,000 tonnes per annum of refined salt.

The above capacity is spread over nearly two hundred salt pans. However, the major areas are Maputo where the capacity is 30,000 tonnes and Nacala where the capacity is 25,000 tonnes. Each of these centres has a major salt pan with a capacity of about 20,000 tonnes per annum each. The Nacala pan is privately- owned and the Maputo pan is State-owned.

The recent expansion in production to 81,000 tonnes per annum has come from improvements to existing capacity through improved techniques and amalgamation of smaller pans into larger ones. The potential to expand production further from the existing capacity is considerable. This potential is well understood by the Ministry of Industry and Energy. The main constraints are manpower and finance.

The Ministry has three major areas it is concentrating upon:

- provision of advice and encouragement to the private and co-operative-owned pans on means and techniques to expand production and improve quality;

- expansion of the State-owned pans, particularly at Maputo by design changes, re-equipment and improved operating techniques;

- expansion of the Nacala salt pans in co-operation.

The objective is to have the Maputo and Nacala pans up to levels of production that will justify the latest technology and mechanised harvesting and handling thereby producing salt of high quality at comparable cost to other major world salt suppliers. This can be achieved as the meteorological and topographical factors are favourable, the infrastructure is already there, and much of the earthworks are already in existence.

6. TECHNOLOGY PACKAGE

For the SADCC countries with a lengthy coast line, solar evaporation is the most appropriate technology for separating salt from water. The raw material is inexhaustible and the climate conditions are such to make the solar technique the cheapest way of producing salt for the region.

The solar evaporation process briefly involves the following sequence of activities:

1. Pumping of saline water into reservoirs;
2. Movement of the water through a system of shallow concentrating ponds so that the salt production increases through the action of sun and wind;
3. Transport of the concentrated saline water to crystallising ponds where the salt settled in a uniform layer;
4. Harvesting of salt, either manually or mechanically.

Most of the salt pans in Mozambique follow traditional methods of salt production.

The expansion project would involve the following upgraded technologies:

- Continuous monitoring of brine densities and control of the volume in the concentrating ponds

- Control of the density of brine transferred to the crystallisers

- The depths in the crystallisers increased and multiple irrigation of the crystallisers adopted

- Provision made to run-off rain diluted brine off the top of the concentrated brine in the crystallisers

- The area of each crystalliser enlarged to allow better evaporation and the introduction of mechanical harvesting

- The crystallisers drained prior to harvesting the salt

- The harvested salt washed in wash plant with fresh brine and then stacked in the open for at least six months

- Strong brines stored in deep ponds over the wet season.

These techniques would be elaborated in the detailed project report.

The principal constraints to the above changes are manpower to advise on and implement the changes, and finance.

7. RAW MATERIAL SITUATION

The three ingredients for solar salt production are sea water, high net evaporation and suitable topography and are all readily available near Nacala in Mozambique. The area selected is well-suited for salt production and involves the closing off of a large shallow inlet and the construction of the salt works behind the sea wall.

8. SADCC TRADING LOGISTICS

Mozambique is very well placed with its production potential and existing railway links to supply the major part of the SADCC present and region's future salt requirements.

The main salt production centres are at Nacala and Maputo. From Nacala, the railway runs directly to Malawi and links in with the Malawi system. From Maputo, railways run to Swaziland and Zimbabwe and through Zimbabwe links into the railway into Zambia and Botswana.

Given Mozambique's geographical location and solar evaporation potential, Mozambique can replace South Africa as the principal supplier of salt to Zambia, Zimbabwe and Swaziland. Mozambique salt should be landed in those countries at a cheaper cost than South African salt because of Mozambique's natural advantage on rail freights.

The potential to expand salt production in Mozambique is almost unlimited and, therefore, production can be increased by the expansion of existing salt pans to meet increased requirements for industrial salt in the SADCC region. This demand will be generated as the textiles, paper, tanning and food industries expand and a chlor-alkali industry is established.

9. PROJECT COST - INITIAL STAGE

US$ 6.5 million - foreign content US$ 3.0 million
- local content US$ 3.5 million

10. PROMOTING INSTITUTION

Ministry of Industry and Energy, Government of Mozambique.

11. IMPLEMENTATION SCHEDULE

Detailed project report	3 months
Earthworks	12 months
Plant construction	9 months

12. INPUTS REQUIRED FROM DONORS

Technical and financial co-operation for the implementation of the project.

EXPANSION OF SALTWORKS AT MAPUTO, MOZAMBIQUE

1. INTRODUCTION

Salt production for industrial and other usage has been selected by the SADCCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. The regional plan of action incorporates specific projects which are now being elaborated for implementation.

The benefits to the SADCC Region of industrial co-operation in salt production would be:-

- trading linkages within SADCC with several salt producing countries supplying the salt requirements of the other;
- industrial linkages as salt is an essential raw material for a number of basic industries such as food processing, textiles, tanning, paper and pulp and heavy chemicals such as soda ash, caustic soda and chlorine;
- self-sufficiency in an essential foodstuff that is currently imported from the Republic of South Africa or is in short supply due to foreign exchange shortages;
- earn foreign exchange by exports outside the region;
- increase size and diversity of the industrial sector and so add to national and regional output, employment opportunities and the development of new skills and technology;
- minimisation of costs by avoiding very large transport costs.

2. PROPOSED PROJECT

2.1 DESCRIPTION OF PROJECT

Upgrade and consolidate existing saltpans at Maputo, Mozambique increasing production from 20,000 to 80,000 tonnes per annum. Introduction of mechanical harvesting and washing of harvested salt. Secondary washing and bagging plant. Upgrade and expansion of existing refinery to 15,000 tonnes per annum. Iodine mixing plant. Production of animal salt licks.

2.2 PROJECT RATIONALE

Expand production capacity and product range to meet Mozambique, Zimbabwe and eventually part of Zambia's market requirements.

2.3. PRODUCT RANGE

Bagged washed/unrefined and iodised salt
Refined salt
Animal salt licks

3. BACKGROUND

Mozambique traditionally has been an exporter of salt and has a well established salt industry along its entire coastline. There are nearly two hundred salt pans in operation with the two main production centres being Maputo and Nacala. The spread of salt pans along the coast means that most regions are self- sufficient in salt and there are few distribution problems.

After independence some of the larger salt pans were taken over by the Government. The smaller pans which are often a part of village agricultural activities are generally operated as co-operatives.

The state-owned pans are operated by the Ministry of Industry and Energy where salt is one of seventeen industries operating within that Ministry. The Ministry has set out about a policy of expanding production by improving its own pans and by providing advice and guidance to the other producers. This policy has been successful with production expanding by about 50% in the last four years entirely due to improvements to existing pans.

In 1981, production was estimated at 85,000 tonnes. Of this 30% was produced on State-owned pans, 50% on privately-owned pans and 20% on co-operatively-owned pans.

The current requirement for salt in Mozambique is estimated at about 55,000 tonnes per annum. This is almost entirely for human consumption with only small quantities being used for industrial purposes. Most of the salt consumed is unrefined crude salt with small quantities of refined salt being consumed as table salt.

The distribution of salt is the responsibility of the Ministry of Internal Commerce who purchases the salt from the Ministry of Industry and Energy. The private and co-operative pans can sell their output to private distributors or to the Ministry of Industry and Energy. Export sales of salt are the responsibility of the Ministry of External Commerce.

4. SADCC MARKET POSITION

Mozambique has a long history of supplying salt to its nearer SADCC neighbours, in particular, Malawi and Zimbabwe. In recent years this has been confined to small quantities in spot sales. The recent expansion in production has meant that Mozambique now has an exportable stockpile of salt and efforts are being made to expand export sales and to re-establish Mozambique's former position as a long term supplier.

Mozambique is in a most favourable position to be the major supplier of salt to the SADCC region in the immediate future. Not only is Mozambique producing an exportable surplus but more importantly its two major salt production centres at Maputo and Nacala are immediately adjacent to these ports and two major railways that link into Malawi, Swaziland, Zimbabwe and Zambia.

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The regional salt plan at Annex 1 estimates that the total requirement of salt in the SADCC region was 380,000 tonnes in 1982, compared with the existing regional production capacity of 264,000 tonnes. There is, therefore, considerable scope to expand existing production capacity in Mozambique for export sales within the SADCC market.

5. EXISTING CAPACITY

The existing capacity of the salt industry in Mozambique is well over 80,000 tonnes per annum given reasonable weather conditions. There is also the capacity to produce about 6,000 tonnes per annum of refined salt.

The above capacity is spread over nearly two hundred salt pans. However, the major areas are Maputo where the capacity is 30,000 tonnes and Nacala where the capacity is 25,000 tonnes. Both these centres have a major salt pan with a capacity of about 20,000 tonnes per annum each. The Nacala pan is privately owned and the Maputo pan is Stated owned.

The recent expansion in production to 81,000 tonnes per annum has come from improvements to existing capacity through improved techniques and amalgamation of smaller pans into larger ones. The potential to expand production further from the existing capacity is considerable. This potential is well understood by the Ministry of Industry and Energy. The main constraints are manpower and finance.

The Ministry has three major areas it is concentrating upon:

- provision of advice and encouragement to the private and co-operative-owned pans on means and techniques to expand production and improve quality;

- expansion of the State-owned pans, particularly at Maputo by design changes, re-equipment and improved operating techniques;

- expansion of the Nacala salt pans in co-operation with the current private owners.

The objective is to have the Maputo and Nacala pans up to levels of production that will justify the latest technology and mechanised harvesting and handling thereby producing salt of high quality at comparable cost to other major world salt suppliers. This can be achieved as the meteorological and topographical factors are favourable, the infrastructure is already there, and much of the earthworks are already in existence.

6. TECHNOLOGY PACKAGE

For the SADCC countries with a lengthy coast line, solar evaporation is the most appropriate technology for separating salt from water. The raw material is inexhaustible and the climate conditions are such to make the solar technique the cheapest way of producing salt for the region.

The solar evaporation process briefly involves the following sequence of activities:

1. Pumping of saline water into reservoirs;
2. Movement of the water through a system of shallow concentrating ponds so that the salt production increases through the action of sun and wind;
3. Transport of the concentrated saline water to crystallising ponds where the salt settled in a uniform layer;
4. Harvesting of salt, either manually or mechanically.

Most of the salt pans in Mozambique follow traditional methods of salt production.

The expansion project would involve the following upgraded technologies:

- Continuous monitoring of brine densities and control of the volume in the concentrating ponds

- Control of the density of brine transferred to the crystallisers

- The depths in the crystallisers increased and multiple irrigation of the crystallisers adopted

- Provision made to run-off rain diluted brine off the top of the concentrated brine in the crystal lisers

- The area of each crystalliser enlarged to allow better evaporation and the introduction of mechanical harvesting

- The crystallisers drained prior to harvesting the salt

- The harvested salt shed in wash plant with fresh brine and then stacked in the open for at least six months

- Strong brines store in deep ponds over the wet season.

These techniques would be elaborated in the detailed project report.

The principal constraints to the above changes are manpower to advise on and implement the changes, and finance.

7. RAW MATERIAL SITUATION

The three ingredients for solar salt production are sea water, high net evaporation and suitable topography and are all readily available near Maputo in Mozambique. The area selected is well-suited for salt production. Packaging materials, limestone and molasses for salt licks could be obtained locally and animal nutrition chemicals imported.

8. SADCC TRADING LOGISTICS

Mozambique is very well placed with its production potential and existing railway links to supply the major part of the SADCC region's present and future. Mozambique is very well placed with its production potential and existing railway links to supply the major part of the SADCC region's present and future salt requirements.

The main salt production centres are at Nacala and Maputo. From Nacala, the railway runs directly to Malawi and links in with the Malawi system. From Maputo, railways run to Swaziland and Zimbabwe and through Zimbabwe links into the railway into Zambia and Botswana.

Given Mozambique's geographical location and solar evaporation potential, Mozambique can replace South Africa as the principal supplier of salt to Zambia, Zimbabwe and Swaziland. Mozambique salt should be landed in those countries at a cheaper cost than South African salt because of Mozambique's natural advantage on rail freights.

The potential to expand salt production in Mozambique is almost unlimited and, therefore, production can be increased by the expansion of existing salt pans to meet increased requirements for industrial salt in the SADCC region. This demand will be generated as the textiles, paper, tanning and food industries expand and a chlor-alkali industry is established.

9. PROJECT COST

US$ 8.5 million - upgrade of field US$ 2.5 million - harvest and washing plant - US$ 2.5 million. Upgrade of refinery US$ 3.5 million. Foreign expenditure US$ 6.5 million. Local expenditure US$ 2.0 million.

10. PROMOTING INSTITUTION

Ministry of Industry and Energy, Government of Mozambique.

11. OUTSTANDING GAPS REGARDING INFORMATION

A feasibility study has been completed and the saltworks project is ready for implementation.

Projected demand for salt licks to be determined in detail and engineering drawings and cost estimates prepared for salt lick plans.

12. IMPLEMENTATION SCHEDULE

Engineering study	3 months
Earthworks	12 months
Plant Construction	18 months

13. INPUTS REQUIRED FROM DONORS

Financial and technical co-operation for the implementation of the project.

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DEVELOPMENT OF SALTWORKS AT SADANI, TANZANIA

1. INTRODUCTION

Salt production for industrial and other usage has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. The regional plan of action incorporates specific projects which are now being elaborated for implementation.

The benefits to the SADCC Region of industrial co-operation in salt production would be:-

- trading linkages within SADCC with several salt producing countries supplying the salt requirements of the other;
- industrial linkages as salt is an essential raw material for a number of basic industries such as food processing, textiles, tanning, paper and pulp and heavy chemicals such as soda ash, caustic soda and chlorine;
- self-sufficiency in an essential foodstuff that is currently imported from the Republic of South Africa or is in short supply due to foreign exchange shortages;
- earn foreign exchange by exports outside the region;
- increase size and diversity of the industrial sector and so add to national and regional output, employment opportunities and the development of new skills and technology;
- minimisation of costs by avoiding very large transport costs.

2. PROPOSED PROJECT

2.1. DESCRIPTION

Completion of project to construct saltfield at Sadani, Tanzania with annual capacity of 40,000 tonnes. Install washing and bagging plant.

2.2. PROJECT RATIONALE

Construction commenced in 1979/80, but completion necessary to meet anticipated growth in domestic and industrial requirements.

2.3. PRODUCT RANGE

Bagged/bulk unrefined salt.

3. BACKGROUND

It is estimated that the current requirement for salt in Tanzania is about 90,000 tonnes per annum. This is made up of 85,000 tonnes of domestic salt and 5,000 tonnes of salt used for industrial purposes.

The principal grade of salt consumed is unrefined crude salt which is consumed in the villages. Small quantities of refined and PDV salt are consumed in the cities as table salt and industrial salt. This refined salt is imported from India and West Germany.

The distribution of salt is controlled by the State Mining Corporation (STAMICO). Any saltfield producing over 5,000 tonnes per annum has to sell its production to STAMICO, under 5,000 tonnes it can sell its production to STAMICO, under 5,000 tonnes it can sell its production direct onto the market.

A subsidiary of STAMICO - Nyanza Salt Mines - produces salt at Uvinza from underground brines and as such is the major supplier to the market.

Total current production is about 55,000 tonnes per annum. Therefore, there is a serious shortage on the domestic market of about 35,000 tonnes per annum which requires rationing of available supplies, a system of regional distribution and imports of salt to help supply the market. Currently, most of the salt sold is not iodised. Iodised salt is imported for consumption. It is highly desirable in goitre areas that all salt is iodised for goitre control. This could be done with simple plants on each major saltfield.

4. SADCC MARKET POSITION

Due to the domestic shortage of salt there has been little export of salt to other SADCC countries.

There were some exports of salt to Zambia in the 1960s but these ceased.

There have been exports of salt to Burundi, Zaire, and Rwanda due to their proximity to the main salt production at Uvinza in North-Western Tanzania.

The shortage of foreign exchange does not allow importation of large quantities of salt from other SADCC countries to ease the shortage of salt.

In fact due to its reserves of underground brine and favourable coastal conditions for the production of solar salt from seawater, Tanzania has the potential to be a major salt supplier to the SADCC region which is presently importing 125,000 tonnes per annum.

5. EXISTING CAPACITY

As stated there is an estimated shortage of about 35,000 tonnes per annum of salt on the market.

Current production of about 55,000 tonnes per annum is from the following sources:

Uvinza - utilising strong underground brine. 20,000 tonnes per annum produced by evaporating the brine in open steel pans heated by wood fires. 8,000 - 10,000 tonnes per annum by solar evaporation.

Coastal - utilising seawater. 5,000 - 6,000 tonnes per annum from 14 or 15 small saltworks spread along the coast.

15,000 to 20,000 tonnes per annum from Stanley's saltworks at Bagomoya and Hitame.

500 tonnes from STAMICO's saltfield being developed at Changwahela.

It is intended to increase STAMICO's production by 110,000 tonnes (net) per annum to about 140,000 tonnes.

This will be from:

- a new vacuum evaporation plant at Uvinza with an annual capacity of 60,000 tonnes per annum of pure dried vacuum salt.

  This plant will replace the salt currently produced in the open steel pans. Therefore, it will add a net 40,000 tonnes per annum to productive capacity. Completion is projected for 1983.

  three coastal solar saltworks with total capacity of 70,000 tonnes per annum.

Changwahela	5,000 tonnes per annum
Sadani	40,000 tonnes per annum
Kitame	25,000 tonnes per annum

  Changwahela is in production but operating well below capacity and is not fully developed.

  Sadani development has commenced but it is behind schedule due to lack of vital construction equipment.

  Kitame has been surveyed but development has not yet commenced.

  It is planned for all to be in production in 5 years.

  Therefore on completion of all the above projects STAMICO's production capacity will be about 140,000 tonnes per annum. When this is added to the private production capacity of 20,000 tonnes per annum Tanzania's total capacity would be 160,000 tonnes per annum, which is sufficient to meet Tanzania's own requirements and produce an exportable surplus.

  With increasing domestic and regional demand, as projected in the regional salt plan at Annex 1, additional saltworks capacity will be required during 1985-90, hence the proposal to develop Lindi/Mtwara.

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6. TECHNOLOGY PACKAGE

The development of the solar industry in Tanzania can be divided into two parts:

- increasing production from existing saltfields. This can be achieved by improved operating techniques and relatively low investment in new equipment and construction

- construction of new saltfields such as Sadani which involve substantial outlays in construction costs and equipment

The main elements of the solar evaporation technology to be installed at Sadani comprises the following:-

1. Pumping of saline water into reservoirs;

2. Movement of the water through a system of shallow concentrating ponds so that the salt concentration increases through the action of sun and wind;

3. Transport of the concentrated saline water to crystallising ponds where the salt settles in a uniform layer;

4. Harvesting of the salt, either manually or mechanically.

The major area of assistance is the design, construction, and financing of the new saltfield and review of its design.

7. RAW MATERIAL SITUATION

Sadani is a swampy marsh about 10 km south of Sadani village. The area for development comprises 1,000 acres.

8. SADCC TRADING LOGISTICS

Tanzania has the production potential to eventually meet its own requirements for salt and produce an exportable surplus.

Logistically Tanzania is well placed to supply Zambia's imports of salt and, to a lesser extent, part of Malawi's and Zimbabwe's imports.

As salt is a low value product freight is a major part of its landed cost and, therefore, efficient rail transport is essential. In order to supply the three SADCC countries above it would require transporting over 40,000 tonnes of salt per annum over the TANZAM railway. It is understood for this to successfully occur the TANZAM railways haulage capacity would have to be upgraded.

In addition salt exports outside SADCC could be developed.

9. PROJECT COST

US$ 3.3 million, of which US$ 1.2 million has been incurred. Balance of expenditure US$ 2.1 million. Local expenditure US$ 0.5 million. Foreign expenditure US$ 1.6 million.

10. PROMOTING INSTITUTION

State Mining Corporation, Tanzania

11. OUTSTANDING GAPS REGARDING INFORMATION

Detailed study and engineering design: cost US$ 45,000

12. IMPLEMENTATION SCHEDULE

Engineering study	3 months
Earthworks	15 months
Plant installation	6 months

13. INPUTS REQUIRED FROM DONORS

Technical and financial co-operation for the implementation of the project.

14. TERMS OF REFERENCE FOR ENGINEERING DESIGN

1. Review existing design and construction to date.

2. Specify changes to design that will improve quality and lower unit costs of production.

3. Prepare revised cost estimates to complete construction and commission the project.

4. Prepare preliminary engineering drawings and cost estimates for washing and bagging plant.

5. Set out implementation schedule.

DEVELOPMENT OF SALTWORKS AT KITAME, TANZANIA

1. INTRODUCTION

Salt production for industrial and other usage has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. The regional plan of action incorporates specific projects which are now being elaborated for implementation. The benefits to the SADCC Region of industrial co-operation in salt production would be:

- trading linkages within SADCC with several salt producing countries supplying the salt requirements of the other;
- industrial linkages as salt is an essential raw material for a number of basic industries such as food processing, textiles, tanning, paper and pulp and heavy chemicals such as soda ash, caustic soda and chlorine;
- self-sufficiency in an essential foodstuff that is currently imported from the Republic of South Africa or is in short supply due to foreign exchange shortages;
- earn foreign exchange by exports outside the region;
- increase size and diversity of the industrial sector and so add to national and regional output, employment opportunities and the development of new skills and technology;
- minimisation of costs by avoiding very large transport costs.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF PROJECT

Development of a salt field at Kitame, Tanzania with capacity of 25,000 tonnes per annum. Secondary washing and bagging plant.

2.2. PROJECT RATIONALE

Kitame has been surveyed and found suitable for salt development. Both domestic and export markets are available for the project output.

2.3 PRODUCT RANGE

Bagged washed/unrefined salt.

3. BACKGROUND

It is estimated that the current requirement for salt in Tanzania is about 90,000 tonnes per annum. This is made up of 85,000 tonnes of domestic salt and 5,000 tonnes of salt is imported from India and West Germany.

The principal grade of salt consumed is unrefined crude salt which is consumed in the villages. Small quantities of refined and PDV salt are consumed in the cities as table salt and industrial salt. This refined salt is imported from India and West Germany.

The distribution of salt is controlled by the State Mining Corporation (STAMICO). Any saltfield producing over 5,000 tonnes per annum has to sell its production to STAMICO, under 5,000 tonnes it can sell its production direct onto the market.

A subsidiary of STAMICO - Nyanza Salt Mines - produces salt at Uvinza from underground brines and as such is the major supplier to the market.

Total current production is about 55,000 tonnes per annum. Therefore, there is a serious shortage on the domestic market of about 35,000 tonnes per annum which requires rationing of available supplies, a system of regional distribution and imports of salt to help supply the market. Currently, most of the salt sold is not iodised. Iodised salt is imported for consumption. It is highly desirable in goitre areas that all salt is iodised for goitre control. This could be done with simple plants on each major saltfield.

4. SADCC MARKET POSITION

Due to the domestic shortage of salt there has been little export of salt to other SADCC countries.

There were some exports of salt to Zambia in the 1960s but these ceased.

There have been exports of salt to Burundi, Zaire, and Rwanda due to their proximity to the main salt production at Uvinza in North-Western Tanzania.

The scarcity of foreign exchange does not allow importation of large quantities of salt from other SADCC countries to ease the shortage of salt.

In fact due to its reserves of underground brine and favourable coastal conditions for the production of solar salt from seawater, Tanzania has the potential to be a major salt supplier to the SADCC region which is presently importing 125,000 tonnes per annum.

5. EXISTING CAPACITY

As stated there is an estimated shortage of about 35,000 tonnes per annum of salt on the market.

Current production of about 55,000 tonnes per annum is from the following sources:

Uvinza - utilising strong underground brine. 20,000 tonnes per annum produced by evaporating the brine in open steel pans heated by wood fires. 8,000 - 10,000 tonnes per annum by solar evaporation.

Coastal - utilising seawater. 5,000 - 6,000 tonnes per annum from 14 or 15 small saltworks spread along the coast.

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15,000 to 20,000 tonnes per annum from Stanley's saltworks at Bagomoya and Hitame.

500 tonnes from STAMICO's saltfield being developed at Changwahela.

It is intended to increase STAMICO's production by 110,000 tonnes (net) per annum to about 140,000 tonnes.

This will be from:

- a new vacuum evaporation plant at Uvinza with an annual capacity of 60,000 tonnes per annum of pure dried vacuum salt.

  This plant will replace the salt currently produced in the open steel pans. Therefore, it will add a net 40,000 tonnes per annum to productive capacity. Completion is projected for 1983.

- three coastal solar saltworks with total capacity of 70,000 tonnes per annum.

Changwahela	5,000 tonnes per annum
Sadani	40,000 tonnes per annum
Kitame	25,000 tonnes per annum

  Changwahela is in production but operating well below capacity and is not fully developed.

  Sadani development has commenced but it is behind schedule due to lack of vital construction equipment.

  Kitame has been surveyed but development has not commenced.

  It is planned for all to be in production in 5 years.

  Therefore on completion of all the above projects STAMICO's production capacity will be about 140,000 per annum. When this is added to the private production capacity of 20,000 tonnes per annum Tanzania's total capacity would be 160,000 tonnes per annum, which is sufficient to meet Tanzania's own requirements and produce an

6. TECHNOLOGY PACKAGE

The development of the solar industry in Tanzania can be divided into two parts:

- increasing production from existing saltfields. This can be achieved by improved operating techniques and relatively low investment in new equipment and construction

- construction of new saltfields such as Kitame which involve substantial outlays in construction costs and equipment

The main elements of the solar evaporation technology to be installed at Kitame comprise the following:-

1. Pumping of saline water into reservoirs;

2. Movement of the water through a system of shallow concentrating ponds so that the salt concentration increases through the action of sun and wind;

3. Transport of the concentrated saline water to crystallising ponds where the salt settles in a uniform layer;

4. Harvesting of the salt, either manually or mechanically.

The major area of assistance is the design, construction, and financing of the new saltfield. This warrants a full scale feasibility study to determine:

- climatic suitability and, therefore, potential production
- design of the saltworks
- estimating costs of construction and equipment

This would lead to the identification of the necessary expertise and funding to bring the saltworks into production as soon as possible and to provide on-going guidance and training and means of maintaining the equipment.

7. RAW MATERIAL SITUATION

Unlimited seawater.

8. SADCC TRADING LOGISTICS

Tanzania has the production potential to eventually meet its own requirement for salt and produce an exportable surplus.

Logistically Tanzania is well placed to supply Zambia's imports of salt and to a lesser extent part of Malawi's and Zimbabwe's imports.

As salt is a low value product freight is a major part of its landed cost and, therefore, efficient rail transport is essential. In order to supply the three SADCC countries above it would require transporting over 40,000 tonnes of salt per annum over the TANZAM railway. It is understood for this to successfully occur the TANZAM railways haulage capacity would have to be upgraded.

In addition salt exports outside SADCC could be developed.

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9. **PROJECT COST** Shs 26 million (estimated)

Investment breakdown
(Solar evaporation)

	Local	Foreign
Surveying equipment & work	200,000	195,000
Plant & Machinery	2,400,000	7,670,000
Saltwork construction	3,000,000	
Infrastructure	10,000,000	
Personnel & Supervision	345,000	
10% contingency	1,594,000	786,000
Total	17,539,000	8,651,000
	26,190,000	

10. **FUNDS REQUIRED**

Local	Shs 17.5 million
Foreign	Shs 8.6 million

11. **PROMOTING INSTITUTION**

State Mining Corporation, Tanzania

12. **OUTSTANDING GAPS REGARDING INFORMATION**

Detailed engineering study required - estimated cost $ 45.000.

13. **IMPLEMENTATION SCHEDULE**

Plant engineering	3 months
Earthworks	12 months
Plant installation	6 months

14. **INPUT REQUIRED FROM DONORS**

Technical and financial co-operation for the implementation of the project.

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DEVELOPMENT OF SALTWORKS AT CHANGWAHELA, TANZANIA

1. INTRODUCTION

Salt production for industrial and other usage has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. The regional plan of action incorporates specific projects which are now being elaborated for implementation.

The benefits to the SADCC Region of industrial co-operation in salt production would be:-

- trading linkages within SADCC with several salt producing countries supplying the salt requirements of the other;
- industrial linkages as salt is an essential raw material for a number of basic industries such as food processing, textiles, tanning, paper and pulp and heavy chemicals such as soda ash, caustic soda and chlorine;
- self-sufficiency in an essential foodstuff that is currently imported from the Republic of South Africa or is in short supply due to foreign exchange shortages;
- earn foreign exchange by exports outside the region;
- increase size and diversity of the industrial sector and so add to national and regional output, employment opportunities and the development of new skills and technology;
- minimisation of costs by avoiding very large transport costs.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF PROJECT

Upgrade existing saltfield at Changwahela, Tanzania and expand capacity to over 5,000 tonnes per annum. Install bagging facilities.

2.2 PROJECT RATIONALE

The salt field which came under development in 1978 is not yet developed to full capacity due to lack of funds. Capacity can be increased by re-design, improved techniques and more equipment.

Expand production to assist in meeting current domestic shortfall.

2.3. PRODUCT RANGE

Bagged unrefined salt.

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3. BACKGROUND

It is estimated that the current requirement for salt in Tanzania is about 90,000 tonnes per annum. This is made up of 85,000 tonnes of domestic salt and 5,000 tonnes of salt used for industrial purposes.

The principal grade of salt consumed is unrefined crude salt which is consumed in the villages. Small quantities of refined and PDV salt are consumed in the cities as table salt and industrial salt. This refined salt is imported from India and West Germany.

The distribution of salt is controlled by the State Mining Corporation (STAMICO). Any saltfield producing over 5,000 tonnes per annum has to sell its production to STAMICO, under 5,000 tonnes it can sell its production direct onto the market.

A subsidiary of STAMICO - Nyanza Salt Mines - produces salt at Uvinza from underground brines and as such is the major supplier to the market.

Total current production is about 55,000 tonnes per annum. Therefore, there is a serious shortage on the domestic market of about 35,000 tonnes per annum which requires rationing of available supplies, a system of regional distribution and imports of salt to help supply the market. Currently, most of the salt sold is not iodised. Iodised salt is imported for consumption. It is highly desirable in goitre areas that all salt is iodised for goitre control. This could be done with simple plants on each major saltfield.

4. SADCC MARKET POSITION

Due to the domestic shortage of salt there has been little export of salt to other SADCC countries.

There were some exports of salt to Zambia in the 1960s but these ceased.

There have been exports of salt to Burundi, Zaire, and Rwanda due to their proximity to the main salt production at Uvinza in North-Western Tanzania.

The shortage of foreign exchange does not allow importation of large quantities of salt from other SADCC countries to ease the shortage of salt.

In fact due to its reserves of underground brine and favourable coastal conditions for the production of solar salt from seawater, Tanzania has the potential to be a major salt supplier to the SADCC region which is currently importing 125,000 tonnes per annum.

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5. EXISTING CAPACITY

As stated there is an estimated shortage of about 35,000 tonnes per annum of salt on the market.

Current production of about 55,000 tonnes per annum is from the following sources:

Uvinza - utilising strong underground brine. 20,000 tonnes per annum produced by evaporating the brine in open steel pans heated by wood fires. 8,000 - 10,000 tonnes per annum by solar evaporation.

Coastal - utilising seawater. 5,000 - 6,000 tonnes per annum from 14 or 15 small saltworks spread along the coast.

15,000 to 20,000 tonnes per annum from Stanley's saltworks at Bagomoya and Hitame.

500 tonnes from STAMICO's saltfield being developed at Changwahela.

It is intended to increase STAMICO's production by 110,000 tonnes (net) per annum to about 140,000 tonnes.

This will be from:

- a new vacuum evaporation plant at Uvinza with an annual capacity of 60,000 tonnes per annum of pure dried vacuum salt.

  This plant will replace the salt currently produced in the open steel pans. Therefore, it will add a net 40,000 tonnes per annum to productive capacity. Completion is projected for 1983.

- three coastal solar saltworks with total capacity of 70,000 tonnes per annum.

Changwahela	5,000 tonnes per annum
Sadani	40,000 tonnes per annum
Kitame	25,000 tonnes per annum

  Changwahela is in production but operating well below capacity and is not fully developed.

  Sadani development has commenced but it is behind schedule due to lack of vital construction equipment.

  Kitame has been surveyed but development has not yet commenced.

  It is planned for all to be in production in 5 years.

  Therefore on completion of all the above projects STAMICO's production capacity will be about 140,000 tonnes per annum. When this is added to the private production capacity of 20,000 tonnes per annum Tanzania's total capacity would be 160,000 tonnes per annum, which is sufficient to meet Tanzania's own requirements and produce an exportable surplus.

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6. TECHNOLOGY PACKAGE

The development of the solar industry in Tanzania can be divided into two parts:

- increasing production from existing saltfields. This can be achieved by improved operating techniques and relatively low investment in new equipment and construction

- construction of new saltfields such as Sadani which involve substantial outlays in construction costs and equipment

Changwahela (STAMICO) comes within the first category and is still in the course of development.

There are a number of areas which could lead to increased production. These include:

- installation of a sea pump on the field

- measures to minimise the crystallisation setback effect of rainfall

- use of a trailer-mounted pump to transfer brine wherever required within the system

- construction of deep storage ponds for storing strong brine during rainy periods.

- additional construction equipment

- measures to reduce brine losses

7. RAW MATERIAL SITUATION

Changwahela is situated about 45 km from Dar-es- Salaam. 150 acres are to be developed with a planned annual capacity of over 5,000 tonnes.

8. SADCC TRADING LOGISTICS

Tanzania has the production potential to eventually meet its own requirements for salt and produce an exportable surplus.

Logistically Tanzania is well placed to supply Zambia's imports of salt and to a lesser extent part of Malawi's and Zimbabwe's imports.

As salt is a low value product freight is a major part of its landed cost and, therefore, efficient rail transport is essential. In order to supply the three SADCC countries above it would require transporting over 40,000 tonnes of salt per annum over the TANZAM railway. It is understood for this to successfully occur the TANZAM railways haulage capacity would have to be upgraded.

In addition salt exports outside SADCC could be developed.

9. PROJECT COST

US$ 0.6 million. Foreign expenditure: US$ 0.4 million. Local expenditure: US$ 0.2 million.

10. PROMOTING INSTITUTION

State Mining Corporation, Tanzania

11. OUTSTANDING GAPS REGARDING INFORMATION

Detailed study and engineering design: cost US$ 15,000

12. TERMS OF REFERENCE FOR ENGINEERING STUDY

1. Study existing layout and operating methods.

2. Specify revised methods.

3. Prepare preliminary engineering drawings and cost estimates for new earthworks and mechanical plant.

4. Prepare preliminary engineering drawings and rest of estimates for bagging plant.

5. Set out implementation schedule.

13. IMPLEMENTATION SCHEDULE

Engineering study	1 month
Earthworks	6 months
Plant installation	6 months

14. INPUTS REQUIRED FROM DONORS

Financial and technical co-operation for the implementation of the project.

DEVELOPMENT OF SALTWORKS AT UVINZA, TANZANIA

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1. INTRODUCTION

Salt production for industrial and other usage has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. The regional plan of action incorporates specific projects which are now being elaborated for implementation.

The benefits to the SADCC Region of industrial co-operation in salt production would be:-

- trading linkages within SADCC with several salt producing countries supplying the salt requirements of the other;
- industrial linkages as salt is an essential raw material for a number of basic industries such as food processing, textiles, tanning, paper and pulp and heavy chemicals such as soda ash, caustic soda and chlorine;
- self-sufficiency in an essential foodstuff that is currently imported from the Republic of South Africa or is in short supply due to foreign exchange shortages;
- earn foreign exchange by exports outside the region;
- increase size and diversity of the industrial sector and so add to national and regional output, employment opportunities and the development of new skills and technology;
- minimisation of costs by avoiding very large transport costs.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF PROJECT

Development of a pan vacuum dried salt plant at Uvinza, Tanzania, with annual capacity of 60,000 tonnes.

2.2. PROJECT RATIONALE

The plant would utilise brine from the brine springs at Uvinza and is intended to phase out the existing high cost open steel pans.

2.3. PRODUCT RANGE

Bagged washed refined and iodised salt.

3. BACKGROUND

It is estimated that the current requirement for salt in Tanzania is about 90,000 tonnes per annum. This is made up of 85,000 tonnes of domestic salt and 5,000 tonnes of salt used for industrial purposes.

The principal grade of salt consumed is unrefined crude salt which is consumed in the villages. Small quantities of refined and PDV salt are consumed in the cities as table salt and industrial salt. This refined salt is imported from India and West Germany.

The distribution of salt is controlled by the State Mining Corporation (STAMICO). Any saltfield producing over 5,000 tonnes per annum has to sell its production to STAMICO, under 5,000 tonnes it can sell its production direct onto the market.

A subsidiary of STAMICO - Nyanza Salt Mines - produces salt at Uvinza from underground brines and as such is the major supplier to the market.

Total current production is about 55,000 tonnes per annum. Therefore, there is a serious shortage on the domestic market of about 35,000 tonnes per annum which requires rationing of available supplies, a system of regional distribution and imports of salt to help supply the market. Currently, most of the salt sold is not iodised. Iodised salt is imported for consumption. It is highly desirable in goitre areas that all salt is iodised for goitre control. This could be done with simple plants on each major saltfield.

4. SADCC MARKET POSITION

Due to the domestic shortage of salt there has been little export of salt to other SADCC countries.

There were some exports of salt to Zambia in the 1960s but these ceased.

There have been exports of salt to Burundi, Zaire, and Rwanda due to their proximity to the main salt production at Uvinza in North-Western Tanzania.

The shortage of foreign exchange does not allow importation of large quantities of salt from other SADCC countries to ease the shortage of salt.

In fact due to its reserves of underground brine and favourable coastal conditions for the production of solar salt from seawater, Tanzania has the potential to be a major salt supplier to the SADCC region which is currently importing 125,000 tonnes per annum.

5. EXISTING CAPACITY

As stated there is an estimated shortage of about 35,000 tonnes per annum of salt on the market.

Current production of about 55,000 tonnes per annum is from the following sources:

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Uvinza - utilising strong underground brine. 20,000 tonnes per annum produced by evaporating the brine in open steel pans heated by wood fires. 8,000 - 10,000 tonnes per annum by solar evaporation.

Coastal - utilising seawater. 5,000 - 6,000 tonnes per annum from 14 or 15 small saltworks spread along the coast.

15,000 to 20,000 tonnes per annum from Stanley's saltworks at Bagomoya and Hitame.

500 tonnes from STAMICO's saltfield being developed at Changwahela.

It is intended to increase STAMICO's production by 110,000 tonnes (net) per annum to about 140,000 tonnes.

This will be from:

- a new vacuum evaporation plant at Uvinza with an annual capacity of 60,000 tonnes per annum of pure dried vacuum salt.

This plant will replace the salt currently produced in the open steel pans. Therefore, it will add a net 40,000 tonnes per annum to productive capacity. Completion is projected for 1983.

- three coastal solar saltworks with total capacity of 70,000 tonnes per annum.

Changwahela	5,000 tonnes per annum
Sadani	40,000 tonnes per annum
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Changwahela is in production but operating well below capacity and is not fully developed.

Sadani development has commenced but it is behind schedule due to lack of vital construction equipment.

Kitame has been surveyed but development has not yet commenced.

It is planned for all to be in production in 5 years.

Therefore on completion of all the above projects STAMIC's production capacity will be about 140,000 tonnes per annum. When this is added to the private production capacity of 20,000 tonnes per annum Tanzania's total capacity would be 160,000 tonnes per annum, which is sufficient to meet Tanzania's own requirements and produce an exportable surplus.

6. TECHNOLOGY PACKAGE

6.1. PAN VACUUM DRIED PROCESS (PVD)

Where a highly refined and purified salt is required, the pan vacuum dried process can be used. Coarse salt or brine is treated for removal of extraneous impurities such as calcium and magnesium salts. The filtered material is then concentrated under vacuum in a pan for rapid removal of water followed by crystallisation and centrifuging. This results in a product of high purity.

6.2. IODISATION

In view of the incidence of goitre in Tanzania it will be desirable to install iodisation facilities at the plant site.

7. RAW MATERIAL SITUATION

The brine reserves at Uvinza are an excellent resource. The brine is very strong being 19° Baumé (sea water is 3° Baumé) and the supply is stated to be unlimited. These reserves could be exploited by expanding solar salt production as well as that used in the PVD plant.

8. SADCC TRADING LOGISTICS

Tanzania has the production potential to eventually meet its own requirement for salt and produce an exportable surplus.

Logistically Tanzania is well placed to supply Zambia's imports of salt and to a lesser extent part of Malawi's and Zimbabwe's imports.

As salt is a low value product freight is a major part of its landed cost and, therefore, efficient rail transport is essential. In order to supply the three SADCC countries above, it would require transporting over 40,000 tonnes of salt per annum over the TANZAM railway. It is understood for this to successfully occur the TANZAM railways haulage capacity would have to be upgraded.

In addition salt exports outside SADCC could be developed.

9. PROJECT COST

Foreign component	-	50.0 million shs
Local component	-	30.0 million shs
Total		80.0

10. PROMOTING INSTITUTION

State Mining Corporation, Tanzania

11. IMPLEMENTATION SCHEDULE

Construction: 2 years

12. INPUTS REQUIRED FROM DONORS

Technical and financial cooperation for the implementation of the project.

SMALL-SCALE SALT REFINING PLANT, BOTSWANA

1. INTRODUCTION

Salt production for industrial and other usage has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. The regional plan of action incorporates specific projects which are now being elaborated for implementation.

The benefits to the SADCC Region of industrial co-operation in salt production would be:-

- trading linkages within SADCC with several salt producing countries supplying the salt requirements of the other;
- industrial linkages as salt is an essential raw material for a number of basic industries such as food processing, textiles, tanning, paper and pulp and heavy chemicals such as soda ash, caustic soda and chlorine;
- self-sufficiency in an essential foodstuff that is currently imported from the Republic of South Africa or is in short supply due to foreign exchange shortages;
- earn foreign exchange by exports outside the region;
- increase size and diversity of the industrial sector and so add to national and regional output, employment opportunities and the development of new skills and technology;
- minimisation of costs by avoiding very large transport costs.

2. PROPOSED PROJECT

Establishment of a small scale salt refining unit in Botswana with a capacity of 1,000 kg. per day.

3. PRODUCT RANGE

Refined salt with the following specifications:

a) white crystalline sodium chloride coated with water repellant agents so as to retard moisture absorption.

b) 99% of the material shall pass through 1.0 mm sieve and not more than 10% by weight of the material shall pass through 212 micron (0.212mm) sieve.

c) the salt shall not contain more than 0.5% by weight of moisture.

4. BACKGROUND

Botswana's estimated requirement for dietary salt is approximately 4,000 tonnes per year. At present all salt consumed in the country is imported. As consumer awareness increases

increases the demand for refined grades of salt will also increase. As the demand for refined grades of salt is still, however, relatively small, a small scale unit is initially proposed producing 250-300 tonnes per year (single shift).

5. EXISTING CAPACITY

Approximately 2,500 tonnes of crude salt are produced in Botswana per year.

6. RAW MATERIALS

For the envisaged production the following raw materials will be required:-

	Approx. Requirement per day
a) Crude common salt	1,200 kg
b) Lime	25 kg
c) Soda Ash	30 kg
d) Hydrochloric acid	2.5 kg
e) Paraffin wax	0.5 kg
f) Coal, firewood or charcoal	500 kg
g) Polythene bags (500 gm capacity)	2,000

7. OTHER INPUT REQUIREMENTS

a) Manpower	18
b) Power	Max demand load 30 KVA
c) Water	8000 litres per day

8. TECHNOLOGY PACKAGE: CRUDE SALT

The manufacturing process is briefly described as follows:

Crude common salt is dissolved to prepare a saturated solution. To this solution lime and soda ash is added and the solution allowed to settle and filtered to separate the undissolved and precipitated impurities. Alkalinity is adjusted by checking the PH value and adding acid/alkali according to requirement. The filtrate is evaporated and conditions adjusted to obtain crystals of the desired shape and size. The slurry is withdrawn from time to time, centrifuged, dried, sieved, treated with water repellent anticaking agent and packed.

The plant and machinery required is as follows:

a) Dissolving tank, mild steel, rubber lined with capacity 6 cubic metres

b) Stirrer-stainless steel complete with 2HP AC 400/440V, 3PH, 50 cycles motor, starter and switch

c) Pump - Vac Seal type. Capacity 1 cu metre/hr complete with 4 HP AC 400/440V, 3PH, 50 cycles motor, starter and switch

d) Plate and frame type filter press with nylon filtering medium capacity - 1 cubic metre/hr.

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e) Rubber lined mild steel storage tank for filtrate - capacity 6 cu. metres

f) Triple effect evaporator cum crystalliser system

g) Boiler, pressure 60 p.s.i.g.

h) Centrifuge

i) Tray drier

j) Laboratory equipment

k) Internal piping, connections, valves, etc

l) Weighing balance

m) Handling equipment

The technology package would also include technician services for the erection and commissioning work and the training of the local operatives in the techniques of production and maintenance work.

9. PLANT AND MACHINERY COST

The estimated c.i.f. cost of the plant and machinery listed in 7 above is approximately US$ 50,000.

10. IMPLEMENTATION SCHEDULE

	Month completed
1. Detailed project report and approval	4
2. Order machinery requirement	7
3. Arrival of machinery & equipment	11
4. Positioning of technical expert	12
5. Installation & commissioning of plant	13
6. Training of workers & trial production	14
7. Commencement of commercial production	15

11. INPUTS REQUIRED FROM DONORS

Financial and technical co-operation for the implementation of the project.

UPGRADING OF EXISTING SALTWORKS, ANGOLA

1. INTRODUCTION

Salt production for industrial and other usage has been selected by the SADCCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. The regional plan of action incorporates specific projects which are now being elaborated for implementation.

The benefits to the SADCC Region of industrial co-operation in salt production would be:-

- trading linkages within SADCC with several salt producing countries supplying the salt requirements of the other;
- industrial linkages as salt is an essential raw material for a number of basic industries such as food processing, textiles, tanning, paper and pulp and heavy chemicals such as soda ash, caustic soda and chlorine;
- self-sufficiency in an essential foodstuff that is currently imported from the Republic of South Africa or is in short supply due to foreign exchange shortages;
- earn foreign exchange by exports outside the region;
- increase size and diversity of the industrial sector and so add to national and regional output, employment opportunities and the development of new skills and technology;
- minimisation of costs by avoiding very large transport costs.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF PROJECT

Study of measures required for the upgradation of the Angola salt industry.

2.2. PROJECT RATIONALE

Angola has an estimated salt production capacity of 125,000 tonnes per year but currently produces only 22,000 tonnes per year. There is a major need for the rehabilitation/reactivation of existing capacity in order to meet domestic requirements and to earn foreign exchange through exports.

3. BACKGROUND

The estimated salt requirement in Angola in 1982 was 45,600 tonnes. According to information available salt production capacity is 125,000 tonnes per year. Total production however amounts to only a fraction of this capacity being only 22,000 tonnes in 1981.

Present capacity would appear to be sufficient for the country's requirements while also leaving a surplus for export. The major need at present is for rehabilitation/reactivation of existing capacity through provision of advisory services, training of operation and management, improvements to the original design of salt works, and new equipment such as pumps and harvesters.

4. RAW MATERIAL SITUATION

Seawater is an unlimited raw material source of salt for Angola.

5. SADCC TRADING LOGISTICS

Angola has a rail link with Zambia through Zaire and potential exists in future for exports of salt from Angola to Zambia. Other possible export markets for Angola are the West African countries.

6. TERMS OF REFERENCE FOR STUDY ON UPGRADING OF EXISTING SALT WORKS IN ANGOLA

1. Assess local and export demand for salt and potential for increased supply.

2. Survey existing salt pans.

3. Detail existing production problems and constraints.

4. Specify improved techniques, design and layout changes aimed at improving quality.

5. Prepare necessary layout drawings for the salt pans.

6. Specify any additional plant required for washing, bagging, refining, iodisation.

7. Conduct economic feasibility studies on recommended investment; covering investment costs, production costs, distribution costs, income, profitability and implementation plan.

8. Specify civil works and mechanised equipment.

9. Prepare cost estimates for required civil works and mechanical equipment.

10. Prepare preliminary engineering drawings of required plant and equipment.

11. Quantify the necessary expertise and funding required to implement the recommended upgradation measures.

7. ESTIMATED COST OF STUDY

£45,000

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SMALL-SCALE SALT REFINING PLANT, LESOTHO

1. INTRODUCTION

Salt production for industrial and other usage has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. The regional plan of action incorporates specific projects which are now being elaborated for implementation.

The benefits to the SADCC Region of industrial co-operation in salt production would be:-

- trading linkages within SADCC with several salt producing countries supplying the salt requirements of the other;
- industrial linkages as salt is an essential raw material for a number of basic industries such as food processing, textiles, tanning, paper and pulp and heavy chemicals such as soda ash, caustic soda and chlorine;
- self-sufficiency in an essential foodstuff that is currently imported from the Republic of South Africa or is in short supply due to foreign exchange shortages;
- earn foreign exchange by exports outside the region;
- increase size and diversity of the industrial sector and so add to national and regional output, employment opportunities and the development of new skills and technology;
- minimisation of costs by avoiding very large transport costs.

2. PROPOSED PROJECT

Establishment of a small scale salt refining unit in Lesotho with a capacity of 1,000 kg. per day.

3. PRODUCT RANGE

Refined salt with the following specifications:

a) white crystalline sodium chloride coated with water repellant agents so as to retard moisture absorption.

b) 99% of the material shall pass through 1.0 mm sieve and not more than 10% by weight of the material shall pass through 212 micron (0.212mm) sieve.

c) the salt shall not contain more than 0.5% by weight of moisture.

4. BACKGROUND

Lesotho's estimated requirement for dietary salt is approximately 7,000 tonnes per year. At present all salt consumed in the country is imported. As consumer awareness increases the demand

for refined grades of salt will also increase. As the demand for refined grades of salt is still, however, relatively small, a small scale unit is initially proposed producing 250-300 tonnes per year (single shift).

5. EXISTING CAPACITY

There is no existing salt refining capacity in Lesotho.

6. RAW MATERIALS

For the envisaged production the following raw materials will be required:-

	Approx. Requirement per day
a) Crude common salt	1,200 kg
b) Lime	25 kg
c) Soda Ash	30 kg
d) Hydrochloric acid	2.5 kg
e) Paraffin wax	0.5 kg
f) Coal, firewood or charcoal	500 kg
g) Polythene bags (500 gm capacity)	2,000

7. OTHER INPUT REQUIREMENTS

a) Manpower	18
b) Power	Max demand load 30 KVA
c) Water	8000 litres per day

8. TECHNOLOGY PACKAGE: CRUDE SALT

The manufacturing process is briefly described as follows:-

Crude common salt is dissolved to prepare a saturated solution. To this solution lime and soda ash is added and the solution allowed to settle and filtered to separate the undissolved and precipitated impurities. Alkalinity is adjusted by checking the PH value and adding acid/alkali according to requirement. The filtrate is evaporated and conditions adjusted to obtain crystals of the desired shape and size. The slurry is withdrawn from time to time, centrifuged, dried, sieved, treated with water repellent anticaking agent and packed.

The plant and machinery required is as follows:

a) Dissolving tank, mild steel, rubber lined with capacity 6 cubic metres

b) Stirrer-stainless steel complete with 2HP AC 400/440V, 3PH, 50 cycles motor, starter and switch

c) Pump - Vac Seal type. Capacity 1 cu metre/hr complete with 4 HP AC 400/440V, 3PH, 50 cycles motor, starter and switch

d) Plate and frame type filter press with nylon filtering medium capacity - 1 cu metre/hr

e) Rubber lined mild steel storage tank for filtrate - capacity 6 cu. metres

f) Triple effect evaporator cum crystalliser system

g) Boiler, pressure 60 p.s.i.g.

h) Centrifuge

i) Tray drier

j) Laboratory equipment

k) Internal piping, connections, valves, etc

l) Weighing balance

m) Handling equipment

The technology package would also include technician services for the erection and commissioning work and the training of the local operatives in the techniques of production and maintenance work.

9. PLANT AND MACHINERY COST

The estimated c.i.f. cost of the plant and machinery listed in 7 above is approximately US$ 50,000.

10. IMPLEMENTATION SCHEDULE

	Month Completed
1. Detailed project report and approval	4
2. Order machinery requirement	7
3. Arrival of machinery & equipment	11
4. Positioning of technical expert	12
5. Installation & commissioning of plant	13
6. Training of workers & trial production	14
7. Commencement of commercial production	15

11. INPUTS REQUIRED FROM DONORS

Financial and technical co-operation for the implementation of the project.

DEVELOPMENT OF SALTWORKS AT LINDI/MTWARA, TANZANIA

1. INTRODUCTION

Salt production for industrial and other usage has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. The regional plan of action incorporates specific projects which are now being elaborated for implementation.

The benefits to the SADCC Region of industrial co-operation in salt production would be:-

- trading linkages within SADCC with several salt producing countries supplying the salt requirements of the other;
- industrial linkages as salt is an essential raw material for a number of basic industries such as food processing, textiles, tanning, paper and pulp and heavy chemicals such as soda ash, caustic soda and chlorine;
- self-sufficiency in an essential foodstuff that is currently imported from the Republic of South Africa or is in short supply due to foreign exchange shortages;
- earn foreign exchange by exports outside the region;
- increase size and diversity of the industrial sector and so add to national and regional output, employment opportunities and the development of new skills and technology;
- minimisation of costs by avoiding very large transport costs.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF PROJECT

Feasibility study of a 30,000 tonnes solar evaporation saltworks in the Lindi/Mtwari area of Tanzania.

2.2 PROJECT RATIONALE

The area appears suitable for solar evaporation of salt. Both domestic and export markets are available for project output.

2.3 PRODUCT RANGE

Bagged washed/unrefined salt.

3. BACKGROUND

It is estimated that the current requirement for salt in Tanzania is about 90,000 tonnes per annum. This is made up of 85,000 tonnes of domestic salt and 5,000 tonnes of salt used for industrial purposes.

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The principal grade of salt consumed is unrefined crude salt which is consumed in the villages. Small quantities of refined and PDV salt are consumed in the cities as table salt and industrial salt. This refined salt is imported from India and West Germany.

The distribution of salt is controlled by the State Mining Corporation (STAMICO). Any saltfield producing over 5,000 tonnes per annum has to sell its production to STAMICO, under 5,000 tonnes it can sell its production direct onto the market.

A subsidiary of STAMICO - Nyanza Salt Mines - produces salt at Uvinza from underground brines and as such is the major supplier to the market.

Total current production is about 55,000 tonnes per annum. Therefore, there is a serious shortage on the domestic market of about 35,000 tonnes per annum which requires rationing of available supplies, a system of regional distribution and imports of salt to help supply the market. Currently, most of the salt sold is not iodised. Iodised salt is imported for consumption. It is highly desirable in goitre areas that all salt is iodised for goitre control. This could be done with simple plants on each major saltfield.

4. SADCC MARKET POSITION

Due to the domestic shortage of salt there has been little export of salt to other SADCC countries.

There were some exports of salt to Zambia in the 1960s but these ceased.

There have been exports of salt to Burundi, Zaire, and Rwanda due to their proximity to the main salt production at Uvinza in North-Western Tanzania.

The scarcity of foreign exchange does not allow importation of large quantities of salt from other SADCC countries to ease the shortage of salt.

In fact due to its reserves of underground brine and favourable coastal conditions for the production of solar salt from seawater, Tanzania has the potential to be a major salt supplier to the SADCC region which is presently importing 125,000 tonnes per annum.

5. EXISTING CAPACITY

As stated there is an estimated shortage of about 35,000 tonnes per annum of salt on the market.

Current production of about 55,000 tonnes per annum is from the following sources:

Uvinza - utilising strong underground brine. 20,000 tonnes per annum produced by evaporating the brine in open steel pans heated by wood fires. 8,000 - 10,000 tonnes per annum by solar evaporation.

Coastal - utilising seawater. 5,000 - 6,000 tonnes per annum from 14 or 15 small saltworks spread along the coast.

15,000 to 20,000 tonnes per annum from Stanley's saltworks at Bagomoya and Hitame.

500 tonnes from STAMICO's saltfield being developed at Changwahela.

It is intended to increase STAMICO's production by 110,000 tonnes (net) per annum to about 140,000 tonnes.

This will be from:

- a new vacuum evaporation plant at Uvinza with an annual capacity of 60,000 tonnes per annum of pure dried vacuum salt.

  This plant will replace the salt currently produced in the open steel pans. Therefore, it will add a net 40,000 tonnes per annum to productive capacity. Completion is projected for 1983.

- three coastal solar saltworks with total capacity of 70,000 tonnes per annum.

Changwahela	5,000 tonnes per annum
Sadani	40,000 tonnes per annum
Kitame	25,000 tonnes per annum

  Changwahela is in production but operating well below capacity and is not fully developed.

  Sadani development has commenced but it is behind schedule due to lack of vital construction equipment.

  Kitame has been surveyed but development has not commenced.

It is planned for all to be in production in 5 years.

Therefore on completion of all the above projects STAMICO's production capacity will be about 140,000 tonnes per annum. When this is added to the private production capacity of 20,000 tonnes per annum Tanzania's total capacity would be 160,000 tonnes per annum, which is sufficient to meet Tanzania's own requirements and produce an exportable surplus.

With increasing domestic and regional demand, as projected in the regional salt plan at Annex 1, additional saltworks capacity will be required during 1985-90, hence the proposal to develop Lindi/Mtwara.

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6. TECHNOLOGY PACKAGE

The development of the solar industry in Tanzania can be divided into two parts:

- increasing production from existing saltfields. This can be achieved by improved operating techniques and relatively low investment in new equipment and construction

- construction of new saltfields such as Kitame which involve substantial outlays in construction costs and equipment

The development of the Lindi/Mtawara project would be a new saltfield based on solar evaporation technology.

The major areas for assistance are the design, construction, and financing of the new saltfield. This warrants a full scale feasibility study to determine:

- climatic suitability and, therefore, potential production
- design of the saltworks
- estimating costs of construction and equipment.

This would lead to the identification of the necessary expertise and funding to bring the saltworks into production as soon as possible and to provide on-going guidance and training and means of maintaining the equipment.

8. SADCC TRADING LOGISTICS

Tanzania has the production potential to eventually meet its own requirement for salt and produce an exportable surplus.

Logistically Tanzania is well placed to supply Zambia's imports of salt and to a lesser extent part of Malawi's and Zimbabwe's imports.

As salt is a low value product freight is a major part of its landed cost and, therefore, efficient rail transport is essential. In order to supply the three SADCC countries above it would require transporting over 40,000 tonnes of salt per annum over the TANZAM railway. It is understood for this to successfully occur the TANZAM railways haulage capacity would have to be upgraded.

In addition salt exports outside SADCC could be developed.

9. TERMS OF REFERENCE FOR LINDI/MTWARI SALTWORKS FEASIBILITY STUDY

A. Summary and plan of action - a synoptic review of the essential findings of each chapter followed by recommendations on action required for project implementation and any action already taken.

B. Introduction - background to the study and reviewof existing studies.

C. Market and plant capacity:

(a) Demand and market

(i) The estimated existing size and capacities of the industry (specifying market leaders), its past growth, the estimate future growth (specifying major programmes of development), the local dispersal of industry, its major problems and prospects, general quality of goods, prices structure.

(ii) Past imports and their future trends, volume and prices

(iii) The role of industry in the national economy and the national policies, priorities and targets related or assigned to the industry.

(iv) The approximate present size of demand, its past growth, major determinants and future growth

(v) Supply/demand balance for the product, regionally, if required

(b) Sales forecast and marketing

(i) Anticipated competition for the project from existing and potential local and foreign producers and suppliers

(ii) Distribution system and costs including possible export market.

(iii) Sales programmes including quantities and selling prices. Indicate any tariffs/taxes on imported/domestic products

(iv) Estimated annual sales revenues from products and by-products (local/ export)

(v) Estimated annual costs of sales promotion and marketing

(c) Production programme (approximate)

(i) Products
(ii) By-products
(iii) Wastes (estimated annual cost of waste- disposal)

(d) Determination of plant capacity

(i) Feasible normal plant capacity
(ii) Quantitative relationship between sales, plant capacity and material inputs.

D. Material inputs approximate input requirements, their present and potential supply positions, and an estimate of annual costs of local and foreign material inputs (for each input give source, availability, unit cost, quantity required for production).

(a) Raw materials

(b) Processed industrial materials

(c) Components

(d) Auxiliary materials

(e) Factory supplies

(f) Utilities, especially power

E. Location and site (preselection, including if appropriate, an estimate of the cost of land).

(a) Locational requirements of the projects e.g. utilities, roads, raw material

(b) Land requirements and availability

(c) If appropriate, specific site recommendations

F. Project engineering

(a) Technology(ies) and equipment with comparison of alternatives

(i) Technologies and processes that can be adopted, given in relation to capacity size; describe production process including flow diagram

(ii) Estimate of costs of local and foreign technology

(iii) Cost of proposed equipment (major components)

a. Production equipment
b. Auxiliary equipment
c. Service equipment
d. Spare parts, wear and tear parts, tools

(iv) Prepare drawing of the proposed saltworks

(v) List of machinery and equipment

(b) Civil engineering works

(i) Brief discussion of civil engineering works, arrangement of buildings, short description of construction materials to be used

(a) Site preparation and development
(b) Buildings and special civil works
(c) Outdoor works

(ii) Estimate of investment of civil engineering works (local/foreign), classified as above.

G. Manpower

(a) Estimated manpower requirements, broken down into labour and staff, and into major categories of skills (local/foreign)

(b) Estimated annual manpower costs, classified as above, including overheads on wages and salaries. Technical support required

(c) Technical support required

(d) Training requirements and costs

H. Implementation scheduling

(a) Proposed implementation time schedule giving main activities

(b) Estimated implementation costs given the implementation programme and including capitalised interest

(c) Recommendations on project promotion e.g. investors, technology sources, finance sources

(d) Bar chart

(e) Organisation chart

I. Financial and economic evaluation

(a) Total investment costs

(i) Estimate of working capital requirements by main item

(ii) Estimated fixed assets by main component, and preproduction expenses

(iii) Total investment costs schedule showing phasing

(iv) Estimate of foreign exchange cost

(b) Project financing

(i) Proposed capital structure and proposed financing (local/foreign)

(ii) Interest and principal payments schedule

(c) Production cost including materials, utilities, manpower, repair and maintenance, depreciation, interest, selling expenses and other. Point out any tariffs, taxes, etc. Tabulate production costs for 6 years.

(d) Financial evaluation based on above estimated values.

(e) National economic evaluation

(i) Estimate of employment creation effect

(ii) Estimate of foreign exchange savings

(iii) Estimate of value-added

(iv) Accounting price analysis

J. Conclusions and recommendations

10. APPROXIMATE COST OF FEASIBILITY STUDY

US$ 170,000

11. PROMOTING INSTITUTION

State Mining Corporation, Tanzania

EXPANSION OF SALT WORKS AT MANBONE, MOZAMBIQUE

1. INTRODUCTION

Salt production for industrial and other usage has been selected by the SADCCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. The regional plan of action incorporates specific projects which are now being elaborated for implementation.

The benefits to the SADCC Region of industrial co-operation in salt production would be:-

- trading linkages within SADCC with several salt producing countries supplying the salt requirements of the other;
- industrial linkages as salt is an essential raw material for a number of basic industries such as food processing, textiles, tanning, paper and pulp and heavy chemicals such as soda ash, caustic soda and chlorine;
- self-sufficiency in an essential foodstuff that is currently imported from the Republic of South Africa or is in short supply due to foreign exchange shortages;
- earn foreign exchange by exports outside the region;
- increase size and diversity of the industrial sector and so add to national and regional output, employment opportunities and the development of new skills and technology;
- minimisation of costs by avoiding very large transport costs.

2. PROPOSED PROJECT

2.1 DESCRIPTION OF PROJECT

Feasibility study of an expansion salt field project at Manbone, Mozambique.

2.2 PROJECT RATIONALE

Present salt production at Manbone is 10,000 tonnes per annum. This can be expanded to 40,000 tonnes per annum for a relatively low investment. The output could be the basis for a caustic soda plant or be exported to other countries in the SADCC region.

2.3 PRODUCT RANGE

Bagged washed/unrefined/refined and iodised salt.

3. BACKGROUND

Mozambique traditionally has been an exporter of salt and has a well established salt industry along its entire coastline. There are nearly two hundred salt pans in operation with the two main production centres being Maputo and Nacala. The spread of salt pans along the coast means that most regions are self-sufficient in salt and there are few distribution problems.

3. BACKGROUND

After independence some of the larger salt pans were taken over by the Government. The smaller pans which are often a part of village agricultural activities are generally operated as co-operatives.

The state-owned pans are operated by the Ministry of Industry and Energy where salt is one of seventeen industries operating within that Ministry. The Ministry has set out about a policy of expanding production by improving its own pans and by providing advice and guidance to the other producers. This policy has been successful with productior expanding by about 50% in the last four years entirely due to improvements to existing pans.

In 1981, production was estimated at 85,000 tonnes. Of this 30% was produced on State-owned pans, 50% on privately-owned pans and 20% on co-operatively owned pans.

The current requirement for salt in Mozambique is estimated at about 55,000 tonnes per annum. This is almost entirely for human consumption with only small quantities being used for industrial purposes. Most of the salt consumed is unrefined crude salt with small quantities of refined salt being consumed as table salt.

The distribution of salt is the responsibility of the Ministry of Internal Commerce who purchases the salt from the Ministry of Industry and Energy. The private and co-operative pans can sell their output to private distributors or to the Ministry of Industry and Energy. Export sales of salt are the responsibility of the Ministry of External Commerce.

4. SADCC MARKET POSITION

Mozambique has a long history of supplying salt to its nearer SADCC neighbours, in particular, Malawi and Zimbabwe. In recent years this has been confined to small quantities in spot sales. The recent expansion in production has meant that Mozambique now has an exportable stockpile of salt and efforts are being made to expand export sales and to re-establish Mozambique's former position as a long term supplier.

Mozambique is in a most favourable position to be the major supplier of salt to the SADCC region in the immediate future. Not only is Mozambique producing an exportable surplus but more importantly its two major salt production centres at Maputo and Nacala are immediately adjacent to these ports and two major railways that link into Malawi, Swaziland, Zimbabwe and Zambia.

The regional salt plan at Annex 1 estimates that the total requirement of salt in the SADCC region was 380,000 tonnes in 1982, compared with the existing regional production capacity of 264,000 tonnes. There is, therefore, considerable scope to expand existing production capacity in Mozambique for export sales within the SADCC market.

5. EXISTING CAPACITY

The existing capacity of the salt industry in Mozambique is well over 80,000 tonnes per annum given reasonable weather conditions. There is also the capacity to produce about 6,000 tonnes per annum of refined salt.

The above capacity is spread over nearly two hundred salt pans. However, the major areas are Maputo where the capacity is 30,000 tonnes and Nacala where the capacity is 25,000 tonnes. Both these centres have a major salt pan with a capacity of about 20,000 tonnes per annum each. The Nacala pan is privately owned and the Maputo pan is State owned.

The recent expansion in production to 81,000 tonnes per annum has come from improvements to existing capacity through improved techniques and amalgamation of smaller pans into larger ones. The potential to expand production further from the existing capacity is considerable. This potential is well understood by the Ministry of Industry and Energy. The main constraints are manpower and finance.

At Manbone existing capacity is about 10,000 tonnes and potential exists to develop this capacity at relatively low investment cost. This would be in addition to the expansions planned for Maputo and Nacala.

6. RAW MATERIAL SITUATION

The three ingredients for solar salt production are sea water, high net evaporation and suitable topography and are all readily available near Manbone in Mozambique. The area selected is well-suited for salt production.

7. SADCC TRADING LOGISTICS

Mozambique is very well placed with its production potential and existing railway links to supply the major part of the SADCC present and region's future salt requirements.

The main salt production centres are at Nacala and Maputo. From Nacala the railway runs directly to Malawi and links in with the Malawi rail system. From Maputo, railways run to Swaziland and Zimbabwe and through Zimbabwe links into the railway into Zambia and Botswana. Manbone is located in proximity to Beira which has rail links to Zimbabwe and Malawi.

Given Mozambique's geographical location and solar evaporation potential it can replace South Africa as the principal supplier of salt to Zambia, Zimbabwe and Swaziland. Mozambique salt should be landed in those countries at a cheaper cost than South African salt because of Mozambique's natural advantage on rail freights.

The potential to expand salt production in Mozambique is almost unlimited and, therefore, production can be increased by the expansion of existing salt pans to meet increased requirements for industrial salt. This demand will be generated as the textiles, paper, tanning and food industries expand and a chlor-alkali industry is established.

8. TERMS OF REFERENCE FOR MAMBOMI SALTWORKS FEASIBILITY STUDY

A. Summary and plan of action - a synoptic review of the essential findings of each chapter followed by recommendations on action required for project implementation and any action already taken.

B. Introduction - background to the study and review of existing studies.

C. Market and plant capacity.

a) Demand and market

(i) The estimated existing size and capacities of the industry (specifying market leaders), its past growth, the estimate future growth (specifying major programmes of development), the local dispersal of industry, its major problems and prospects, general quality of goods, prices structure

(ii) Past imports and their future trends, volume and prices

(iii) The role of industry in the national economy and the national policies, priorities and targets related or assigned to the industry

(iv) The approximate present size of demand, its past growth, major determinants and future growth

(v) Supply/demand balance for the product, regionally, if required.

b) Sales and marketing

(i) Anticipated competition for the project from existing and potential local and foreign producers and supplies

(ii) Distribution system and costs, including possible export markets

(iii) Sales programmes including quantities and selling prices. Indicate any tariffs/taxes on imported/domestic products

(iv) Estimated annual sales revenues from products and by-products (local/ export)

(v) Estimated annual costs of sales promotion and marketing

c) Production programme (approximate)

(i) Products

(ii) By-products

(iii) Wastes (estimated annual cost of waste-disposal)

d) Determination of plant capacity

(i) Feasible normal plant capacity

(ii) Quantitative relationship between sales, plant capacity and material inputs.

D. Material inputs - approximate input requirements, their present and potential supply positions, and an estimate of annual costs of local and foreign material inputs (for each input give source, availability, unit cost, quantity required for production).

a) Raw materials

b) Processed industrial materials

c) Components

d) Auxiliary materials

e) Factory supplies

f) Utilities, especially power

E. Location and site (preselection, including if appropriate, an estimate of the cost of land).

a) Locational requirements of the project e.g. utilities, roads, raw material

b) Land requirements and availability

c) If appropriate, specific site recommendations

F. Project engineering

a) Technology/(ies) and equipment with comparison of alternatives

(i) Technologies and processes that can be adopted, given in relation to capacity size; describe production process including flow diagram

(ii) Estimate of costs of local and foreign technology.

(iii) Cost of proposed equipment (major components)

a. Production equipment
b. Auxiliary equipment
c. Service equipment
d. Spare parts, wear and tear parts, tools

(iv) Prepare drawings for the layout of the salt pans.

(v) List of machinery and equipment.

b) Civil engineering works

(i) Brief discussion of civil engineering works, arrangement of buildings, short description of construction materials to be used

a. Site preparation and development
b. Buildings and special civil works
c. Outdoor works

(ii) Estimate of investment cost of civil engineering works (local/foreign), classified as above. classified as above.

G. Manpower

(a) Estimated manpower requirements, broken down into labour and staff, and into major categories of skills local/foreign

(b) Estimated annual manpower costs, classified as above, including overheads on wages and salaries.

(c) Technical support required

(d) Training requirements and costs

H. Implementation scheduling

(a) Proposed implementation time schedule giving main activities

(b) Estimated implementation costs given the implementation programme and including capitalised interest

(c) Recommendations on project promotion e.g. investors, technology sources, finance sources

(d) Bar chart

(e) Organination chart

I. Financial and economic evaluation

(a) Total investment costs

(i) Estimate of working capital requirements by main item

(ii) Estimated fixed assets by main component, and preproduction expenses

(iii) Total investment costs schedule showing phasing

(iv) Estimate of foreign exchange cost

(b) Project financing

(i) Proposed capital structure and proposed financing (local/foreign)

(ii) Interest and principal payments schedule

(c) Production cost including materials, utilities, manpower, repair and maintenance, depreciation, interest, selling expenses and other. Point out any tariffs, taxes, etc. Tabulate production costs for 6 years.

(d) Financial evaluation based on above estimated values:

(i) Pay-back period

(ii) Simple rate of return

(iii) Break-even point

(iv) Internal rate of return and net present value

(v) Income statement for 6 years (adjusting for inventory)

(vi) Sources and applications of funds statement for 6 years

(vii) Balance sheet

(viii) Sensitivity analysis

(e) National economic evaluation

(i) Estimate of employment-creation effect

(ii) Estimate of foreign exchange savings

(iii) Estimate of value-added

(iv) Accounting price analysis

(Note: more detailed economic efficiency analysis may be required in specific cases)

9. APPROXIMATE COST OF STUDIES

£170,000

10. PROMOTING INSTITUTION

Ministry of Industry and Energy, Government of Mozambique.

DEVELOPMENT OF SALT WORKS AT KAZANGULA, ZAMBIA

1. INTRODUCTION

Salt production for industrial and other usage has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. The regional plan of action incorporates specific projects which are now being elaborated for implementation.

The benefits to the SADCC Region of industrial co-operation in salt production would be:-

- trading linkages within SADCC with several salt producing countries supplying the salt requirements of the other;
- industrial linkages as salt is an essential raw material for a number of basic industries such as food processing, textiles, tanning, paper and pulp and heavy chemicals such as soda ash, caustic soda and chlorine;
- self-sufficiency in an essential foodstuff that is currently imported from the Republic of South Africa or is in short supply due to foreign exchange shortages;
- earn foreign exchange by exports outside the region;
- increase size and diversity of the industrial sector and so add to national and regional output, employment opportunities and the development of new skills and technology;
- minimisation of costs by avoiding very large transport costs.

2. PROPOSED PROJECT

Feasibility study of a solar evaporation saltworks at Kazangula, Zambia.

2.1 PROJECT RATIONALE

Preliminary investigations indicate possible availability of commercially exploitable sub-soil brine in the Kazangula area. The bulk of Zambia's salt requirements are currently met by imports.

2.2 PRODUCT RANGE

Bagged, washed, unrefined/refined salt.

3. BACKGROUND

It is estimated that Zambia is currently importing 30,000 - 35,000 tonnes of salt per annum.

All salt is imported by the National Milling Company who are responsible for the packing and distribution of salt.

Salt consumption is estimated as follows:

30,000 tonnes per annum for human consumption which corresponds about 5 kg per capita p.a.

5,000 to 10,000 tonnes per annum for other uses such as papermaking, textiles, and hide tanning.

The National Milling Company has just commissioned a plant to iodise the salt sold for human consumption.

The major source of supply is South Africa with small quantities from other countries. South Africa is the major supplier due to railway links, availability and pricing.

There are small quantities of salt produced in some villages where salty earth is collected and the salt leached out and then the solution is boiled over a fire until the salt precipitates out. This production is only several hundred tonnes and, therefore, just sufficient for the local area.

4. MATERIAL SITUATION

Zambia has no known significant deposits of rock salt or strong brines.

The only known sources of salt are saline water with about 1% salt content. The Geological Survey Department has carried out some shallow drilling at Maputa, Haimbwe and Chienge and tapped sources of saline water. This water has been run out into solar evaporation pans and crystalline pans and salt produced. However, due to the low salt concentration this is considered to be non-commercial but can be developed into a village industry as evaporation rates in those areas are suitable.

The best prospects for determining commercial salt sources is to explore for stronger brines at deeper depths than the current drilling. If strong brines can be found in significant quantities then they could provide the basis for commercial production of solar salt.

A large swamp exists in the Kazangula area of the Southern Province, about 40 miles from Livingstone and near the border of Botswana. The composition of the water in the wells of the upper reaches of the swamp is similar to that of seawater. The geology of the area and salt manufacturing activity from brine across the Zambesi in Botswana would suggest that sub-soil brine may exist in the area and should be investigated.

A systematic programme of drilling exploratory holes is initially required in order to determine the approximate quantities of sub-soil brine available.

Should this investigation establish the existence of subterranean brine in sufficient quantities salt could be extracted by the solar evaporation process as climate and land conditions for solar evaporation in the area appear favourable.

The Kazangula belt area is located near the main Livingstone-Lusaka road, and there is a railroad from Livingstone. Thus all the main salt consuming markets could be served from Kazungula.

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The broad terms of reference for the geological investigations are as follows:

1. Prepare a large scale topographical map of the Kazangula area.

2. Select about 12 drill hole sites over an area of about 16-20 sq kilometres.

3. Carry out a programme of drilling exploratory drill holes.

4. Measure the existence, discharge and salinity of the brine from the drill holes.

5. Determine the quantities available of sub-soil brine.

6. If the results of 5 are positive, conduct a detailed technical and economic feasibility study for recovery of the salt. Detailed terms of reference for the feasibility study are given.

5. TERMS OF REFERENCE FOR KAZANGULA SALTWORKS FEASIBILITY STUDY

A. Summary and plan of action - a synoptic review of the essential findings of each chapter followed by recommendations on action required for project implementation and any action already taken.

B. Introduction - background to the study and review of existing studies.

C. Market and plant capacity:

(a) Demand and market

(i) The estimated existing size and capacities of the industry (specifying market leaders), its past growth, the estimated future growth (specifying major programmes of development), the local dispersal of industry, its major problems and prospects, general quality of goods, prices structure.

(ii) Past imports and their future trends, volume and prices.

(iii) The role of industry in the national economy and the national policies, priorities and targets related or assigned to the industry.

(iv) The approximate present size of demand, its past growth, major determinants and future growth.

(v) Supply/demand balance for the product, regionally, if required.

(b) Sales forecast and marketing

(i) Anticipated competition for the project from existing and potential local and foreign producers and suppliers

(ii) Distribution system and costs.

(iii) Sales programmes, including quantities and selling prices. Indicate any tariffs/taxes on imported/domestic products.

(iv) Estimated annual sales revenues from products and by-products (local/export).

(v) Estimated annual costs of sales promotion and marketing.

(c) Production programme (approximate)

(i) Products

(ii) By-products

(iii) Wastes (estimated annual cost of waste-disposal)

(d) Determination of plant capacity

(i) Feasible normal plant capacity

(ii) Quantitative relationship between sales, plant capacity and material inputs.

D. Material inputs (approximate input requirements, their present and potential supply positions, and an estimate of annual costs of local and foreign material inputs (for each input give source, availability, unit cost, quantity required for production).

(a) Raw materials

(b) Processed industrial materials

(c) Components

(d) Auxiliary materials

(e) Factory supplies

(f) Utilities, especially power

E. Location and site (preselection, including if appropriate, an estimate of the cost of land).

(a) Locational requirements of the project : e.g. utilities, roads, raw material.

(b) Land requirements and availability.

(c) If appropriate, specific site recommendations.

F. Project engineering

(a) Technology/(ies) and equipment with comparison of alternatives

(i) Technologies and processes that can be adopted, given in relation to capacity size; describe production process including flow diagram.

(ii) Estimate of costs of local and foreign technology.

(iii) Cost of proposed equipment (major components)

a. Production equipment
b. Auxiliary equipment
c. Service equipment
d. Spare parts, wear and tear parts, tools

(iv) Prepare drawings for the layout of the salt pans.

(v) List of machinery and equipment.

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(b) Civil engineering works

(i) Brief discussion of civil engineering works, arrangement of buildings, short description of construction materials to be used

a. Site preparation and development
b. Buildings and special civil works
c. Outdoor works

(ii) Estimate of investment cost of civil engineering works (local/foreign), classified as above.

G. Manpower

(a) Estimated manpower requirements, broken down into labour and staff, and into major categories of skills (local/foreign)

(b) Estimated annual manpower costs, classified as above, including overheads on wages and salaries

(c) Technical support required

(d) Training requirements and costs

H. Implementation scheduling

(a) Proposed implementation time schedule giving main activities

(b) Estimated implementation costs given the implementation programme and including capitalised interest

(c) Recommendations on project promotion e.g. investors, technology sources, finance sources (d) Bar chart

(e) Organisation chart

I. Financial and economic evaluation

(a) Total investment costs

(i) Estimate of working capital requirements by main item

(ii) Estimated fixed assets by main component, and preproduction expenses

(iii) Total investment costs schedule showing phasing

(iv) Estimate of foreign exchange cost

(b) Project financing

(i) Proposed capital structure and proposed financing (local/foreign)

(ii) Interest and principal payments schedule

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(c) Production cost including materials, utilities, manpower, repair and maintenance, depreciation, interest, selling expenses and other. Point out any tariffs, taxes, etc. Tabulate production costs for 6 years.

(d) Financial evaluation based on above estimated values:

(i) Pay-back period

(ii) Simple rate of return

(iii) Break-even point

(iv) Internal rate of return and net present value

(v) Income statement for 6 years (adjusting for inventory)

(vi) Sources and applications of funds statement for 6 years

(vii) Balance sheet

(viii) Sensitivity analysis

(e) National economic evaluation

(i) Estimate of employment-creation effect

(ii) Estimate of foreign exchange savings

(iii) Estimate of value-added

(iv) Accounting price analysis

(Note: more detailed economic efficiency analysis may be required in specific cases)

9. APPROXIMATE COST OF STUDIES

US$ 200,000

10. PROMOTING INSTITUTION

Ministry of Mines, Lusaka, Zambia

SECTION III:
Textiles

i) Manufacture of Synthetic and Cotton Synthetic blended textiles

ii) a) Production of synthetic yarn

b) Manufacture of synthetic fibre

1. INTRODUCTION

The two SADCC projects - manufacture of blended textiles and texturised polyester fabrics, and manufacture of the intermediate and basic inputs are of priority for the development of the Region. They fall in the basic needs sector and their implementation will promote SADCC self-reliance. At present, blended textiles and texturised polyester fabric constitute about 27.50% of the present demand for textiles, and both the pattern and trend of consumption indicate that the demand will rapidly grow, particularly in the rural areas. The Region has the basis of present industrial capacities for manufacture of blended cloth and has the resources in cotton as well as petroleum to sustain a progressive development of the manufacture of basics and intermediates. The implementation of the development plan suggested in this report will result in valuable import substitution of approximately US$ 120 million, representing foreign exchange used for the import of textile products and inputs. The total investment envisaged is US$ 135 million for value added activities in the manufacture of cloth and yarn in the large and medium/small scale sectors in all the countries of the Region. Employment opportunities would be generated for about 6,000 persons.

In presenting the development plan and the projects, consideration has been given to the comparative advantages of markets and resources, economic utilisation of existing and planned capacities, linkages in supply of intermediates and end products, and for balanced industrial growth in keeping with the policies of the individual countries.

The study incorporated in this paper had necessarily to be completed within a limited time period. Field investigations were conducted in most of the countries concerned, and in the others analysis and projections have been made on the basis of trends of consumption and the pattern of current production. Further work in the field is in progress and will be directed towards elaborating and refining the financial and technological particulars as well as the linkage aspects involved in implementation. The approach presented in this paper also enables the incorporation of modifications and additions which may be required during the further stages of implementation.

SUMMARY PARTICULARS OF RECOMMENDED PROJECTS

COUNTRY	PROJECT	LOCATION	ESTIMATED CAPACITY (p.a.)	ESTIMATED COST (US$ million)	ESTIMATED ANNUAL TURNOVER (VALUE)	ESTIMATED RETURN/ INVESTMENT (%)	IMPLEMENTATION PERIOD (years)	EMPLOYMENT GENERATION
Angola	Petro-Chemical Complex	Feasibility study recommended for wider market						
Botswana	Polyester knitting unit	Everest	2 million sq meters	3.1	3.0	15	2	200
	5 x 20 power looms	various	2 m m^2 100% cotton + PE/cotton	1.5	20.0	25	2	
Lesotho	Polyester knitting	?	2 m m^2	3.1	3.0	15	2	200
	5 x 20 power looms	various	2 m m^2 100% cotton + PE/cotton	1.5	20.0	25	2	
Malawi	Extension to D Whitehead	Blantyre	4 m m^2 PES/cotton woven	8.0	10.0	19	3	20*
Mozambique	POY/Text yarn plant	Zambezia	2,500 tpa	9.0	6.7	22	2	450
	Commission PE knitting	Zambezia	6 m m^2	3.6	16.2	44(on extra capital)	1	
	Convert weaving plant	Rio-pele	8 m m^2 PES/cotton	4.9	20.0	60(" ")	1.5	
Swaziland	Polyester knitting unit	?	2 m m^2	3.1	3.0	15	2	200
	5 x 20 power looms	various	2 m m^2 100% cotton + PE/cotton	1.5	20.0	25	2	
Tanzania	POY/Text'd yarn plant	?	2,500 tpa	9.0	6.7	22	3	3500
	Revitalise PES/ cotton mill	Morogoro	21 m m^2 PES/cotton PES/viscose	additional				
	10 x 20 power looms	various	+ 650 tpa " " yarn	20.0	33.6	19	1.5	
			4 m m^2 100% cotton + PES/cotton	2.8	40	25	2	
Zambia	Polyester polymerisation + PE staple production	?	20,000 tpa chips for sale + 10,000 tpa PES	35.0	52.0	22	4	750
	Polyester knitting unit	?	6 m m^2	8.5	9.0	15	2	
	Extension to KTZ	Kafue	5 m m^2 PES/cotton woven	10.0	12.5	19	3	
	10 x 20 power looms	various	4 m m^2 100% cotton + PES/cotton	2.8	40	25	2	
Zimbabwe	POY extrusion plant	near Harare	6,000 tpa	9.0	13.5	22	2	20*
	PE staple production		5,000 tpa	6.8	8.0	20	3	70

* The generation of employment in Malawi is less as we are recommending mainly conversion of machinery.
* The employment in Zimbabwe is less as the plant is capital power intensive.

2. DEMAND AND INDUSTRIAL CAPACITY

2.1. DEMAND

The total fabric demand in SADCC countries is 708 million square meters, this includes cotton, 100% polyester and blended fabrics. The estimated quantities have been grouped under two broad classifications:

2.2. 100% POLYESTER FABRICS

Under this classification fabrics principally made from texturised polyester continuous filament yarn have been taken. The bulk of these will be knitted (85% to 90%), with some woven fabrics.

2.3. POLYESTER/STAPLE/COTTON BLENDED FABRICS

Fabrics produced from blends of polyester and cotton (67:33) or (50:50) come under this classification with some production of polyester and viscose fibre (approximately 10%). The fabric under this category is predominantly woven.

The countrywise demand and capacity by the end of 1983 for the SADCC countries is as below in Table I.

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TABLE 1

SADCC: 100% POLYESTER AND POLYESTER BLEND FABRICS : ESTIMATED DEMAND AND CURRENT PRODUCTIVE CAPACITY (by 1983/84)

		100 P.E. FABRIC ($10^6 m^2$)			PES BLEND FABRIC ($10^6 m^2$)			TOTAL 100% PE + PES BLEND ($10^6 m^2$)			
	POPULATION (1982 est million)	DEMAND	CAPACITY	SHORTFALL	DEMAND	CAPACITY	SHORTFALL	DEMAND	CAPACITY	SHORTFALL	TOTAL FABRIC DEMAND INCLUDING COTTON IN MILLION M^2
ANGOLA	7.8	1.0*	0	- 1.0	1.0	0	- 1.0	2.0*	0	- 2.0	83
BOTSWANA	1.0	1.0	0	- 1.0	1.0	0	- 1.0	2.0	0	- 2.0	15
LESOTHO	1.4	1.5	0	- 1.5	1.5	0	- 1.5	3.0	0	- 3.0	15
MALAWI	6.4	2.0	0.5	- 1.5	5.0	4.0	- 1.0	7.0	4.5	- 2.5	70
MOZAMBIQUE	11.1	1.5*	0	- 1.5	1.5*	8.0	+ 6.5	3.0*	8.0	+ 5.0	120
SWAZILAND	0.6	1.0	0	- 1.0	2.0	0	- 2.0	3.0	0	- 3.0	10
TANZANIA	19.7	30.0	24.0	- 6.0	25.0	21.0*	- 4.0	55.0*	45.0	-10.0	200
ZAMBIA	6.1	8.6	1.6	- 7.0	18.0	7.0	-11.0	26.6	8.6	-18.0	75
ZIMBABWE	7.9	20.0	22.0	+ 2.0	15.0	18.0	+ 3.0	35.0	40.0	+ 5.0	120
Total	62.0	66.6	48.1	- 18.5	70.0	58.0	-12.0	136.6	106.1	-30.5	708

* Included Morogoro plant (under implementation)

* NOMINAL AMOUNTS ONLY because of GOVERNMENT POLICY encouraging HIGH DOMESTIC CONSUMPTION OF COTTON

x Output from Everest Ltd. Botswana : assumed to be dyed/finished through CONE textiles, Zimbabwe)

NOTES: The total shortfall of $30.5 \times 10^{6.2}$ is artifically low due to controls on domestic consumption by Mozambique and Angola ariving from Government policies. With the removal of these controls the demand would be approximately $50 \times 10^6 m^2$ p.a.

As shown in the Table, the demand for Polyester and Polyester/ blended fabric in Angola and Mozambique represent nominal figures. as consumers demand in both countries for polyester and polyester blended textile will be depressed as a result of Government policies to reduce imports. Without these restrictions the total demand in these countries would be expected to rise by a further 20 million square meters per annum.

The demands for Botswana, Lesotho and Swaziland has been estimated in line with the average per capita consumption for the SADCC Region as a whole.

2.4. PRODUCTION CAPACITIES

In Malawi the capacity for polyester blended fabric production represents David Whitehead's new extension due on stream in 1983.

In Mozambique it is assumed that polyester blended fabric capacity will be available from the existing 100% polyester (or viscose) mill near Maputo (Rio-Pele).

In Tanzania 21 million square meters capacity for polyester blended woven fabrics would be achieved by the implementation of the Morogoro projects.

In Zambia the production capacity for polyester blended textiles will arise principally from Kafue Textiles' new extension which would be on stream in 1983.

In Zimbabwe the production will mainly come from Cone Textiles and David Whitehead.

2.5. SUPPLY/DEMAND GAP

As shown in Table 1 there is a short fall of demand of 18.5 million square meters of knitted fabrics, and a shortfall of demand of polyester blended fabrics to the tune of 33.5 million square meters by the end of 1983 if the Morogoro unit does not come into production. By relaxation of Government policies in Angola and Mozambique on consumption of blended fabrics locally, the total demand can go up to 50 million square meters.

3. PROJECTS PROPOSALS TO MEET SHORTFALL IN SUPPLY OF SYNTHETIC AND COTTON SYNTHETIC BLENDED TEXTILES

Two important factors have been taken into consideration in assessing the need for new capacities:

a) Utilisation of existing capacities and upgradation of existing units where the advantage of using common facilities already developed will bring down capital costs, improve profitability and facilitate implementation of projects in the short term.

b) Expediting implementation and commissioning of projects which are already planned and for which effective steps have been undertaken.

It is recommended specifically that the following facilities be implemented:

BOTSWANA

At present Botswana has a knitting unit where they are knitting fabric for Cone Textiles Ltd, Zimbabwe. The existing capacity to be increased to produce 2 million square meters and installation of processing and finishing facilities.

A new knitting plant is proposed with a capacity of 2 million square metres and installation of processing and finishing facilities.

Expansion of Everest knitting.

Estimated cost of project	3.1 million
Annual Production	2 million sq. m.
Estimated turnover	US$ 3 million
Estimated Return on Investment	15%
Implementation Period	2 years

ZAMBIA

Extension of the present and planned production in KTZ Mills Ltd Kafue by addition of new spinning frames and high speed looms as they also have sufficient dyeing/printing and finishing facilities, thus increasing production by 5 million square meters.

Extension of KTZ Textiles Kafue.

Estimate cost of project	US$ 10 million
Annual Production	5 million sq. m.
Estimated turnover	US$ 12.5 million
Return on Investment	19%
Implementation Period	3 years

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MOZAMBIQUE

In Mozambique two knitting factories were constructed in 1977-78 in Beira and Zambezia but the machines could never be installed. These are still in crates. The machinery mainly consists of the following makes - Bently, Sing-Sang, Textima, Stible and Marat. These machines could be installed and commissioned to produce 20 million square meters of fabrics (consisting of jersey, interlock, piquet, rib). By going into production these plants would be able to supply 30% of the combined output totalling to 6.5 million square meters per annum of the combined output in 100% polyester fabric.

Commissioning of P E Knitting Zambezia.

Estimated Cost	US$ 3.6 million
Annual Production	6 million sq. m.
Estimated annual turnover	US$ 16.2 million
Estimated Return on Investment	44% on extra capital
Implementation period	1 year

Conversion of 100% polyester textile mills into polyester blended fabrics at Rio-pele

Estimated cost of projects	US$ 4.9 million
Annual Production	8 million sq. m.
Estimated turnover	US$ 20 million
Estimated Return on Investment	60% on extra capital
Implementation Period	1.5 years

TANZANIA

The Morogoro plant was initially designed to produce the polyester blended fabrics but did not due to many constraints. The mill is now being planned for 100% cotton with scope for polyester/blended production up to the spinning and weaving stage. By addition of dyeing/printing and finishing facilities the plant can produce 21 million square meters of fabrics and 650 tonnes of blended yarn.

The above projects which could be implemented would provide a total production of 8.5 million sq. m. of knitted 100% polyester fabrics and 38 million sq.m. of blended fabrics of polyester/cotton blends. Thus leaving a shortfall of 10 million sq. m. of knitted fabrics and about 20 million m. of blended fabrics, taking into account the potential demand of Angola and Mozambique.

In terms of facilitating the logistics of the plan in terms of profitability and comparative advantage it would also be appropriate to consider the following:

a) Because there is a high demand in Zambia for 100% knitted fabrics and because the infrastructure is already available in the country it is recommended to have a plant of 6 million sq. m. for knitted fabrics in Zambia.

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Estimated cost	US$ 8.5 million
Annual Production	6 million sq. m.
Estimated turnover	US$ 9 million
Return on Investment	16%
Implementation period	2 years

b) The establishment of knitting facilities is far less complex than putting up an integrated textile mill. Small knitting plants to produce 2 million square meters are recommended in Lesotho and Swaziland.

Lesotho

Estimated cost of knitting project	US$ 3.1 million
Annual production	2 million sq. m.
Estimated turnover	US$ 3 million
Return on Investment	15%
Implementation Period	2 years

Swaziland

Estimated cost of knitting project	US$ 3.1 million
Annual Production	2 million sq. m.
Estimated turnover	US$ 3 million
Return on investment	15%
Implementation period	2 years

c) Power looms

Textile weaving also lends itself easily to decentralised operations in the small scale sector. Power loom technology is such that it permits the setting up of small scale units. The size of the minimum economically viable unit depends upon patterns of ownership, market conditions, and cost of labour. In Indian conditions, where the operator is the entrepreneur, technician and manager, all combined into one, even two powerlooms can constitute an economically viable unit.

In the case of developing countries where local skill are moderately available, expatriates are needed initially. The minimum quantity of powerlooms that constitutes an economically viable unit is twenty.

The concept has been very successful in Tanzania, where nine units have been successfully working for the last five years, some of them in remote areas like Ukerewe and Kitelo.

The concept has also been successful in Zambia and Zimbabwe where there are a number of power looms units, though they have more than twenty looms each.

Cost of 20 Power loom Unit

Plant and Machinery	US$ 125,000
Building & Fixtures	US$ 100,000
Power	35 Kva.
Working capital	US$ 300,000
Production	420,000 meters p.a. per unit

Following are the project proposals for power loom units:-

TANZANIA

Ten units of 20 power looms each manufacturing polyester/ cotton blended shirting and suiting. The units could be situated around Morogoro whereby the units can utilise the yarn produced by Morogoro plant. They could also produce cotton fabric if need be.

Estimated cost of 10 units of 20 powerlooms project	US$ 2.8 million
Annual production	4 million sq. m. of blended & cotton fabrics
Estimated turnover	US$ 40 million
Estimated Return on Investment	25%
Implementation Period	2 years

ZAMBIA

Ten units of 20 power looms each manufacturing shirting, suitings of blended yarn. The units could be situated around Kafue Textile Ltd.

Estimated cost of 10 units of 20 Powerlooms project	US$ 2.8 million
Annual production	4 million sq. m. of blended & cotton fabrics
Estimated turnover	US$ 40 million
Estimated Return on investment	25%
Implementation period	2 years

SWAZILAND, BOTSWANA, LESOTHO

Each of these countries could have five units of 200 looms each. The yarn could come from Zimbabwe. The units can have a centralised process house to process the cloth produced from these units.

Estimated cost of 5 units of 20 looms	US$ 1.5 million
Annual production	2 million sq. m. blended & cotton fabrics
Estimated turnover	US$ 20 million
Estimated return on investment	25%
Implementation period	2 years

MALAWI

Two units of 20 power looms each to be commissioned in the rural area. The cloth produced to be dyed/finished by David Whitehead Ltd at Blantyre.

Estimated cost of 2 units of 20 looms	US$ 0.76 million
Annual production	800,000 sq. m.
Estimated turnover	US$ 8 million
Estimated return on investment	25%
Implementation period	2 years

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TABLE 2

SADCC: POLYESTER STAPLE FIBRE AND P.O.Y./TEXTURISED POLYESTER FILAMENT YARN ESTIMATED DEMAND (1985/86) AND PRODUCTIVE CAPACITY (1983/84)

		POY/TEXT'D PE YARN (tonnes p.a.)			PE STAPLE (tonnes p.a.)			TOTAL POY/TEXT'D + PES		
	POPULATION (1982 est million)	DEMAND	CAPACITY	SHORTFALL	DEMAND	CAPACITY	SHORTFALL	DEMAND	CAPACITY	SHORTFALL
ANGOLA	7.8	0	0	0	0	0	0	0	0	0
BOTSWANA	1.0	0	0	0	0	0	0	0	0	0
LESOTHO	1.4	0	0	0	0	0	0	0	0	0
MALAWI	6.4	100	0	- 100	800	0	- 800	900	0	- 900
MOZAMBIQUE	11.1	2,000	0	- 2,000	800	0	- 800	2,800	0	- 2,800
SWAZILAND	0.6	0	0	0	0	0	0	0	0	0
TANZANIA	19.7	9,500	7,500	- 2,000	3,000	0	- 3,000	12,500	7,500	- 5,000
ZAMBIA	6.1	1,000	0	- 1,000	1,100	0	- 1,100	2,100	0	- 21,00
ZIMBABWE	7.9	6,000	0	- 6,000	2,100	0	- 2,100	8,100	0	- 8,100
Total	62.0	18,600	7,500	11,100	7,800	0	- 7,800	26,400	7,500	18,900

N.B. Demand is defined as that quantity of polyester required if the 100% and polyester blend textile requirements are also met (see Table 1). (If ANGOLA and MOZAMBIQUE allow increased usage internally of polyester, the above 26,400 t.p.a. total requirement will probably rise to approximately 30,000 t.p.a.)

The Polyester Staple Fibre (PES) requirement for Malawi is computed on an increase from 4 million square meters of blended fabric in 1983 to 8 million by 1985-86.

The demand of (PES) in Mozambique has been assumed on the basis of start of blended fabric production from the (Riopele) mills at Maputo and commissioning of knitting mills (Zatricot) at Zambezia.

Zambia's demand is assumed to come from further expansion of blended textiles at KTZ Kafue by starting of suiting manufacture and offtake by knitters and powerlooms.

Zimbabwe's requirements will arise from proper utilisation of installed capacity (1982-83) and export of yarn to Botswana for the existing knitting unit and to Swaziland and Lesotho for powerlooms and knitting units and reimport of fabrics.

No immediate domestic requirement for substantial quantities of polyester has yet been identified. However, any eventual satisfaction of latent demand for polyester and blended fabrics in Angola and Mozambique could lead to such textile installations in these countries with a resultant demand for polyester fibre and yarn.

In Tanzania the demand is assumed on the basis that the Morogoro unit would come on stream and there would be demand from decentralised sectors and knitters.

4.2. PROJECT FOR POLYESTER YARN AND FIBRE MANUFACTURE

In round figures the estimated demand for polyester within the SADCC region over the next few years is:-

POY/Textured yarn	17,500 t.p.a.
P.E.S.(Fibre)	7,500 t.p.a.
	25,000 t.p.a.

The polyester from which the fibre is produced is polyethylene terephthalate and this is made by condensing ethylene glycol with terephthalic acid (T.P.A.), either by direct interaction or by ester exchange using dimethyl terephthalate (O.M.T.)

The former process is illustrated below, with an indication of the mass of each component needed to produce the above quantity of fibre and yarn.

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a) From Refinery 7450 t. Ethylene Mixed xylenes (20,800 t.)

b) Petro-Chemical Plant 8450 t. Ethylene Oxide p-Xylene (16,750 t.)

10075 t Ethylene Glycol T.P.A. (24125 t)

c) Polymerisation Plant Polyethylene Terephthalate (27250 t)

d) Extrusion/Spinning Plant 7500 t P.E.S. P.O.Y.(17500 t)

e) Texturising Plant Texturised PE

Total P.E.S. & P.O.Y : 25,000 tonnes

The typical economical size of plants to produce each component in the above chain are:

a) Ethylene: 50,000 - 1135,000 t.p.a.
p-xylene: 7,000 - 240,000 t.p.a.

b) Ethylene oxide/ethylene glycol
15,000 - 365,000 t.p.a.
T.P.A. 100,000 - 320,000 t.p.a.

c) Polyethylene terephthalate
5,000 t.p.a. upwards

d) P.E.S. and P.O.Y.
2,500 t.p.a. upwards

Comments

Both (a) and (b) stages require large, expensive plants and would not be justified for fibre/yarn production alone (e.g. other applications in the petrochemicals and plastics field would be needed). Furthermore, as can be seen, these economical sizes (which tend to be the higher output plants) are much larger than required for the production of 25,000 t.p.a. of fibre and yarn. Nevertheless, a feasibility study is recommended with respect to establishing refining and petro-chemical plants.

A polymerisation plant (c) for the production of some 30,000 t.p.a. of polyethylene terephahalate is seen as the best starting point at this stage. Initially the monomers (ethylene glycol and T.P.A.) would need to be purchased from outside the Region until such time as these may be available within SADCC (e.g. from future petro-chemical installations in Angola?)

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Fibre and yarn production (d) can be carried out on a reasonably small scale, although, obviously larger plants tend to be more economical.

From the above considerations and the estimated requirements indicated in Table 2, the following types of installations suggest themselves:-

- ONE POLYMERISATION PLANT with a capacity for up to 30,000 t.p.a. of polyethylene terepthalate. The output of this polymer to be in TWO forms:

  - up to 10,000 t.p.a. of molten polymer to be fed directly to an ON-SITE STAPLE FIBRE extrusion/spinning plant

  - up to 20,000 t.p.a. of polymer chips to be shipped to individual P.O.Y. extrusion/spinning units located elsewhere in the SADCC Region.

- THREE FURTHER P.O.Y EXTRUSION/SPINNING PLANTS (of minimum size 2,500 t.p.a.) to be located at or adjacent to (a) existing draw-texturising facilities (b) major textile factories utilising this yarn. e.g. Table 2 identifies major requirements in Zimbabwe, Tanzania (existing) and Mozambique (projected).

  The combined capacity of these plants needs to be approximately 11,000 t.p.a. to supplement the existing (by end 1983) Tanzania capacity of 7,500 t.p.a. (who, it is anticipated, would also purchase polymer chips from the above polymerisation plant).

- No accurate assessment of the DRAW-TEXTURISING capacity in the Region has yet been made. However, with known installations in Zimbabwe (5,500 t.p.a.?) and Tanzania (2,500 - 7,500 t.p.a.?) it is assumed that the additional capacity required for carrying out this process is 7-8,000 t.p.a. These machines should be located either at the proposed P.O.Y. extrusion plants or with individual textile companies, who would purchase P.O.Y.

4.3. FACTORS CONSIDERED IN THE LOCATION OF NEW PLANTS OR EXTENSIONS

a) Transport logistics. The combined polymer/P.E.S. plant should be sited such as to allow easy access to its customers for polymer and P.E.S. within the Region. Deliveries of imported monomer and other raw materials also demand good access.

b) Local raw material availability (in the event of Angola or other SADCC country eventually establishing a petrochemical industry capable of supplying monomers)

c) Power: availability, cost, reliability.

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d) Labour: compared with traditional textile operations (e.g. spinning, weaving, knitting etc) PES and, to a lesser extent, POY and texturised yarn production are not labour intensive industries. Therefore labour costs will have less influence on site selection. A reasonably high level of technical competence is obviously required for operating and maintaining sophisticated equipment.

e) Water and effluent disposal availability: not a major item of concern.

4.4. APPROXIMATE CAPITAL COSTS

This is difficult to estimate at this stage as so much depends upon the availability of services, necessary site development and local infrastructure.

However, an indication of the likely approximate costs involved are provided later in this report, for Projects (I) and (II) combined.

4.5. POSSIBLE SCHEDULE FOR IMPLEMENTATION

It is assumed that a minimum of 2 years would be required for obtaining feasibility studies, subsequent detailed planning and design work for the proposed polymer/P.E.S. plant, and negotiation of the necessary financing of this project. With erection of buildings, installation of equipment and services etc it is unlikely that this project could be on-stream before 1986.

Additional P.O.Y. capacity (initially from imported chips) could probably be approved, financed and installed by, say, 1984/85.

Additional Draw-texturising machines to those already available could probably be installed within 1 year of ordering, say, 1984.

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5. NOTES ON INTERNAL AND EXTERNAL REGIONAL LINKAGES

In any decision-making process concerning the desirability and viability of the above two projects (wholly or in part), many factors need to be considered. Amongst these will be:

- the benefits to the SADCC countries which will be derived from importing lower value basic material (e.g. monomer or polymer instead of fibre/yarn; fibre/yarn instead of fabrics, etc), thus making better use of scarce foreign currency.

- The desirability of achieving appropriate trade linkages between the SADCC countries, with respect to these products (e.g. the country producing the polymer chips/P.E.S. could purchase yarn and fabric from its customer countries; yarn and fabric producing countries could supply these to others for fabric and garment making, for re-purchase, etc).

In order to assist decision-making in these areas the following are indications of current price ranges along with, consequently how much of each can be purchased with, for example, US$ 1 million:

PRODUCT	ESTIMATED WORLD PRICE (US $)	QUANTITY BOUGHT BY US $ 1 MILLION
Ethylene glycol	550/tonne	1,820 tonnes
T.P.A.	700/tonne	1,430 tonnes
P.E.T. chips	1,400/tonne	715 tonnes
P.Q.Y. (210 denier)	2,245/tonne	445 tonnes
Text'd PE ("150 denier")	2,665/tonne	375 tonnes
65/35 PES/cotton (av:Ne 30's)	4,000/tonne	250 tonnes

5.1. FOREIGN EXCHANGE SAVINGS

Example:

	US$ million
Cost of importing PES and POY:	
7,500 tpa PES	13.1
17,500 tpa POY	39.3
Total	52.4
compared with cost of importing monomers:	
10,075 tpa Ethylene Glycol	5.54
24,125 tpa T.P.A.	16.89
Total	22.43
Gross saving in foreign currency:	30.00

(less interest on loans, depreciation, spares, etc)

5.2. TRADE BENEFIT

Country 'A' (producing PES and polymer chips) sells to country 'B":

		US$ million
2,000 tpa PES		3.48
6,000 tpa polymer chips		8.40
	Total	11.88

This would then allow country 'A' to purchase yarn and fabric from country 'B' to the value of approximately US$ 12 million, e.g.:

		US$ million
890 tpa of POY		2.00
500 tpa of PES/cotton yarn		2.00
4 million sq. m. fabric		8.00
	Total	12.00

- or some other appropriate combination.

Other, similar balances could be worked out (for example, the purchase of yarn/fabric and the selling back of garments).

Such considerations should assist or influence the siting of new plants or extensions as indicated by Projects 2 (I) and (II) to the maximum benefit of the SADDC Region as a whole.

5.3. WORLD FIBRE CAPACITY AND PRICES

On a world-wide basis there is overcapacity in the production of all man-made fibres, which, it is estimated, is likely to persist for the next 5-10 years. Of this, polyester accounts for almost half of the world production of man-made fibres with a total 1981 production of some 5.4 million tonnes (45% filament yarn, 55% staple fibre).

In this highly competitive situation, fibre and yarn prices have been held down, particularly in the export markets of companies in the USA, Europe and Japan, where returns may hardly cover production costs, insurance and freight charges.

In these circumstances it is likely that any developing polyester production industry within SADCC will require some protection (in the form of tariffs on imported fibre and yarn, for example), at least in the initial stages. (For instance, South Africa, with indigenous polyester and nylon production, is understood to protect these interests by means of a 20% duty on imports.)

6. PROJECT RECOMMENDATIONS FOR SYNTHETIC YARN AND FIBRE

From the foregoing initial assessments of these two main Projects and due consideration of the appropriate factors involved, the following specific recommendations can be made.

Taking into account the close links between the two Projects, these recommendations will be presented in a form which combines both areas and which follows the complete process, from basic chemicals, through fibre and yarn to finished fabric and garment making in logical order.

6.1. PRODUCTION OF BASIC CHEMICALS AND MONOMERS FOR POLYESTER PRODUCTION

As pointed out earlier, the undertakings required to produce ethylene, xylene initially, leading to ethylene glycol and terephthalic acid as the basic monomers in the production of polyethylene terephthalate (polyester) are very large installations which could not be justified merely by a requirement for 25,000-30,000 tpa of polyester fibre and yarn. Such operations normally form only a part of large refining and petro-chemical complexes producing a whole range of products for the chemical and plastics as well as the fibre industry. As such, this area is outside the scope of this study.

Nevertheless, it is recommended that an appropriate feasibility study should be made into this subject.

Broad terms of reference would include:

- a market survey of current and potential demand, both within SADCC and in other African and world countries.
- Identification of the products required.
- The recommended size of such plants
- Schedule of implementation
- Cost and Financing

Such a feasibility study could be implemented within 6-12 months and could be undertaken by any of the major oil and petro-chemical companies. Recent examples of petro-chemical installations are:

- Saudi Arabia	Ethylene glycol	Belleli
- Libya	" "	Scientific Design
- Saudi Arabia	" "	Shell/Chiyona
- Canada	" "	Fluor Canada
- Taiwan	T.P.A.	Amoco/Mitsui
- Indonesia	"	Mitsui
- India	Ethylene & others	Braun/ICB

It is assumed at this stage that any such complex would be located in Angola adjacent to indigenous oil supply.

The estimated cost of the feasibility study is £250,000.

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6.2. POLYESTER POLYMERISATION AND STAPLE FIBRE PLANT

with an output of:

- up to 10,000 tpa of polyester staple fibre
- up to 20,000 tpa of polymer chips

Recommended site: ZAMBIA

(centrally located within SADCC, relatively cheap and reliable power, communications by rail or road to SADCC textile sector, technically trained manpower).

Approximate project cost:

	US $ million
Equipment: polymer production	11.2
PES production	6.3
Total	17.5
Plus Civil engineering, erection, construction, utilities, electrical etc	17.5
Total installed cost	35.0

Estimated schedule:

Feasibility study, planning & design, negotiation of financing	2 years
Civil engineering, services, machine installation, commissioning	2 years

Benefits:

Cost of importing PES and polymer chips SADCC Region):

	US $ million
7,500 tpa PES	13.1
17,500 tpa POT, polymer chips	24.5
Total	37.6

This would be replaced by importing monomers:

10,075 tpa Ethylene glycol	5.4
24,125 tpa T.P.A.	16.89
Total	22.43

Therefore, gross saving in foreign currency — US$ million 15.2

- Additional employment
- Value of sales — 52.4 US$ million

At 15% "mark-up" — 7.9 US$ million profit
22% return on installed capital

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Benefits:

	US$ Million
Cost of importing P.O.Y.	
6,000 t.p.a. P.O.Y.	13.5 p.a.
Cost of importing chips (initially from outside SADCC, within two years from Zambia - see 6.2): 6,200 t.p.a. chips	8.7 p.a.
Therefore, gross saving in Foreign Currency	4.8 p.a.
"Sales Value" of Production	13.00
Assume 15% difference (Price-Production cost)	2.00

which is the benefit of "in-house" manufacture.

= 22% return on installed capital

Additional production capacity for polyester staple fibre could also be considered for :

Zimbabwe to allow for the rapidly increasing market for synthetic fibres within the region.

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6.3. THREE P.O.Y. EXTRUSION PLANTS

(two with texturising capacity)

The three recommended locations are:

ZIMBABWE

Capacity	6,000 t.p.a. P.O.Y. only
Location	Cone Textiles (Pvt) Ltd, Harare
Output	Cone Textiles own use (including Everest Mills, Botswana; associate company) Textured Yarns (Pvt) Ltd, Bulawayo

Approximate Project Cost:

	US$ million
Equipment : P.O.Y. production	4.6
Plus: civil engineers, erection, construction, utilities, electrical, etc	4.4
Total erected cost	9.0

Estimated Schedule:

Feasibility study planning & design negotiation of financing	1 year
Civil engineering, services, m/c installation, commissioning	1 year

TANZANIA

Capacity:		2,500 t.p.a. P.O.Y.
Plus		Texturising capacity
Location	Either	A to Z Textiles
	Or	Texco
Output		Approx 2000 tpa to Tanzania
		Approx 500 tpa to Zambia/Malawi

- assumed all in the form of texturised yarn

Approximate Project cost:	US$ million
Equipment: P.O.Y. production:	2.1
Draw Texturising:	2.5
Total	4.6
Plus: civil engineering, erection, construction, utilities, electrical, etc	4.4
Total installed cost	9.0

Estimated Schedule:

Feasbility studies, planning & design negotiation of financing etc	1 year
Civil engineering, services, m/c installation, commissioning	1 year

Benefits:

Cost of importing texturised P.E.:

2,500 t.p.a. text'd P.E.	= US $ million	6.7

Cost of importing chips:

2,600 t.p.a. chips	= US $ million	3.6 p.a.
Therefore, gross saving in foreign currency	= US $ million	3.1 p.a.
Value of export of 500 t.p.a. text'd yarn to SADCC	= US $ million	1.34
'Sales Value' of Production (text'd yarn)	= US $ million	6.7
Assume 2 x 15% difference for (Price - Production cost) for P.O.Y. and Text'd yarn	= US $ million = 22% return on installed capital	2.0

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MOZAMBIQUE

Capacity	2,500 t.p.a. P.O.Y. plus texturising capacity
Location	At or adjacent to Zambezia projected knitting plant (Zatricot)
Output	Approx. 2,000 t.p.a. to Zatricot Approx. 500 t.p.a. to Zambia/Malawi

Approximate Project Cost:

	US$ million
Equipment: P.O.Y. production	2.1
Draw - Texturising	2.5
Total	4.6
Plus: civil engineering, erection, construction, utilities, electrical, etc	4.4
Total installed cost	9.0

Estimated schedule:

Feasibility study, planning & design negotiation of financing etc	1 year
Civil engineering services, m/c installation and commissioning	1 year

Benefits

Cost of importing textured P.E.: 2,500 t.p.a. text'd P.E.	= US $ million	6.7
Cost of importing chips: 2,600 t.p.a. chips	= US $ million	3.6
Therefore, gross saving in foreign currency	= US $ million	3.1 p.a.
Value of export of 500 t.p.a. text'd P.E. to SADCC	= US $ million	1.34
'Sales Value' of Production (text'd yarn)	= US $ million	6.7
Assume 2 x 15% difference for (Price - Production cost) for P.O.Y. and text'd yarn	= US $ million = 22% return on installed capacity	2.0

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7. SADCC : PROPOSED REGIONAL PLAN

The requirements of the SADCC Region as a whole, as analysed in some detail in the previous sections, demand that certain criteria are satisfied with respect to the number and types of installations and their locations. Taking the individual projects in progression from basic chemicals through to finished fabric:

Petro-chemical complex

Assuming that any subsequent detailed feasibility studies justify the establishment of such an industry in the medium/ longterm future, only one plant would be required by the Region at least in the first instance, and this should logically be located adjacent or near to the major source of oil, namely in Angola. In that a proportion of its products are likely to be sold in world markets, as well as SADCC, port handling facilities are also indicated.

Polyester polymerisation plant and staple fibre production

In the interests of economy of scale and minimising of overheads, the required productive capacity for up to 30,000 t.p.a. of polymer, (of which up to 10,000 t.p.a. will be extruded directly as staple fibre and the remaining 20,000 tpa sold as chips) should be located on one site. The recommended position for the plant is Zambia, in that:

- Zambia represents a good "centre of gravity" for the distribution of both polymer chips and staple fibre to neighbouring customer countries.

- Likewise Zambia has direct links with Angola for the anticipated eventual delivery of monomers.

- The country has a plentiful, reliable and relatively cheap supply of power.

- Technically trained manpower is available.

A polyester staple fibre plant may also be considered for Zimbabwe, the capacity to be scaled in line with market growth for staple fibre during the 1980s.

P.O.Y. extrusion plants (with draw-texturising where necessary)

In that relatively smaller centres can be established for P.O.Y. production, it is possible in this case to aim at siting these as near as possible to the main centres of demand. These havebeen identified as Zimbabwe, Tanzania and Mozambique (projected knitting factory). Therefore three locations are recommended: one in each country, with appropriate capacity for producing P.O.Y. and Texturised Yarn, mostly for domestic consumption but with sufficient capacity to also supply the needs of neighbouring SADCC countries (i.e. Zambia, Botswana, Malawi, Swaziland and Lesotho.)

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100% polyester knitting factories

Again, the relatively small scale which is possible for such installations enables the main criterion in site selection to be that of local demand. Thus, new installations or extensions to existing units, are recommended for Botswana, Lesotho, Swaziland, and Zambia. Although domestic demand is currently depressed for policy reasons the commissioning of an existing factory in Mozambique (with machines in crates on site) is also recommended as a source of supply to other SADCC countries.

Polyester blended woven fabric production

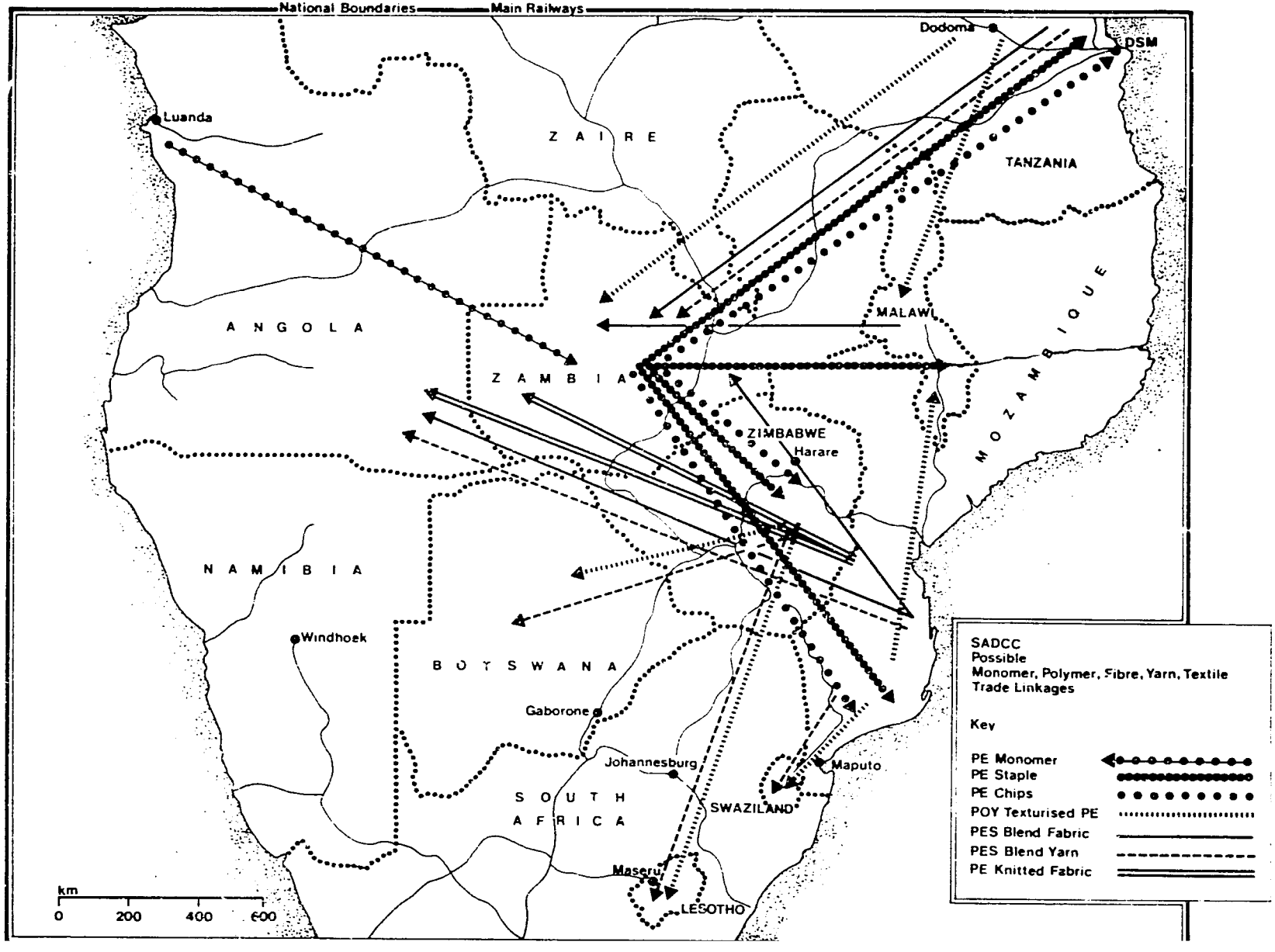
The criteria for siting new plants or extensions to satisfy demand in this area are:

- Availability of existing projects requiring an injection of capital to realise their potential in a relatively short time period. Hence, the development of production in Tanzania and Mozambique is recommended.

- The availability of existing (by 1983) polyester blend installations and on-site expertise which lend themselves readily to further extensions. Here, the expansion of facilities at Malawi and Zambia are recommended.

- Local demand. This criterion is met by the above proposed installations/extensions (apart from Mozambique which will concentrate, at least in the first instance, upon exports within the SADCC region). In addition, the production of these units can be suppemented on a local basis by the setting up of "power-loom" units, which, although probably producing mainly 100% cotton textiles, could also weave polyester blended fabrics. Recommended sites are in Botswana, Lesotho, Swaziland and Zambia.

Although the projects recommended should cater for a normal growth pattern from the current demand base, it is not unlikely that a significant increase in demand (e.g. up to a further 20 million square metres p.a.) could arise within Angola and Mozambique over the next few years. The siting of further P.O.Y./texturised yarn, knitted and woven fabric production units in Angola, and to some extent, Mozambique, would then be recommended.


National Boundaries
Main Railways
Dodoma
DSM
Luanda
ZAIRE
TANZANIA
ANGOLA
MALAWI
MOZAMBIQUE
ZAMBIA
ZIMBABWE
Harare
NAMIBIA
Windhoek
BOTSWANA
Gaborone
Johannesburg
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Monomer, Polymer, Fibre, Yarn, Textile
Trade Linkages
Key
PE Monomer
PE Staple
PE Chips
POY Texturised PE
PES Blend Fabric
PES Blend Yarn
PE Knitted Fabric

ESTABLISHMENT OF A POWERLOOM PROJECT IN BOTSWANA

1. INTRODUCTION

A significant increase in the indigenous production of woven and knitted textiles has been adopted by the SADCC Industry Ministers as an area of high priority in the successful further development of the Region. In particular, the need to boost production of 100% polyester and polyester blended textiles has been identified.

The regional plan of action incorporates the specific projects relating to polyester and polyester blended knitted and woven textiles which are now being elaborated for implementation.

The benefits to the SADCC Group would include:

- The strengthening of trade linkages between member countries.
- Self-sufficiency in an increasingly important sector of the textile market.
- Savings in foreign currency, currently used for importing such fabrics.
- Satisfaction of both current and anticipated demand for such textiles within the Region.

2. PROPOSED PROJECT

2.1. DESCRIPTION

Manufacture of cotton and polyester cotton fabric including shirting, suiting, safaris and dress material.

2.2. LOCATION

Botswana

3. SADCC MARKET POSITION

Botswana, with a population of 900,000, has a consumption of approximately 9 million meters of fabric including cotton, polyester/cotton, polyester and knitted fabrics. There are 13 units of readymade garments. The country at present is importing most of its requirement in textiles. Some knitted fabrics are produced which are then further processed in Zimbabwe. Hence there is a need for local production of fabric. The total demand is 15 million square meters.

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4. TECHNOLOGY PACKAGE

Five units of 20 looms are proposed which would use cotton and cotton polyester yarn. The units would produce fabric in the decentralised sector and the fabric then processed in a centralised processing house. The five units would be able to produce 2 million square meters of fabric running at 90% efficiency.

5. RAW MATERIAL

The raw material cotton and polyester/cotton yarn is available from SADCC countries such as Zimbabwe which has excess capacity in yarn production.

6. IMPLEMENTATION SCHEDULE

Preparation of detailed project report	1 to 6 months
Agreement with donor country	6 to 12 months
Site allocation of building construction	12 to 18 months
Placement of order	12 to 14 months
Shipment of machinery	14 to 20 months
Arrival of machinery at site	20 to 21 months
Erection and commissioning	21 to 23 months
Trial run	23 months
Commercial production	24 months

7. INPUT REQUIRED FROM DONORS

Plant and machinery consisting of power looms, winder and other allied machinery for weaving. Machinery for processing consisting of boilers pirn, stentor, high pressure dyer, and printing equipment. Technical assistance for construction, commissioning of commercial production, and training of staff.

8. FIXED CAPITAL COST

	LOCAL in US$ million	FOREIGN in US$ million
8.1 WEAVING PROJECT		
Building	0.90	-
Plant & Machinery		1.00
8.2 PROJECT FOR PROCESSING FABRIC		
Building	0.80	-
Plant & Machinery		0.21

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ESTABLISHMENT OF A KNITTING PROJECT IN BOTSWANA

1. INTRODUCTION

A significant increase in the indigenous production of woven and knitted textiles has been adopted by the SADCC Industry Ministers as an area of high priority in the successful further development of the Region. In particular, the need to boost production of 100% polyester and polyester blended textiles has been identified.

The regional plan of action incorporates the specific projects relating to polyester and polyester blended knitted and woven textiles which are now being elaborated for implementation.

The benefits to the SADCC Group would include:

- The strengthening of trade linkages between member countries.
- Self-sufficiency in an increasingly important sector of the textile market.
- Savings in foreign currency, currently used for importing such fabrics.
- Satisfaction of both current and anticipated demand for such textiles within the Region.

2. PROPOSED PROJECT

2.1. DESCRIPTION

Expansion of the existing Everest knitting unit in Botswana to 1 million square metres, with a processing facility for dyeing/finishing and printing for the production of cotton, and polyester/cotton knitted dress material.

2.2. LOCATION

Botswana

3. SADCC MARKET POSITION

The total SADCC market demand at present is 66.6 million square meters, with a capacity of 48.1 million square meters. Consequently there is a shortfall of 18.5 million square metres of which Botswana accounts for 1 million square metres.

4. TECHNOLOGY PACKAGE

The technology package would comprise the supply of plant and machinery for knitting and processing equipment for knitted fabrics. It would also include technical services, the erection and commissioning of plant and commercial production and training of local personnel.

5. RAW MATERIAL

The raw material, consisting of cotton yarn and polyester cotton, is available in the SADCC region and can be obtained from Zimbabwe.

6. FIXED CAPITAL COST

Plant & Machinery	US$ 0.75 million
Building	US$ 0.80 million

7. PRODUCTION CAPACITY

One million square metres of knitted fabrics dyed and printed for dress material.

8. TRADING LOGISTICS

The yarn is available from SADCC countries such as Zimbabwe.

9. IMPLEMENTATION SCHEDULE

Detailed report preparation	1 to 6 months
Agreement with donor country	6 to 12 months
Site allocation & building construction	12 to 18 months
Placement of order	12 to 14 months
Shipment of machinery	14 to 20 months
Arrival of machinery at site	20 to 21 months
Erection and commissioning	21 to 23 months
Trial run	23rd month
Commercial production	24th month
Total time required for implementation	2 years

10. INPUT REQUIRED FROM DONORS

Supply of plant for knitting and processing equipment and other machinery,and technical services for the erection, commissioning, commercial production and training of local personnel.

ESTABLISHMENT OF A KNITTING PROJECT IN LESOTHO

1. INTRODUCTION

A significant increase in the indigenous production of woven and knitted textiles has been adopted by the SADCC Industry Ministers as an area of high priority in the successful further development of the Region. In particular, the need to boost production of 100% polyester and polyester blended textiles has been identified.

The regional plan of action incorporates the specific projects relating to polyester and polyester blended knitted and woven textiles which are now being elaborated for implementation.

The benefits to the SADCC Group would include:

- The strengthening of trade linkages between member countries.
- Self-sufficiency in an increasingly important sector of the textile market.
- Savings in foreign currency, currently used for importing such fabrics.
- Satisfaction of both current and anticipated demand for such textiles within the Region.

2. PROPOSED PROJECT

2.1. DESCRIPTION

Production of knitted polyester fabric for dress material; cotton knitted fabric; and dyeing, and printing of the finished product.

2.2. LOCATION

Lesotho

3. SADCC MARKET POSITION

The total SADCC market demand is 66.6 million square meters at present. With a capacity of 48. million square meters there is a shortfall of 18.5 million square meters.

4. TECHNOLOGY PACKAGE

The technology package would comprise the supply of plant and machinery for knitting and processing equipment for knitted fabrics. It would also include technical services, erection, commissioning of plant and the training of local personnel. The project would produce 2 million square metres of knitted fabric.

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5. **RAW MATERIAL**

The raw material consists of cotton yarn and polyester cotton.

6. **FIXED CAPITAL COST**

Building	US$ 0.6 million
Plant & Machinery	US$ 2.5 million

7. **TRADING LOGISTICS**

There is a shortfall of 1.5 million square metres of knitted polyester fabric in Lesotho as the country is not producing any knitted polyester/cotton fabric. There is also a shortfall of 18.5 million square metres in the SADCC region as a whole. The yarn is easily available in the SADCC region and can be obtained from Zimbabwe, where there is excess spinning capacity.

8. **IMPLEMENTATION SCHEDULE**

Detailed report	1 to 6 months
Agreement with donor country	6 to 12 months
Site allocation & building construction	12 to 18 months
Placement of order	12 to 14 months
Shipment of machinery	14 to 20 months
Arrival of machinery at site	20 to 21 months
Erection & commissioning	23 months
Trial run	24 months
Total time required for implementation	2 years

9. **INPUT REQUIRED FROM DONORS**

Knitting and processing equipment and other machinery, and technical services for the erection, commissioning, commercial production and training of local personnel.

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ESTABLISHMENT OF A KNITTING PROJECT IN MALAWI

1. INTRODUCTION

A significant increase in the indigenous production of woven and knitted textiles has been adopted by the SADCC Industry Ministers as an area of high priority in the successful further development of the Region. In particular, the need to boost production of 100% polyester and polyester blended textiles has been identified.

The regional plan of action incorporates the specific projects relating to polyester and polyester blended knitted and woven textiles which are now being elaborated for implementation.

The benefits to the SADCC Group would include:

- The strengthening of trade linkages between member countries.
- Self-sufficiency in an increasingly important sector of the textile market.
- Savings in foreign currency, currently used for importing such fabrics.
- Satisfaction of both current and anticipated demand for such textiles within the Region.

2. PROJECT

2.1. DESCRIPTION

Production of knitted polyester fabric for dress material and cotton knitted fabric; dyeing and printing of the finished product.

2.2. LOCATION

Malawi

3. MARKET POSITION

Malawi has an existing capacity of 0.5 million square meters against a demand of 2 million square meters, resulting in a shortfall of 1.5 million square meters. There is a total shortfall of 18.5 million square meters of polyester knitted fabrics in the SADCC region.

4. TECHNOLOGY PACKAGE

The technology package would consist of the supply of plant and machinery for knitting and processing equipment for knitted fabrics. It would also include technical services, erection, commissioning, commercial production and the training of local personnel.

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5. RAW MATERIAL

The raw material consisting of cotton yarn and polyester yarn would be available locally from David Whitehead Malawi Ltd.

6. PRODUCTION CAPACITY

The unit would be able to produce 2 million square meters of knitted polyester, polyester/cotton and cotton fabrics.

7. IMPLEMENTATION SCHEDULE

Detailed project report preparation	1 to 6 months
Agreement with donor country	6 to 12 months
Site allocation & building construction	12 to 18 months
Placement of order	12 to 14 months
Shipment of machinery	14 to 20 months
Arrival of machinery on site	20 to 21 months
Erection and commissioning	21 to 23 months
Trial run	24th month
Commercial production	24th month
Total time required for implementation	2 years

8. INPUT REQUIRED FROM DONORS

Plant for knitting and processing equipment and other machinery, and technical services for erection, commissioning, commercial production and training of local personnel.

9. FIXED CAPITAL

	LOCAL US$ million	FOREIGN US$ million
Building	0.6	
Plant & Machinery		2.5

ESTABLISHMENT OF A KNITTING PROJECT IN MOZAMBIQUE

1. INTRODUCTION

A significant increase in the indigenous production of woven and knitted textiles has been adopted by the SADCC Industry Ministers as an area of high priority in the successful further development of the Region. In particular, the need to boost production of 100% polyester and polyester blended textiles has been identified.

The regional plan of action incorporates the specific projects relating to polyester and polyester blended knitted and woven textiles which are now being elaborated for implementation.

The benefits to the SADCC Group would include:

- The strengthening of trade linkages between member countries.
- Self-sufficiency in an increasingly important sector of the textile market.
- Savings in foreign currency, currently used for importing such fabrics.
- Satisfaction of both current and anticipated demand for such textiles within the Region.

2. PROPOSED PROJECT

2.1. DESCRIPTION

Erection and commissioning of Sotricot Zatricot, Sotricot for production of Jacquard, interlock and other knitted materials for export.

2.2. LOCATION

Mozambique

3. SADCC MARKET POSITION

Against a demand of 66.6 million square meters for knitted fabric in the SADCC region there is a production of 48.1 million square meters, resulting in a shortfall of demand of 18.5 million square meters.

3.1. EXISTING CAPACITY

There are two knitting units which require erection and commissioning.

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4. TECHNOLOGY PACKAGE

The technology package would comprise:

a) erection and commissioning of machinery already imported

b) trial run and commercial production

c) procurement of raw material and export of finished product

d) procurement of additional equipment for finishing

The capacity of the project would be 3 million square metres.

5. RAW MATERIAL

The raw material would be imported from within the SADCC region and can be obtained from Zimbabwe.

6. PROJECT COST

Commissioning and additional finishing equipment	US$ 3.6 million

7. INTENDED IMPLEMENTATION SCHEDULE

Detailed report	1 to 5 months
Agreement with donor country	5 to 6 months
Erection & commissioning	6 to 11 months
Commercial production	11 to 12 months
Total time required	1 year

8. INPUT REQUIRED FROM DONORS

Supply of equipment, erection and commissioning of the unit, the procurement of raw material and export of the product with a buy-back guarantee.

ESTABLISHMENT OF A KNITTING PROJECT IN ZAMBIA

1. INTRODUCTION

A significant increase in the indigenous production of woven and knitted textiles has been adopted by the SADCC Industry Ministers as an area of high priority in the successful further development of the Region. In particular, the need to boost production of 100% polyester and polyester blended textiles has been identified.

The regional plan of action incorporates the specific projects relating to polyester and polyester blended knitted and woven textiles which are now being elaborated for implementation.

The benefits to the SADCC Group would include:

- The strengthening of trade linkages between member countries.
- Self-sufficiency in an increasingly important sector of the textile market.
- Savings in foreign currency, currently used for importing such fabrics.
- Satisfaction of both current and anticipated demand for such textiles within the Region.

2. PROPOSED PROJECT

2.1. DESCRIPTION

Production of knitted polyester fabric for dress material; cotton/polyester and cotton knitted fabric; dyeing and printing of the finished product.

2.2. LOCATION

Zambia

3. MARKET POSITION

Against Zambia's demand of 8.6 million square metres of knitted polyester fabric there is a capacity of 1.6 million square metres. This results in a shortfall of 7 million square metres. The total shortfall in the SADCC region is 18.6 million square metres.

4. TECHNOLOGY PACKAGE

The technology package would comprise the supply of plant and machinery for knitting, and processing equipment for knitted fabrics. It would also include technical services, the

erection and commissioning of plant and commercial production and training of local personnel.

5. RAW MATERIAL

The raw material, consisting of cotton yarn and polyester cotton, is available locally in Zambia and there would therefore be no foreign exchange requirement.

6. FIXED CAPITAL COST

Plant & Machinery	US$ 7.0 million
Building	US$ 1.5 million

7. PRODUCTION CAPACITY

The unit would be able to product 6 million square meters of knitted polyester/cotton, cotton and polyester fabrics.

8. IMPLEMENTATION SCHEDULE

Detailed report	1 to 6 months
Agreement with donor country	6 to 12 months
Site allocation & building construction	12 to 14 months
Placement of order	12 to 14 months
Shipment of machinery	14 to 20 months
Arrival of machinery at site	20 to 21 months
Erection and commissioning	21 to 23 months
Trial run	24th month
Commercial production	24th month
Total time required for implementation	2 years

9. INPUT REQUIRED FROM DONORS

Plant for knitting and processing equipment and other allied machinery. Technical services for erection, commissioning, commercial production. Training of local personnel.

ESTABLISHMENT OF A POWERLOOM PROJECT IN LESOTHO

1. INTRODUCTION

A significant increase in the indigenous production of woven and knitted textiles has been adopted by the SADCC Industry Ministers as an area of high priority in the successful further development of the Region. In particular, the need to boost production of 100% polyester and polyester blended textiles has been identified.

The regional plan of action incorporates the specific projects relating to polyester and polyester blended knitted and woven textiles which are now being elaborated for implementation.

The benefits to the SADCC Group would include:

- The strengthening of trade linkages between member countries.
- Self-sufficiency in an increasingly important sector of the textile market.
- Savings in foreign currency, currently used for importing such fabrics.
- Satisfaction of both current and anticipated demand for such textiles within the Region.

2. PROJECT

2.1. DESCRIPTION

Manufacture of cotton and polyester cotton fabrics, including shirting, suitings, safaris and dress material. Five units are proposed.

2.2. LOCATION

Lesotho

3. SADCC MARKET POSITION

With a population of 1.3 millions the expected consumption in Lesotho is 13 to 15 million square meters of fabrics including cotton, polyester/cotton, polyester knitted fabrics. All fabrics are currently imported.

4. TECHNOLOGY PACKAGE

Five units would produce fabric in decentralised sector. The unit would use cotton and cotton polyester yarn. The fabric can be processed in a centralised processing house.

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Plant and machinery would comprise power looms. Services would be required for the plant erection and commissioning of commercial production and the training of local personnel.

5. RAW MATERIAL

The raw material cotton and polyester/cotton yarn is available from within the SADCC region such as Zimbabwe.

6. PRODUCTION CAPACITY OF 5 UNITS

The five units would be able to produce 2 million square meters of fabric running at 90% efficiency.

7. IMPLEMENTATION SCHEDULE

Detailed project report preparation	1 to 6 months
Agreement with donor country	6 to 12 months
Site allocation & building constructon	12 to 18 months
Placement of order	12 to 14 months
Shipment of machinery	14 to 20 months
Arrival of machinery on site	20 to 21 months
Erection and commissioning	21 to 23 months
Trial run	23rd month
Commercial production	24th month
Total time required for implementation	2 years

8. INPUT REQUIRED FROM DONORS

Plant and machinery consisting of power looms, pirn winders and other allied machinery for weaving Machinery for processing consisting of boiler, stentor, high pressure dyer and printing equipment. Technical assistance to erect and commission the plant and ensure commercial production and the training of local personnel.

9. FIXED CAPITAL COST OF PROJECT

	LOCAL US$ million	FOREIGN US$ million
Building	0.18	
Plant & machinery		0.20
Total 5 units	0.90	1.00
Processing unit:		
Building	0.80	
Plant & machinery		0.21

ESTABLISHMENT OF A POWERLOOM PROJECT IN MALAWI

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1. INTRODUCTION

A significant increase in the indigenous production of woven and knitted textiles has been adopted by the SADCC Industry Ministers as an area of high priority in the successful further development of the Region. In particular, the need to boost production of 100% polyester and polyester blended textiles has been identified.

The regional plan of action incorporates the specific projects relating to polyester and polyester blended knitted and woven textiles which are now being elaborated for implementation.

The benefits to the SADCC Group would include:

- The strengthening of trade linkages between member countries.
- Self-sufficiency in an increasingly important sector of the textile market.
- Savings in foreign currency, currently used for importing such fabrics.
- Satisfaction of both current and anticipated demand for such textiles within the Region.

2. PROJECT

2.1. DESCRIPTION

Manufacture of cotton fabric dress material for ladies wear. Two units are proposed.

2.2. LOCATION

Malawi

3. MARKET POSITION

With a population of 5.8 million there is a total demand for 70 square million meters per annum. The demand is being locally met by David Whitehead Malawi Ltd. There is still however the possibility of starting a small industry in the rural areas since 90% of the population live in villages.

4. TECHNOLOGY PACKAGE

The unit would use cotton and cotton polyester yarn. The yarn is available locally. The unit would produce fabric in decentralised sector and supply cloth to the mills for processing.

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The technology package would consist of plant and machinery comprising powerlooms and allied machinery. Technical assistance would be required for erection, commissioning, and training of local personnel.

5. RAW MATERIAL

The cotton yarn and polycotton yarn is available locally.

6. PRODUCTION CAPACITY

The two units would produce 800,000 square meters of cloth running at 90% efficiency.

7. IMPLEMENTATION SCHEDULE

Preparation of detailed project report	1 to 6 months
Agreement with donor country	6 to 12 months
Site allocation & building construction	12 to 18 months
Placement of order	12 to 14 months
Shipment of machinery	14 to 20 months
Arrival of machinery at site	20 to 21 months
Erection & commissioning	21 to 23 months
Trial run	23 month
Commercial production	24 month
Total time required for implementation	2 years

8. INPUT REQUIRED FOR DONORS

Plant and machinery consisting of power looms, pirn winder and other allied machinery.

9. FIXED CAPITAL COST OF PROJECT

	LOCAL US$ million	FOREIGN US$ million
Building	0.18	
Plant & machinery		0.20
Total: 2 units	0.36	0.40
Employment	80	
Return on Investment	22%	

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ESTABLISHMENT OF A POWERLOOM PROJECT IN SWAZILAND

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1. INTRODUCTION

A significant increase in the indigenous production of woven and knitted textiles has been adopted by the SADCC Industry Ministers as an area of high priority in the successful further development of the Region. In particular, the need to boost production of 100% polyester and polyester blended textiles has been identified.

The regional plan of action incorporates the specific projects relating to polyester and polyester blended knitted and woven textiles which are now being elaborated for implementation.

The benefits to the SADCC Group would include:

- The strengthening of trade linkages between member countries.
- Self-sufficiency in an increasingly important sector of the textile market.
- Savings in foreign currency, currently used for importing such fabrics.
- Satisfaction of both current and anticipated demand for such textiles within the Region.

2. PROJECT

2.1. DESCRIPTION

Manufacture of cotton and polyester cotton fabrics, including shirting, suitings, safaris and dress material.

2.2. LOCATION

Swaziland

3. MARKET POSITION

With a population of 0.5 million, Swaziland's per capita consumption of fabric is approximately 20 square metres. This includes cotton, poly/cotton and polyester fabrics. All fabrics are currently imported. There is also a good ready-made garment market in Swaziland. The total demand for fabric is 10 million square metres.

4. TECHNOLOGY PACKAGE

The unit would produce basically cotton fabric such as ladies dress material, bedsheets, towels dyed and printed. Plant and machinery would comprise power looms and processing equipment. Services for the construction, commissioning of commercial production, and training of local personnel would also be required.

5. RAW MATERIAL

The raw material in the form of cotton yarn and poly/cotton yarn is available in SADCC countries such as Zimbabwe.

6. PRODUCTION CAPACITY OF THE UNIT

The unit would produce 800,000 square metres of fabric annually running at 90% efficiency.

7. IMPLEMENTATION SCHEDULE

Detailed project report preparation	1 to 6 months
Agreement with donor country	6 to 12 months
Site allocation & building construction	12 to 18 months
Placement of order	12 to 14 months
Shipment of machinery	14 to 20 months
Arrival of machinery on site	20 to 21 months
Erection and commissioning	21 to 23 months
Trial run	23rd month
Commercial production	24th month
Total time required for implementation	2 years

8. INPUTS REQUIRED FROM DONORS

Plant and machinery consisting of power looms, pirn winder and other allied machinery for weaving. Machinery for processing, consisting of boiler, stentor, high pressure dyer and printing equipment. Technical assistance for erection, commissioning, commercial production, and training of personnel.

9. FIXED CAPITAL COST OF PROJECT

	LOCAL US$ million	FOREIGN US$ million
Building	0.80	
Plant & Machinery		0.90

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ESTABLISHMENT OF A POWERLOOM PROJECT IN TANZANIA

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1. INTRODUCTION

A significant increase in the indigenous production of woven and knitted textiles has been adopted by the SADCC Industry Ministers as an area of high priority in the successful further development of the Region. In particular, the need to boost production of 100% polyester and polyester blended textiles has been identified.

The regional plan of action incorporates the specific projects relating to polyester and polyester blended knitted and woven textiles which are now being elaborated for implementation.

The benefits to the SADCC Group would include:

- The strengthening of trade linkages between member countries.
- Self-sufficiency in an increasingly important sector of the textile market.
- Savings in foreign currency, currently used for importing such fabrics.
- Satisfaction of both current and anticipated demand for such textiles within the Region.

2. PROJECT

2.1. DESCRIPTION

Manufacture of cotton and polyester cotton fabrics, including shirting, suitings, safaris and dress material. Ten units are proposed.

2.2. LOCATION

Tanzania

3. SADCC MARKET POSITION

The estimated domestic demand for textiles in Tanzania is currently 180 to 200 million square meters per annum. The current production capacity is 100 million square meters per annum but actual production is 72 million square meters, so that there is a shortfall of 108 million square meters including cotton and polyester cotton.

There is a demand in SADCC for 70 million square meters of polyester cotton fabrics and with an existing capacity of 37 million square meters there is a shortfall of 33 million square meters.

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4. TECHNOLOGY PACKAGE

The unit would use cotton and cotton polyester yarn to produce fabric on powerlooms. The fabric produced would be given to the mills in Tanzania for processing.

Plant and machinery would comprise power looms. Services would be required for erection, commissioning of commercial production, and the training of local personnel.

5. RAW MATERIAL

Cotton yarn is available locally in Tanzania from 10^s - 60^s count. Tanzania is in the process of putting up a plant at Morogoro which could also provide cotton polyester yarn.

6. TRADING LOGISTICS

With good rail and road links with Zambia, Tanzania can also export the fabric to Zambia, which has a shortfall of 11 million square meters in polyester cotton fabric.

7. PRODUCTION CAPACITY

The ten units would be able to produce 4 million square meters of fabric running at 90% efficiency.

8. IMPLEMENTATION SCHEDULE

Detailed project report preparation	1 to 6 months
Agreement with donor country	6 to 12 months
Site allocation & building construction	12 to 18 months
Placement of order	12 to 14 months
Shipment of machinery	14 to 20 months
Arrival of machinery on site	20 to 21 months
Erection and commissioning	21 to 23 months
Trial run	23rd month
Commercial production	24th month
Total time required for implementation	2 years

9. INPUT REQUIRED FROM DONORS

Plant and machinery consisting of power looms, pirn winders and other allied machinery.

10. FIXED CAPITAL COST OF PROJECT

	LOCAL US$ million	FOREIGN US$ million
Building	0.18	
Plant & machinery		0.20
Total: 10 units	1.80	2.00
Employment	450	
Return on Investment	25%	
Estimated turnover	US$ 40 million	

ESTABLISHMENT OF A POWERLOOM PROJECT IN ZAMBIA

1. INTRODUCTION

A significant increase in the indigenous production of woven and knitted textiles has been adopted by the SADCC Industry Ministers as an area of high priority in the successful further development of the Region. In particular, the need to boost production of 100% polyester and polyester blended textiles has been identified.

The regional plan of action incorporates the specific projects relating to polyester and polyester blended knitted and woven textiles which are now being elaborated for implementation.

The benefits to the SADCC Group would include:

- The strengthening of trade linkages between member countries.
- Self-sufficiency in an increasingly important sector of the textile market.
- Savings in foreign currency, currently used for importing such fabrics.
- Satisfaction of both current and anticipated demand for such textiles within the Region.

2. PROJECT

2.1. DESCRIPTION

Manufacture of cotton and polyester cotton fabrics, including shirting, suitings, safaris and dress material. Ten units are proposed.

2.2. LOCATION

Zambia

3. SADCC MARKET POSITION

Zambia has an expected demand of 75 to 80 million square metres of fabric, including 18 million square metres of polyester cotton fabrics. Zambia is currently importing 4.5 million square metres of fabric - basically of the polyester cotton variety. With the new unit coming at Mulungushi and expansion of KTZ at Kafue there would be a shortfall in demand of 5 to 8 million square metres.

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4. TECHNOLOGY PACKAGE

The units would use cotton, cotton polyester yarn produced in the mills to produce fabric on power looms. The fabric produced would be given to the mills in Zambia for processing. The KTZ mill in Kafue after expansion would have spare processing capacity to the tune of 25% of their installed (expanded) capacity.

Capital equipment required mainly power looms. Services required cover erection, commissioning of commercial production, and the training of local personnel.

5. RAW MATERIAL

Cotton yarn is locally available between 10^s to 40^s count. The cotton polyester yarn would be available locally after the expansion of the KTZ mills at Kafue.

6. PRODUCTION CAPACITY OF 10 UNITS

The ten units would be able to produce 4 million square meters of fabric running at 90% efficiency.

7. IMPLEMENTATION SCHEDULE

Detailed project report preparation	1 to 6 months
Agreement with donor country	6 to 12 months
Site allocation & building construction	12 to 18 months
Placement of order	12 to 14 months
Shipment of machinery	14 to 20 months
Arrival of machinery on site	20 to 21 months
Erection and commissioning	21 to 23 months
Trial run	23rd month
Commercial production	24th month
Total time required for implementation	2 years

8. INPUT REQUIRED FROM DONORS

Plant and machinery consisting of power looms, pirn winder and other allied machinery.

9. FIXED CAPITAL COST OF PROJECT

	LOCAL US$ million	FOREIGN US$ million
Building	1.5	
Plant & Machinery		2.00
Employment	450	
Return on Investment	23%	
Estimated turnover	US$ 40 million	

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NEW P.O.Y./TEXTURISED POLYESTER PLANT
IN MOZAMBIQUE

1. INTRODUCTION

The indigenous production of polyester continuous filament yarn from polymer chips has been adopted by the SADCC Industry Ministers as a project with high priority in the successful development of the Region. The regional plan of action incorporates three specific projects relating to P.O.Y. and texturised polyester which are now being elaborated for implementation.

The benefits to the SADCC Group of regional industrial co-operation in this field includes:-

- import substitution of approximately US$ 11 million p.a., representing foreign currency used for the import of either Polyester Oriented Yarn (P.O.Y.) or texturised polyester.

- trading linkages within SADCC with a number of P.O.Y./Texturised yarn producing countries supplying the requirements of others

- assurance of supply of the necessary basic yarns for the existing or projected knitting and weaving sectors within SADCC

- satisfaction both of current and anticipated demand for such yarns and textiles within the Region.

2. PROJECT

Production of 2,500 t.p.a. of texturised continuous filament polyester yarn from polymer chips at or adjacent to the projected revitalised Zatricot knitting plant at Zambezia, Mozambique.

3. PRODUCT RANGE

The proposed plant should be capable of producing:

75* denier texturised polyester yarn
150* denier texturised polyester yarn
300* denier texturised polyester yarn

in a product range yet to be determined but probably averaging 150* denier.

(*Note the deniers are given according to common usage in the textile trade. In fact, the actual (measured) deniers produced will be approximately 10% higher than the figures quoted.)

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4. MARKET POSITION

The total SADCC market demand for texturised polyester yarn has been identified as approximately 19,000 tonnes p.a. Currently Tanzania is the only SADCC country extruding and texturising T.P.Y. at a production rate of 2,500 t.p.a., which will rise to a total of 7,500 t.p.a. when further plant is commissioned in 1983. At that time a shortfall of some 2,500 tpa will still remain.

With the revitalisation of the Zatricot plant, a consumption of some 2,000 tpa of T.P.Y. is anticipated, leaving 20% of the proposed production for export to other SADCC countries with knitting plants but no domestic production of T.P.Y.

5. EXISTING CAPACITY

There is no existing capacity for the extrusion and texturising of polyester continuous filament yarn within Mozambique.

6. TECHNOLOGY PACKAGE

This involves:

- supply of plant and machinery for the extrusion of Partially Oriented Yarn (POY) from polymer chips
- associated civil engineering and building work (as necessary), machine erection and commissioning
- provision of technical knowhow and training for staff and operatives. The establishment of quality control customs and standards.

7. RAW MATERIAL SITUATION

Currently there would be a necessity to import polymer chips from suppliers external to both Tanzania and SADCC. However, a study is to be undertaken which will examine the feasibility of indigenous production of polymer chips within the SADCC region, probably in Zambia.

It is assumed that other minority raw materials (e.g. yarn lubricants/finishes) will need to be imported from outside SADCC.

8. PROJECT COST

Currently estimated at:

		US$ million
Equipment:	POY production	2.1
	Draw texturising	2.5
Civil engineering, machine erection and commissioning, utilities etc.		4.4
Total erected cost		9.0

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9. TRADING LOGISTICS

With the bulk of the production (some 80%) assigned to the adjacent Zatricot knitting plant, transport of finished goods is not a major problem. The yarn produced for export to other neighbouring SADCC countries should present few problems with regard to transport.

Similarly the supply of raw materials (e.g. polymer chips) should present few problems with Mozambique's long coastline and port facilities (for imports from outside SADCC) and rail connections with Zambia (should the projected polymerisation plant be implemented.)

10. PROMOTING INSTITUTION

Ministry of Industry and Energy Development, Maputo, Mozambique.

11. INTENDED IMPLEMENTATION SCHEDULE

Presentation of documents to donor countries and detailed project report preparation	1 to 6 months
Detailed feasibility study, planning, design, negotiation of financing	1 year
Civil engineering, services, machine installation, commissioning	1 year

12. INPUTS REQUIRED FROM DONORS

Technical and financial co-operation for the implementation of the project.

NEW POLYESTER/TEXTURISED POLYESTER PLANT
IN TANZANIA

1. INTRODUCTION

The indigenous production of polyester continuous filament yarn from polymer chips has been adopted by the SADCC Industry Ministers as a project with high priority in the successful development of the Region. The regional plan of action incorporates three specific projects relating to P.O.Y. and texturised polyester which are now being elaborated for implementation.

The benefits to the SADCC Group of regional industrial co-operation in this field includes:-

- import substitution of approximately US$ 11 million p.a., representing foreign currency used for the import of either Polyester Oriented Yarn (P.O.Y.) or texturised polyester.

- trading linkages within SADCC with a number of P.O.Y./Texturised yarn producing countries supplying the requirements of others

- assurance of supply of the necessary basic yarns for the existing or projected knitting and weaving sectors within SADCC

- satisfaction both of current and anticipated demand for such yarns and textiles within the Region.

2. PROPOSED PROJECT

Production of 2,500 t.p.a. of texturised filament polyester yarn from polymer chips at a site yet to be designated in Tanzania.

3. PRODUCT RANGE

The proposed plant should be capable of producing:

75* denier texturised polyester yarn
150* denier " " " "
300* denier " " " "

in a product mix yet to be determined but probably averaging 150* denier.

(* Note: the denier are given according to common usage in the textile trade. In fact the actual (measured) deniers produced will be approximately 10% higher than the figures quoted.)

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4. MARKET POSITION AND EXISTING CAPACITY

The total SADCC market demand for texturised polyester yarn (T.P.Y.) has been identified as approximately 19,000 t.p.a. Currently Tanzania is the only SADCC country which is extruding and texturising T.P.Y. at a 2,500 t.p.a. plant operated by Sunflower at Arusha. Although a further 5,000 tpa capacity is due on stream from a plant under construction by JV. Synthetics, a shortfall between demand and production of some 11,000 tpa within the SADCC Region and 2,000 tpa within Tanzania itself is predicted.

Thus, the proposed new plant is intended to satisfy Tanzania's remaining demand as well as providing yarn for other SADCC countries with knitting plants, but no domestic production of T.P.Y.

5. TECHNOLOGY PACKAGE

This involves:

- supply of plant and machinery for the extrusion of partially oriented yarn (P.O.Y.) from polymer chips.

- associated civil engineering and building work machine erection and commissioning

- provision of technical know-how and training for staff and operatives. The establishment of quality control customs and standards.

6. RAW MATERIAL SITUATION

Currently there would be a necessity to import polymer chips from suppliers external to both Tanzania and SADCC. However, a study is to be undertaken which will examine the feasibility of indigenous production of polymer chips within the SADCC region, probably in Zambia.

It is assumed that other minority raw materials (e.g. yarn lubricants/finishes) will need to be imported from outside SADCC.

7. PROJECT COST

Currently estimated at:

	US$ million
Equipment: POY production	2.1
Draw texturising	2.5
Civil engineering, machine erection and commissioning, utilities etc.	4.4
Total erected cost	9.0

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8. TRADING LOGISTICS

An adequate system of road and rail linkages exists within Tanzania to allow satisfaction of the predominantly domestic market requirement for T.P.Y. Similarly, good transport exists beween Tanzania and the neighbouring SADCC countries who are likely export customers.

Similarly, the supply of raw materials (e.g. polymer chips) is equally easy whether they are imported from outside SADCC (cg via the port of Dar-es-Salaam) or from the projected polymerisation plant in Zambia.

9. PROMOTING INSTITUTION

Ministry of Industries, Dar-es-Salaam, Tanzania

10. INTENDED IMPLEMENTATION SCHEDULE

Presentation of documents to donor countries and detailed project report preparation	1 to 6 months
Detailed feasbility study, planning, design negotiation of financing	1 year
Civil engineering, services, machine, installation, commissioning	1 year

11. INPUTS REQUIRED FROM DONORS

Technical and financial co-operation for the implementation of the project.

FURTHER EXTENSION TO THE POLYESTER BLEND
INTEGRATED WEAVING PLANT IN ZAMBIA

1. INTRODUCTION

The indigenous production of polyester continuous filament yarn from polymer chips has been adopted by the SADCC Industry Ministers as a project with high priority in the successful development of the Region. The regional plan of action incorporates three specific projects relating to P.O.Y. and texturised polyester which are now being elaborated for implementation.

The benefits to the SADCC Group of regional industrial co-operation in this field includes:-

- import substitution of approximately US$ 11 million p.a., representing foreign currency used for the import of either Partially Oriented Yarn (P.O.Y.) or texturised polyester.
- trading linkages within SADCC with a number of P.O.Y./ Texturised yarn producing countries supplying the requirements of others
- assurance of supply of the necessary basic yarns for the existing or projected knitting and weaving sectors within SADCC
- satisfaction both of current and anticipated demand for such yarns and textiles within the Region.

2. PROPOSED PROJECT

To further extend the planned production of polyester blend woven fabrics at K.T.Z., Kafue, Zambia.

3. PRODUCT RANGE

Two main types of fabrics are due to be produced in the current expansion programme and it is envisaged that further quantities of similar fabrics will be required as follows:

	Production (million sq. m.) p.a.
a) 65/35 polyester/cotton in 1/36's cc: sheeting (120-130 gm/m^2)	4.6
b) 65/35 polyester/cotton in 2/36's cc and 1/36's cc: Safari suits and slacks (250-260 gm/m^2)	0.4

A possibility also exists that additional open end spinning capacity will be required to that already planned to utilise the additional waste fibre in coarse count yarn production.

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4. MARKET POSITION

The total SADCC demand for polyester blended woven fabric by 1983/84 has been identified as approximately 70 million sq. metres p.a. By that time, the production of such fabrics within SADCC will be only 29 million sq. metres p.a. from existing and proposed mills in Zimbabwe, Malawi and Zambia. Although it is proposed to develop capacity for 8 million square metres p.a. in Mozambique and 21 million sq. metres p.a. in Tanzania, a shortfall of 12 million sq. metres p.a. is still expected unless further capacity is installed.

KTZ have currently embarked on an expansion programme to double their current capacity of 12-13 million square metres p.a., of which some 5.5 million sq. metres p.a. will be in 67/33 polyester/cotton blends. This should then cater for 25-30% of Zambia's anticipated demand for such products. The new production is due on stream in 1983.

An opportunity exists to reduce the above shortfall by a further extension to the existing expansion.

5. EXISTING CAPACITY

By 1983, KTZ will have capacity for 24-26 million square metres of woven fabric, of which 5.5 million square metres will be in 67/33 polyester/cotton blends. Sufficient dyeing/printing and finishing capacity will be available for a further 5 million sq. metres p.a. of polyester/cotton fabric.

6. TECHNOLOGY PACKAGE

With dyers/finishing equipment available from the current extension, the additional proposed extension would only require further fibre processing/blending, spinning and weaving capacity. Significant civil engineering and building work may not be required if the opportunity is taken to replace old, slower looms with higher speed machines (processing more fabric in a given floor space).

The technology package involves:

- Supply of plant for the additional spinning and weaving capacity required

- Associated civil engineering and building work (as necessary), machine erection and commissioning

- Provision of technical know-how and training of staff and operatives (if required, bearing in mind that KTZ will by then have experience of production of polyester/cotton fabrics.)

7. RAW MATERIALS SITUATION

Zambia is self-sufficient in cotton fibre production but its quality is of a somewhat inferior quality (e.g. to that produced in Zimbabwe and Tanzania) and supplies may need to be taken from neighbouring countries for blending with polyester.

Polyester staple fibre (PES) currently requires to be imported. However, a feasibility study is to be made into the production of PES within the SADCC region, probably in Zambia itself. If approved, this could be on stream by 1986.

Most of the required textile chemicals, auxiliaries and dyes will need to be imported, as at present.

8. PROJECT COST

Currently estimated at US$ 10 million.

9. TRADING LOGISTICS

A good system of road and rail linkages exists within Zambia to allow satisfaction of the predominantly domestic market.

Similarly, the supply of raw materials (e.g. polyester fibre, cotton and associated dyes and chemicals) is equally satisfactory, using existing routes, or, in the case of polyester staple, from the projected plant in Zambia itself.

10. PROMOTING INSTITUTION

Ministry of Planning, Lusaka, Zambia

11. INTENDED IMPLEMENTATION SCHEDULE

Presentation of documents to donor countries and detailed project report preparations	1 to 6 months
Detailed feasibility study, planning design negotiation of financing	½ year
Civil engineering, services, machine erection and commissioning	1½ years

12. INPUTS REQUIRED FROM DONORS

Technical and financial co-operation for the implementation of the project.

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NEW POLYESTER (P.O.Y.) PLANT IN ZIMBABWE

1. INTRODUCTION

The indigenous production of polyester continuous filament yarn from polymer chips has been adopted by the SADCC Industry Ministers as a project with high priority in the successful development of the Region. The regional plan of action incorporates three specific projects relating to P.O.Y. and texturised polyester which are now being elaborated for implementation.

The benefits to the SADCC Group of regional industrial co-operation in this field includes:-

- import substitution of approximately US$ 11 million p.a., representing foreign currency used for the import of either Polyester Oriented Yarn (P.O.Y.) or texturised polyester.

- trading linkages within SADCC with a number of P.O.Y./Texturised yarn producing countries supplying the requirements of others

- assurance of supply of the necessary basic yarns for the existing or projected knitting and weaving sectors within SADCC

- satisfaction both of current and anticipated demand for such yarns and textiles within the Region.

2. PROJECT

Production of 6,000 t.p.a. of partially oriented continuous filament polyester yarn (P.O.Y.) from polymer chips to be located at or adjacent to Cone Textiles (Pvt) Ltd's draw/texturising plant near Harare, Zimbabwe.

3. PRODUCT RANGE

The proposed plant should be capable of producing:

115 denier	POY	(for	draw/texturising	to	75 denier
222 denier	"	"	"	"	"	150 denier
450 denier	"	"	"	"	"	300 denier

in approximately equal proportions by weight.

The majority of the output (eg 75%) will be draw/texturised on-site by Cone Textiles for internal use or sale, the remainder being sold to other draw/texturisers.

4. MARKET POSITION

The total SADCC market demand for POY/texturised polyester has been identified as approximately 19,000 tonnes p.a. The

extrusion of POY from imported polymer chips is currently 2,500 t.p.a. due to rise to 7,500 t.p.a. by 1983 (all in Tanzania). There is no POY extrusion capacity indigenous to Zimbabwe.

The current demand for P.O.Y. in Zimbabwe is estimated to be 5,300 t.p.a. and is expected to rise to approaching 6,000 t.p.a. by 1985. This will be mostly required by Zimbabwean draw/texturising companies (e g. Cone Textiles (Pvt) Ltd., Texturised Yarns (Pvt) Ltd), mainly for internal consumption, with some output for other SADCC countries (e.g. Everest Mills, Botswana).

5. EXISTING CAPACITY

There is no existing capacity for P.O.Y. extrusion within Zimbabwe.

6. TECHNOLOGY PACKAGE

This involves:

- supply of plant and machinery for P.O.Y. extrusion from polymer chips
- associated civil engineering and building work (as necessary), machine erection and commissioning
- provision of technical know-how and training for staff and operatives. The establishment of quality control customs and standards.

7. RAW MATERIAL SITUATION

Currently there would be a necessity to import polymer chips from suppliers external to both Zimbabwe and SADCC. However, a study is to be undertaken which will examine the feasibility of indigenous production of polymer chips within the SADCC region, probably in Zambia.

It is assumed that other minority raw materials (e.g. yarn lubricants/finishes) will need to be imported from outside SADCC.

8. PROJECT COST

Currently estimated at:

	US$ million
Equipment for POY production	4.6
Civil engineering, machine erection and commissioning, utilities etc.	4.4
Total erected cost	9.0

9. TRADING LOGISTICS

A good system of road and rail linkages exists from the proposed site near Harare to potential customers within Zimbabwe.

Similarly, the supply of raw materials (e.g. polymer chips) will follow the same routes as those currently used for importing fibre and yarn. If the proposed polymerisation plant is, in fact, commissioned in Zambia, the supply route to Zimbabwe will be very short.

10. PROMOTING INSTITUTION

Ministry of Industry and Energy Development, Harare, Zimbabwe.

11. INTENDED IMPLEMENTATION SCHEDULE

Presentation of documents to donor countries and detailed project report preparation	1 to 6 months
Civil engineering, services, machine installation, commissioning	1 year

12. INPUTS REQUIRED FROM DONORS

Technical and financial co-operation for the implementation of the project.

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REVITALISATION OF A POLYESTER BLEND INTEGRATED WEAVING PLANT IN TANZANIA

1. INTRODUCTION

The indigenous production of polyester continuous filament yarn from polymer chips has been adopted by the SADCC Industry Ministers as a project with high priority in the successful development of the Region. The regional plan of action incorporates three specific projects relating to P.O.Y. and texturised polyester which are now being elaborated for implementation.

The benefits to the SADCC Group of regional industrial co-operation in this field includes:-

- import substitution of approximately US$ 11 million p.a., representing foreign currency used for the import of either Polyester Oriented Yarn (P.O.Y.) or texturised polyester.

- trading linkages within SADCC with a number of P.O.Y./Texturised yarn producing countries supplying the requirements of others

- assurance of supply of the necessary basic yarns for the existing or projected knitting and weaving sectors within SADCC

- satisfaction both of current and anticipated demand for such yarns and textiles within the Region.

2. PROPOSED PROJECT

To convert the currently 100% cotton integrated weaving plant at Morogoro, Tanzania, to the production of polyester blended fabrics and yarns at the full capacity originally planned.

3. PRODUCT RANGE

In the original plan, the following product range was envisaged:

Article	Blend	Width (cm)	Weight (gm/m^2)	Production pa (million sq m)
Calico bleached	67/33 polyester/cotton	90	138	2.09
Poplin, printed	" "	90	147	4.21
Poplin, "	" "	90	147	2.19
Shirting, bleached	" "	90	127	0.70
Shirting, "	" "	90	127	1.45
Twill, bleached	" "	150	263	0.39
" dyed	" "	150	263	2.90
Suiting, dyed	67/33 polyester/rayon	150	199	7.47
		Total fabric		21.38

67/33 Polyester/rayon for outside sale 650 tonnes

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4. MARKET POSITION

The total SADCC demand for polyester blended woven fabric by 1983/84 has been identified as approximately 70 million sq. metres p.a. By that time, the production of such fabrics within SADCC will be only 29 million sq metres p.a. from existing and proposed mills in Zimbabwe, Malawi and Zambia. Although it is proposed to develop capacity for 8 million sq metres p.a. in Mozambique, a shortfall of 33 million sq. metres p.a. is still expected unless further capacity is installed.

An opportunity to reduce this shortfall by an estimated 21 million sq. metres p.a. presents itself if the existing project at Morogoro is revitalised. This was planned and approved some years ago following a feasibility study made by the World Bank/I.D.A., following its identification by the Gherzi Textile Organisation, Switzerland as a project to reduce imports and achieve self-sufficiency in textiles. The original total financing of the Morogoro Project was estimated at US$ 107 million. However, with construction and commissioning of the mill at an advanced stage, a shortfall of approximately US$ 20 million has been identified and consequently the original objectives have been modified to a more modest project of producing a smaller quantity of only 100 tpa cotton cloth, with the polyester blend project deferred. The additional financing is required principally for the purchase of fabric dyeing/finishing equipment and imported raw materials.

5. EXISTING CAPACITY

None for polyester blended textile production (e.g. specialised dyeing/finishing equipment) but fibre processing, spinnng, yarn preparation and weaving and most of the civil engineering and services are available.

6. TECHNOLOGY PACKAGE

This involves:

- supply of plant for polyester blend fabric dyeing and finishing

- associated civil engineering and building work (as necessary), machine erection and commissioning

- provision of technical knowhow and training of staff and operatives. The establishment of quality control systems and standards.

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7. RAW MATERIAL SITUATION

Tanzania is self-sufficient in cotton production which is of good quality and well suited for use in blend with polyester.

Polyester staple fibre (PES) currently requires to be imported. However, a feasibility study is to be made into the production of PES within the SADCC region, probably in Zambia. If approved, this could be on stream by 1986.

Most of the required textile chemicals, auxiliaries and dyes will need to be imported, as at present.

8. PRESENT COST

The original estimate for the total financing of the Morogoro project made by the World Bank/I.D.A. was:

	US$ million
Basic cost	65.7
PLUS contingencies	78.9
PLUS working capital	93.4
PLUS interest during construction	104.7
PLUS technical assistance	106.9
Estimate return on investment	19%

It has now been estimated by the National Textile Corporation of Tanzania (TEXCO) that a further US$ 20 million is needed to complete the project as originally defined.

9. TRADING LOGISTICS

An adequate system of road and rail linkages exists within Tanzaniato allow satisfaction of the predominantly domestic market.

Similarly, the supply of raw materials (e.g. polyester fibre, cotton, viscose and associated dyes and chemicals) is equally easy whether they are imported from outside SADCC (e.g. via Dar-es-Salaam port) or, in the case of polyester staple, from the projected plant in Zambia.

10. PROMOTING INSTITUTION

Ministry of Industries, Dar-es-Salaam, Tanzania.

11. INTENDED IMPLEMENTATION SCHEDULE

Presentation of documents to donor countries and detailed project report preparation	1 to 6 months
Delivery of machines, installation and commissioning	1 to 1½ years

12. INPUTS REQUIRED FROM DONORS

Technical and financial co-operation for the implementation of the project.

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NEW POLYESTER STAPLE FIBRE PLANT IN ZIMBABWE

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1. INTRODUCTION

The indigenous production pf polyester staple fibre from monomers has been recommended for further study by the SADCC Industry Ministers as a project with potentially high priority in the successful development of the Region. A SADCC Project regional plan covering (1) the manufacture of synthetic and cotton/synthetic blended textiles and (2) the production of synthetic fibres and yarns, has already been prepared by the SADCC member countries. The regional plan of action incorporates specific projects relating to polyester staple fibre which are now being elaborated for further study.

The benefits to the SADCC Group would be:-

- import substitution of over US$ 15 million, representing the saving in foreign currency between importing polyester staple fibre/polymer chips and the basic monomers with which to produce these

- trading linkages in the SADCC with the requirements for polymer chips and polyester staple in other countries in the Region being met

- assurance of supply of the necessary basic fibres for the existing or projected spinning/weaving sectors within SADCC

- satisfaction of both current and anticipated demand for polymer chips and staple fibre within the Region.

2. PROJECT

Production of 500 tpa of polyester staple fibre 1.5 denier x 38 semi-dull.

3. MARKET

The market for polyester fibre has been fully researched to establish both local and export future trends.

In Zimbabwe the users of polyester fibre are as follows:

1. For Blending with Cotton

David Whitehead Textiles	- Chegutu
Cone Textiles Limited	- Harare
Gatooma Textiles	- Kadoma
Cotton Printers	- Bulawayo
Karina Textiles	- Norton and Mutare

2. For Blending with other Synthetic fibres

Consolidated Textiles	- Bulawayo
Marina Textiles	- Mutare
Twine and Cordage	- Harare

3. Re-Orientated Yarn for texturising

Cone Textiles	- Harare
Textured Yarns	- Bulawayo

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3.1. TOTAL IMPORTS OF SYNTHETIC FIBRES

These are as follows:

Year	Value Z$,000
1978	1,981,000
1979	3,576,000
1980	4,959,000
1981	5,008,000

Of the above imports, the project will provide import substitution of most synthetic fibres classed as follows:

Class	Imported 1980		1981	
26691 Viscose Rayon	394	348,000	630	638,000
Staple fibre	-	-	-	-
26694 Acrylic fibre	782	779,000	709	700,000
26696 Polyester	1,115	1,332,000	997	1,274,000
26699 Other Synthetic fibres	3,309	2,290,000	3,741	2,184,000
	5,555	4,749,000	6,077	4,796,000

4. SADCC TRADING LOGISTICS

The textile mills in the region import polyester fibre to the same specifications as used in Zimbabwe from various suppliers around the world at prices comparable to those expected to be quoted by the proposed project.

5. PROJECT DETAILS

1. Technical Partner	- EMS Inventa AG of Switzerland
2. Contractors	- EMS Inventa AG of Switzerland with Partnership of Klockner INA GmbH of West Germany
3. Site	- Norton - Town is equidistant to all end users of fibre
4. Employment	- The project will initially employ 48 skilled and 21 unskilled. The suppliers of the equipment will provide training for all staff at every stage of project development.
5. Raw materials	- Polyester pes chips, spin finish (oil) and packaging materials.
6. Production	- Output 16,640 kg per day for d. Tax 1.7 or 3.3 (dependent on end use)
	- Fibre waste approximately 300 tpa.
	- Total net production 5,500 tpa.

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7. Financial Details

Capital	Z $
Land	75,000
Buildings	500,000
Equipment	4,850,000
Transport	500,000
Sundries	200,000
	6,125,000

8. Operating Costs per annum

	Z $	
Raw materials	4,601,00	(imported)
Labour overheads	2,250,000	
	6,851,000	

9. Sales income - local or export

	Z $
5,000 tonnes @ Z$1.60kg	8,000,000
300 tonnes @ Z$0.20kg	60,000
	8,060,000

(per month Z$ 671,666)

10. Profit

Operating profit before tax Z$1,245,000 p.a.
(per month Z$ 103,750)

4. PROJECT PLAN

Stage 1	- Basic research to qualify all information prepared.
Stage 2	- Base data prepared for construction selection of local and external capital inputs.
Stage 3	- Commissioning of project
Stage 4	- Long term consultancy

L.A.C.H. Consultants (Pvt) Limited - Harare.

5. EQUITY PARTICIPATION

- The Zimbabwe Government (through appropriate agency)
- Mazamo Investment (Pvt) Limited, Harare
- Employees of project
- The textile producers of yarn in Zimbabwe
- The technical partners (if need be)

6. PLANT

The plant will be a "turn-key" project covering the following equipment:

- chips transport and drying
- chips meeting
- spinning section for staple fibres
- fibre line

6.1. UTILITY PLANTS

- air conditioning
- demineralised water
- compressed air
- energy unit

6.2. OTHER EQUIPMENT

- electrical
- piping/instruments
- workshop
- insulation/painting
- laboratory

6.3. ENGINEERING SERVICES

- process
- detailed
- front end
- erection supervision
- start-up supervision

7. FINANCING

The financial proposals have to be determined and amounts of borrowing will be subject to shares issued. Calculations are based on the plant, buildings and land being purchased upon loan finance; repayable within five years for plant and within ten years for buildings.

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POLYESTER POLYMERISATION AND STAPLE FIBRE PLANT
IN ZAMBIA

1. INTRODUCTION

The indigenous production of polyester polymer and staple fibre from monomers has been recommended for further study by the SADCC Industry Ministers as a project with potentially high priority in the successful development of the Region. The regional plan of action incorporates a specific project relating to polymer chip and polyester staple fibre which is now being elaborated for further study.

The benefits to the SADCC Group would be:-

- import substitution of over US$ 15 million, representing the saving in foreign currency between importing polyester staple fibre/polymer chips and the basic monomers with which to produce these

- trading linkages in the SADCC with the requirements for polymer chips and polyester staple in other countries in the Region being met

- assurance of supply of the necessary basic fibres for the existing or projected spinning/weaving sectors within SADCC.

- satisfaction of both current and anticipated demand for polymer chips and staple fibre within the Region

2. PROPOSED PROJECT

Production of up to 10,000 tpa of polyester staple fibre and up to 20,000 tpa of polyester polymer chips at a site yet to be designated in Zambia.

3. PRODUCT RANGE

The proposed plant should be capable of producing:

- 1.5 denier, 38-40 mm, semi-dull (i.e. delustred), crimped, polyester staple fibre (with a facility for 2.5-3.0 denier 55mm fibre, if required). Up to 10,000 tpa.

- polyester polymer (polyethylene texturised - P.E.T.) chips suitable for use by P.O.Y./ texturised polyester spinners in other SADCC countries. Up to 20,000 tpa.

4. MARKET POSITION

The total SADCC market demand for polyester staple fibre (P.E.S.) has been identified as just under 8,000 tpa by 1985/86. However, if certain current constraints on demand (particularly in the domestic markets of Angola and Mozambique) are removed, a requirement of up to 10,000 tpa of PES is foreseen. Currently all PES has to be imported into the SADCC region.

With respect to PES chips for extrusion to continuous filament partially oriented yarn (P.O.Y.) capacity will be installed by 1983 (in Tanzania) which will require a supply of 7,500 tpa of PES chips. However, three further POY/texturised polyester plants with a combined capacity of 11,000 tpa have been included in the regional plan (Annex 1) which would lead to a total combined demand for polymer chips of nearly 19,000 tpa by 1985.

By virtue of its central location within SADCC, relatively cheap and reliable power, communications network and pool of technically competent manpower, Zambia has been selected as a likely site for this proposed project within SADCC.

The principal SADCC customers for P.E.S. will be:

		Demand 1985/86 tonnes p.a.
Zimbabwe:	David Whitehead Ltd) Cone Textiles (Pvt) Ltd	2,100
Malawi :	David Whitehead Ltd	800
Tanzania:	Texco (proposed)	3,000
Mozambique:	Riopele (proposed)	800
Zambia :	K.T.Z.	1,100

The principal SADCC customers for PES chips will be:

		Demand 1985/86 tonnes p.a.
Tanzania :	Sunflag J V Synthetics	10,000
Zimbabwe :	Cone Textiles (proposed)	6,000
Mozambique:	Zambezia (proposed)	2,500

5. EXISTING CAPACITY

Neither PET chips or PES are produced within the SADCC region.

6. TECHNOLOGY PACKAGE

This involves:-

- the supply of plant and machinery for the polymerisation of imported monomers with a total capacity up to 30,000 t.p.a.

- The output of this polymer to be in two forms:

- up to 10,000 tpa of molten polymer to be fed directly to an on-site P.E.S. extrusion/ spinning plant

- up to 20,000 tpa of P.E.T. chips to be shipped to POY/texturised polyester spinning plants within SADCC

- the supply of plant and machinery for the extrusion spinning of molten polymer into tow, stretching, annealing, crimping, cutting and baling

- associated civil engineering and building work, machine erection and commissioning

- provision of technical knowhow and training to staff and operatives. The establishment of quality control systems and standards.

7. RAW MATERIAL SITUATION

Currently there would be a necessity to import monomers from suppliers external to both Zambia and SADCC. However, a study is to be undertaken which will examine the feasibility of indigenous production of monomers within the SADCC region, as part of a wider petro-chemical complex in Angola.

It is assumed that other minority raw materials (e.g. fibre finishes) will need to be imported from outside SADCC.

8. PROJECT COST

Currently estimated at:

	US$ million
Equipment: polymer production	11.2
PES production	6.3
Civil engineering, machine, erection, utilities commissioning etc	17.5
Total installed cost	35.0

9. TRADING LOGISTICS

A good system of road and rail linkages exists within Zambia itself and to neighbouring customer countries (Zimbabwe, Malawi, Tanzania and Mozambique.)

Similarly, the supply of raw materials (e.g. monomers) should present no problems whether they are imported from outside SADCC or from the possible petro-chemical complex in Angola.

10. PROMOTING INSTITUTION

Ministry of Planning, Lusaka, Zambia

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11. INTENDED IMPLEMENTATION SCHEDULE

Presentation of documents for further study	1 to 6 months
Presentation of documents to donor countries and detailed project report preparations	6 months
detailed feasibility study, planning design, negotiation of financing	2 years
civil engineering, services, machine, installation, commissioning	2 years

12. INPUTS REQUIRED FROM DONORS

Technical and financial co-operation for the implementation of the further study.

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DEVELOPMENT OF A PETRO-CHEMICAL COMPLEX IN ANGOLA

1. INTRODUCTION

The petro-chemical industry has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. A regional synthetic textiles plan has already been prepared by the SADCC member countries, the implementation of which is projected to lead to a large growth in the demand for polyester fibre and yarn. The SADCC region is also an increasingly significant market for a wide range of chemical and plastic end-products based on petro-chemicals. A detailed study of the feasibility of establishing a petro-chemical complex in the region is, therefore, to be undertaken.

The benefits to the SADCC Region if industrial co-operation in the development of the petro-chemical industry would be:

- saving and earning of foreign exchange
- providing a nucleus for the establishment of other derivative or linked industries
- added value to raw materials currently being exported in raw form
- increased trading linkages within SADCC
- increased size and diversity of the industrial sector, so adding to national and regional output, employment opportunities, and the development of new skills and technology

2. PROPOSED PROJECT

Feasibility study of a petro-chemical complex to be located in Angola and serving the SADCC regional market.

3. BACKGROUND

With its major oil and mineral reserves, agricultural, fishery and forestry resources, and abundant sources of hydroelectric power, Angola's economic prospects are among the highest in Africa.

3.1. OIL RESOURCES

Oil has been Angola's most important export since the early 1970s and formed 80% of total exports in 1981.

Production since 1977 has been as follows:

Oil Production

	'000 b/d	mn barrels/year
1977	184	67.2
1978	138	50.4
1979	147	53.7
1980	150	54.7
1981	132	48.1

Production is projected by the Government of Angola to rise to 200,000 b/d in 1982 and 500,000 b/d in 1985. Total proven reserves of crude oil and gas are estimated at 1.2 bn barrels and 30 bn cu m respectively.

The Government established a state oil company in 1976, the Sociedade Angolana de Combustiveis (Sonangol). A petroleum law was enacted in 1978 which enables foreign oil companies to enter into participation ventures with Sonangol or to receive concessions on production sharing terms.

Three other oil companies are operating in Angola, Gulf is operating offshore Cabinda, in the Malongo North, Malongo South, Malongo West, Limba and Kungulo oil fields. Gulf is also building a gas reinjection project which will produce LPG for export. Petrangol is operating an onshore oil fields in Congo and Kwanza basin. Texaco commenced oil production in Angola in 1980 and is operating off the mouth of the Congo river. In addition to these oil production activities, a number of other foreign oil companies are engaged in offshore exploration along the Angolan continental shelf.

Angola has one oil refinery located near Luanda and owned jointly by Petrangol and Sonangol. The refinery commenced operations in 1973 and its highest throughput of crude oil (1.2 million tonnes) in 1981. The Government is planning to expand the oil refinery capacity to 4 mm tonnes per year and also to build an additional refinery.

3.2. ELECTRICITY

Angola has very large hydroelectric potential. Major rivers, and their potential, are the Kwanza (960 mw), the Cunene (945 mw), the Kubango (975 mw) and the Queve. Total electricity capacity will be substantially increasd after the Cambambe dam comes into full operation and the Cunene river scheme is developed.

4. DEVELOPMENT OF PETRO-CHEMICALS

Regional industrial co-operation among member countries of SADCC in industries such as textiles, textile chemicals, and pesticides, offer scope for establishing a petro-chemical industry to supply the basic and intermediate inputs require. For example, the implementation of the SADCC regional plans in synthetic and cotton synthetic blended textiles synthetic yarn and synthetic fibre is projected to lead to a large demand for polyester. The SADCC region is also becoming an increasingly significant market for other products based on petro-chemicals such as plastics and a wide range of chemical products.

Detailed market investigations are required to quantify the demand for petro-chemical products within the SADCC Region. This will provide the basis for identifying the type of petro-chemical complex and types of downstream industries to be established. Terms of reference for the studies are given below.

5. TERMS OF REFERENCE - PETROCHEMICAL COMPLEX

A. MARKET DEMAND STUDY

1. Conduct market investigations to assess in detail past, current and future growth of demand for selected petro-chemical products and derivatives in the SADCC region by country. Detail past imports, volume, value and prices.

2. Determine possibilities for export of petro-chemical products.

3. Analyse the major determinants of demand for petro-chemical products in the SADCC region and projected future course of these determinants.

4. Specify criteria for selecting list of major products to be produced by the petro-chemical complex and type of petro-chemical complex to be established. Consideration should be given, but not necessarily confined to, minimum economic viable size, nature and quantity of feedstocks, maximisation of value added and international price competitiveness.

5. Describe the main products to be produced, including products of downstream industries and the main market areas.

6. Describe the proposed distribution and marketing arrangements for the products e.g. will they be an integral part of the organisation itself or will they be handled through a separate organisation? Outline the proposed distribution network including means of transport, wholesale outlets etc.

7. Specify the market development strategies proposed and any required protection from imports.

8. Assess the likely competition for the project from foreign producers and suppliers.

9. Provide details on current prices for the products being considered. Indicate any tariffs/taxes on imported products.

10. Detail the proposed sales programme including quantities and selling prices.

11. Estimate annual sales revenues from products and by-products (local/export).

12. Estimate annual costs of sales promotion, marketing and distribution.

B. PROJECT FEASIBILITY STUDY

1. Introduction - background to the study and review of existing studies. Type of petro-chemical complex under consideration: major products and end users. Total estimated cost of the project. Alternatives considered. Planned capacity of the project in terms of its expected annual output. Share of the market the project is to supply.

   Relationship of the proposed petro-chemical project to current economic policies e.g. in the saving of foreign exchange, general industrialisation policy etc.

   Project location. Supply sketch plans (including a flow diagram) and a map. Also specify consultants' reports or feasibility studies if any exist.

   Proposed status of the project e.g. publicly or privately owned and/or a joint government/private industry concern.

2. Summary and plan of action - a synoptic review of the essential findings of each chapter followed by recommendations on action required for project implementation and any action already taken.

3. Market and plant capacity

   (a) Demand and market

      (i) Past imports and their future trends, volume and prices

      (ii) The role of the industry in the national policies, priorities and targets related or assigned to the industry.

      (iii) The approximate present size of demand, its past growth, major determinants and future growth.

      (iv) Supply/demand balance for the product, regionally and by country.

   (b) Sales forecast and marketing

      (i) Anticipated competition for the project from existing and potential local and foreign producers and supplies

      (ii) Distribution system proposed.

      (iii) Sales programmes including quantities and selling prices. Indicate any tariffs/taxes on imported/domestic products.

Volume of production and sales forecast for each category of output per annum over as long a period as possible. Indicate whether the plant operates at full capacity as soon as this is technically feasible e.g. what is the expected annual throughput of the plant as a percentage of total operating capacity over the next ten years?

Expected level of revenues which will accrue to the plant each year from products and by-products (local/export).

Degree of confidence attached to the forecast of future revenues and sales e.g. are sales outlets assured through government and/or private purchasing contracts: indicate whether protection from foreign competitors will be given in the form of tariff barriers etc.

Rate at which demand is expected to grow for as long a period as possible.

What local products, if any, will be displaced by the project?

(iv) Valuation of output items

Give the estimated value by price and quantity of the main items.

For each item, state whether directly exported or sold within the country. Give the fob price and any export subsidies, and the internal transport cost to the port. If not directly exported give this information for a closely comparable exported product, or give the cif price of an imported equivalent, together with its internal transport cost from the port to the point of domestic sale. If receipts are given net of indirect taxation, the rate of tax should be specified.

Comment on any indirect or non-quantifiable benefits: also indicate whether the price to be charged understates the amount which consumers will be willing to pay.

(v) Estimated annual costs of sales promotion and marketing. Give payments for transport separately.

(c) Production programme (approximate)

(i) Products

(ii) By-products

(iii) Wastes (estimated annual cost of waste-disposal)

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(d) Determination of plant capacity

(i) Feasible normal plant capacity

(ii) Quantitative relationship between sales, plant capacity and material inputs.

4. Material inputs, utilities, and services: approximate input requirements, their present and potential supply positions, and an estimate of annual costs of local and foreign material inputs - for each input give source, availability, unit cost, quantity required for production, transport cost where applicable.

List the major raw materials and say from what source they will be purchased e.g. as by-products of an oil refinery located elsewhere, or as the "output" of one of the plants in the project complex itself. What happens to these by-products at present?

From what original source are the raw materials for this project (e.g. crude petroleum, natural gas) obtained?

Assess whether the demand for any utility, e.g. electricity, water, fuels and energy (e.g. for steam raising), will cause a strain on the existing capacity of any of these industries, and the reliability of supply of utilities.

Indicate any contractual agreements, including delivery commitments, for the supply of raw materials and/or utilities, to be entered into.

Describe facilities existing locally to provide those services which a petro-chemical plant will demand e.g. local engineering shops and repair facilities, laboratory supplies and services, local availability of spare parts, small tools, etc.

Describe facilities for waste disposal. Is there suitable adjacent land or water; will transport to dumping areas be forthcoming? Will this waste disposal cause environmental or economic damage?

Indicate the adequacy of safety precautions considered in the design of the plant and its operation.

Give the estimated cost of any associated investments in utilities e.g. electric power, water, fuels, considered necessary for the success of the project. State the tariff and/or rate structure of these utilities.

Indicate any possibility of obtaining either utilities or raw materials on favourable terms. If so, state what these are, and draw attention to any required purchasing contracts and/or letters of intent.

Where inputs into the project are taken from other parts of the petro-chemical complex, state how they have been costed.

For each imported input give the cif price and the relevant tariff or tax. If the input is at present exported, give the fob price.

5. Location and site (preselection, including if appropriate, an estimate of the cost of land).

   (a) Locational requirements of the project e.g. utilities, roads, raw material

   (b) Land requirements and vailability. Present use and value.

   (c) Specific site recommendations.

6. Project engineering

   (a) Technology/(ies) and equipment with comparison of alternatives

      (i) Technologies and processes that can be adopted, given in relation to capacity size; describe production process, including flow diagram.

      Brief description of the proposed production process, showing the relationship of the different plants to each other, and the basic steps followed throughout the production chain.

      Explain why particular processes are selected and indicate other possible processes investigated.

      Proposed plant capacities e.g. daily/annual operating schedules. Provision for expansion. Efficiency of the plant in relation to its scale. Effect of scale on the efficiency of production.

      What guarantee can be given by this process of the quality control of output?

      Is anything known about the danger of obsolescence of this particular production process? Anticipated economic life as opposed to the physical life of the plant.

      Royalty or know-how agreements applying to these production processes.

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(ii) Estimate of costs of local and foreign technology

(iii) Cost of proposed equipment (major components)

Production equipment
Auxiliary equipment
Service equipment
Spare parts, wear and tear parts, tools

(iv) Block layout

(v) List of machinery and equipment

(b) (i) Buildings and civil works

Give a brief description of the project and list the buildings therein showing the overall area of each, measured over external walls.

(ii) Building materials

Indicate which building materials to be used on the project will be of local origin and supply and of foreign origin and supply.

(iii) Estimates of cost

Provide the estimated cost for each of the following items and indicate whether the work will be undertaken by contract or by direct labour.

Each building in the project, including all fixtures and fittings forming part of the construction programme (e.g. built-in cupboards, science benches etc including all such items covered by provisional sums).

Loose furniture, if provided.

External works (e.g. site development, access roads).

Public utilities and services (e.g. water and electricity supplies)

Sanitation outside the buildings.

Abnormal items (e.g. excessive requirements for under-building).

Other expenses, such as professional fees.

Contingency sum.

Estimated cost by component.

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(iv) Consultants

If the work is to be designed and/or controlled by consultants indicate whether any particular firms are preferred and state which sections of the project are to be covered by their services.

(v) Contractors

If the construction is to be undertaken by contract specify whether:

A local contracting company (i.e. a company indigenous to the country) is likely to be the successful tenderer

Foreign contractors (ie non-indigenous) will submit tenders for the project or a part of the contract

Foreign sub-contractors will be employed.

(vi) Alternatives

What alternative methods have been considered, e.g. industrial building techniques etc.

(vii) Provide:

Site plan showing proposed development of building and environs.

Sketch design showing plans elevations and sections of buildings to a scale of not less than 1/16th inch to 1 foot or 1:200.

Specification. The minimum information should provide details of the materials to be used and may take the form of annotated drawings.

7. Manpower

(a) Estimate manpower requirements, broken down into labour and staff, and into major categories of skills (local/foreign). Indicate the supply position of each category e.g. unskilled, skilled, technical/managerial, expatriate.

(b) Estimate annual manpower costs, classified as above, including overheads on wages and salaries.

(c) Technical support required.

(d) Training requirements and costs.

8. Implementation scheduling

(a) Propose an implementation time schedule giving main activities.

(b) Estimate the implementation costs given the implementation programme and including capitalised interest.

(c) Recommend measures relating to project promotion e.g. investors, technology sources, finance sources.

(d) Bar chart

(e) Organisation chart

(f) Management and corporate structure

Describe the structure of the board of directors and the role of each equity shareholder (including voting rights on the board).

Indicate the role of each sponsor and participant in undertaking responsibility for different management functions, including management and staff recruitment and training.

Indicate who is to supervise (a) the construction, and (b) the operation, of the project and the length and nature of their experience on petrochemical projects of this kind.

What degree of autonomy will the managing authority have?

Will adequate trained supervisory and technical staff be available? If not, indicate what additional staff will be needed and what arrangements are to be made for their training.

9. Financial and economic evaluation

(a) Total investment costs

- Estimate of working capital requirements by main item

- Estimate fixed assets by main component, and pre-production expenses

- Total investment costs schedule showing phasing

- Estimate foreign exchange cost

(b) Project financing

(i) Proposed capital structure and proposed financing (local/foreign)

What form will the equity contributions take e.g. cash (local currency or foreign exchange), technical know-how (if capitalised) equipment etc?

Indicate all sponsors and participants, showing their precise interest in the project a) in construction, b) in operation and c) in marketing.

(ii) Interest and principal payments schedule

(c) Production cost schedule including materials, utilities, manpower, repair and maintenance, depreciation, interest, selling expenses, general overheads and other. Point out any tariffs, taxes, etc. Tabulate production costs for 10 years.

(d) Financial evaluation based on above estimated values

(i) Pay-back period

(ii) Simple rate of return

(iii) Breakeven point

(iv) Internal rate of return and net present value

(v) Projected income statement

(vi) Projected sources and applications of fund statement.

(vii) Projected balance sheet

(viii) Sensitivity and risk analysis

(e) National economic evaluation

(i) Estimate of employment-creation effect

(ii) Estimate of foreign exchange savings

(iii) Estimate of value-added

(iv) Cost-benefit analysis

(v) External effects

Specify the nature and size of any effects which are peculiar to the project under consideration. Examine all the ramifications of the project including:

- effects on the environment

- effects on attitudes (including the effects of 'learning by-doing')

- effects on industries involved with the inputs and outputs of the project

(vi) Distributional aspects

Identify:

- the principal groups which will gain or lose from the project
- their average income/consumption levels
- the numbers in each group
- the values of their gains/losses

6. ESTIMATED COST OF STUDIES

£500,000

7. PROMOTING INSTITUTION

Government of Angola

SECTION IV:
Textile Chemicals

TEXTILE CHEMICALS IN THE SADCC REGION

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1. INTRODUCTION

The present production of textile fabrics in the SADCC region is around 446 million square meters, which is roughly 60-65% of the estimated demand (1983-84) of 708 million square meters. The growth rate of the industry is estimated at 6%.

Textile processing chemicals and auxiliaries, hitherto not produced in the SADCC region, constitute an important and essential requisite for the development of the textile industry. It is therefore very much important that these materials are manufactured within the SADCC region, preferably near the consumption centres for ease of transport and reduction of packaging cost as well as to ensure uninterrupted supplies.

It is assessed that some of the basic raw materials for the manufacture of textile processing chemicals, as indicated subsequently, are available in the SADCC region. These should be utilised for worthwhile projects resulting in import substitution. Other important textile auxiliaries and chemicals could be manufactured from the imported basic and intermediate materials, wherever feasible.

Phasewise production planning of textile processing chemicals and auxiliaries has been done as follows:

1) Manufacture of simple formulatory type of products from indigenous raw materials as well as from imported intermediates.

2) Manufacture of some important and sophisticated type of formulatory products.

3) Manufacture of intermediates from imported as well as indigenous raw materials.

4) Manufacture of basic chemicals.

In this context it is worthwhile to mention that similar to textile industries, paper, leather and some other industries also require considerable amount of auxiliary chemicals, very much akin to textile auxiliaries and chemicals. Relevant consideration has therefore been given to include the manufacture of some of these auxiliaries and chemicals also, while working out a programme for the development of textile processing chemicals and auxiliaries.

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2. CLASSIFICATION OF TEXTILE PROCESSING CHEMICALS AND AUXILIARIES

Textile processing chemicals and auxiliaries have been broadly classified into two categories:

a) basic chemicals and intermediates (long term projects)

b) Formulatory products. (short term projects)

2.1. BASIC CHEMICALS & INTERMEDIATES

Chemicals of this group require higher investment and sophisticated plant, machinery and technology. Typical of such chemicals are:

- caustic soda
- chlorine
- bleaching powder, hydrogen peroxide, sodium chlorite, perborates, etc.
- sodium hydrosulphite and rongolite
- phosphoric acid, sodium hexametaphosphate, tri-sodium phosphates and other phosphates.
- EDTA (Ethylene diamine, tetra acetic acid, sodium salt) starch, modified starch,
- glues, gelatines, gums
- tallow, fats, oils. Fatty acids, Fatty alcohols, etc.
- Basic surfactant materials - non-ionics, cationics and anionics
- Basic materials for softening agents - non-ionics, cationics and anionics
- synthetic resins: polyvinyl alcohol, polyvinyl acetate, alkyd resins, polyacrylic acid, UF, MF resins etc.
- Basic dyestuffs and intermediates
- Thickening agents like CMC, Alginates
- Miscellaneous chemicals

2.2. FORMULATORY PRODUCTS

Large tonnage of formulatory products are required at different stages of textile processing. Such chemicals require less investment towards plant and machinery and hence their manufacture should preferably be done near the consumption centres to reduce transport and packaging costs.

Typical of such chemicals are:

Surface active agents and detergent compositions,
Fibre and yarn lubricants,
Sizing compounds,
De-sizing chemicals,
Scouring, bleaching and mercerising compositions,
Dyestuffs and pigments,
Water soluble resins,
Finishing compounds,
Miscellaneous formulated compositions, etc.

3. ESTIMATED DEMAND

The present capacity and the estimated demand for textile fabrics (synthetic and cotton) by 1983/84 has been indicated in Table I.

The usual norms adopted for computation of the requirement of textile processing chemicals and auxiliaries on the weight of textile fabrics to be processed are as under:

Requirement as % by weight of textiles	
Synthet detergents	1
Fibre & yarn lubricants	2
Sizing agents	10
Desizing, scouring, bleaching and mercerising composition	1
Dye-stuffs	1
Finishing Agents	2
Total	17

Based on the estimated demand for textile fabrics (reduced to quantities by weight) in the different countries (1983-84) the requirement of the above groups of textile process chemicals and auxiliaries has also been worked out and presented in Table I. The total estimated requirement of these chemicals accordingly works out to be 9,000 tonnes for the short term projects and 25,000 tonnes for the long term projects (Table II).

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4. PRESENT MANUFACTURING ACTIVITY

As per information available from different sources there is no manufacturing activity worth reporting for the production of textile process chemicals and auxiliaries in the SADCC region. As such, the entire requirement is presently met through imports.

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5. PROPOSED PROJECTS

It is proposed to make a start with the manufacture of textile processing chemicals and auxiliaries in the SADCC region with the establishment of some projects for formulated items in the first phase. This would include the manufacture of formulated products in respect of synthetic detergents, fibre and yarn lubricants, sizing compounds, desizing, scouring, bleaching, mercerising agents, dyestuffs and finishing agents. This may be followed in the second phase with the manufacture of more complex and sophisticated products including some basic materials and intermediates like starch, carboxy methyl cellulose, synthetic resins and their derivatives, caustic soda and chlorine, hydrogenperoxide, sodium chlorite, etc.

The sizes of the proposed production units should be those corresponding to a minimum technically and economically viable scale of operation. In the projects relating to the first phase the production capacity can be easily extended by multiplying the lines of operations. The production capacities in respect of basic chemicals like caustic soda, chlorine, phosphates, etc can not obviously be based on their requirement for textile process chemicals and auxiliaries only and while minimum viable capacities and other particulars for these projects have been indicated, the production will cater to the requirement of a wide area of consuming industries and other requirements. Based on this consideration, the project proposals both for the short term and long term operations have been framed and are presented in Table III.

A short description of the product mix and the usages in respect of various projects recommended follows hereunder (in Table III).

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6. SUGGESTED LOCATIONS

Country	Short term Projects	Long term projects
Zambia	Synthetic detergents - 1 Dyestuffs & pigments - 1	Dyestuffs - 1 Phosphates & salts - 1 Sodium nitrite - 1
Tanzania	Scouring, bleaching, etc. 1 Naphthol dyes - 1 Finishing agent - 1	Starch - 1 Synthetic resins -1
Zimbabwe	Sizing compounds - 1 glue, casein, etc	CMC - 1
Angola		Synthetic detergents - 1
Botswana		Tallow - 1
Mozambique	Scouring, bleaching etc - 1	Caustic soda/ chlorine - 1
Total	7	9
Lesotho) Swaziland) Malawi)	Smaller units on detergents, finishing agents, dyestuffs pigments etc may be set up for captive consumption in the member states.	

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7. **PROJECT PROFILE ON THE MANUFACTURE OF SYNTHETIC DETERGENTS AND FIBRE & YARN LUBRICANTS**

1. CAPACITY OF PRODUCTION: 3,000 tonnes p.a.

2. MACHINERY & EQUIPMENT: 1.0 million US $

1) sulfonators
2) reactors
3) separators
4) neutralisers
5) colloidal mill/homogeniser
6) dryer
7) pulveriser
8) boiler
9) compressor
10) misc. equipment
11) laboratory
12) effluent disposal and treatment plant

3. RAW MATERIALS (main) Dodecyl benzene, lauryl alcohol, cetyl oleyl alcohol, alkylated naphthalenes, vegetable oils, fatty acids, tallow, glycols, glycerin, sulphuric acid, oleum, chlorosulfonic acid, mineral oils, petrolatum, triethanolamine, diethanol amine, etc.

4. EMPLOYMENT 75

5. TURNOVER 4.50 million US $

6. PROFITABILITY ON SALES 20% approximately

7. NOTE Total demand of synthetic detergents in the SADCC region is estimated to be 2,000 tonnes and that of fibre and yarn lubricants is 4,000 tonnes per annum. Fifty percent of this requirement is mainly of formulatory types. The present project has been proposed to undertake manufacture of the formulatory type of products in the first phase. Plant and equipment should be kept flexible so as to be able to undertake the manufacture of formulations of an allied nature, should circumstances warrant so in future.

The more complex type of products could also be manufactured when the basic raw materials like ethylene oxide etc were available in the region from the petro-chemical complexes, if set up in the future.

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8. SADCC PROPOSED REGIONAL PLAN

The manufacture of textile processing chemicals and auxiliaries is an intermediate industry required for improving the productivity, efficiency and profitability of the textile industry in the SADCC region. At present manufacturing capacity is negligible, but considering the demand as well as the present and foreseeable availability of raw material, viz: petrochemical resource based materials, starch, tallow, vegetable oils and minerals, etc, there is a good potential for developing these industries. This development will also result in considerable savings of foreign exchange. The industries could also provide intermediate inputs to the paper, leather and pesticides industries.

The plan suggested involves the setting up of small scale industries which would also achieve the objective of regional dispersal of industries. These have been suggested for the manufacture of synthetic detergents, fibre and yarn lubricants, sizing compounds based on natural products, desizing, scouring and bleaching agents, dyestuffs and finishing formulations, total project cost being 9.08 million US$. The foreign exchange requirement may be around 10.9 million US$, of which the cost towards plant and machinery is 4.3 million US$ and raw materials for one year is 6.6 million US $. In computing the project cost, the requirement of raw materials for 3 months was considered.

Action would also require to be initiated for starting the manufacture of some basic and intermediates which will necessarily be located on the grounds of feasibility and viability in countries which have the resources and where the demand pattern would provide the necessary economies of scale. The cost of these projects are estimated as under:

Total project cost	:	29.94 million US$
Foreign Exchange component	:	22.46 million US$ (total)
1. machinery, equipment installation & technology	:	15.12 million US$
2. raw materials for 1 year	:	7.34 million US$

Field investigations are in progress for developing project parameters in consultations with member Governments. Most of the projects would be covered by an Action plan for implementation.

Four projects would require detailed feasibility studies which could be undertaken by interested donor countries. Terms of reference for these feasibility studies would include assessment of different end use applications, identification of suitable location within the SADCC regions, viable

production capacities, suggested technology sources and its transfer arrangements, project costs and financial particulars establishing project viabilities and action plans for establishment of the projects.

The feasibility studies may involve 36 man months and the projected costs would be around £ 200,000.

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Table 1: Estimated Demand for Textiles & Textile Processing Chemicals & Auxiliaries in SADCC Region

Sr No	Country	Population in millions	Present Production (1982) of textile fabrics IN THOUSANDS: Synthetic	Cotton	Total of syn. & cotton	Estimated demand for fabrics 1983-84 TONNES PER ANNUM: Synthetic	cotton	Total of syn. & cotton	Estimated demand of textile process chemicals & auxiliaries by 83/84 p.a. in tonnes: Synthetic detergents: Short term	Long term	Fibre & yarn lubricants: Short term	Long term (Tallow)	Sizes: Gums glues	Starch	Desizing, scouring, bleaching mercering: Short term	Long term	Dyestuffs: Short term	Long term	Finishing agents: Short term	Resins	CMC
1	Angola	7.8	0	15.0	0.4	24.3	24.7	125.0	125	125	250	250	240	2250	125	125	125	125	250	125	125
2	Botswana	1.0	0	0.8	0.8	0.4	3.9	4.3	200	20	40	40	40	360	20	20	20	20	40	20	20
3	Lesotho	1.4	0	0.8	0.8	0.6	3.6	4.2	20	20	40	40	40	360	20	20	20	20	40	20	20
4	Malawi	6.4	0.9	10.0	10.9	1.4	18.9	20.3	100	100	200	200	200	1800	100	100	100	100	200	100	100
5	Mozambique	11.1	1.6	23.5	25.1	0.6	35.1	35.7	180	180	360	360	360	3240	180	180	180	180	360	180	180
6	Swaziland	0.6	0	0	0	0.6	2.1	2.7	15	15	30	30	30	270	15	15	15	15	30	15	15
7	Tanzania	19.7	6.6	30.0	36.6	9.0	46.5	55.5	280	280	550	550	550	4950	280	280	280	280	550	280	280
8	Zambia	6.1	1.7	7.5	9.2	5.3	14.5	19.8	100	100	200	200	200	1800	100	100	100	100	200	100	100
9	Zimbabwe	7.9	8.4	15.0	23.4	7.0	25.5	32.5	160	160	330	330	330	2970	160	160	160	160	330	160	160
	Total	62.0	19.2	102.6	121.8	25.3	174.4	200.0													
Total demand of textile processing chemicals & auxiliaries: short term products									1000		2000		2000		1000		1000		2000		9000
Total demand of textile processing chemicals & auxiliaries: long term products										1000		2000		18000		1000		1000		1000 1000	25000

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Table II ESTIMATED DEMAND OF TEXTILE PROCESSING CHEMICALS & AUXILIARIES

PRODUCT MIX	SHORT TERM PROJECTS (FORMULATED PRODUCTS) In tonnes per annum	LONG TERM PROJECTS (BASIC CHEMICALS & INTERMEDIATES) In tonnes per annum
1 Synthetic detergents		
Anionic		
Non-ionic & cartonics	1,000.0	1,000.0
2 Fibre & yarn lubricants		
emulsion products etc	2,000.0	
tallow, etc.		2,000.0
3 Sizing chemicals		
gums, glues, gelatins casein etc	2,000.0	
Starch & modified starches		18,000.0
4 Desizing, scouring bleaching, mercerising etc	1,000.0	1,000.0
5 Dyestuffs		
simple type	1,000.0	
sophisticated type		1,000.0
6 Finishing agents:		
a) simple type	2,000.0	
b) synthetic resins		1,000.0
c) CMC, thickening agents and misc. chemicals		1,000.0
Total	9,000.0	25,000.0

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Table III - Suggested Projects on Textile Processing Chemicals & Auxiliaries in the SADCC Region

Part 1

Projects Short term	Capacity Tonnes per annum	Number of units	Investment for Plant & Machinery US $ million	Employment Number of Persons	Turnover in US million $	Profitability % on sales	Location of the Projects	Remarks
Synthetic detergents AND Fibre & yarn lubricants	1,000) 2,000)	one	1.00	75	4.50	20%	Zambia	Basic raw materials like sulphuric acid, nitric acid, phosphoric acid would be available
Sizing compounds based on gums, glues, casein, etc	2,000	one	0.5	100	1.6	20%	Zimbabwe	Animal wastes, (bones etc), milk available plenty all over SADCC regions. Hence crudes may be produced locally & finally processed in larger scales.
Desizing, scouring, bleaching mercerising agents	4x250	four	0.5	60	0.7	20%	Tanzania, Zambia, Zimbabwe & others	Should be installed near the textile processing centres for in situ consumption
Simple types of dyestuffs direct, reactives & optical whiteners, pigments, etc.	500	one	0.5	30	2.5	25%	Zambia	Some basic chemicals would be available. Rest to be imported.
Simple types of dyestuffs namely naphthols & fast bases. Rapid fast & rapidogens	500	one	0.5	30	3.5	25%	Tanzania	Raw materials have to be imported
Finishing agents Formulatory products	2,000	one	1.0	50	2.0	20%	Tanzania	Raw materials have to be imported

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Table III - Suggested Projects on Textile Processing Chemicals & Auxiliaries in the SADCC Region

(Part 2)

Projects Long Term	Capacity Tonnes per annum	Number of units	Investment for Plant & Machinery US $ million	Employment Number of Persons	Turnover in US million $	Profitability % on sales	Location of the Projects	Remarks
Sophisticated types of (non-ionics & cationics) Synthetic detergents	1,000	one	1.0	50	3.0	25%	Angola	Ethylene oxide may be available at Angola when the petro chemical complex would be set up
Tallow and its derivations	2,000	one	0.8	100	1.6	20%	Botswana	Centrally located place is desirable for bringing the crude/semi-processed raw materials from slaughter houses of different countries
Starch and starch derivations	18,000	one	3.0	100	10.8	20%	Tanzania	Maize, casava etc are available
Dyestuffs sophisticated types & intermediates	1,000	one	2.0	100	10.0	25%	Zambia	Some of the basic raw materials would be available
Carboxymethyl cellulose & its derivatives	1,000	one	1.0	50	1.2	20%	Zimbabwe	Cotton waste may be used as a source of cellulose & rest of the raw materials either made or imported
Synthetic resins, namely pv-acetate, PV alcohols polyacrylates, etc.	1,000	one	1.5	50	4.0	25%	Tanzania	Raw materials to be imported
Caustic soda/chlorine	6,000 (each)	one	2.0	100	5.0	20%	Mozambique (Nacara)	Power & salt available
Hydrogen peroxide, perborates etc	2,000	one	1.0	75	1.6	20%	Zambia	Raw materials would be available
Sodium nitrite & others	1,000	one	1.0	50	0.8	20%	Zambia	Raw materials & facilities available

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PROPOSED INDUSTRIAL CAPACITIES IN THE PRODUCTION OF TEXTILE PROCESSING CHEMICALS & AUXILIARIES IN SADCC REGION AND SADCC TECHNICAL LINKAGES

Total demand (1983-84) : 34,000 tonnes per annum
Formulary types 9,000
Basic & intermediates 25,000
Existing capacity - negligible

New Projects	COUNTRY	Name of Projects	No. of units	Proposed capacity TPY	Total Investment million US$	Employment	Foreign Exchange Requirement Capital Gross	Foreign Exchange Requirement Raw materials for 1 year
1	ANGOLA	1 basic syn detergents*	1	1,000	2.06	50	1.05	0.3
2	BOTSWANA	1 Tallow etc*	1	2,000	1.52	100	0.84	0.16
3	MALAWI	1 Sizing on natural products	1	2,000	1.10	100	0.525	0.24
4	MOZAMBIQUE	1 Hydrogen peroxide & perborates etc*	1	2,000	1.9	75	1.05	0.10
5		2 caustic soda/ chlorine*	1	6,000 6,000	4.0	100	2.10	0.30
6	TANZANIA	1 desizing, scouring bleaching, etc.	1	1,000	0.92	50	0.525	0.32
7		2 dyes (naphthols fast basses, rapidogine, etc)	1	500	1.5	30	0.58	1.60
8		3 finishing agents	1	2,000	1.8	50	1.05	0.9
9		4 synthetic resins*	1	1,000	3.2	50	1.68	1.7
10		5 starch*	1	18,000	6.36	100	3.15	0.65
11	ZAMBIA	1 syn detergents & lubricants etc	1	3,000	2.4	75	1.05	2.02
12		2 dyes & pigments	1	500	1.36	30	0.58	1.05
13		3 basic dyes & intermediates*	1	1,000	4.9	100	2.1	4.23
14		4 phosphoric acid & phosphates*	1	2,000	2.0	75	1.05	0
15		5 Sodium Nitrite & other salts*	1	6,000	2.1	50	1.05	0
16	ZIMBABWE	carboxymethyl cellulose (CMC) etc*	1	1,000	1.9	50	1.05	0.36
Total					39.02	1,085	19.43	13.93

* basic chemicals & intermediates
others medium - small units

SADCC TECHNICAL LINKAGES

LEATHER INDUSTRY	TEXTILE INDUSTRY	PAPER INDUSTRY	INSECTICIDE FORMULATION
AUXILIARIES		BASIC & INTERMEDIATES	
Zambia	Synthetic detergents Lubricants Sizing Agents	Tallow Starch CMC	Angola Botswana Tanzania
Tanzania	Desizing, scouring, bleaching agents	Syn. Resins Dyes & intermediates	Zambia Zimbabwe
Malawi	Dyes & pigments Finishing compounds	Hydrogen peroxide Sodium Nitrite Phosphates Caustic soda Chlorine, etc	Mozambique

RAW MATERIALS & NATURAL RESOURCES

maize	Salt
cassava	Rock phosphate
vegetable oils	chromium ores
mineral oils	pyrites
crude tallow	crude petroleum etc
bone glues	
casein (milk product)	
cellulose etc	

Angola	Mozambique	Zimbabwe
Botswana	Zambia	Swaziland
Malawi	Tanzania	Lesotho

TEXTILE PROCESSING CHEMICALS PLANT IN TANZANIA

1. INTRODUCTION

Textile processing chemicals and auxiliaries constitute an essential requirement for the textile industry in the SADCC region. At present there is practically no manufacturing activity for this group of chemicals almost anywhere within the SADCC region and so the entire requirement has practically to be imported. Manufacture of textile chemicals and auxiliaries has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. A regional textile chemicals industry plan has already been prepared by the SADCC member countries, a copy of which is attached at Annex 1. The benefit to the SADCC Region of Industrial Co-operation in the production of textile chemicals and auxiliaries would be:

- A large measure of self sufficiency is an essential requirement for the development of the textile industry within the countries and the region as a whole.

- Import substitution in respect of these chemicals which are also required for several other industries such as oils and fats, soap and detergents, and inorganic chemicals, leather processing, etc.

- Utilisation of indigenous resources of raw materials and other essential inputs for value-added production.

- Increase in the size and diversity of industrial sector adding to national and regional output.

- Generation of employment opportunities and development of new skills and technology.

- Conservation of foreign exchange otherwise needed for the import of these indispensible requirements.

- Strengthening of the SADCC linkages among member countries.

The regional Plan for Action incorporates development of facilities for manufacture of: (a) desizing, scouring, bleaching and mercerising agents in four selected locations, (b) simple dye-stuffs, and (c) textile finishing agents in Tanzania, which is being elaborated for implementation.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Development of the manufacture of:

(a) Desizing, scouring, bleaching and mercerising agents	1 unit
(b) Dye-stuffs: direct dyes, reactive dyes, optical whiteners, pigments, etc.	1 unit
(c) Textile finishing agents	1 unit

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2.2. PRODUCT RANGE

Desizing, scouring, bleaching and mercerising compositions	: 250 tonnes/year per unit
Direct dyes)	
Reactive dyes)	
Optical whiteners)	
Pigment dye-stuffs)	: 500 tonnes/year
Textile finishing agent	: 2000 tones/year

3. SADCC MARKET POSITION

This is reflected in the table below:

ESTIMATED DEMAND IN TONNES/YEAR

COUNTRY	DESIZING, SCOURING, BLEACHING & MERCERISING COMPOSITIONS	DYE-STUFFS	FINISHING AGENTS
Angola	125	125	250
Botswana	20	20	40
Lesotho	20	20	40
Malawi	100	100	200
Mozambique	180	180	360
Swaziland	15	15	30
Tanzania	280	280	550
Zambia	100	100	200
Zimbabwe	160	160	330
Total	1,000	1,000	2,000

4. EXISTING CAPACITY

There is at present practically no existing capacity for the above groups of textile processing chemicals in the SADCC Region.

5. TECHNOLOGY PACKAGE

There are a wide variety of dyes - acid, basic, mordant, reactive, vat, solubilised, sulphur, diperse, and pigment dye-stuffs, etc which are manufactured by a variety of processes e.g. diazotization and coupling for Azo dyes; sulfonation, nitration, reduction, alkylation etc for acid dyes, cyanuration, diazotisation and coupling for reactive dyes and heating of phthalonitrile or related substances with a cuprous salt for phthalocyanine pigments. For specific types of dyes there are well set process operations with elaborate operational parameters and controls.

Desizing, scouring, bleaching and mercerising compositions and finishing agents are manufactured by comparatively simpler techniques and are usually formulation compositions where processes involved are taking of ingredients in the required

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proportion, dilutions and at specific temperatures, mixing (with or without heating) etc. There are set and tried compositions for specific end-use applications which could be available from the technology source along with operation details.

It would be necessary to have a proper technology transfer arrangement which will give technical and operational details of processes, assist in plant elaboration, layout, installation and commissioning and train technicians and operators for regular commercial production activities.

6. PLANT AND EQUIPMENT

(a) Dye-stuffs and pigments

Storage vessels for chemicals
Reactor vessels and tanks
Condensation tubs and reactors
Pulverisers
Blenders
Driers
Filter presses
Pumps
Compressors
Vacuum pumps
Water chilling units
Boiler
Storage vessels for intermediate operations
Platforms, piping and ancillary equipment
Testing, standardisation and quality control laboratory
Effluent disposal and treatment plant

(b) Desizing, scouring, bleaching and mercerising compositions

Reaction vessels
Mixing tanks
Separators
Pumps
Filters
Boiler
Colloid mill
Storage vessels
Boiler
Miscellaneous equipment
Testing and quality control laboratory
Effluent disposal and treatment plant

Finishing Agents

Plant & Machinery identical to (b) above.

7. RAW MATERIALS

A wide variety of chemical raw materials - organic chemicals and intermediates, solvents, mineral acids, hydrogen peroxide, fatty

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acids, caustic soda, synthetic resins, carboxy-methyl cellulose, sodium nitrite, chlorine glycerin, etc, depending upon the specific products to be manufactured will be needed. The exact requirements can only be worked out after selecting the product mix for various manufacturing activities.

8. PROJECT HIGHLIGHTS

8.1. PLANT AND MACHINERY COST

The estimated cif cost of the plant and machinery for the different projects is as under:

Project		Cost (US $)
Desizing, scouring, bleaching, mercerising agents	4 units	500,000
Dyestuffs manufacture	1 unit	500,000
Textile finishing agents	1 unit	1,000,000
	Total	2,000,000

8.2. ESTIMATED EMPLOYMENT, TURNOVER AND PROFITABILITY

Project	Employment	Turnover (US$)	Profitability on sales %
Desizing, scouring, bleaching, mercerising	60	0.7 million	20%
Dye-stuffs manufacture	30	3.5 million	25%
Textile finishing agents	50	2.0 million	20%

9. IMPLEMENTATION SCHEDULE

The different plants can go into operation within about 18 months from the date of decision, as under:

	Month Completed
Preparation of detailed project report	4
Order for machinery & equipment	7
Order for raw materials	10
Arrival of machinery & equipment	12
Positioning of technical experts	12
Arrival of raw materials	14
Erection & installation of plant & machinery	16
Commissioning & trial production	17
Commencement of regular production	18

10. INPUTS REQUIRED FROM DONORS

Financial and technical co-operation for the implementation of the projects.

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TEXTILE PROCESSING CHEMICALS PLANTS IN ZAMBIA

1. INTRODUCTION

Textile processing chemicals and auxiliaries constitute an essential requirement for the textile industry in the SADCC region. At present there is practically no manufacturing activity for this group of chemicals almost anywhere within the SADCC region and so the entire requirement has practically to be imported. Manufacture of textile chemicals and auxiliaries has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. A regional textile chemicals industry plan has already been prepared by the SADCC member countries, a copy of which is attached at Annex 1. The benefit to the SADCC Region of Industrial Co-operation in the production of textile chemicals and auxiliaries would be:

- A large measure of self sufficiency in an essential requirement for the development of the textile industry within the countries and the region as a whole.

- Import substitution in respect of those chemicals which are also required for several other industries such as oils and fats, soap and detergents, and inorganic chemicals, leather processing, etc.

- Utilisation of indigenous resources of raw materials and other essential inputs for value-added production.

- Increase in the size and diversity of industrial sector adding to national and regional output.

- Generation of employment opportunities and development of new skills and technology.

- Conservation of foreign exchange otherwise needed for the import of these indispensible requirements.

- Strengthening of the SADCC linkages among member countries.

The regional Plan for Action incorporates development of facilities for: (a) manufacture of synthetic detergents and lubricants, and (b) simple dyes and pigments in Tanzania, which is being elaborated for implementation.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Development of the manufacture of:

(a) Synthetic detergents and lubricants	1 unit
(b) Simple dye-stuffs and pigments	1 unit

2.2. PRODUCT RANGE

- Synthetic detergents : 1,000 tonnes/year
- Fibre yarn lubricants : 2,000 tonnes/year
- Dye stuffs and pigments : 500 tonnes/year

3. SADCC MARKET POSITION

This is reflected in the table below:

ESTIMATED DEMAND IN TONNES/YEAR

COUNTRY	SYNTHETIC DETERGENTS	FIBRE & YARN LUBRICANTS	DYE-STUFFS & PIGMENTS
Angola	125	250	215
Botswana	20	40	20
Lesotho	20	40	20
Malawi	100	200	100
Mozambique	180	360	180
Swaziland	15	30	15
Tanzania	280	550	280
Zambia	100	200	100
Zimbabwe	160	330	160
Total	1,000	2,000	1,000

4. EXISTING CAPACITY

There is at present practically no existing capacity for the above groups of textile processing chemicals in the SADCC Region.

5. TECHNOLOGY PACKAGE

There are a wide variety of dyes - acid, basic, mordant, reactive, vat, solubilised, sulphur, diperse, and pigment dye-stuffs, etc which are manufactured by a variety of processes e.g. diazotisation and coupling for Azo dyes; sulfonation, nitration, reduction, alkylation etc for acid dyes, cyanuration, diazotisation and coupling for reactive dyes and heating of phthalonitrile or related substances with a cuprous salt for phthaloyanine pigments. For specific types of dyes there are well set process operations with elaborate operational parameters and controls.

Synthetic detergents are produced by various processes depending on the type of detergents required. For anionic detergents, which are simple, the process requires sulphonation of linear alkyl benzene, neutralisation with caustic soda and preparation of suitable formulations with the addition of builders, soil redeposition controllers, optical whiteners, etc.

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Fibre yarn lubricants are specific compositions used as formulations and require mixing of various ingredients in desired proportions and dilutions and at specific temperatures. These are set and tried compositions, which at some times may have to be suitably adjusted for required characteristics.

It would be necessary to have a proper technology transfer arrangement which will give technical and operation details of processes, assist in plant elaboration, layout, installation and commissioning and train technicians and operators for regular commercial production activities.

6. PLANT AND EQUIPMENT

(a) Dye-stuffs and pigments

Storage vessels for chemicals
Reactor vessels and tanks
Condensation tubs and reactors
Pulverisers
Blenders
Driers
Filter presses
Pumps
Compressors
Vacuum pumps
Water chilling units
Boiler
Storage vessels for intermediat operations
Platforms, piping and ancillary equipment
Testing, standardisation and quality control laboratory
Effluent disposal and treatment plant

(b) Synthetic Detergents and Fibre Yarn Lubricants

Sulfonators
Reaction vessels
Neutralisation vessels
Mixing tanks
Separators
Pumps
Filters
Pulveriser
Colloid Mill
Storage vessels
Compressor
Boiler
Miscellaneous equipment
Testing and quality control laboratory
Effluent disposal and treatment plant

7. RAW MATERIALS

A wide variety of chemical raw materials - organic chemicals and intermediates, solvents, oleum, sulphuric acid, hydrogen peroxide

fatty acids, caustic soda, synthetic resins, carboxy-methyl cellulose, sodium nitrite, alkylated naphthalenes, mineral oils, petrolatum, diethanolamine, triethanolamine, etc, depending upon the specific products to be manufactured, will be needed. The exact requirements can only be worked out after selecting the product mix for various manufacturing activities.

8. PROJECT HIGHLIGHTS

8.1. PLANT AND MACHINERY COST

The estimated cif cost of the plant and machinery for the different projects is as under:

Project		Cost (US $)
Dyestuffs manufacture	1 unit	500,000
Synthetic detergents & fibre yarn lubricants	1 unit	1,000,000
	Total	1,500,000

8.2. ESTIMATED EMPLOYMENT, TURNOVER AND PROFITABILITY

Project	Employment	Turnover (US$)	Profitability on sales %
Dye-stuffs & pigments	30	2.5 million	25%
Synthetic detergents & fibre yarn lubricants	75	4.5 million	20%

9. IMPLEMENTATION SCHEDULE

The two plants can go into operation within about 18 months from the date of decision, as under:

	Month Completed
Preparation of detailed project report	4
Order for machinery & equipment	7
Order for raw materials	10
Arrival of machinery & equipment	12
Positioning of technical experts	12
Arrival of raw materials	14
Erection & installation of plant & machinery	15
Commissioning & trial production	17
Commencement of regular production	18

10. INPUTS REQUIRED FROM DONORS

Financial and technical co-operation for the implementation of the projects.

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TEXTILE CHEMICALS PLANT IN ANGOLA

1. INTRODUCTION

Textile processing chemicals and auxiliaries constitute an essential requirement for the textile industry in the SADCC region. There is currently virtually no manufacturing activity for this group of chemicals anywhere in the SADCC region and so the entire requirement has to be imported. Broadly this group of chemicals can be sub-divided into two: (a) basic chemicals and intermediates - caustic soda, chlorine, starch, synthetic resins, carboxy methyl cellulose, basic surfactants and detergents, etc, and (b) formulated products - surface active agents and detergent compositions, fibre and yarn lubricants, sizing components, resizing chemicals, scouring, bleaching and mercerising compositions etc. These types of chemicals are also required, apart from the textile industry, by industries for the manufacture of such products as paper and leather.

Manufacture of textile chemicals and auxiliaries has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. A regional textile Processing Chemicals and Auxiliaries Industry Plan, based on a phase-wise production programme has been prepared by the SADCC member countries, a copy of which is attached at Annexure 1. The regional plan of action incorporated a specific project for development in Angola for the manufacture of basic textile chemicals: synthetic non-ionic and cationic surfactants and detergents, which is now being elaborated for a feasbility study.

Based on the estimated demand for textile fabrics in the different SADCC countries, the requirement for textile chemicals and auxiliaries by 1983-84 will be approximately 25,000 tonnes per year for the basic chemicals and intermediates group and 9,000 tonnes per year for the formulated products. The manufacture of a large variety of these chemicals is feasible and desirable within the SADCC region as this would provide sufficient strength and flexibility for textile manufacturing operations. While some of the basic raw materials for the manufacture of textile processing chemicals and auxiliaries are available within the region, others could be imported, wherever considered feasible for the production activity.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Development of the manufacture of basic chemicals and intermediates; non-ionic and cationic surfactants and detergents in Angola.

2.2. PROJECT RATIONALE

Ethylene oxide is one of the basic chemicals required for the manufacture of these types of chemicals and intermediates. There is a distinct possibility of development of a petro-chemical complex in Angola, which may be able to provide this basic raw material. Besides, it ma also produce Linear Alkyl Benzene, which could also be utilised for the manufacture of anionic types of surfactants and detergents.

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3. BACKGROUND

The requirement of basic non-ionic and cationic surfactants and detergents for the textile industry by 1983-84 within the SADCC region is estimated at 1,000 tonnes. This capacity is generally feasible for developing a viable small project for the manufacture of the proposed type of chemicals, which could later be used for preparing the formulated products of the type necessary for textile industry in the SADCC region.

4. RAW MATERIAL SITUATION

The study would take into account the likely availability of ethylene oxide from the proposed petro-chemical complex in Angola and the import of other raw materials for the proposed manufacturing activities.

5. SADCC TRADING LOGISTICS

There is already an existing railway system connecting Angola through Zambia with various countries of the SADCC region except Lesotho. With the development of regional transport and communication facilities as envisaged, there may not be much problem in trading and transport of the manufactured products within the region when the proposed manufacturing activity comes to fruition. The finished products are not hazardous, which would make the trading comparatively easier.

6. TERMS OF REFERENCE FOR THE STUDY

- To estimate regional demand, by country, for various non-ionic and cationic surfactants and detergents for the textile and other industry groups.

- To establish detailed feasibility for the establishment of a 1,000 tonne per year (or of a modified size based on study) production capacity of such chemicals specifying quality standards of end-products and end-use applications.

- To indicate sources of various raw materials and other requisites for the proposed manufacturing capacity.

- To identify a suitable location for the project.

- To provide detailed engineering and financial particulars for the project, including cost estimates of civil works, specifications of plant and machinery, plant layouts, process flow charts and technology requirements, effluent control and management, production costs, distribution costs, income and profitability, etc.

- To identify the appropriate technology source for the proposed manufacturing activity, spell technology transfer arrangements and provide a detailed Action Plan for the implementation of the project.

7. ESTIMATED COST OF STUDY

£60,000

TEXTILE CHEMICALS PLANT IN BOTSWANA

1. INTRODUCTION

Textile processing chemicals and auxiliaries constitute an essential requirement for the textile industry in the SADCC region. At present there is practically no manufacturing activity for this group of chemicals almost anywhere within the SADCC region and so the entire requirement has practically to be imported. Manufacture of textile chemicals and auxiliaries has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. A regional textile chemicals industry plan has already been prepared by the SADCC member countries, a copy of which is attached at Annex 1. The benefit to the SADCC Region of Industrial Co-operation in the production of textile chemicals and auxiliaries would be:

- A large measure of self sufficiency in an essential requirement for the development of the textile industry within the countries and the region as a whole.

- Import substitution in respect of those chemicals which are also required for several other industries such as oils and fats, soap and detergents, inorganic chemicals, leather processing, etc.

- Utilisation of indigenous resources of raw materials and other essential inputs for value-added production.

- Increase in the size and diversity of industrial sector adding to national and regional output.

- Generation of employment opportunities and development of new skills and technology.

- Conservation of foreign exchange otherwise needed for the import of these indispensible requirements.

- Strengthening of the SADCC linkages among member countries and growth of self-reliance.

The regional Plan for Action incorporates development of facilities for the manufacture of tallow and tallow derivatives in Botswana which is being elaborated for implementation.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Establishment of a plant for the manufacture of tallow and tallow derivatives to meet the requirement of textile and other industries.

2.2. PROJECT RATIONALE

Based on the estimated demand (1983-84) for textile fabrics in the different countries of the SADCC region, the requirement for refined tallow is estimated at 2,000 tonnes per year. A similar quantity i.e., 2,000 tonnes is estimated to be required for some other important industrial uses eg., in the manufacture of soap, metal stearates, wire drawing lubricants etc. Besides, tallow is the basic raw material for the production of fatty acids, particularly stearic and oleic and glycerin. The development of this activity would further improve the profitability and viability of tallow operations besides providing valuable raw materials for a variety of industrial and other applications.

Botswana has a good sheep and goat population. More than 4,000 tonnes of raw tallow is reported to be exported at present from slaughter houses. The balance of requirements can be imported from other SADCC countries.

The manufacture of tallow will also give encouragement to the soap industry, which is given a priority by the Government.

2.3. PRODUCT RANGE

Industrial tallow of refined grade	4,000 tonnes/year
Stearic acid	1,500 tonnes/year
Oleic acid	1,800 tonnes/year
Glycerine	230 tonnes/year

3. SADCC MARKET POSITION

Country	Estimated demand in tonnes/year		
	Refined Tallow for textile	Stearic acid	Oleic acid
Angola	250	187	225
Botswana	40	30	36
Lesotho	40	30	36
Malawi	200	150	180
Mozambique	360	270	324
Swaziland	30	23	27
Tanzania	560	420	504
Zambia	200	150	180
Zimbabwe	320	240	288
	2000	1500	1800

4. EXISTING CAPACITY

At present there is practically no existing capacity for the above group of chemicals in the SADCC Region.

5. TECHNOLOGY PACKAGE

The process of manufacture of refined tallow comprises melting out the animal fats in a digester to isolate the crude tallow in molten stage. The residual part of tallow is extracted from the animal wastes by digesting them in presence of water under pressure. The extracted liquor is filtered through a hot pressure filter. The crude tallow floats on the top and is isolated. This is then refined by treatment with hydrogen peroxide or other suitable bleaching earths and finally filtered in a hot pressure filter.

Stearic acid, oleic acid and glycerine are manufactured by splitting crude tallow or other fatty materials under pressure with and without catalyst-like twitchell reagent, an aromatic sulfonic acid. The hydrolysis of fats results in mixed fatty acids (stearic, oleic etc) and glycerine. Glycerine is recovered from the sweet water. Fatty acids are separated by vacuum distillation and repeated hydrolytic pressing.

It would be necessary to have a proper technology transfer arrangement - which will give technical and operational details of processes, assist in plant elaboration, layout installations and commissioning and train technicians and operators for regular commmercial production activities.

6. PLANT AND EQUIPMENT

The following types of plant and equipment are required:

a) Refined Tallow

Digesters
Extractors
Storage tanks
Reactors
Hot pressure filters

b) Stearic Acid, Oleic Acid and Glycerine

Reactors
Autoclaves/pressure reactors
Washing tanks
Glycerine recovery unit
Vacuum distillation unit
Refrigerated pan racks
Hydraulic press
Boiler
Compressor
Steam ejector
Centrifuge
Hot oil unit
Platform, piping, ancillary equipment
Testing, standardisation and quality control laboratory
Effluent disposal and treatment plant

7. RAW MATERIALS

Raw materials for the production of refined tallow, stearic acid, oleic acid, glycerine etc. are essentially crude tallow, fats, animal wastes, flesh cuttings, hide trimmings etc. from slaughter houses. These are availabe in sufficient quantities in Botswana and in other SADCC countries.

8. PROJECT HIGHLIGHTS

8.1. PLANT & MACHINERY COSTS

The estimated cost of the plant and machinery, installed and erected for the project is as under:

Project	Cost in US$ in million
Refined tallow	1.60
Stearic acid, oleic acid & glycerine	2.50
Total	4.10

8.2. ESTIMATED EMPLOYMENT, TURNOVER AND PROFITABILITY

Project	Employment	Turnover in US$ million	Profitability on sales %
Refined tallow	100	3.20	25
Stearic Acid, oleic acid, glycerine	100	4.86	20

9. IMPLEMENTATION SCHEDULE

The project can go into operation within about 24 months from the date of decision, as under:

	Months completed
Preparation of detailed project report	4
Selection of site	6
Order for machinery & equipment	8
Construction of work shops and buildings	16
Order for raw materials	14
Arrival of machinery & equipment	16
Positioning of technical experts, in phases	16
Arrival of raw materials	20
Erection & installation of plant & equipment	22
Commissioning and trial production	23
Commencement of regular production	24

10. INPUTS REQUIRED FROM DONORS

Financial and technical co-operation for the implementation of the project.

TEXTILE CHEMICALS PLANT IN MOZAMBIQUE

1. INTRODUCTION

Textile processing chemicals and auxilaries constitute an essential requirement of the textile industry in the SADCC region. At present, there is practically no manufacturing activity for this group of chemicals almost anywhere within the SADCC region and so the entire requirement has to be imported. Manufacture of textile chemicals and auxiliaries has been selected by the SADCC Industry Ministers as an industry in which regional industrial cooperation would be desirable and worthwhile. A regional textile chemicals industry plan has already been prepared by the SADCC member countries, a copy of which is attached at Annex 1. The regional plan of action incorporates development of projects for the manufacture of important basic chemicals viz caustic soda, chlorine, hydrogen peroxide and perborates in Mozambique, which are now being elaborated for a feasibility study.

Caustic soda (sodium hydroxide) is not only one of the most important basic chemicals for the textile chemical industry, being used extensively in the manufacture of a wide variety of textile processing chemicals and auxilaries, but is also one of the most important basic chemicals for the chemical industry, in general. Caustic soda finds extensive use in the processing of a variety of industrial products such as soap, detergents, vegetable oil refining, paper and pulp, petroleum refining and manufacture of a large variety of organic and inorganic chemicals, vinyl chloride monomer, propylene oxide and methylene chloride etc. Hydrogen peroxide and perborates are also sufficiently used in textile processing for various purposes.

Based on the estimated demand for textile fabrics in the different SADCC countries, the requirement of textile chemicals and auxiliaries by 1983-84 works out approximately to 25,000 tonnes per year for the Basic Chemicals and Intermediates Group and 9,000 tonnes per year for the Formulated Products. Manufacture of a large variety of these chemicals is feasible and desirable within the SADCC region as this would provide sufficient strength and flexibility to textile manufacturing operations. Besides, manufacture of basic chemicals like caustic soda and chlorine and hydrogen peroxide and perborates obviously cannot be taken up only to meet the requirement of textile chemicals, but has to be based on at least a minimum viable operation which would also cater to the requirement of other consuming industries and thus further help the industrial development of the region.

2. PROPOSED PROJECT

2.1 DESCRIPTION OF THE PROJECT

Development of the manufacture of basic textile chemicals: caustic soda and chlorine, about 6,000 tonnes per year each and hydrogen peroxide and perborates, about 2,000 tonnes per year (or modified size of operations based on the study), in Mozambique.

2.2. PROJECT RATIONALE

Salt forms the basic raw material for the manufacture of caustic soda and chlorine. Mozambique is a producer of salt with a well established salt industry along its entire coastline. Maputo and Nacala are the two main production centres. Development of the salt industry in Mozambique is also included in the regional plan. Electric power is another important requirement for salt production, the electro chemical process being used for salt manufacture. Electric power is sufficiently available in Mozambique and would be of an advantage as electro-chemical processes for the manufacture of caustic soda, chlorine and hydrogen peroxide would be power-intensive.

3. BACKGROUND

Caustic soda is an important requirement for the production of various textile chemicals. Chlorine is a by-product of caustic soda manufacture. Caustic soda and chlorine are also required for a variety of other industrial uses. The minimum economically viable capacity of production appears to be 6,000 tonnes of each chemical per year, which could be used for different requirements within the region. Hydrogen peroxide and perborates will also find applications in textile processing and other industrial usages.

4. RAW MATERIALS

Salt, the basic raw material, is sufficiently available in Mozambique and further development of the salt industry in Mozambique is envisaged in the regional plan. Raw material requirements for hydrogen peroxide and perborates will be determined on the basis of technology adopted for manufacture.

Cylinders for bottling chlorine will need to be imported.

5. SADCC TRADING LOGISTICS

Mozambique is very well placed with its production potential and existing railway links to SADCC countries to supply them the production of caustic soda and chlorine for their requirements. The envisaged development of regional transport and communication facilities would further ease the trading and transport mechanisms for the manufactured products within the region. Caustic soda - chlorine (bottled cylinds), hydrogen peroxide and perborates can be handled safely during transport after propoer precautions are taken.

6. TERMS OF REFERENCE FOR STUDY

- To estimate the regional demand, country-wise, of caustic soda, chlorine, hydrogen peroxide and perborates for the textile chemicals and other industry groups.

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- To establish a detailed feasibility for the establishment of a viable size of production capacity for caustic soda, chlorine, hydrogen peroxide and perborates manufacture.

- To identify a suitable location for the project.

- To provide detailed engineering, technical and financial particulars for the project including cost estimates of civil works, specifications of plant and machinery, process flow-charts and technology requirements, effluent control and management, production costs, distribution costs, income and profitability etc

- To suggest a suitable viable alternative for meeting the requirement of gas cylinders for bottling chlorine.

- To identify appropriate technology source for the proposed manufacturing activity, spell technology transfer, arrangements and provide a detailed Action Plan for the implementation of the project.

7. ESTIMATED COST OF STUDY

£60,000

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TEXTILES CHEMICALS PLANTS IN TANZANIA

1. INTRODUCTION

Textile processing chemicals and auxillaries constitute an essential requirement of the textile industry in the SADCC region. At present there is practically no manufacturing activity for this group of chemicals almost anywhere within the SADCC region and so the entire requirement has practically to be imported. Manufacture of textile chemicals and auxiliaries has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. A regional textile chemicals industry plan has already been prepared by the SADCC member countries, a copy of which is attached at Annex 1. The benefit to the SADCC Region of Industrial Co-operation in the production of textile chemicals and auxiliaries would be:-

- A large measure of self-sufficiency in an essential requirement for the development of the textile industry within the countries and the region as a whole.

- Import substitution in respect of these chemicals which are also required for several other industries such as oils and fats, soaps and detergents, paper and pulp, organic and inorganic chemicals, leather processing, etc.

- Utilisation of indigenous resources of raw materials and other essential inputs for value-added production.

- Increase in size and diversity of industrial sector adding to national and regional output.

- Generation of employment opportunities and development of new skills and technology.

- Conservation of foreign exchange otherwise needed for import of these indispensible requirements.

- Strengthening of SADCC linkages among members countries and growth of self-reliance.

The regional plan of action incorporates development of projects for the manufacture of starch and synthetic resins for the textile industry in Tanzania, which is being elaborated for feasibility study.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Development of the manufacture of starch and synthetic resins for textile industries in Tanzania.

2.2. PROJECT RATIONALE

Based on the estimated demand for the processing of textile fabrics in SADCC countries (1983-84), the estimated requirement of starch works out to 18,000 tonnes per year and of synthetic resins to 1,000 tonnes per year. None of these essential

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chemicals used in textile sizing and finishing operations are currently manufactured within the SADCC region.

Among the SADCC countries, Tanzania ranks at the top in respect of the requirement of starch and synthetic resins.

Manufacture of starch and synthetic resins are wellknown and established technologies now. The requirement for these chemicals within the SADCC region is sufficient for the development of viable production units. Tanzania possesses adequate resources of maize and cassava for the manufacture of starch. Chemical raw materials for the manufacture of synthetic resins can easily be imported.

Tanzania is thus considered a suitable location for the establishment of the proposed manufacturing activities considered essential for the proper development of a textile industry.

3. BACKGROUND

Starch and synthetic resins are widely used in the sizing and finishing operations of textiles. These also find extensive usage for many other industrial requirements. In fact, the manufacture of starch (where raw materials are available) and synthetic resins is widely taken up in developing countries for meeting diverse applications in a wide area of industrial activity. The technologies are well established and easily available. Manufacture of these items, in fact, is the first requirement for a start in the textile chemicals and auxiliaries industry in the SADCC region.

4. RAW MATERIALS REQUIREMENT

The requirement for important raw materials for the manufacture of starch and synthetic resins is as under:-

Starch	Synthetic Resin
Maize Cassava Sulphur/sulphur dioxide	Fatty acids, oils, phthalic anhydride, urea, phenol-formaldehyde, pentaerythritol, glycerine, solvents, vinyl monomers, surfactants, etc

5. SADCC TRADING LOGISTICS

There is already an existing railway system linking most of the SADCC countries. In addition the envisaged development of the regional transport and communications facilities would further ease the trading and transport operations with the SADCC region. Tanzania already has well established trading channels. The country is open to sea transport to enable imports of required raw materials etc. Thus no trading and transport problems are foreseen as handicaps to the projects development.

6. TERMS OF REFERENCE FOR STUDY

- To estimate regional demand by country for starch and different types of synthetic resins, item-wise, for textile chemicals and other industry groups.

- To establish detailed feasibility for the establishment of viable size manufacturing facilities for starch and synthetic resin of standard quality keeping in view the current and potential demand.

- To identify suitable locations for the projects.

- To provide detailed engineering, technical and financial particulars of the projects, including cost estimates for civil works, specifications of plant and machinery, process flow charts and technology requirements, effluents control and management, production costs, distribution costs, income and profitability, etc.

- To identify appropriate technology sources for the proposed manufacturing activities, spell technology transfer arrangements and provide detailed Action Plans for the implementation of the projects.

7. ESTIMATED COST OF STUDY

£60,000

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TEXTILE CHEMICALS PLANT IN ZAMBIA

1. INTRODUCTION

Textile processing chemicals and auxiliaries constitute an essential requirement for the textile industry in the SADCC region. At present there is practically no manufacturing activity for this group of chemicals almost anywhere within the SADCC region and so the entire requirement has practically to be imported. Manufacture of textile chemicals and auxiliaries has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. A regional textile chemicals industry plan has already been prepared by the SADCC member countries, a copy of which is attached at Annex 1. The benefit to the SADCC Region of Industrial Co-operation in the production of textile chemicals and auxiliaries would be:

- A large measure of self sufficiency is an essential requirement for the development of the textile industry within the countries and the region as a whole.

- Import substitution in respect of those chemicals which are also required for several other industries such as oils and fats, soap and detergents, and inorganic chemicals, leather processing, etc.

- Utilisation of indigenous resources of raw materials and other essential inputs for value-added production.

- Increase in the size and diversity of industrial sector adding to national and regional output.

- Generation of employment opportunities and development of new skills and technology.

- Conservation of foreign exchange otherwise needed for the import of these indispensible requirements.

- Strengthening of the SADCC linkages among member countries.

The regional Plan for Action incorporates specific proposals for the development of textiles chemical plants in Zambia for the production of (a) dyes and intermediates - 1,000 tonnes per year, (b) phosphoric acid and phosphates (c) sodium nitrite & other salts - 1,000 tonnes per year.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Development of the manufacture of:

(a) Manufacture of dyes & intermediates	1,000 tonnes/year
(b) Manufacture of phosophoric acid & phosphates	1,000 tonnes/year
(c) Manufacture of sodium nitrite & other salts	

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2.2. PROJECT RATIONALE

Dyes and intermediates (particularly for the manufacture of dye-stuffs) are an essential requirement in the textile industry. The total requirement for dye-stuffs and pigments for the region for the textile industry alone is estimated at about 2,000 tonnes. Similarly, inorganic chamicals and salts such as phosphoric acid, phosphates and sodium nitrite are also required in different quantities. It is considered that viable production capacities, as indicated above, or as modified after a proper assessment of the requirements for these chemicals in the SADCC region can be developed in some suitable locations in Zambia.

3. BACKGROUND

Zambia has a developing base of industrial activity in the manufacture of some chemicals. There are indications of likely availability of some raw materials for the proposed manufacturing activities in Zambia. Manufacture of dyes, etc could be undertaken in Zambia based on imports of dye-stuffs from outside countries. The technology involved in the manufacture of the proposed chemicals is not very complicated and can be easily required.

4. RAW MATERIALS

Raw materials for the manufacture of dyes and intermediates would depend on the types of dyes - acid, basic, reactive, vat, sulphur, disperse and pigment dye-stuffs proposed to be undertaken for production. Phosphate minerals and sulphuric acid and metal salts will form the main raw materials for production of phosphoric acid and phosphates. Sodium nitrate (Chile salt-peter) or soda ash, nitric oxide and nitrogen dioxide are generally employed for the manufacture of sodium nitrite.

5. SADCC TRADING LOGISTICS

There is already an existing railway system linking most of the SADCC countries. Besides, the envisaged development of the regional transport and communication facilities would further ease the trading and transport operations within the SADCC countries. Zambia is open to sea transport through Mozambique and Tanzania. There are already established trading channels in Zambia to enable the import of the required raw materials etc. Thus, with the developing trade and transport links among the SADCC countries no trading and transport problems are foreseen as handicaps to project development.

6. TERMS OF REFERENCE FOR STUDY

- To estimate the present and potential requirement within the country, and by country within the region, for different types of these textile chemicals, by item/group.

- To estimate the production capacity within the country and the region, present and foreseeable, for different types of pesticide/insecticide formulations.

- To work out details of feasible and viable product mix for the three units indicating the size of capacities for select product groups of different types.

- To provide detailed engineering, technical and financial particulars for establishing the operations of the three units including the cost of civil works, plant and machinery, working capital and indicating clearly production costs, distribution costs, incomes and profitability, etc.

- To identify appropriate technology source and indicate pollution and effluents control and management systems.

- To provide a detailed Action Plan for the establishment of these three units.

7. ESTIMATED COST OF THE PROJECT

£60,000

TEXTILE CHEMICALS PLANT IN ZIMBABWE

1. INTRODUCTION

Textile processing chemicals and auxiliaries constitute an essential requirement for the textile industry in the SADCC region. There is currently virtually no manufacturing activity for this group of chemicals anywhere in the SADCC region and so the entire requirement has to be imported. Broadly this group of chemicals can be sub-divided into two: (a) basic chemicals and intermediates - caustic soda, chlorine, starch, synthetic resins, carboxy methyl cellulose, basic surfactants and detergents, etc, and (b) formulated products - surface active agents and detergent compositions, fibre and yarn lubricants, sizing components, resizing chemicals, scouring, bleaching and mercerising compositions etc. These types of chemicals are also required, apart from the textile industry, by industries for the manufacture of such products as paper and leather.

Manufacture of textile chemicals and auxiliaries has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. A regional textile Processing Chemicals and Auxiliaries Industry Plan, based on a phase-wise production programme has been prepared by the SADCC member countries, a copy of which is attached at Annexure 1. The regional plan of action incorporated a specific project for development in Zimbabwe for the manufacture of basic textile chemicals: manufacture of carboxymethyl cellulose and its derivatives which is now being elaborated for a feasibility study.

Based on the estimated demand for textile fabrics in the different SADCC countries, the requirement for textile chemicals and auxiliaries by 1983-84 will be approximately 25,000 tonnes per year for the basic chemicals and intermediates group and 9,000 tonnes per year for the formulated products. The manufacture of a large variety of these chemicals is feasible and desirable within the SADCC region as this would provide sufficient strength and flexibility for textile manufacturing operations. While some of the basic raw materials for the manufacture of textile processing chemicals and auxiliaries are available within the region, others could be imported, wherever considered feasible for the production activity.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Study of the manufacture of basic textile chemicals and intermediates; carboxy-methyl cellulose and its derivatives.

2.2. PROJECT RATIONALE

Carboxy methyl cellulose (CMC) and its derivatives have varied applications in the textile industry - as a soil redeposition controller, as a thickener in dye-stuff printing pastes and for warp sizing formulations to improve weaving efficiency. Purified CMC products are used in many types of foods and pharmaceutical

products. Other uses include those in sizing of paper, in cosmetics, and as a suspending agent and binder in ceramics and vitreous enamels. The technology is not very complicated. In view of its essentiality for textile processing and versatility in other applications, the establishment of viable manufacturing operations may be of considerable advantage to the region.

3. BACKGROUND

The requirement for carboxy methyl cellulose and its derivatives by 1983-84 in the SADCC region is estimated at 1,000 tonnes per annum. It may be feasible to develop a viable project for the manufacture of carboxy methyl cellulose and its derivatives for meeting the requirement of the SADCC region, which will add to the self-reliance within the region and save foreign exchange.

4. RAW MATERIAL SITUATION

Waste cotton, caustic soda and monochloracetic acid are the important basic raw materials required for the proposed manufacturing activities. Waste cotton is available within the region including in Zimbabwe. Caustic soda manufacture is included in the regional industrial development plan and monochloracetic acid can be imported or even produced within the region.

5. SADCC TRADING LOGISTICS

With the development of regional transport and communications facilities, as envisaged, and the existing linkage of Zimbabwe with the other SADCC countries through the railway/road systems, there should be no problem in trading and transport of the manufactured products within the region. The size of the operation is also quite modest, making it easy to work out suitable trading logistics.

6. TERMS OF REFERENCE FOR THE STUDY

- To estimate the regional demand, by country, for carboxy methyl cellulose and its derivatives for the textile and other industry groups.

- To establish detailed feasibility for the establishment of a 1,000 tonnes per year (or of a modified size based on study) production capacity of such chemicals specifying quality standards of end-products and end-use applications.

- To indicate sources of various raw materials and other requisites for the proposed manufacturing capacity.

- To identify a suitable location for the project.

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- To provide detailed engineering and financial particulars of the project, including cost estimates of civil works, specifications of plant and machinery, plant layouts, process flow charts and technology requirements, effluent control and management, production costs, distribution costs, income and profitability, etc.

- To identify appropriate technology source for the proposed manufacturing activity, spell technology transfer arrangements, and provide a detailed Action Plan for the implementation of the project.

7. ESTIMATED COST OF THE STUDY

£ 60,000

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Industry

VOLUME TWO:

Pesticides and Insecticides
Farm Implements
Tractors and Tractor Components

SADCC: MASERU

SOUTHERN AFRICAN
DEVELOPMENT COORDINATION CONFERENCE
Maseru, Kingdom of Lesotho · 27/28 January 1983

Industry

VOLUME TWO:

Pesticides and Insecticides
Farm Implements
Tractors and Tractor Components

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SADCC - INDUSTRIAL CO-OPERATION

INTRODUCTION

The main focus of SADCC: Maseru in January 1983, is industrial co-operation. The conference is requested to consider assistance for SADCC industrial projects.

Accelerated economic development and regional self-reliance are the twin objectives of the Lusaka Declaration (April 1980). The Declaration also contains an appeal for external co-operation and international support. Southern African development co-ordination "will be achieved more rapidly and will be more effective if development takes place within the context of global co-operation". Priority sectors have been demarcated and assigned to a co-ordinating country. In respect of Industrial Co-operation, this sector was assigned to Tanzania as the co-ordinating country.

REGIONAL PLAN OF INDUSTRIAL CO-OPERATION

Tanzania, in consultation with the SADCC member states prepared a Regional Plan of Industrial Co-operation which was discussed and finalised at the Meeting of the SADCC Industry Sub-Committee at Dar es Salaam in September 1981.

This Plan was presented to the SADCC 1981 Ministerial Meeting at Blantyre in November 1981 and was approved.

The main thrust of the plan was to develop minimum-needs industries in the areas of:

- Food
- Clothing
- Housing
- Health
- Water Supply
- Power
- Transport
- Education

Development of core industries such as fertilisers, pharmaceuticals, pesticides, iron and steel and capital goods engineering industries also formed an integral part of the Regional Plan.

SECTORAL PROFILES

In pursuance of SADCC 1981 decision on follow-up action on the plan, sectoral profiles on the eight minimum-needs industries identified were prepared and discussed at the SADCC Industry Sub-Committee Meeting at Arusha in April 1982.

INDUSTRY STUDIES

From the perspective of these sectoral profiles, 17 industries were identified for market/industry analysis:

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1. Ammonium nitrate plant, Malawi
2. Ammonia Urea plant, Tanzania
3. Potassic fertiliser plant, Botswana
4. Development of fertiliser industries
5. Utilisation of cement plants
6. Cement-based products
7. Development of pulp and paper industry
8. Paper and packaging materials
9. Wool/mohair spinning plant
10. Electrical transmission and distribution equipment
11. Production of synthetic yarn
12. Production of blended textiles
13. Production of textile chemicals
14. Formulation of insecticides/pesticides
15. Production of salt
16. Tractors and farm implements
17. Tractor components

The work involved field investigations, data collections, consultations with relevant Government departments and other agencies in the SADCC member countries.

INDUSTRY MINISTERS MEETING, ARUSHA SEPTEMBER 1982

The Industry studies were discussed at the meeting of SADCC Industry Ministers in Arusha in September 1982. The meeting agreed guidelines and criteria for selection of projects and directed that all projects contributing to the SADCC goal of economic independence in the context of the 1980 Lusaka Declaration and the 1981 Blantyre decisions, as well as meeting criteria relating to utilisation of SADCC resources for regional needs, be considered as SADCC industrial projects. For the purpose of selecting projects for presentation at Maseru, and subsequent donors conferences, the projects should have:

a) a funding gap in foreign exchange
b) bankability and
c) a reasonable implementation period

A list of specific projects was approved for presentation to the SADCC: Maseru to be held in January 1983. This list comprised both projects for implementation and the projects requiring feasibility studies. The Minister also directed that:

i) Member states are to be responsible for executing the projects in co-ordination with donors. The co-ordinating country should be kept informed on progress.

ii) The co-ordinating country is responsible for the general study type of projects. The co-ordinating country was also directed to initiate action for co-operation in the areas of industrial products standardisation, industrial consultancy services, and industrial research and development including appropriate technology.

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PROJECT DOCUMENTATION

Of the projects which appear in Volumes I and II the total project funding estimates are:

43 projects for implementation: US$ 194.31 million
23 projects for study: US$ 4.38 million

Most of the projects are in the small to medium scale category.

Volume III consists of projects for which detailed documentation was not available until after the first two volumes had been completed. These projects relate to the production of cement, pulp and paper, fertilisers, textiles, electrical items and chemicals.

ASSISTANCE SOUGHT

The assistance sought is thus of two kinds:

i) Towards project implementation

- In the form of technology transfer, project financing, lines of credit, capital goods, training of project personnel, joint ventures, and marketing arrangements

(ii) Towards undertaking studies

- financing of feasibility/project studies.

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SUMMARY OF REPORTS

A. SALT

	Projects for Implementation	Country	Cost (US$)
1.	Expansion of Saltworks at Nacala	Mozambique	6.5 m
2.	Expansion of Saltworks at Maputo	Mozambique	8.5 m
3.	Development of Saltworks at Sadani	Tanzania	2.1 m
4.	Development of Saltworks at Kitame	Tanzania	1.64m
5.	Development of Saltworks at Changwahela	Tanzania	600,000
6.	Development of Saltworks at Uvinza	Tanzania	4.9 m
7.	Small-scale Salt Refining Plant	Botswana	50,000
8.	Small-scale Salt Refining Plant	Lesotho	50,000

	Projects for Study		
9.	Upgrading of Existing Saltworks	Angola	76,500
10.	Development of Saltworks at Lindi/Mtwara	Tanzania	170,000
11.	Expansion of Saltworks at Manbone	Mozambique	170,000
12.	Development of Saltworks at Kazangula	Zambia	200,000

B. TEXTILES

	Projects for Implementation		
1.	Establishment of a Knitting Project	Botswana	455,000
2.	Establishment of a Knitting Project	Lesotho	3.1 m
3.	Establishment of a Knitting Project	Malawi	3.1 m
4.	Establishment of a Knitting Project	Mozambique	3.6 m
5.	Establishment of a Knitting Project	Zambia	8.5 m
6.	Establishment of a Powerloom Project	Botswana	3.0 m
7.	Establishment of a Powerloom Project	Lesotho	3.29m
8.	Establishment of a Powerloom Project	Malawi	760,000
9.	Establishment of a Powerloom Project	Swaziland	1.7 m
10.	Establishment of a Powerloom Project	Tanzania	3.8 m
11.	Establishment of a Powerloom Project	Zambia	3.5 m
12.	New P.O.Y./Texturised Polyester Plant	Mozambique	9.0 m
13.	New Polyester/Texturised Polyester Plant	Tanzania	9.0 m
14.	Further extension to the Polyester Blend Integrated Weaving Plant	Zambia	10.0 m
15.	New Polyester (P.O.Y.) Plant	Zimbabwe	9.0 m
16.	Revitalisation of a Polyester Blend Integrated Weaving Plant	Tanzania	20.0 m
17.	New polyester staple fibre plant	Zimbabwe	10.2 m

	Projects for Study		
18.	Polyester Polymerisation and Staple Fibre Plant	Zambia	500,000
19.	Development of a Petro-Chemical Complex	Angola	850,000

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SUMMARY OF REPORTS (cont)

C. TEXTILE CHEMICALS

	Projects for Implementation	Country	Cost (US$)
1.	Textile Processing Chemicals Plant	Tanzania	1.0 m
2.	Textile Processing Chemicals Plant	Zambia	1.0 m
3.	Textile Chemicals Plant	Botswana	5.2 m
	Projects for Study		
4.	Textile Chemicals Plant	Angola	102,000
5.	Textile Chemicals Plant	Mozambique	102,000
6.	Textile Chemicals Plant	Tanzania	102,000
7.	Textile Chemicals Plant	Zambia	102,000
8.	Textile Chemicals Plant	Zimbabwe	102,000

D. PESTICIDES AND INSECTICIDES

	Projects for Study		
1.	Upgradation/expansion of existing pesticide/insecticide formulation plants	Angola	102,000
2.	Upgradation/expansion of existing pesticide/insecticide formulation plant	Mozambique	102,000
3.	Upgradation/expansion of existing pesticide/insecticide formulation plant	Tanzania	102,000
4.	Upgradation/expansion of existing pesticide/insecticide formulation plant	Zambia	102,000
5.	Upgradation/expansion of existing pesticide/insecticide formulation plant	Zimbabwe	102,000
6.	Pesticide/insecticide formulation plant	Malawi	85,000
7.	Pesticide/insecticide formulation plant	Swaziland	85,000
8.	Pesticide/insecticide formulation plant	Zimbabwe	85,000
9.	Pesticide Chemical plant	Tanzania	85,000
10.	Pesticide Chemical plant	Zimbabwe	51,000

E. FARM IMPLEMENTS

	Projects for Implementation		
1.	Expansion of farm implements factory	Zambia	2.0 m
2.	Agricultural implements units	Angola	4.25m
3.	Agricultural implements units	Botswana	3.0 m
4.	Agricultural implements units	Lesotho	3.0 m
5.	Agricultural implements units	Malawi	3.0 m
6.	Agricultural implements units	Swaziland	3.0 m
7.	Agricultural implements units	Tanzania	10.0 m
8.	Agricultural implements units	Zambia	1.0 m

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SUMMARY OF REPORTS (cont)

		Country	Cost (US$)
9.	Artisan units for the manufacture of farm implements	Botswana	120,000
10.	Artisan units for the manufacture of farm implements	Lesotho	120,000
11.	Artisan units for the manufacture of farm implements	Tanzania	975,000
12.	Extension of continuous casting facility	Zimbabwe	10.4 m
13.	Manufacture of tool steel	Zimbabwe	2.4 m
	Projects for Study		
14.	Rationalisation and development of Farm Equipment Testing Facilities		500,000

F. TRACTORS AND TRACTOR COMPONENTS

	Projects for Implementation		
1.	Tractor Manufacture	Swaziland	2.0 m
2.	Tractor Manufacture	Tanzania	15.5 m
	Project for Study		
3.	Rationalisation of Tractor Production		500,000

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SUMMARY OF REPORTS (cont)

		Number of Reports	
	Projects for Implementation		
A.	Salt	8	
B.	Textiles	17	
C.	Textile Chemicals	3	
E.	Farm Implements	13	
F.	Tractors and Tractor Components	2	43
	Projects for Study		
A.	Salt	4	
B.	Textiles	2	
C.	Textile Chemicals	5	
D.	Pesticides & Insecticides	10	
E.	Farm Implements	1	
F.	Tractors and Tractor Components	1	23
			66

Total project costs

Projects for Implementation	US$ 194,310,000
Projects for Study	US$ 4,377,000
Total	US$ 198,687,000

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SECTION V:

Pesticides and Insecticides

PESTICIDES/INSECTICIDES IN THE SADCC REGION

1. INTRODUCTION

Pesticides and Insecticides are toxic chemicals that are used to control and kill pests and insects that cause economic damage to crops or ornamental plants or are hazardous to the health of domestic animals or man. Estimates suggest that the total annual loss to agriculture through pests may range anywhere from 10 to 20% in different countries, the worldwide agricultural losses on this account being about 15%. Insects, on the other hand, cause diseases in human beings like malaria, filariasis trachoma, etc, all of which have a sizeable to colossal magnitude. Pesticides and insecticides have been used on a very wide scale the world over since 1946 and have substantially reduced the losses to crop plants as well as human lives over the years. The average benefit/cost ratio of pesticides/insecticides used in agriculture is estimated to range from 3 to 5 dollars return for every dollar invested by the farmers. Whereas the usage of pesticides and insecticides has increased manifold in the developed countries, the pace has been rather slow in the developing countries.

The successful employment of any pesticide or insecticide depends upon its proper formulation into a preparation that can be applied for pest or insect control with safety to the applicators, animals and plants. Pesticides and insecticides are accordingly formulated as dusts, emulsifiable concentrates, wettable powders, liquids, granules and flowables dilutions etc. The preparation and use of such formulations involve accessory agents such as dust carriers, solvents, emulsifiers, wetting and dispersing agents, stickers, deodorants, masking agents, synergists etc.

1.1. DUSTS

Dusts are the simplest formulations and contain a concentration of basic technical material of 0.1 to 20%. The properties of the carriers largely determine the quality of the finished dusts. Carriers commonly include Bentonite, Kayolin, organic flours, sulphur, talc, gypsum, pyrophilite etc.

Selection of the carrier is made on the basis of compatability with the desired insecticide, particle size, abrasiveness, absorbability, density, wettability and cost. The mixture of the technicals/toxicants and diluents is made by a variety of simple operacions particularly grinding and blending.

1.2. WETTABLE POWDERS

These are prepared by blending the toxicants in high concentration, usually from 15 to 95%, with a dust carrier and a wetting agent to improve the wetting and suspensibility of the powder. Sprays of wettable powders are used widely in agriculture because of their relative safety to plants.

1.3. EMULSIFIABLE CONCENTRATES

These are emulsions of toxicants dissolved in select organic solvents, commonly at 15 to 50% to which a small percentage of surface active agents is added to promote emulsification, wetting and spreading. These are widely used in plant protection and household insect control.

1.4. GRANULES

These are palleted mixtures of toxicants, usually 1.0 to 10% and a dust carrier e.g. absorptive clay, bentonite, diatomaceous earth. The particle size ranges from 250 to 590 a millimicron. They are prepared by impregnation of the carrier with a solution or slurry of the toxicants and used principally for mosquito larviciding and soil applications.

1.5. FLOWABLES DILUTIONS

The term 'Flowables' stands for an ultrafine and stable dispersion of water-insoluble solid active ingredient in water. Besides the presence of wetting and dispersing agents, it contains some additional auxiliaries including an antifoaming material, a thickening agent, a germicide and sometimes an antifreezing agent, if required. The carrier used in the case of flowables formulations is water. Flowables formulations have basically the same advantages as the other liquid formulations. In addition, they can be applied in high concentrations.

2. DEMAND AND INDUSTRIAL CAPACITY

2.1. PRESENT REQUIREMENT ESTIMATES (1982-83)

Agriculture is the primary occupation of the SADCC region countries and a majority of the people of Southern Africa are dependent on farming and animal husbandry. The land thus far developed for irrigated crop production is, however, comparatively small which prevents the area from achieving self-sufficiency in wheat and rice requirements. Of the total land area of 475.2 mill. ha. the arable land accounts for 23 mill. ha. The important agricultural crops include maize, wheat, rice, coarse grains, sugar cane, cotton, groundnuts, soya bean, sunflower, sesame, tobacco, cashewnut and sorghum. The important fruits and vegetables grown in the region are citrus fruits, bananas, asparagus, strawberries, plumbs, pineapples, guavas, tomatoes, etc.

The arable land and the crop production in the different countries is indicated in Annexure 1. Among the essential inputs in agriculture, the usage of fertilisers and pesticides has been increasing at a very fast pace in almost all the SADCC countries. To illustrate, there was a reported increase of 283% in the import of pesticides from 1970 to 1977 in Tanzania. The actual usage of pesticides for different crops in different countries seem to be varying for a variety of practical reasons. The import of pesticides (in terms of technical materials) for application during 1981-82 in the different countries is indicated in Annexure 1. However, it appears that while in some countries like Zimbabwe and Mozambique, the application of pesticides and insecticides is comparatively much advanced, in advanced, in case of others like Angola, Malawi and Swaziland, it is rather at a lower level. A recent study by UNIDO on the formulation of selected pesticides in Tanzania has placed this requirement of pesticides at 12,000 tonnes in terms of technical materials during 1982-83. As no scientific assessment of the requirement of pesticides and insecticides in different SADCC countries for the year 1982-83 onwards is available, for estimate purposes, the aforesaid projected requirement of Tanzania, which is practically in between the highest consumption rate in Zimbabwe and the lowest consumption rate in Angola and Malawi has been taken as an index for computing the requirement of pesticides and insecticides (in terms of technical materials) for Angola, Malawi, and Swaziland. The estimated requirement of pesticide technicals for the year 1982 - 83 worked on the above basis is set out in Annexure I.

At present pesticides and insecticides are being formulated and used mostly in the form of dusting powder, emulsifiable concentrates and wettable powders. Some insecticides for public health are being largely used as wettable powder and liquid sprays. From the developing use pattern, there appears to be scope for formulation of granules and flowables or suspension concentrates. This would, however, need more sophisticated equipment and expertise. Any planning for the

development of pesticide and insecticide formulation industry should therefore keep in view the development of facilities for the manufacture of the sophisticated types of formulation also at a few selected locations.

2.2. PROJECTED REQUIREMENT ESTIMATES

The average growth rate in the pesticide consumption in the normal way ranges between 5 to 15% per annum in the different countries of the world. The bulk of the pesticides are consumed on a few selected crops like coffee, cotton, maize, sugar cane and for fruits and vegetable plantations. The growth rate in the case of insecticides for public health may also vary within the same range.

In some cases the lower consumption appears to have resulted from non-availability of adequate funds and organisations to implement the various programmes. With the growing awareness on the part of farmers, health administrators and the governments about the importance and utility of pesticides and insecticides, the pace of growth in the consumption of these chemicals in developing countries like those in the SADCC region would certainly be not less than corresponding to 10% of the annual compounded growth rate The projected demand for pesticides and insecticides (in terms of technical materials) has been computed on this basis and shown in Annexure I.

2.3. EXISTING FORMULATION CAPACITY

There exists a formulation capacity in some countries of the region, namely Tanzania, Zambia, Zimbabwe, Mozambique and Angola. Precise information on the existing formulation capacity is not available. However, there appear to be 15 units existing at present with the total installed capacity of 52,000 tonnes in terms of technical material. The breakdown is shown in Annexure I. It may, however, be mentioned that only about 4 units of the existing 15, one each in Tanzania, Zimbabwe, Zambia and Mozambique are functional at present, others being either closed or turning out very insignificant production.

2.4. POTENTIAL FOR NEW CAPACITY

It would appear from the above that the estimated demand for pesticides and insecticides during 1982-85 is about 39,400 tonnes, during 1987-88 is likely to be of the order of 63,400 tonnes, while the existing formulation capacity is of about 52,000 tonnes per annum (all in terms of technical materials). Taking in view the fact that a modest growth rate has been applied while estimating the demand for pesticides and insecticides (as technical material) in 1987-88, there appears to be definite scope for the creation of an additional formulation capacity of about 15,000 tonnes (in terms of technical materials) capacity utilisation at 80%. Simultaneously effective steps will have to be undertaken to make the existing units fully working and closed units functional.

2.5. PRODUCT RANGE OF NEW UNITS

Pesticides formulation units are generally designed as a multipurpose manufacturing facility where a variety of products could be formulated at any time to cater to the diverse requirements. Normally, it may take a minimum of about 2 years to establish a composite formulation unit. There already exists a sizeable capacity in the SADCC region for turning out dusts and liquid (including emulsifiable concentrates) formulations. As against this, the existing capacity for wettable powders, granular preparations and herbicide dilutions, which enjoy developing usages, appears to be rather limited. While designing additional production facilities of formulations to fill in the gap of about 15,000 tonnes/year between estimated demand and existing capacity in the SADCC region, it will therefore be appropriate that the production there is tilted in favour of wettable powder, granules and flowables dilution. In the formulated forms these are comparatively much less bulky than the dusting powders and emulsifiable concentrates. These also do not require organic solvents, use of which is more prone to health hazards. Moreover, these types of formulation also enjoy good export potential, which will provide additional strength to the projects. An economic size of a pesticide formulation unit for the manufacture of a product mix tilted in favour of wettable powder, granules and flowable dilution may be around 5,000 tonnes (in terms of technical material per year). There is thus a scope for the establishment of 3 such formulation units in the SADCC region. A profile of the type of units is given in Annexure II.

3. SUGGESTED LOCATIONS

There are only two countries in the SADCC region where both the projected demand for pesticides and insecticides formulation in 1987-88 is of the order of 4,000 and 5,300 tonnes per year, but which do not have any formulation unit so far. These are Malawi and Swaziland. Of the proposed three units, one each may be located in Malawi and Swaziland.

As regards the third project, Tanzania and Zimbabwe have the maximum demand for pesticides formulation - 19,300 tonnes and 16,100 tonnes respectively during 1987-88. Tanzania has already three units existing at present with a capacity of around 20,000 tonnes per year, which is sufficient to take care of the projected demand. The formulation capacity of the two existing units at Zimbabwe is of an order of 12,000 tonnes per year against the projected demand of about 16,100 tonnes during 1987-88. The formulation capacities existing in Zambia, Mozambique and Angola are practically sufficient to take care of the projected demands. Botswana and Lesotho have comparatively much smaller demands for the formulations to justify a viable formulation capacity. The third project may, therefore, be located in Zimbabwe.

4. MANUFACTURE OF PESTICIDE ACTIVE INGREDIENTS

Manufacture of pesticide active ingredients is generally a complex manufacturing activity requiring elaborate facilities, high investments, detailed process know-how and specialised management and operational controls. In most of the cases, this also requires availability of certain bulk basic chemicals, from mineral, petrochemical and other resources, for ensuring viable operations. Simultaneously, by the very nature of these projects, a substantial quantum of production may need to be exported after meeting the comparatively small internal requirements in most of the cases. This would call for large installations to effectively compete in the export markets. There is, thus, a very limited scope at present for undertaking the manufacture of basic technical materials. A start could, however, be made in respect of one or two selected low tonnage chemicals like copper sulphate, copper oxychloride and 2, 4-D, (2,4-Dichlorophenoxy acetic acid) sodium and amine salts. Copper sulphate, oxychloride, and oxides are used as fungicides mainly in the form of wettable powders. 2, 4-D salts are used as herbicides in the form of dust, liquid and flowables dilutions. The requirement of copper salts in the SADCC region by 1987-88 is estimated at 6,000 tonnes while that of 2,4-D salts at 3,400 tonnes. Small viable units can be set up for the manufacture of copper salts with a capacity of about 3,000 tonnes per year and 2,4-D salts of about 1,500 tonnes per year keeping the plants flexible for a gradual increase in the output.

At present Tanzania appears to have the maximum requirement for fungicides, 3,566 tonnes of copper fungicides having been imported as wettable powder for use mainly on coffee plantations, during 1977. The corresponding requirement for copper salts (as oxychloride) would be around 1,800 tonnes, which may reach around 2,500 tonnes during 1987-88. The unit for the manufacture of copper salts (mainly oxychloride) can therefore be set up in Tanzania with a capacity of around 3,000 tonnes per year. A profile for this type of unit is given in Annexure III.

Zimbabwe at present is the biggest consumer of herbicides, around 5,000 tonnes per year, the corresponding requirement of 2,4-D salt being of an order of 750 tonnes, calculated on a very conservative estimate of 15% of the total requirement of herbicides being 2,4-D. Further this unit would cater to the requirement of the other countries, which is estimated to be 3,400 tonnes by 1987-88. A profile for the establishment of a 2,4-D salt unit with the production capacity of 1,500 tonnes/ year is given in Annexure IV.

5. SADCC PROPOSED REGIONAL PLAN:

The above regional plan, as per Annexure V for the manufacture of Pesticides and Insecticides Formulations has been prepared on the basis of general analysis of input-output data. Field investigations are in progress in consultation with member Governments towards elaborating the project particulars, particularly the elements required for implementation. There would, therefore, be modifications in the course of the investigations in respect of individual project parameters. It is, however, possible at this stage to indicate the framework of the regional plan, which briefly is as follows:-

5.1. **Reactivation and upgrading** of the existing formulation units in Angola, Mozambique, Tanzania, Zambia and Zimbabwe. While the precise cost including the foreign exchange component would be worked out in the course of field investigations, it is suggested at this stage, a reckoning may be made on the basis of 1/3 to ½ of the cost of new plant. On this basis the foreign exchange and local costs work out as under for 11 units:

Total investment	: 39 million US$
Foreign exchange requirement	: 14.3 million US$

5.2. **NEW PROJECTS**

For formulation to be located in Malawi, Swaziland and Zimbabwe on the basis elaborated above of inadequacies between demand and capacities and the necessity of getting the pesticides and insecticides at economic cost to the priority end-users like farmers and Public Health Agencies. The estimated project cost is as follows for 3 units:

Total investment	: 30 million US$
Foreign Exchange requirement	: 11.7 million US$

5.3. **NEW PROJECTS FOR THE MANUFACTURE OF BASIC TECHNICAL MATERIALS**

The new projects (namely copper oxychloride & salts and 2,4-D, sodium salt) are to be located in Tanzania and Zimbabwe on the basis of consumption patterns and availability of local raw materials essential for the feasibility and viabilities of these projects. While the project profiles for these two projects have been appended in Annexures III & IV, the estimate project cost at a glance is given hereunder:

5.3.1. **Copper Oxychloride and Salts**

Total investment	: 2.7 million US$
Foreign exchange requirement	: 1.7 million US$

5.3.2. **2,4-D Sodium Salt**

Total investment	: 1.6 million US$
Foreign exchange requirement	: 1.0 million US$

IDU would develop the Action Plans for the implementation of these projects after they have been approved and would also assist in the presentation of these projects to donor countries for assistance particularly in respect of foreign exchange elements involved in the supply of capital goods, technology transfer and supply of some of the raw materials.

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ANNEXURE I

PROPOSED INDUSTRIAL CAPACITIES IN PRODUCTION OF PESTICIDE AND INSECTICIDE FORMULATIONS

	Area '000 sq. km.	Crop production '000 t. / Arable land ('000 ha)	Actual import of Pesticide Technicals in 1981-82 (tonnes) with source of information	Estimated Requirement of Pesticide Technicals in '82-83 (tonnes)	Important crops	Broad categories of Pesticides/ Insecticides etc in use at present	Projected Demand for Technicals in 87-88 (tonnes)	Existing formulation capacity (apx) & no. of existing units in bracket	Number of formulation units proposed with capacity (tonnes/year)
ANGOLA	1247	4,026 1.8	2,500 year book '80 international trade	4,000	Coffee, tea, cotton	Insecticide - 60% Herbicide - 40%	6,400	6,000(4)	
BOTSWANA	600	137 1.4	300	300	sorghum, maize	-	500	-	
LESOTHO	30	200 0.4	600	600	maize, wheat, sorghum	-	1,000	-	
MALAWI	118	3,277 2.3	2,000 FAO/year book 78 etc	3,300	maize, tobacco, tea, sugar	Insecticide - 50% Others - rest	5,300	-	1 5000
MOZAMBIQUE	783	2,458	4,700 import stat	4,700	Maize, Cotton sugar, tea	Insecticide - 60% Herbicide - 40%	7,600	8,000(3)	
SWAZILAND	17	2,487 0.2	2,000 FAO year book	2,500	sugar cane	herbicide mainly	4,000	-	1, 5,000
TANZANIA	365	11,581 6.3	12,000 UNRP/URT/ 79/006	12,000	Cotton, coffee tobacco, cashew maize, sugar	Insecticide - 50% Fungicide - 33% Others:rest	19,300	20,000(3)	
ZAMBIA	753	2,131 5.0	2,000 Import stat	2,000	Cotton, maize sugar, tea	Insecticide - 45% Herbicide - 55%	3,200	6,000(3)	
ZIMBABWE	391	4,517 2.5	10,000 Import stat/ Ag. Dept.	10,000	Maize, cotton sugar, soya, tobacco, coffee	Insecticide - 40% Herbicide - 50% Fungicide - 10%	16,100	12,000(2)	1 5000
			36,100	39,400			63,400	52,000	

A PROPOSED PROFILE FOR A MULTIPLE PESTICIDE AND INSECTICIDE FORMULATIONS UNIT

Installed Capacity - 5,000 tonnes/year
Capacity Utilisation - 80%

Products	Average Strength %	Technical materials tonnes/year	Nature of Technical materials used in formulations	Other raw materials used in formulation	Quantity of Formulations tonnes/year	Production capacity per day in tonnes	Investment towards machinery & equipment in million US$	Turnover in million US $	Profitability on sales in million US $	Employment
Wettable powder	50	1,800	DDT, BHC, endosulphan, carbaryl, dieldrin, aldrin, etc.	China clay, bentonite, wetting agent, etc.	3,600	12.0	0.32	3.6	25%	80
Granules	10	240	Endosulphan, lindane BHC, diazinon, etc.	Absorptive clay, bentonite, diatomaceous earth etc.	2,400	8.0	0.27	1.4	25%	
Flowables dilution	40	720	Atrazine, simazine ametryn, terbutryn, paraquat, diquat etc	Water, dispersing & wetting agent etc.	1,800	6.0	0.17	7.2	25%	
Dusting powder	10	400	BHC, DDT, toxaphane dicophol, dalapon, malathion, etc.	China clay, bentonite soap stone, etc.	4,000	13.3	0.20	2.0	25%	
Emulsifiable Concentrate	35	840	Malathion, lindane fenitrothion, DDT, pirimiphos methyl, ethion, tetra-diofon etc.	Solvents, surfactants, emulsifiers, etc.	2,400	8.0	0.10	7.2	25%	
Total		4,000			14,200	47.3	1.06	21.4		

A PROPOSED PROFILE FOR THE MANUFACTURE OF COPPER OXYCHLORIDE AND COPPER SALTS - A BASIC FUNGICIDE

1. Capacity of Production : 3,000 tonnes per annum

2. Machinery & Equipment :

   a) size reduction unit
   b) furnace
   c) reactors
   d) centrifuge
   e) filter press
   f) dryer
   g) pulveriser
   h) packing unit
   i) effluent disposal & treatment plant
   j) laboratory

   Total Estimated Cost: 1.0 million US Dollars

3. Raw materials:

   Copper scrap/waste,
   sulphuric acid,
   caustic soda, salt, etc.

4. Employment : 75

5. Turnover : 5.4 million US $

6. Profitability on sales : 33% approximately

7. Note:

   Total requirement of fungicides has been estimated to be 11,800 tonnes per annum, out of which 6,400 tonnes is the estimated requirement of Tanzania. On a modest estimation on the requirement of copper fungicides, calculated on the basis of the half of requirement of total fungicides, the requirement of copper oxychloride works out to be about 6,000 tonnes by 1987-88. It is therefore proposed to set up a unit with a production capacity of 3,000 tonnes per annum, keeping the plant and machinery flexible for a gradual increase in the output to match the requirement at the end of the estimated 5 year period.

ANNEXURE IV

A PROPOSED PROFILE FOR THE MANUFACTURE OF 2,4-D SODIUM SALT ETC (BASIC HERBICIDE/WEEDICIDE)

1. Capacity of Production : 1,500 tonnes per annum

2. Machinery & Equipment :

   a) chlorinator
   b) distillation unit
   c) reactor
   d) centrifuge
   e) dryer
   f) pulveriser
   g) packing unit
   h) effluent disposal/treatment unit
   i) laboratory

   Total Estimated Cost: 0.5 million US Dollars

3. Raw materials:

   Phenol, chlorine,
   caustic soda, soda ash,
   mono chloro, acetic acid,
   mineral acids, etc.

4. Employment : 40

5. Turnover : 3.75 million US $

6. Profitability on sales : 35% approximately

7. Note :

   Total requirement of herbicides in the SADCC region is estimated to be 22,500 tonnes per annum by 1987-88, of which the requirement of basic 2-4D sodium salt, calculated at 15% of total herbicides requirement, is 3,400 tonnes. It is, therefore, proposed to set up a unit with a capacity of production of 1,500 tonnes per year, keeping the plant and machinery flexible for a gradual increase in the output to match the requirement at the end of the estimated 5 year period.

SADCC PROPOSED REGIONAL PLAN

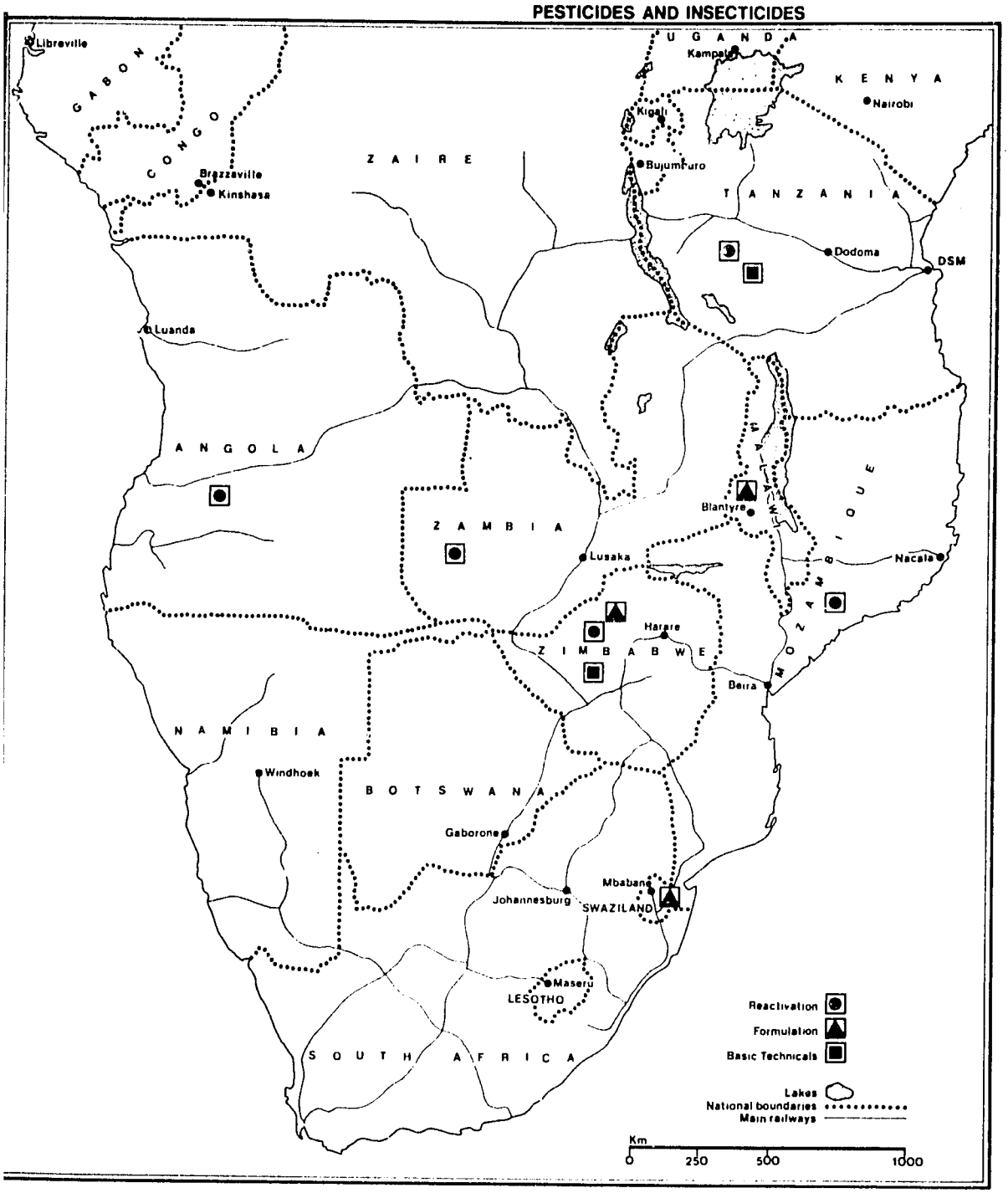
PROPOSED: INDUSTRIAL CAPACITIES IN PRODUCTION OF PESTICIDE AND INSECTICIDE FORMULATIONS

Total demand (1987-88) : 63,400 tonnes/year (in terms of technical materials)
Existing Formulation Capacity : 52,000 tonnes/year (in terms of technical materials)
Short fall : 11,400 tonnes/year (in terms of technical materials)
New Capacity Proposed : 15,000 tonnes/year (in terms of technical materials)
(based on 80% capacity utilisation)

COUNTRY PROJECTS		Proposed Capacity	Total Investment	Employment	FOREIGN EXCHANGE REQUIREMENTS Capital Goods	Raw Materials
NEW PROJECTS (multiple pesticide formulation units)						
* ANGOLA	4 units	8,000	14	320	2.0	3.2
** MALAWI	1 unit	5,000	10	80	1.5	2.4
* MOZAMBIQUE	2 units	4,000	7	160	1.0	1.6
** SWAZILAND	1 unit	5,000	10	80	1.5	2.4
* TANZANIA	2 units	4,000	7	160	1.0	1.6
** TANZANIA°	1 unit	3,000	2.7	75	1.2	0.5
* ZAMBIA	2 units	4,000	7	160	1.0	1.6
* ZIMBABWE	1 unit	2,000	3.5	80	0.5	0.8
** ZIMBABWE°	1 unit	1,500	1.6	40	0.6	1.4
** ZIMBABWE	1 unit	5,000	10	80	1.5	2.4
		TOTAL	72.8	1,235	11.8	17.9

* Upgradation/expansion - 11 units
** Medium - small units - 5 units
° (including 2 for basic materials)

PESTICIDES AND INSECTICIDES



UPGRADATION/EXPANSION OF EXISTING PESTICIDE/INSECTICIDE FORMULATION PLANTS IN ANGOLA

1. INTRODUCTION

Manufacture of pesticides and insecticides, including some basic technical materials, for protection of agricultural and horticultural crops and control of diseases, has been selected by the SADCC Inudstry Ministers as an Industry in which regional industrial co-operation would be desirable and worthwhile.

A regional pesticides and insecticide industry plan has already been prepared by the SADCC member countries, a copy of which is attached at Annex 1. The benefits to the SADCC Region of Industrial Co-operation in the production of pesticide and insecticide formulations would be:-

- self sufficiency in an essential requirement for the development of agricultural and horticultural produce within the countries and in controlling a number of diseases of collosal magnitude like malaria, filariasis, trachoma, etc.

- Utilisation of available or likely to be available material resources of extenders and diluents for the formulations like china clay, absorptive clays like whiting, talc, bentonite, etc.

- Savings on transport and other costs, as many inert materials which constitute the bulk of imported formulations could be available within the SADCC region.

- Increase in size and diversity of industrial sector adding to national and regional output.

- Generation of employment opportunities and development of new skills and technology.

- Conservation of foreign exchange otherwise needed for import of these indispensible items.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Expansion and upgradation of pesticide and insecticide formulation activity in the four existing units in Angola.

2.2. PROJECT RATIONALE

Coffee, tea and cotton are the three important agricultural cash crops of Angola. Besides a substantial requirement for insecticides for spray for disease control, the country needs a variety of pesticide formulations including a large volume of herbicide formulations, for spraying on crops.

The estimated requirement for pesticide/insecticide formulations (during 1987/88) is of an order of 6,400 tonnes (in terms of technical materials). There are reported to be four formulations units existing at present, with very little operational activity, if at all. The total capacity is estimated at 6,000 tonnes per year, mostly for liquid type formulations and repackaging operations. The actual import of pesticides (as technicals) during 1981-82 is reported to be of the order of 2,500 tonnes. There is thus obviously a need for balancing and diversifying the available production facilities to effectively cater to the developing requirements of different types of formulations for various end-use applications.

2.3. PRODUCT RANGE

Standard pesticide & insecticide formulations based on different technical materials	In the form of dusts, wettable powders, emulsifiable concentrates, granules, liquids and flowable dilutions.

3. BACKGROUND

Although there is an existing formulation capacity for pesticides/insecticides, it has yet to make the impact. This is perhaps due to some basic inadequacies such as very limited production facilities for a wide variety of fast moving and more efficacious types of formulations, lack of standardisation and quality control and irregular production activity. The manufacturing activity perhaps largely comprises liquid formulations and repackaging of imported formulations.

4. RAW MATERIALS

Basic technical raw materials for the manufacture of pesticide/insecticide formulations include:

D.D.T.	Lindane	Dicophol
B.H.C.	Paraquat	Dalapon
Endosulphan	Aldrin	Fenitrothion
Carbaryl	Dieldrin	Ethion
Malathion	Toxaphane	Tetradiofon
2,4-D salt	Copper salts	Diaznion

Other raw materials include inert materials used as diluent and carriers e.g. china clay, whiting, bentonite, diatamaceous earth and soap stone etc, dispersing and wetting agents, emulsifiers and solvents etc.

Whereas practically all basic technical materials will need to be imported from outside countries, some of the diluents and carriers may be available indigenously or within the SADCC region and a few dispersing and wetting agents, emulsifiers and solvents may be available from within the SADCC region after some of regional plans for such chemicals are implemented.

5. SADCC TRADING LOGISTICS

There is already an existing railway system linking most of the SADCC countries. Besides, the envisaged development of the regional transport and communication facilities would further ease the trading and transport operations within the SADCC countries. There are already established trading channels in Angola. Thus with the developing trade and transport links among the SADCC countries no trading and transport problems are foreseen as handicaps to project development.

6. TERMS OF REFERENCE FOR STUDY

- To estimate the present and potential requirement within the country, and country-wise within the region, for different types of pesticide/insecticide formulations, item/group wise.

- To estimate the production capacity within the country and the region, present and foreseeable, for different types of pesticide/insecticide formulations.

- To work out a feasible and viable product mix for each unit indicating the size of capacities for select product groups of different types with a view to expand, diversify and upgrade the performance of units for meeting the country's requirement and, wherever possible, selectively exporting the products.

- To provide detailed engineering, technical and financial particulars for expanding and upgrading the operations of the four units including the cost of additional civil works, plant and machinery, working capital and indicating clearly production costs, distribution costs, incomes and profitability etc.

- To identify appropriate technology source and indicate pollution and effluent control and management systems.

- To provide a detailed Action Plan for implementing the expansion and upgradation of the four units.

7. ESTIMATED COST OF THE PROJECT

£60,000

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UPGRADATION/EXPANSION OF EXISTING PESTICIDE/INSECTICIDE FORMULATION PLANTS IN MOZAMBIQUE

1. INTRODUCTION

The manufacture of pesticides and insecticides, including some basic technical materials, for protection of agricultural and horticultural crops and control of diseases, has been selected by the SADCC Industry Ministers as an Industry in which regional industrial co-operation would be desirable and worthwhile.

A regional pesticides and insecticide industry plan has already been prepared by the SADCC member countries, a copy of which is attached at Annex 1. The benefits to the SADCC region of industrial co-operation in the production of pesticide and insecticide formulations would be:-

- Self-sufficiency in an essential requirement for the development of agricultural and horticultural produce within the countries and in controlling a number of diseases of collosal magnitude such as malaria, filariasis, trachoma, etc.

- Utilisation of available or likely to be available material resources of extenders and diluents for such formulations as china clay and such absorbant clays as whiting talc, bentonite, etc.

- Savings on transport and other costs, as many inert materials which constitute the bulk of imported formulations could be available within the SADCC region.

- Increase in the size and diversity of the industrial sector adding to the national and regional output.

- Generation of employment opportunities and development of new skills and technology.

- Conservation of foreign exchange otherwise needed for import of these indispensible items.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Expansion and upgradation of pesticide and insecticide formulation activity in the two existing units in Mozambique.

2.2. PROJECT RATIONALE

Maize, cotton, sugar and tea are the four important agricultural crops in Mozambique. Besides a substantial requirement for insecticides for spray for disease control, the country needs a variety of pesticide formulations including a large volume of herbicide formulations, for spraying on crops.

The estimated requirement for pesticide/insecticide formulations (during 1987-88) is of the order of 7,600 tonnes (in terms of technical materials). There are reported to be three formulations units existing at present, with very little operational activity, if at all. The total capacity is estimated at 8,000 tonnes per year, mostly for liquid type formulations and repackaging operations. The actual import of pesticides (as technicals) during 1981-82 is reported to be of the order of 2,500 tonnes. There is thus obviously a need for balancing and diversifying the available production facilities to effectively cater to the developing requirements of different types of formulations for various end-use applications.

2.3. PRODUCT RANGE

Standard pesticide & insecticide formulations based on different technical materials	In the form of dusts, wettable powders, emulsifiable concentrates, granules, liquids and flowable dilutions

3. BACKGROUND

Although there is an existing formulation capacity for pesticides/insecticides, it has yet to make the impact. This is perhaps due to some basic inadequacies such as very limited production facilities for a wide variety of fast moving and more efficacious types of formulations, lack of standardisation and quality control and irregular production activity. The manufacturing activity perhaps largely comprises liquid formulations and repackaging of imported formulations.

4. RAW MATERIALS

Basic technical raw materials for the manufacture of pesticide/insecticide formulations include:

D.D.T.	Lindane	Dicophol
B.H.C.	Paraquat	Dalapon
Endosulphan	Aldrin	Fenitrothion
Carbaryl	Dieldrin	Ethion
Malathion	Toxaphane	Tetradiofon
2,4-D salt	Copper salts	Diaznion

Other raw materials include inert materials used as diluent and carriers e.g. china clay, whiting, bentonite, diatamaceous earth and soap stone etc, dispersing and wetting agents, emulsifiers and solvents etc.

Whereas practically all basic technical materials will need to be imported from outside countries, some of the diluents and carriers may be available indigenously or within the SADCC region and a few dispersing and wetting agents, emulsifiers and solvents may be available from within the SADCC region after some of regional plans for such chemicals are implemented.

5. SADCC TRADING LOGISTICS

There is already an existing railway system linking most of the SADCC countries. Besides, the envisaged development of the regional transport and communication facilities would further ease the trading and transport operations within the SADCC countries. Mozambique is open to sea transport to enable the import of required raw materials etc. Thus, with the developing trade and transport links among the SADCC countries no trading and transport problems are foreseen as handicaps to project development.

6. TERMS OF REFERENCE FOR STUDY

- To estimate the present and potential requirement within the country, and country-wise within the region, for different types of pesticide/insecticide formulations, item/group wise.

- To estimate the production capacity within the country and the region, present and foreseeable, for different types of pesticide/insecticide formulations.

- To work out two sets of the feasible and viable product mix indicating the size of capacities for select product groups of different types with a view to expand, diversify and upgrade the performance of the unit for meeting the country's requirement and, wherever possible, selectively exporting the products.

- To provide detailed engineering, technical and financial particulars for expanding and upgrading the operations of the two units including the cost of additional civil works, plant and machinery, working capital and indicating clearly production costs, distribution costs, incomes and profitability etc.

- To identify appropriate technology source and indicate pollution and effluent control and management systems.

- To provide a detailed Action Plan for implementing the expansion and upgradation of the two units.

7. ESTIMATED COST OF THE PROJECT

£60,000

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UPGRADATION/EXPANSION OF EXISTING PESTICIDE/INSECTICIDE FORMULATION PLANTS IN TANZANIA

1. INTRODUCTION

The manufacture of pesticides and insecticides, including some basic technical materials, for protection of agricultural and horticultural crops and control of diseases, has been selected by the SADCC Industry Ministers as an Industry in which regional industrial co-operation would be desirable and worthwhile.

A regional pesticides and insecticide industry plan has already been prepared by the SADCC member countries, a copy of which is attached at Annex 1. The benefits to the SADCC region of industrial co-operation in the production of pesticide and insecticide formulations would be:-

- self-sufficiency in an essential requirement for the development of agricultural and horticultural produce within the countries and in controlling a number of diseases of collosal magnitude such as malaria, filariasis, trachoma, etc.

- Utilisation of available or likely to be available material resources of extenders and diluents for such formulations as china clay and such absorbant clays as whiting talc, bentonite, etc.

- Savings on transport and other costs, as many inert materials which constitute the bulk of imported formulations could be available within the SADCC region.

- Increase in the size and diversity of the industrial sector adding to the national and regional output.

- Generation of employment opportunities and development of new skills and technology.

- Conservation of foreign exchange otherwise needed for import of these indispensible item.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Expansion and upgradation of pesticide and incecticide formulation activity in the existing two units in Tanzania.

2.2. PROJECT RATIONALE

Cotton, coffee, tobacco, cashew, maize and sugar constitute the main agricultural crops of Tanzania. Besides a large tonnage of insecticides in the form of wettable powders and emulsifiable concentrates etc used as sprays for disease control, the country needs different types of formulations in the form of dusts, emulsifiable concentrates, wettable powders, granules and flowable dilutions etc to meet various emerging requirements for crop protection.

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The estimated demand for pesticide/insecticide formulations (during 1987-88) is of an order of 19,300 tonnes per annum in terms of technical materials. There are at present three formulation units, two of which are reported to be non-functional, with a production capacity of about 20,000 tonnes per annum, as technical material). The present production of formulations is very small perhaps largely because the production facilities are heavily tilted towards manufacture of a few types (generally liquid) formulations and low concentration dusts only. There is thus obviously a need for balancing and diversifying the available production facilities to effectively cater to developing requirement of different types of formulations for various end use applications.

2.3. PRODUCT RANGE

Standard Pesticide & insecticide formulations based on different technical materials	as dusts, wettable powders, emulsifiable concentrates, granules, liquids and flowables dilutions

3. BACKGROUND

Use of pesticides and insecticides has been increasing at a fast pace in SADCC countries. In countries like Zimbabwe and Mozambique, the application of pesticides and insecticides is comparatively advanced while in the case of others such as Angola, Malawi and Swaziland it is at a rather lower level. The use is in between in countries like Tanzania, where a recent UNIDO study as placed the requirement for pesticides and insecticides at 12,000 (1982-83) tonnes in terms of technical materials.

The present production of pesticides in Tanzania in the absence of required facilities is limited to a few liquid and low concentration dusts only. The bulk of the requirement for pesticides and insecticides is currently imported.

Tanzania has a variety of agricultural crops and needs a wide variety of pesticidal formulations in dusts, wettable powders, emulsifiable concentrates, liquids, granules and flowables dilutions to cater to specific end use requirements. The usage could substantially develop with increased indigenous production which would bring down the cost of products. This would effect a saving of foreign exchange and also help to produce more crops and control diseases with increased application of pesticides and insecticides.

4. RAW MATERIALS

Basic technical raw materials for the manufacture of pesticide/insecticide formulations include:

D.D.T.	Lindane	Dicophol
B.H.C.	Paraquat	Dalapon
Endosulphan	Aldrin	Fenitrothion
Carbaryl	Dieldrin	Ethion
Malathion	Toxaphane	Tetradiofon
2,4-D salt	Copper salts	Diaznion

Other raw materials include inert materials used as diluent and carriers e.g. china clay, whiting, bentonite, diatomaceous earth and soap stone etc, dispersing and wetting agents, emulsifiers and solvents etc.

Whereas practically all basic technical materials will need to be imported from outside countries. Some of the diluents and carriers may be available indigenously or within the SADCC region and a few dispersing and wetting agents, emulsifiers and solvents may be available from within the SADCC region after some of regional plans for such chemicals are implemented.

5. SADCC TRADING LOGISTICS

There is already an existing railway system linking most of the SADCC countries. Besides, the envisaged development of the regional transport and communication facilities would further ease the trading and transport operations within the SADCC countries. Mozambique is open to sea transport to enable the import of required raw materials etc. Thus, with the developing trade and transport links among the SADCC countries no trading and transport problems are foreseen as handicaps to project development.

6. TERMS OF REFERENCE FOR STUDY

- To estimate the present and potential requirement within the country, and country-wise within the region, for different types of pesticide/insecticide formulations, item/group wise.

- To estimate the production capacity within the country and the region, present and foreseeable, for different types of pesticide/insecticide formulations.

- To work out two sets of the feasible and viable product mix indicating the size of capacities for select product groups of different types with a view to expand, diversify and upgrade the performance of the unit for meeting the country's requirement and, wherever possible, selectively exporting the products.

- To provide detailed engineering, technical and financial particulars for expanding and upgrading the operations of the two units including the cost of additional civil works, plant and machinery, working capital and indicating clearly production costs, distribution costs, incomes and profitability etc.

- To identify appropriate technology source and indicate pollution and effluent control and management systems.

- To provide a detailed Action Plan for implementing the expansion and upgradation of the two units.

7. ESTIMATED COST OF THE PROJECT

£60,000

UPGRADATION/EXPANSION OF EXISTING PESTICIDE/INSECTICIDE FORMULATION PLANTS IN ZAMBIA

1. INTRODUCTION

Manufacture of pesticides and insecticides, including some basic technical materials, for protection of agricultural and horticultural crops and control of diseases, has been selected by the SADCC Inudstry Ministers as an Industry in which regional industrial co-operation would be desirable and worthwhile.

A regional pesticides and insecticide industry plan has already been prepared by the SADCC member countries, a copy of which is attached at Annex 1. The benefits to the SADCC Region of Industrial Co-operation in the production of pesticide and insecticide formulations would be:-

- self sufficiency in an essential requirement for the development of agricultural and horticultural produce within the countries and in controlling a number of diseases of collosal magnitude like malaria, filariasis, trachoma, etc.

- Utilisation of available or likely to be available material resources of extenders and diluents for the formulations like china clay, absorptive clays like whiting, talc, bentonite, etc.

- Savings on transport and other costs, as many inert materials which constitute the bulk of imported formulations could be available within the SADCC region.

- Increase in size and diversity of industrial sector adding to national and regional output.

- Generation of employment opportunities and development of new skills and technology.

- Conservation of foreign exchange otherwise needed for import of these indispensible items.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Expansion and upgradation of pesticide and insecticide formulation activity in the two existing units in Zambia.

2.2. PROJECT RATIONALE

Maize, cotton, sugar and tea are the four important agricultural cash crops of Zambia. Besides a substantial requirement for insecticides for spray for disease control, the country needs a variety of pesticide formulations including a large volume of herbicide formulations, for spraying on crops.

The estimated requirement for pesticide/insecticide formulations (during 1987/88) is of an order of 3,200 tonnes (in terms of technical materials). There are reported to be three formulations units existing at present, with very little operational activity, if at all. The total capacity is estimated at 6,000 tonnes per year, mostly for liquid type formulations and repackaging operations. The actual import of pesticides (as technicals) during 1981-82 is reported to be of the order of 2,000 tonnes. There is thus obviously a need for balancing and diversifying the available production facilities to effectively cater to the developing requirements of different types of formulations for various end-use applications.

2.3. PRODUCT RANGE

Standard pesticide & insecticide formulations based on different technical materials	In the form of dusts, wettable powders, emulsifiable concentrates, granules, liquids and flowable dilutions.

3. BACKGROUND

Although there is an existing formulation capacity for pesticides/insecticides, it has yet to make the impact. This is perhaps due to some basic inadequacies such as very limited production facilities for a wide variety of fast moving and more efficacious types of formulations, lack of standardisation and quality control and irregular production activity. The manufacturing activity perhaps largely comprises liquid formulations and repackaging of imported formulations.

4. RAW MATERIALS

Basic technical raw materials for the manufacture of pesticide/insecticide formulations include:

D.D.T.	Lindane	Dicophol
B.H.C.	Paraquat	Dalapon
Endosulphan	Aldrin	Fenitrothion
Carbaryl	Dieldrin	Ethion
Malathion	Toxaphane	Tetradiofon
2,4-D salt	Copper salts	Diaznion

Other raw materials include inert materials used as diluent and carriers e.g. china clay, whiting, bentonite, diatamaceous earth and soap stone etc, dispersing and wetting agents, emulsifiers and solvents etc.

Whereas practically all basic technical materials will need to be imported from outside countries, some of the diluents and carriers may be available indigenously or within the SADCC region and a few dispersing and wetting agents, emulsifiers and solvents may be available from within the SADCC region after some of regional plans for such chemicals are implemented.

5. SADCC TRADING LOGISTICS

There is already an existing railway system linking most of the SADCC countries. Besides, the envisaged development of the regional transport and communication facilities would further ease the trading and transport operations within the SADCC countries. Zambia is open to sea transport through Mozambique and Tanzania. There are already established trading channel in Zambia to enable the import of the required raw materials etc. Thus with the developing trade and transport links among the SADCC countries no trading and transport problems are foreseen as handicaps to project development.

6. TERMS OF REFERENCE FOR STUDY

- To estimate the present and potential requirement within the country, and country-wise within the region, for different types of pesticide/insecticide formulations, item/group wise.

- To estimate the production capacity within the country and the region, present and foreseeable, for different types of pesticide/insecticide formulations.

- To work out two sets of a feasible and viable product mix for each unit indicating the size of capacities for select product groups of different types with a view to expand, diversify and upgrade the performance of units for meeting the country's requirement and, wherever possible, selectively exporting the products.

- To provide detailed engineering, technical and financial particulars for expanding and upgrading the operations of the two units including the cost of additional civil works, plant and machinery, working capital and indicating clearly production costs, distribution costs, incomes and profitability etc.

- To identify appropriate technology source and indicate pollution and effluent control and management systems.

- To provide a detailed Action Plan for implementing the expansion and upgradation of the two units.

7. ESTIMATED COST OF THE PROJECT

£60,000

321

UPGRADATION/EXPANSION OF PESTICIDE/INSECTICIDE FORMULATION PLANTS IN ZIMBABWE

322

1. INTRODUCTION

The manufacture of pesticides and insecticides, including some basic technical materials, for protection of agricultural and horticultural crops and control of diseases, has been selected by the SADCC Industry Ministers as an Industry in which regional industrial co-operation would be desirable and worthwhile.

A regional pesticides and insecticide industry plan has already been prepared by the SADCC member countries, a copy of which is attached at Annex 1. The benefits to the SADCC region of industrial co-operation in the production of pesticide and insecticide formulations would be:-

- self-sufficiency in an essential requirement for the development of agricultural and horticultural produce within the countries and in controlling a number of diseases of collosal magnitude such as malaria, filariasis, trachoma, etc.

- Utilisation of available or likely to be available material resources of extenders and diluents for such formulations as china clay and such absorbant clays as whiting talc, bentonite, etc.

- Savings on transport and other costs, as many inert materials which constitute the bulk of imported formulations could be available within the SADCC region.

- Increase in the size and diversity of the industrial sector adding to the national and regional output.

- Generation of employment opportunities and development of new skills and technology.

- Conservation of foreign exchange otherwise needed for import of these indispensible items.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Expansion and upgradation of pesticide and insecticide formulation activity in the existing units in Zimbabwe.

2.2. PROJECT RATIONALE

Maize, cotton, sugar, soyabean, tobacco and coffee are the important agricultural crops in Zimbabwe. Besides a substantial requirement for insecticides for spray for disease control, the country needs a variety of pesticide formulations including a large volume of herbicide formulations, for spraying on crops.

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The estimated requirement for pesticide/insecticde formulations (during 1987-88) is of the order of 16,100 tonnes (in terms of technical materials). There are reported to be two formulations units existing at present, with very little operational activity, if at all. The total capacity is estimated at 12,000 tonnes per year, mostly for liquid type formulations and repackaging operations. The actual import of pesticides (as technicals) during 1981-82 is reported to be of the order of 10,000 tonnes. There is thus obviously a need for balancing and diversifying the available production facilities to effectively cater to the developing requirements of different types of formulations for various end-use applications.

2.3. PRODUCT RANGE

Standard pesticide & insecticide formulations based on different technical materials	In the form of dusts, wettable powders, emulsifiable concentrates, granules, liquids and flowable dilutions

3. BACKGROUND

Although there is an existing formulation capacity for pesticides/insecticides, it has yet to make the impact. This is perhaps due to some basic inadequacies such as very limited production facilities for a wide variety of fast moving and more efficacious types of formulations, lack of standardisation and quality control and irregular production activity. The manufacturing activity perhaps largely comprises liquid formulations and repackaging of imported formulations.

4. RAW MATERIALS

Basic technical raw materials for the manufacture of pesticide/insecticide formulations include:

D.D.T.	Lindane	Dicophol
B.H.C.	Paraquat	Dalapon
Endosulphan	Aldrin	Fenitrothion
Carbaryl	Dieldrin	Ethion
Malathion	Toxaphane	Tetradiofon
2,4-D salt	Copper salts	Diaznion

Other raw materials include inert materials used as diluent and carriers e.g. china clay, whiting, bentonite, diatamaceous earth and soap stone etc, dispersing and wetting agents, emulsifiers and solvents etc.

Whereas practically all basic technical materials will need to be imported from outside countries. Some of the diluents and carriers may be available indigenously or within the SADCC region and a few dispersing and wetting agents, emulsifiers and solvents may be available from within the SADCC region after some of regional plans for such chemicals are implemented.

5. SADCC TRADING LOGISTICS

There is already an existing railway system linking most of the SADCC countries. Besides, the envisaged development of the regional transport and communication facilities would further ease the trading and transport operations within the SADCC countries. Zimbabwe is open to sea transport through Mozambique to enable import of the required raw materials etc. There are already established trading channels operating in the country. Thus with the developing trade and transport links among the SADCC countries no trading and transport problems are foreseen as handicaps to project development.

6. TERMS OF REFERENCE FOR STUDY

- To estimate the present and potential requirement within the country, and country-wise within the region, for different types of pesticide/insecticide formulations, item/group wise.

- To estimate the production capacity within the country and the region, present and foreseeable, for different types of pesticide/insecticide formulations.

- To work out the feasible and viable product mix indicating the size of capacities for select product groups of different types with a view to expand, diversify and upgrade the performance of the unit for meeting the country's requirement and, wherever possible, selectively exporting the products.

- To provide detailed engineering, technical and financial particulars for expanding and upgrading the operations of the unit including the cost of additional civil works, plant and machinery, working capital and indicating clearly production costs, distribution costs, incomes and profitability etc.

- To identify appropriate technology source and indicate pollution and effluent control and management systems.

- To provide a detailed Action Plan for implementing the expansion and upgradation of the unit.

7. ESTIMATED COST OF THE PROJECT

£60,000

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PESTICIDE/INSECTICIDE FORMULATION PLANT IN MALAWI

1. INTRODUCTION

Insecticides and pesticides formulations constitute an essential requirement for controlling insects and pests that cause economic damage to crops and ornamental plants and are hazardous to animal and human health. Estimates suggest that the total annual loss to agriculture and other crops through pests may range anywhere from 10 to 20% in different countries, developing countries like those in the SADCC region being nearer to the 20% range. Insects on the other hand cause diseases like malaria, filariasis, trachoma, etc, which have a sizable to colossal magnitude in underdeveloped and developing countries such as those in the SADCC region. Use of insecticides and pesticides can, therefore, be neglected only at the cost of unwanted damage to and loss of crops and animal and human life.

The use of pesticides and insecticdes has been increasing at a fast rate in SADCC countries. However, while in such countries as Zimbabwe and Mozambique the application of pesticides and insecticides is comparatively much advanced, it is rather at a lower level in such others as Angola, Malawi and Swaziland. The estimated demand for pesticides and insecticides during 1982-83 is about 39,400 tonnes, during 1987-88 is likely to be of the order of 63,400 tonnes, while the existing formulation capacity is about 52,000 tonnes per annum (all in terms of technical materials). The actual production appears to be very much less. There is thus an obvious scope for the creation of an additional capacity of 15,000 tonnes (in terms of technical materials) on an 80% capacity utilisation basis. Simultaneously, effective steps have to be undertaken to make the existing units (some of which are closed) fully functional.

Manufacture of pesticide and insecticide chemicals and formulations has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. A regional Insectide/Pesticide Chemical & Formulation Industry Plan has already been prepared by the SADCC countries, a copy of which is attached at Annex 1. The regional plan of action incorporates a specific project for the development of an Insecticide and Pesticide Formulation Unit in Malawi which is now being elaborated for feasibility study.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Development of the manufacture of pesticide and insecticide formulations, capacity 5,000 tonnes (in terms of technical materials) per year in Malawi.

Pesticides are generally used in the form of dustic powders, wettable powders and emulsifiable concentrates. Granules and flowable dilutions are developing for sophisticated forms of applications. Insecticides are largely used as wettable powders and emulsifiable concentrates. The proposed project would have facilities for the manufacture of different types of formulations, as per assessed use pattern.

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2.2. PROJECT RATIONALE

Maize, tobacco, tea and sugar constitute important agricultural crops for Malawi. Pesticides and insecticides are required for crop and disease control sprays etc. There is at present no established capacity for the manufacture of these items, whereas the demand by 1987-88 is estimated at 15,300 tonnes per year. There is thus obviously a need to establish a viable formulation capacity to meet domestic demand.

3. BACKGROUND

The existing formulation activity in the SADCC region spreads over 15 units, of which only the 4 units - one each in Tanzania, Zimbabwe, Zambia and Mozambique are functional. The manufacture is heavily tilted towards liquid (including emulsifiable concentrate) formulations. Apart from dusts which are manufactured very little, formulations such as wettable powders, herbicidal dilutions and granule preparations, which enjoy developing usages, are produced to a very limited extent. The new formulation capacity in the regional plan is therefore proposed to be loaded towards formulations hitherto not produced. The Malawi project should also be designed on this pattern with a view to taking care primarily of the domestic requirements.

4. RAW MATERIAL SITUATION

Basic technical materials used in the formulation activity include benzene hexachloride (BHC), Dichlorodiphenyltrichloro ethane (DDT), Endosulphan, Carbaryl, dieldrin, aldrin, lindane, diazinon, toxaphane, dicophol, dalapon, malathion, fenitrothion, tetradiofon, 2,4-Dichloro phenoxy acetic acid, copper salts, etc.

Besides the active raw materials - formulations manufacture activity requires (a) bulk of inert materials and diluents - china clay, bentonite, talc, other absorptive clays; and (b) solvents, surfactants and emulsifers, etc.

Most of the basic technical materials, excepting some small off-take items such as copper salts and 2,4 Dichlorophenoxy acetic acid, whose manufacture is proposed for development within the SADCC region, will have to be imported.

Some solvents may be available within the region after some time, particularly if a petro-chemical complex comes into existance. Some types of surfactants and emulsifiers may also be available from within the region when the proposed projects come up. However until then the raw materials, except for some inert earths and clays which may be available within the region, will have to be imported.

5. SADCC TRADING LOGISTICS

With the existing railway system available within the SADCC region and with the available transport and communications facilities within the country which would be further strengthened during the

coming years, no difficulty is envisaged in the procurement of any raw materials available within the region or distribution of manufactured formulations in the different areas within the country. Basic technical materials will have to be practically imported.

6. TERMS OF REFERENCE FOR THE STUDY

- To estimate the current and future requirement of pesticides and insecticides formulations, item-wise and end-use application wise, within the country.

- To work out the size of a viable production capacity, detailing product-mix and phased programme (if necessary), taking into account the country's demand and overall regional view in terms of demand, capacity and production details.

- To establish the feasibility of a viable production activity with sufficient operational flexibility, for the manufacture of important pesticide/insecticide formulations (including granules, wettable powders and flowable dilutions) to meet the current and developing usages.

- To identify a suitable location for the project.

- To provide detailed engineering, technical and financial particulars of the project, including cost estimates of civil works, specifications of plant and machinery, process flow-charts and technology requirements, pollution and effluents control and management, production costs, distribution costs, income and profitability, etc.

- To identify appropriate technology source for the proposed manufacturing activity, spell technology transfer arrangements, and provide a detailed Action Plan for the implementation of the project.

7. ESTIMATED COST OF THE PROJECT

£50,000.

329

PESTICIDE/INSECTICIDE FORMULATION PLANT IN SWAZILAND

1. INTRODUCTION

Insecticides and pesticides formulations constitute an essential requirement for controlling insects and pests that cause economic damage to crops and ornamental plants and are hazardous to animal and human health. Estimates suggest that the total annual loss to agriculture and other crops through pests may range anywhere from 10 to 20% in different countries, developing countries like those in the SADCC region being nearer to the 20% range. Insects on the other hand cause diseases like malaria, filariasis, trachoma, etc, which have a sizable to colossal magnitude in underdeveloped and developing countries such as those in the SADCC region. Use of insecticides and pesticides can, therefore, be neglected only at the cost of unwanted damage to and loss of crops and animal and human life.

The use of pesticides and insecticides has been increasing at a fast rate in SADCC countries. However, while in such countries as Zimbabwe and Mozambique the application of pesticides and insecticides is comparatively much advanced, it is rather at a lower level in such others as Angola, Malawi and Swaziland. The estimated demand for pesticides and insecticides during 1982-83 is about 39,400 tonnes, during 1987-88 is likely to be of the order of 63,400 tonnes, while the existing formulation capacity is about 52,000 tonnes per annum (all in terms of technical materials). The actual production appears to be very much less. There is thus an obvious scope for the creation of an additional capacity of 15,000 tonnes (in terms of technical materials) on an 80% capacity utilisation basis. Simultaneously, effective steps have to be undertaken to make the existing units (some of which are closed) fully functional.

Manufacture of pesticide and insecticide chemicals and formulations has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. A regional Insecticide/Pesticide Formulation Industry Plan has already been prepared by the SADCC countries, a copy of which is attached at Annex 1. The regional plan of action incorporates a specific project for the development of an Insecticide and Pesticide Formulation Unit in Swaziland, which is now being elaborated for feasibility study.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Development of the manufacture of pesticide and insecticide formulations, capacity 4,000 tonnes (in terms of technical materials) per year, in Swaziland.

It would be advisable to develop a multi-purpose formulation capacity for dusts, emulsifiable concentrates, wettable powders, liquid formulations, granules and flowable dilutions with required flexibility to effectively cater to developing demands.

2.2. PROJECT RATIONALE

Sugar cane is the most important agricultural crop in Swaziland. In terms of pesticide formulations, herbicides are reckoned to be of bulk use. Some insecticidal compositions, wettable powders and liquids primarily, are in demand for public health use including disease control. There may be additional developing uses for pesticide/insecticide formulations. The demand during 1982-83 is estimated at 2,500 tonnes. There is at present no formulation activity within the country. There is thus obviously a need to establish a viable formulation activity to cater to domestic requirements.

3. BACKGROUND

The existing formulation activity in the SADCC region spreads over 15 units, of which only the 4 units - one each in Tanzania, Zimbabwe, Zambia and Mozambique are functional. The manufacture is heavily tilted towards liquid (including emulsifiable concentrates) formulations. Apart from dusts, which are manufactured very little, formulations like wettable powders, herbicidal formulations and granule preparations, which enjoy developing usages are produced to a very limited extent.

The regional plan, therefore, emphasised the establishment of one multi-purpose formulation capacity in such countries as Swaziland where it does not exist, and making the existing units functional in other countries particularly by providing balancing facilities for formulations for which they are not equipped.

4. RAW MATERIAL SITUATION

Basic technical materials used in the formulation activity include benzene hexachloride (BHC), Dichlorodiphenyltrichloro ethane (DDT), Endosulphan, Carbaryl, dieldrin, aldrin, lindane, diazinon, toxaphane, dicophol, diofon, malathion, fenitrothion, tetradiofon, 2,4-Dichloro phenoxy acetic acid, copper salts, etc.

Besides the active raw materials - formulations manufacture activity requires (a) bulk of inert materials and diluents - china clay, bentonite, talc, other absorptive clays; and (b) solvents, surfactants and emulsifers, etc.

Most of the basic technical materials, except some small off-take items such as copper salts and 2,4 dichlorophenoxy acetic acid, whose manufacture is proposed for development within the SADCC region, will have to be imported.

Some solvents may be available within the region after some time, particularly if a petro-chemical complex comes into existance. Some types of surfactants and emulsifiers may also be available from within the region when the proposed projects come up. However until then the raw materials, except for some inert earths and clays which may be available within the region, will have to be imported.

5. SADCC TRADING LOGISTICS

With the existing railway system available within the SADCC region and with the available transport and communications facilities within the country which would be further strengthened during the coming years, no difficulty is envisaged in the procurement of any raw materials available within the region or distribution of manufactured formulations in the different areas within the country. Basic technical materials will have to be practically imported.

6. TERMS OF REFERENCE FOR THE STUDY

- to estimate the current and future requirement of pesticides and insecticides formulations, item-wise and end-use application wise, within the country.

- To work out the size of a viable production capacity, detailing product-mix and phased programme (if necessary), taking into account the country's demand and overall regional view in terms of demand, capacity and production details.

- To establish the feasibility of a viable production activity with sufficient operational flexibility, for the manufacture of important pesticide/insecticide formulations (including granules, wettable powders and flowable dilutions) to meet the current and developing usages.

- To identify a suitable location for the project.

- To provide detailed engineering, technical and financial particulars of the project, including cost estimates of civil works, specifications of plant and machinery, process flow-charts and technology requirements, pollution and effluents control and management, production costs, distribution costs, income and profitability, etc.

- To identify appropriate technology source for the proposed manufacturing activity, spell technology transfer arrangements, and provide a detailed Action Plan for the implementation of the project.

7. ESTIMATED COST OF THE PROJECT

£50,000.

PESTICIDE/INSECTICIDE FORMULATION PLANT
IN ZIMBABWE

1. INTRODUCTION

Insecticides and pesticides formulations constitute an essential requirement for controlling insects and pests that cause economic damage to crops and ornamental plants and are hazardous to animal and human health. Estimates suggest that the total annual loss to agriculture and other crops through pests may range anywhere from 10 to 20% in different countries, developing countries like those in the SADCC region being nearer to the 20% range. Insects on the other hand cause diseases like malaria, filariasis, trachoma, etc, which have a sizable to colossal magnitude in underdeveloped and developing countries such as those in the SADCC region. Use of insecticides and pesticides can, therefore, be neglected only at the cost of unwanted damage to and loss of crops and animal and human life.

The use of pesticides and insecticides has been increasing at a fast rate in SADCC countries. However, while in such countries as Zimbabwe and Mozambique the application of pesticides and insecticides is comparatively much advanced, it is rather at a lower level in such others as Angola, Malawi and Swaziland. The estimated demand for pesticides and insecticides during 1982-83 is about 39,400 tonnes, during 1987-88 is likely to be of the order of 63,400 tonnes, while the existing formulation capacity is about 52,000 tonnes per annum (all in terms of technical materials). The actual production appears to be very much less. There is thus obvious scope for the creation of an additional capacity of 15,000 tonnes (in terms of technical materials) on an 80% capacity utilisation basis. Simultaneously, effective steps have to be undertaken to make the existing units (some of which are closed) fully functional.

Manufacture of pesticide and insecticide chemicals and formulations has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. A regional Insecticide/Pesticide Formulation Industry Plan has already been prepared by the SADCC countries, a copy of which is attached at Annex 1. The regional plan of action incorporates a specific project for the development of an Insecticide and Pesticide Formulation Unit in Zimbabwe, which is now being elaborated for feasibility study.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Development of the manufacture of pesticide and insecticide formulations, capacity about 5,000 tonnes (in terms of technical materials) per year, in Zimbabwe.

The project would be designed to develop a multi-purpose formulation capacity for dusts, emulsifiable concentrates, wettable powders, liquid formulations, granules and flowable dilutions with the required flexibility to effectively cater to developing demands.

2.2. PROJECT RATIONALE

Maize, cotton, sugar cane, soyabean, tobacco and coffee are the important crops in Zimbabwe. In terms of pesticide formulations, herbicides may be accounting for 50% and fungicides 10% of the potential use applications. Insecticidal compositions for disease control account for about 40% of the total requirement.

The consumption of formulations during 1981-82 and 1982-83, in terms of technical materials, is estimated at 10,000 tonnes, while the demand during 1987-88 is estimated at 16,000 tonnes. There exists a formulation capacity (mostly for liquid formulations) as two units, for about 12,000 tonnes of formulations (in terms of technical materials) per year. A gap of about 4,000 tonnes therefore still exists besides the need to develop facilities for turning out different types of formulations for specific end applications.

3. BACKGROUND

The existing formulation activity in the SADCC region spreads over 15 units, of which only 4 - including 1 in Zimbabwe - are functional. The present manufacturing activity is heavily tilted towards liquid (including emulsifiable concentrates) formulations. Apart from dusts which are manufactured very little formulations like wettable powders, herbicidal formulations and granule preparations which enjoy developing usages are produced to a very limited extent. The regional plan, therefore, emphasised the establishment of one multi-purpose formulation capacity in countries like Malawi, Swaziland and Zimbabwe and upgrading/expanding the existing units in other countries and making them functional for turning out formulations to meet specific end-use requirements.

4. RAW MATERIALS

Basic technical materials used in the formulation activity include benzene hexachloride (BHC), Dichlorodiphenyltrichloro ethane (DDT), Endosulphan, Carbaryl, dieldrin, aldrin, lindane, diazinon, toxaphane, dicophol, dalapon, malathion, fenitrothion, tetradiofon, 2,4-Dichloro phenoxy acetic acid, copper salts, etc.

Besides the active raw materials - formulations manufacture activity requires (a) bulks of inert materials and diluents - china clay, bentonite, talc, other absorptive clays; and (b) solvents, surfactants and emulsifers, etc.

Most of the basic technical materials, excepting some small off-take items such as copper salts and 2,4 Dichlorophenoxy acetic acid, whose manufacture is proposed for development within the SADCC region, will have to be imported.

Some solvents may be available within the region after some time, particularly if a petro-chemical complex comes into existence.

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However until then the raw materials, except for some inert earths and clays which may be available within the region will have to be imported.

5. SADCC TRADING LOGISTICS

With the existing railway system available within the SADCC region and with the available transport and communications facilities within the country which would be further strengthened during the coming years, no difficulty is envisaged in the procurement of any raw materials available within the region or distribution of manufactured formulations in the different areas within the country. Basic technical materials will have to be practically imported.

6. TERMS OF REFERENCE FOR THE STUDY

- To estimate the current and future requirement of pesticides and insecticides formulations, item-wise and end-use application wise, within the country.

- To work out the size of a viable production capacity, detailing product-mix and phased programme (if necessary), taking into account the country's demand and overall regional view in terms of demand, capacity and production details.

- To establish the feasibility of a viable production activity with sufficient operational flexibility, for the manufacture of important pesticide/insecticide formulations (including granules, wettable powders and flowable dilutions) to meet the current and developing usages.

- To identify a suitable location for the project.

- To provide detailed engineering, technical and financial particulars of the project, including cost estimates of civil works, specifications of plant and machinery, process flow-charts and technology requirements, pollution and effluents control and management, production costs, distribution costs, income and profitability, etc.

- To identify appropriate technology source for the proposed manufacturing activity, spell technology transfer arrangements, and provide a detailed Action Plan for the implementation of the project.

7. ESTIMATED COST OF THE PROJECT

£50,000

PESTICIDE CHEMICAL PLANT IN TANZANIA

338

1. INTRODUCTION

Pesticides and Insecticides are in increasing demand in all the SADCC countries for developing applications for crop protection and disease control. The actual usage would much increase with the establishment of manufacturing activity within the region. The estimated demand for pesticide/insecticide formulations in the SADCC region during 1982-83 is estimated at 39,400 tonnes and is likely to be of the order of 63,400 tonnes during 1987-88, both in terms of technical materials. The existing formulation capacity (mostly for simple and liquid type formulations) is of about 52,000 tonnes per annum (in terms of technical materials). There does not at present exist any manufacturing capacity for basic insecticide and pesticide technical materials.

Manufacture of pesticide and insectide chemicals and formulations has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. A regional pesticide chemicals and formulations manufacturing plan has already been prepared by the SADCC member countries, a copy of which is attached at Annex 1. The regional plan of action incorporates, besides strengthening and esablishment of new formulations activity in different countries, setting up of a plant each in Tanzania and Zimbabwe for the manufacture of two simple basic technical materials (viz. copper salts (mainly oxychloride) and 2,4-D sodium salt, etc.

The important pesticide/insecticide basic technical materials include DDT, BHC, Endosulphan, lindane, carbaryl, malathion, aldrin, dieldrin, toxaphene, dicophol, dalapon, atrazin, simazin, paraquat, copper salts, and 2,4-D sodium and amine salts etc.

The manufacture of pesticide active ingredients is generally a complex manufacturing activity requiring elaborate facilities, high investments, complex technology, detailed process know-how and specialised management and operational controls. In most of the cases this also requires availability of certain bulk chemicals, from mineral, petro-chemical and other resources, for ensuring viable operations. Simultaneously, by the very nature of these projects, it would require large installations to be commercially viable for the manufacture of most of such technical materials. However a start could be made with the manufacture of selected low tonnage chemicals such as copper sulphate and copper oxychloride and 2,4-D, (2,4-Dichlorophenoxy acetic acid) sodium salt. Copper sulphate, oxychloride and oxides are used as fungicides mainly in the form of wettable powders, while 2,4-D salts are used as herbicides in the form of dust, liquid and flowable dilutions.

The requirement of copper salts in the SADCC region by 1987-88 is estimated at 6,000 tonnes and a viable manufacturing activity can be set up based on a capacity of about 3,000 tonnes per year, which can gradually be expanded to meet the developing requirements.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Development of the manufacture of pesticide basic chemicals; copper sulphate and copper oxychloride, 3,000 tonnes per year in Tanzania.

2.2. PROJECT RATIONALE

Copper sulphate, and more so copper oxychloride, is extensively used as fungicidal formulation, mainly on coffee plantations. In Tanzania, which appears to be the biggest user of fungicides in the SADCC countries. 3,566 tonnes of copper fungicides were imported as wettable powders, for coffee plantations during 1977. The corresponding requirement for copper salts (as oxychloride) would be around 1,800 tonnes, which may reach around 2,500 tonnes during 1987-88. Generally, a project for the manufacture of 3,000 tonnes per year of copper salts (mainly oxychloride) is considered viable and can be set up in Tanzania.

3. BACKGROUND

Among the SADCC countries, Tanzania at present has the highest formulation capacity for different types of insecticide/pesticide formulations. It is also the biggest consumer of fungicides. It is well connected to other SADCC countries to be able to export to them the copper salts for any formulation activity. The proposed project located in Tanzania would be able to effectively serve the needs of SADCC countries.

4. RAW MATERIAL SITUATION

Copper scrap/waste, sulphuric acid, caustic soda and salt constitute the essential raw materials for the proposed manufacturing activity. Copper scrap/waste and salt could be available from local markets and Zambia. Sulphuric acid and caustic soda would be available from the developing projects within the region, and can be imported during the intervening period.

5. SADCC TRADING LOGISTICS

Tanzania has sufficiently developed transport and commmunications facilities as well as trading channels within the country. There exists a railway system linking most of the SADCC countries. The envisaged development of regional transport and communications facilities would further ease the trading and transport operations within the SADCC countries. Tanzania has the port facilities for the import of raw materials. No trading and transport problems are foreseen as a handicap to the project development.

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6. TERMS OF REFERENCE FOR THE STUDY

- To estimate the present and potential requirement of copper salts (copper oxychloride and copper sulphate) end-use application wise, within the country and in the SADCC region.

- To establish the feasibility of the establishment of manufacture of copper oxychloride and copper sulphate, to the tune of about 3,000 tonnes per year (or of a modified size corresponding to estimated demand by say 198[illegible]-88) to meet the regional requirements.

- To identify a suitable location for the project.

- To provide detailed engineering, technical and financial particulars of the project, including cost estimates of civil works, specifications of plant and machinery, process flow charts and technology requirements, pollution and effluents control and management production costs, distribution costs, income and profitability, etc.

- To identify appropriate technology source for the proposed manufacturing activity, spell technology transfer arrangements and provide a detailed Action Plan for the implementation of the project.

7. ESTIMATED COST OF THE PROJECT

£50,000.

PESTICIDE CHEMICAL PLANT IN ZIMBABWE

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1. INTRODUCTION

Pesticides and Insecticides are in increasing demand in all the SADCC countries for developing applications for crop protection and disease control. The actual usage would much increase with the establishment of manufacturing activity within the region. The estimated demand for pesticide/insecticide formulations in the SADCC region during 1982-83 is estimated at 39,400 tonnes and is likely to be of the order of 63,400 tonnes during 1987-88, both in terms of technical materials. The existing formulation capacity (mostly for simple and liquid type formulations) is of about 52,000 tonnes per annum (in terms of technical materials). There does not at present exist any manufacturing capacity for basic insecticide and pesticide technical materials.

Manufacture of pesticide and insectide chemicals and formulations has been selected by the SADCC Industry Ministers as an industry in which regional industrial co-operation would be desirable and worthwhile. A regional pesticide chemicals and formulations manufacturing plan has already been prepared by the SADCC member countries, a copy of which is attached at Annex 1. The regional plan of action incorporates, besides strengthening and esablishment of new formulations activity in different countries, setting up of a plant each in Tanzania and Zimbabwe for the manufacture of two simple basic technical materials (viz. copper salts (mainly oxychloride) and 2,4-D sodium salt, etc.

The important pesticide/insecticide basic technical materials include DDT, BHC, Endosulphan, lindane, carbaryl, malathion, aldrin, dieldrin, toxaphane, dicophol, dalapon, atrazin, simazin, paraquat, copper salts, and 2,4-D sodium and amine salts etc.

The manufacture of pesticide active ingredients is generally a complex manufacturing activity requiring elaborate facilities, high investments, complex technology, detailed process know-how and specialised management and operational controls. In most of the cases this also requires availability of certain bulk chemicals, from mineral, petro-chemical and other resources, for ensuring viable operations. Simultaneously, by the very nature of these projects, it would require large installations to be commercially viable for the manufacture of most of such technical materials. However a start could be made with the manufacture of selected low tonnage chemicals such as copper sulphate and copper oxychloride and 2,4-D, (2,4-Dichlorophenoxy acetic acid) sodium salt. Copper sulphate, oxychloride and oxides are used as fungicides mainly in the form of wettable powders, while 2,4-D salts are used as herbicides in the form of dust, liquid and flowable dilutions.

The requirement of herbicides in the SADCC region by 1987-88 is estimated at 22,500 tonnes per year, of which the requirement of basic 2,4-D sodium salt, calculated at 15% of total herbicides requirement is estimated at 3,400 tonnes. It is, therefore, proposed to set up a unit with a capacity of production of 1,500 tonnes per year, keeping the plant and machinery flexible for a gradual increase in the output to match the requirement at the end of the estimated 5 year period.

2. PROPOSED PROJECT

2.1. DESCRIPTION OF THE PROJECT

Development of the manufacture of basic pesticide chemical; 2,4-Dichlorophenoxy acetic acid, 1,500 tonnes per year in Zimbabwe.

2.2. PROJECT RATIONALE

Zimbabwe at present is the biggest consumer of herbicides, around 5,000 tonnes per yar, the corresponding requirement of 2,4-D salt being of an order of 750 tonnes, calculated on a very conservative estimate of 15% of the total requirement of herbicides being 2,4-D. This would consitute more than 50% of the effective production capacity of the unit. The balance of production could easily be marketed to other countries in the region, which also have a sizable demand for this herbicide technical.

3. BACKGROUND

Among the SADCC countries, Zimbabwe at present ranks second only to Tanzania in the consumption of pesticides. It also has the second highest existing capacity for pesticide formulations. Herbicides constitute about 50% of the total end use applications of pesticides. Zimbabwe is well connected to other SADCC region countries to be able to meet their requirement of this basic chemical. The proposed project located in Zimbabwe would be able to effectively serve the needs of SADCC countries.

4. RAW MATERIALS

Phenol, chlorine, caustic soda, soda ash, monochloroacetic acid and mineral acids are the important raw materials requirement for the manufacture of 2,4-D salt. Manufacture of some of these such as caustic soda and chlorine is included in the SADCC regional plan of industrial development. Besides, these are the basic industrial chemicals, which can easily be imported till alternative facilities for meeting their requirement develop within the region.

5. SADCC TRADING LOGISTICS

Zimbabwe has sufficiently developed transport and communications facilities as well as trading channels within the country. It is linked to most SADCC countries by a railway system. The envisaged development of regional transport and communications facilities would further ease the trading and transport operations within the SADCC countries. Zimbabwe is open to sea transport through Mozambique and RSA ports to enable import if required of raw materials, etc. Thus no trading, or transport problems are foreseen as handicaps to project developments.

6. TERMS OF REFERENCE FOR STUDY

- To estimate the present and potential requirement of 2,4-D salt with the SADCC region by country.

- To establish the feasibility of the establishment of manufacture of 2,4-D salt to the tune of about 1,500 tonnes per year (or of a modified size based on estimated demand by say 1984-85 with a provision for expanding the capacity further) to meet the regional requirement.

- To identify a suitable location for the project.

- To provide detailed engineering, technical and financial particulars of the project, including cost estimates for civil works, specifications of plant and machinery, process flow charts and technology requirements, effluents control and management, production costs, distribution costs, income and profitability, etc.

- To identify appropriate technology sources for the proposed manufacturing activities, spell technology transfer arrangements and provide detailed Action Plans for the implementation of the projects.

7. ESTIMATED COST OF STUDY

£50,000

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SECTION VI:
Farm Implements

DEMAND ANALYSIS AND PRODUCTION OF
FARM IMPLEMENTS

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1. INTRODUCTION

A UNIDO study (1979) on the Agricultural Machinery Industry observed that the African countries import 5 to 10 times the amount in value of foodgrains than of agricultural machinery which contributes to the local production of the same cereals. It is estimated that 80% of African farmers have at their disposal only traditional handtools, 15% make use of animal drawn equipment and 5% employ tractors.

The picture in SADCC countries is no better than the average African picture. In fact, even the supply of handtools is constrained by lack of adequate local production. And the problem of limited usage of other farm equipment including tractors is exacerbated by the foreign exchange difficulties. Investment in agricultural equipment is hardly one-hundredth of the value of agricultural output.

This picture however can be changed in only a few years by the adoption of suitable industry/technology mix and SADCC regional cooperation. The analysis in these preliminary studies shows that relatively modest investments can lead to self-reliance in the production of essential farm implements and equipment and spread of industrial activity in the SADCC region, in tune with the principal objectives of the Lagos Plan of Action and those of SADCC member States.

2. FARMING IN SADCC REGION

2.1. An idea of the relative extent of major categories of equipment needed for various agricultural activities can be had from the import data of Table 2.1:

Table 2.1 IMPORTS INTO AFRICA, 1978

Equipment	Value in $ million	% of total value
Tractors	390	23
Pumps	326	19
Hand tools	298	18
Agricultural machines	180	11
Building equipment	317	19
Engines	114	7
Packaging & weighing	50	3
Total	1,675	100

2.2. The studies here are concerned mainly with the equipment needed for the operations specifically linked with agricultural production. Broadly, these activities are:

- Land preparation
- Nursery work
- Planting & applying fertilisers
- Seeding & banking
- Topping & spraying
- Harvesting
- Grading & Marketing
- Shelling
- Uprooting

2.3. Besides such modern practices as the use of high yielding variety of seeds and the application of fertilisers and other agricultural chemicals, timing is very critical to the success of an agricultural operation. The usage of tools and other agricultural equipment and machinery improves this timeliness of various activities in addition to performing operations that cannot be done by other means. Specifically, such usage is:

- to bring additional land under cultivation by clearing new areas and by utilising land unsuitable for hand cultivation

- to reduce labour requirements especially during peak periods and to increase labour employment during slack periods

- to improve the timing of operations so as to use optimum tillage and planting dates, to avoid unfavourable weather conditions, to reduce the effects of weeds and to harvest at the optimum time

- to facilitate the introduction of intensive and multiple farming

- to reduce drudgery of agricultural operations

- to increase farm productivity and income

2.4. Up to 80% of a farmer's work in the cropping season is concerned with re-ridging (land preparation) and weeding, and these are the operations where he needs the assistance of tools and equipment most. Tractors and other engine powered machinery can especially be useful for activities like seed-bed preparation, general cultivation, plant protection, harvesting, threshing, water pumping and land reclamation.

TYPICAL SADCC CALENDAR OF CROPPING

2.5. The major crops of SADCC region include maize, groundnuts, cotton and tobacco. A typical calendar of various activities performed and the average man days spent on them for these four crops in one of the SADCC countries is given in Table 2.2.

2.6. It will be seen that seasonality of labour inputs is very critical. Peak inputs are required during land preparation and harvesting stages and, to an extent, at the weeding stage. Mechanisation of harvesting has been achieved only to a limited extent. Crop-distinct features of harvesting include:

Groundnut

Harvesting is labour-intensive; timing is critical since the nut starts deteriorating if left in the ground too long; and also the harvesting becomes increasingly harder as the soil dries.

Tobacco

Harvesting and curing are labour-intensive and timing is crucial as over or under-ripe means lower quality. Tobacco topping and picking is generally done by hand.

Cotton

Laborious harvesting. Though risk of deterioration is not great the harvest has to be completed in time so that the plants can be uprooted and burnt for pest control reasons.

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Table 2.2 TYPICAL AGRICULTURAL CALENDAR (MAN DAYS) IN ONE SADCC COUNTRY

Month	Maize	Groundnuts	Cotton	Tobacco
Sept.	Start land preparation (7.4)	Start land preparation (12.4)	Start land preparation (12.4)	Prepare Nursery (7.4) Land Preparation field (7.4)
Oct.	Continue land preparation (12.4)	Continue land preparation (14.9)	Continue land preparation (24.8)	Nursery work (17.3) Land preparation field (9.9)
Nov.	Finish land preparation Plant (21.0)	Finish land preparation Plant (17.3)	Finish land preparation Plant(29.7)	Nursery work (17.4) land preparation (9.9)
Dec.	Weed Fertilise (24.8)	Weed (22.3)	Weed (22.3)	Nursery work(7.4) Land preparation (7.4)Plant(11.1) Fertilise (3.7)
Jan.	Weed (16.1)	Weed (14.9)	Weed Spray (49.5)	Finish fertilise (3.7) Weed (27.2)
Feb.	Weed (9.9)	Weed (14.9)	Spray (7.4)	Weed(24.8, Prime Top & sucker (16.1)
March	-	Harvest (14.9)	Spray (7.4)	Prime, Top and Sucker (17.3) Harvest & Cure (37.1)
April	Harvest (12.4)	Harvest (34.7)	Spray & Harvest (34.7)	Harvest & Cure (37.1)Uproot(5.0)
May	Finish (13.6)	Harvest (34.7)	Harvest (34.7)	Harvest & Cure (9.9) Grade & Sell (24.8) Uproot (5.0)
June	-	Shell (19.8)	Harvest & Uproot (44.6)	Grade & Sell (27.2) Uproot (5.0)
July	-	Shell (19.8)	Harvest & Uproot (52.0)	Grade & Sell (24.8)
Aug.	-	Shell (19.8)	Uproot (5.0)	-

Maize

Relatively less labour intensive and less sensitive to exact timing. Susceptible to damage by pests if left too long in the field.

FARMING SYSTEMS IN SADCC

2.7. All the three major systems of farming - manual-based, animal-based and tractor-based - are prevalent in the SADCC Region to varying degrees. Their characteristics are shown in Exhibit 2.1 Table 2.3 estimates the average power inputs from the three sources of labour, animals and tractors, for some of the SADCC countries. It also shows the picture for Africa as a whole in 1980.

Table 2.3 PATTERN OF POWER INPUTS

	Labour %	Draught animals %	Tractors %
Angola	90.6	3.6	5.8
Malawi	94.5	3.2	2.3
Mozambique	90.4	4.4	5.2
Tanzania	81.6	16.4	2.0
Zambia	81.4	12.2	6.4
Zimbabwe	63.7	20.6	15.7
Africa - 1980	81	16	3
- 2000	81	11	8
Envisaged growth rate % p.a. - 1980-2000	3.0	1.3	8.0

(Based on FAO data)

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EXHIBIT 2.1 CHARACTERISTICS OF THE FARMING SYSTEMS IN SADCC REGION

Farming systems characteristics	Hand farming	Animal drawn farming	Tractorisation
Bases of the system	Agricultural system basically man-dependent, using human strength to accomplish all tasks either directly or with the aid of simple traditional tools.	Agricultural system based on the use of animals to carry out all or part of the agricultural work. This implies a complementary agriculture/husbandry system and the use of animal drawn equipment.	Agricultural system making use of the motor and more precisely of the tractor to carry out all or part of the agricultural work. This implies in particular a corresponding set up of the environment to ensure the operations of machines and sets of heavy equipment.
Machines used	* nil (picking) * simple tools (machette-hoe) * simple machinery to be carried (back carried sprayer) or pushed (cart-hoe) or stationary (sheller-pump)	* simple machine(cart-swing-plough - harrow) * more sophisticated machinery (plough - sower - multicultor)	* tractor with heavy equipment (plough - disk harrow - sower drill-trailer) * motorised fixed machinery (thresher-motopump) self-propelled machine
Initial investment level	* The purchase cost of the equipment corresponds to about: US$ 10/labourer/5 years for simple hand tools. less than US$ 100/labourer/5 years for simple machinery	* The purchase cost of the equipment is evaluated at US$325/5 years. To this is added the cost of purchase and rearing and training an animal evaluated at US$ 400/animal (ox).	* The cost of motorised set of equipment including one tractor (45 HP) is evaluated at US$ 11,000/5 years and US$ 16,000 if a thresher is included.
Agricultural operations performed with appropriate equipment	* partial clearing * light preparation of soil upkeep and protection of cultures * help to harvesting and to the transformation of products	* light preparation of soil * sowing * upkeep of cultures * light transportation	* preparation of soil * sowing * transportation * accessorily: threshing - irrigation
	* All crops: - food crops based on cereals roots or fruit - cash crops, annual (cotton - groundnut) or perennial (palm tree - sugar cane) - for export (coffee - cocoa - citrus fruit)	* Crops based on cereals (rice - corn - millet - wheat) Annual cash crops (cotton - groundnut - tobacco)	* Crops based on cereals (rice - corn - wheat) Annual cash crops (cotton - soya) or pluriannual (sugar cane - bananas) Perennial crops (palm tree - coffee - cocoa)

EXHIBIT 2.1 CHARACTERISTICS OF THE FARMING SYSTEMS IN SADCC REGION (cont)

Farming systems characteristics	Hand farming	Animal drawn farming	Tractorisation
Categories of farmers and farming units affected	* Small individual farming of the family type (less than 5 Ha), but also medium and large plantations, where much of the work is still manual.	* Medium size family type (less than 20 ha) the agricultural production of which is especially based on cereals.	* Middle or large size farming where production is based on cereals or cash crops including: - some family farming of more than 20 ha. - large private farming - private, mixed or State agro-industrial units - State farms production co-operatives
Positive aspects of different systems	* low level of investment with direct supply available to farmers from local blacksmiths * the system is adapted to the agro-ecological environment (cultivation on ridges with several types of plants on the same parcel) * the conditioning of the land concerns basically the control of water * no training is essential	* introducing animal drawn farming allows to relieve some bottlenecks (preparation of soil) and makes transportation easier * the investment level is limited and made profitable by an increase in production conditioning is easily feasible by farmers (partial grubbing and land clearning) * maintenance can be carried out by local artisans and blacksmiths * production can be by craftsmen or industrial without requiring major investments in equipment * the low degree of complexity requires little supervision * the system adapts to the agro-ecological environment without disturbing it.	* introducing heavy mechanisation allows: . to valorise waste land . to increase production by expanding arable land . to carry out some arduous work (deep tillage) . eventually to improve the value of inputs by introducing modern farming techniques. * Very high attractiveness of the tractor, as a synonym of modernity * Can compensate for a lack or absence of farm labourers.

for Africa as a whole in 1980, the targetted percentage power from the three sources in 2000 and the annual growth rate required to achieve the targetted percentage mix of power inputs.

Potential for increasing output

2.8. According to the documentation compiled for SADCC 'Regional Coordination in Food and Agriculture' the extent of cultivation practised in the Region is as shown in Table 2.4.

Table 2.4 LAND RESOURCES OF THE REGION (1977)

Country	Land Utilisation (millions of ha) Total Land	Arable	Other	Other land as a % of total land	Inhabitants per hectare of arable land
Angola	124.7	1.8	122.9	98.6	3.7
Botswana	58.5	1.4	57.1	97.6	0.5
Lesotho	3.0	0.4	2.6	86.7	3.0
Malawi	9.4	2.3	7.1	75.5	2.2
Mozambique	76.5	3.1	73.4	95.9	3.1
Swaziland	1.7	0.2	1.5	88.2	2.5
Tanzania	88.6	6.3	82.3	93.9	2.6
Zambia	74.1	5.0	69.1	93.3	1.1
Zimbabwe	38.7	2.5	36.2	93.5	2.7

Note: Arable land refers to land currently under cultivation.

2.9. Not only the percentage of arable land needs to be improved, the group on 'Food & Agriculture' also emphasised that considerable scope existed for improving the output per hectare of the presently utilised land area as is evident from Table 2.5.

Table 2.5 YIELDS FOR TWO SAMPLE CROPS

Country	Average yield per year (1975-77) in tonnes per hectare: Maize	Shelled groundnuts
Angola	0.746	0.542
Botswana	0.683	1.119
Lesotho	0.928	-
Malawi	1.117	0.627
Mozambique	0.538	0.467
Swaziland	1.332	-
Tanzania	0.728	0.595
Zambia	0.962	1.017
Zimbabwe	2.831	0.716

2.10. Appendices I to IX provide a profile of each of the SADCC member states on their land resource, cropping pattern, and the stock, imports and production of farm implements and machinery.

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3. FARM TOOLS AND IMPLEMENTS

3.1. Corresponding to three major systems of farming in use in SADCC as outlined in Exhibit 2.1, there are three main categories of farm tools and implements:-

Category 1:

Hand tools and simple manually-operated machines, such as hoes, forks, shovels, spades, axes, machette, cutlasses, sickles, scythes, knives, etc; hand wheel-hoe, planters, seed-drills, etc.

Category 2:

Animal-drawn implements and manually-operated machines such as: ploughs, mould-board ploughs, ridgers, harrows, cultivators, planters, seed-drills, manure spreaders, etc; threshers, choppers, shellers, grinders, mills, decorticators etc; dusters, sprayers, hand pumps, etc; dryers, bins, carts, etc.

Category 3:

Tractor-drawn implements and simple power operated machines such as: ploughs, seed-drills, cultivators, harrows, disc-harrows, harvesters, etc; threshers, choppers, shellers, grinders, mills, etc; dusters, sprayers, pumps, etc; dryers, silos, trailers, etc.

PRODUCTION PATTERN

3.2. Broadly, there are three sectors of industry in which the manufacture of the following categories of tools and implements is undertaken:

I Artisan and blacksmithy sector
II Small industries
III Medium to large industry sector.

Present position

3.3. The present position with respect to supply, production capabilities, imports and exports of farm tools and implements for each of the SADCC countries is given in Appendices I to IX. This is based on the data and information collected during field visits to all SADCC countries (except Angola), documentation of UNIDO, FAO and ECA and the estimates made in the lack/absence of desired information.

The position as it emerges is summarised in Table 3.1.

Table 3.1 FARM TOOLS AND IMPLEMENTS - PRESENT POSITION

Country	Hand Tools	Animal Drawn Implements	Tractor Drawn Implements	Remarks
Angola				
Capacity	1 million pa	10,000 pa	1000 pa	Exclusive of production in artisan sector. Plans include expansion of implements cap & production of 1000 pumps p.a.
Utilisation	50%	12%	12%	
Botswana till 1981	Imported	Imported	Imported	Production of tools and animal drawn implements started in 1982.
Lesotho	Imported	Prototype production only	Imported	Carts & trailers are being produced.
Malawi				
Capacity	1.5 million pa	30,000 pa		1 large unit dominates. Diversification is planned to utilise space capacity.
Average prodn.	5 million pa	3/5000 pa	3/400 pa	
Mozambique				
Targetted Prodn. for 1982	1 million hoes 70000 machetes 60000 spades 1200t shovels	20,000 ploughs		A number of small units exist. Agro-Alfa has 3 factories. & production of 1000 pumps p.a.
Major imports for 1982			95 disc harrows; 150 heavy duty disc ploughs;39 seeders;40 subsoilers 30, combiner etc	A $50m renovation and expansion of Beira plant will increase the production to 3,000 tpa of farm implements.

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Table 3.1 FARM TOOLS AND IMPLEMENTS - PRESENT POSITION (cont)

Country	Hand Tools	Animal Drawn Implements	Tractor Drawn Implements	Remarks
Swaziland	Imported	Imported	Imported	Some implements are supplied with Tinkabi tractor
Tanzania				
Cap	------ 8,110	tonnes p.a.	-----	2 large units
Prodn.	------ 30	to 40 %	-----	dominate. There are
	559 tpa	1210 tpa	4656 tpa	also about 800 blacksmithy and 70 small scale units.
Zambia				
Prodn.	0.5 million pa	5000 ploughs p.a.		3 medium large units, expansion of 1 unit on hand, 12 small units.
Imports	0.[illegible] p.a.	15000 ploughs pa 2000 other implements pa		
Zimbabwe	-- All made locally -- some exports (1800-2000 tpa)		Combine harvesters imported	4 major units

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4. DEMAND FOR FARM IMPLEMENTS IN SADCC

4.1. The demand in each of the SADCC countries in 1986, taking 1981 as the base year, for each of the three categories of farm tools and implements is estimated on the following rationale and assumptions:

HANDTOOLS

4.2. The demand for handtools is calculated on the basis of surveys of tool stocks in rural households in Tanzania and Malawi (1969 Agricultural census). Average number and weight of tools per household are - hoe 3.5 pieces per household (5.5 kg) and other handtools 6.5 pieces per household with an average weight of 1 kg. per piece. Data on households is based on population data (IBRD).

An alternative estimation method based on handtool usage per cultivated hectare was also tried but the results were regarded as less reliable. Import and production data were also collected and analysed as a basis for the market estimate and used as a cross check for the estimates derived by other methods. Handtool replacement was taken as 4 years, based on survey information. The growth rate of demand was based on the objective of achieving agricultural production growth above the population growth rates (average 2.5% - 3% in SADCC area). The assumption made was 4% p.a. and handtool stocks are also assumed to grow proportionately at this rate.

ANIMAL DRAWN IMPLEMENTS

4.3. Demand for ox ploughs has been estimated again on 'household' and 'cultivated hectarage' basis. Household data were taken, as above, from Tanzania and Malawi surveys. The number of ox ploughs per household in Malawi and Tanzania is in the range 0.025 to 0.05. For other ox drawn implements, the market is not so developed and any projections assume some promotional activity by SADCC governments. A survey by the Government of Tanzania (Regional Development Directors 1977) estimated that other ox drawn implements, mainly chains but including harrow, planter, cultivator, ridger etc amounted to 0.36 per trained animal. Ox ploughs amounted to 0.3 per trained animal. An alternative forecast based on population of trained oxen (FAO data except for Tanzania and Zambia where local estimates are taken) was also attempted.

The demand estimate actually used is an average of the 'house survey' and the 'oxen-in-use' bases. The number of ox drawn implements other than ploughs was assumed to be equal to the number of ploughs per animal in use. Import data were also used as an alternative check on the above estimate.

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The replacement period for ox drawn implements has been assumed to be 5 years and the growth rate of implements stock 5% per annum. This rate is based on the expectation that implement introduction will accelerate as projected in the FAO provisional study 'Indicative World Plan', and taking into account the planning targets of a number of SADCC governments with regard to the rate of introduction of draft implements.

TRACTOR DRAWN IMPLEMENTS

4.4. The demand for these implements is based on estimated tractor stocks. Tool stocks per tractor in Tanzania (Houston Dagg, FAO, 1978) were used as a lower bound estimate for the SADCC area. These were as follows: for tillage equipment, 0.82 per tractor-in-use; for planting/seeding 0.14 per tractor-in-use; for mowers, sprayers, cutters etc 0.2 per tractor-in-use. Total implements according to this basis are 1.16 items per tractor-in-use. Other information suggests that this is an underestimate. Indian experience, for example, indicates an average of about 3 implements per tractor-in-use. This has been taken as an upper bound.

Between these two bounds of 1.16 and 3 implements per tractor, an overall average of 1.7 pieces per tractor provides a good indication for estimating the demand of tractor drawn implements in SADCC. Country to country variations as gathered during field visits are also taken into account. The average life and rate of growth in implements stock is taken to be the same as for tractors. The average distribution of tractor implements is based on the field sample survey:

70% tillage equipment (ploughs, harrows, cultivators, etc

13% for planting and seeding

and 17% for other usage, such as spraying, cutting, mowing, etc.

The forecast of demand (both replacement and new) computed on the above bases and assumptions is presented in Table 4.1. Both numbers and tonnage units are given.

Table 4.2 segregates the total SADCC demand by the major types of tools and implements in both numbers and tonnage units.

DEMAND FOR OTHER AGRICULTURAL EQUIPMENT

4.5. Besides the three main categories of farm implements, an estimate is also made of haulage, and processing equipment so as to provide a total picture and also because such equipment may be fabricated by the same manufacturers. Such equipment includes carts, trailers, grain millers and cane crushers.

Table 4.1 SADCC REGION - FARM IMPLEMENT DEMAND

	HANDTOOLS				ANIMAL DRAWN IMPLEMENTS				TRACTOR DRAWN IMPLEMENTS			
	1981		1986		1981		1986		1981		1986	
	NOS. (000)	TONS	NOS. (000)	TONS	NOS. (000)	TONS	NOS. (000)	TONS	NOS.	TONS	NOS.	TONS
ANGOLA	2,325	2,732	2,829	3,324	10.8	486	13.8	620	2,500	2,080	3,190	2,650
BOTSWANA	100	120	120	145	1.0	45	1.3	58.5	650	540	830	690
LESOTHO	500	587.5	608	715	3.2	144	4.1	184	350	290	420	350
MALAWI	2,125	2,497	2,585	3,038	11.2	504	14.3	643	900	750	1,100	910
MOZAMBIQUE	3,750	4,407	4,562	5,362	19.4	873	24.8	1,114	1,820	1500	2,420	2,000
SWAZILAND	200	235	243	286	1.3	58.5	1.7	75	780	650	950	790
TANZANIA	6,849	8,077	8,346	9,818	43.6	1,962.5	55.6	2,505	1,785	1,490	2,280	1,900
ZAMBIA	1,549	1,820	1,885	2,214	11.8	531	15.0	678	1,300	1,080	1,660	1,380
ZIMBABWE	2,475	2,908	3,011	3,538	34.0	1,530	43.0	1,953	7,800	6,500	8,650	7,230
TOTAL	19,873	23,383	24,189	28,440	136.3	6,134	173.6	7,830	17,885	14,880	21,500	17,900

Table 4.2 BREAKDOWN OF TOTAL DEMAND BY TYPE OF EQUIPMENT

	1981		1986	
Handtools	Pieces	Tons	Pieces	Tons
Hoes	6,981,000	10,471	8,492,000	12,760
Other - (panga, axe sickle, slasher, weeding hoe etc)	12,892,000	12,912	,697,000	15,680
Total	19,873,000	23,383	24,189,000	28,440
Animal drawn implements				
Ploughs (40kg/pc)	68,150	2,726	86,800	3,480
Other - (harrow, planters, chains, cultivators etc) (50kg/pc)	68,150	3,408	86,800	4,350
Total	136,300	6,134	173,600	7,830
Tractor drawn implements				
Tillage equipment (900 kg/pc)	12,520	11,270	15,143	13,630
Planting/seeding (500 kg/pc)	2,325	1,160	2,720	1,360
Other - (sprayer, mower etc) (800 kg/pc)	3,040	2,450	3,637	2,910
Total	17,885	14,880	21,500	17,900

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4.6. This demand is estimated on the following basis and assumptions:

Ox Carts UNIDO and local data suggests usage by 10% of trained oxen pairs.

Trailers Demand calculated on Tanzania FAO survey figure of 0.24 per tractor-in-use. This may be regarded as a conservative estimate.

Cane crushers For countries with significant sugar production. The estimated is based on cultivated hectarage under sugar cane.

Grain Millers Based on market estimate of equipment per tonne of production of cereal crops.

4.7. The growth rate of equipment stock is taken as 4% per annum, reflecting a planned acceleration in agricultural output growth, and accelerated introduction of animal and mechanical power. The equipment life in case of ox-carts is taken as 5 years and for others, 7 years.

4.8. Based on the above, the demand forecast for haulage, and processing equipment for SADCC countries is presented in Table 4.3

Table 4.3 DEMAND ESTIMATE - HAULAGE AND PROCESSING EQUIPMENT

		TRAILERS		OX CARTS		CANE CRUSHERS		GRAIN MILL/ RICE MILLER	
Average weight :		1.2 tonne		300kg		430kg		400kg	
		1981	1986	1981	1986	1981	1986	1981	1986
Angola	Nos.	336	409	720	880	420	511	501	682
	Tons	403	490	216	264	179	218	224	273
Botswana	Nos.	69	84	500	610	-	-	70	85
	Tons	83	101	150	183	-	-	28	34
Lesotho	Nos.	21	25	500	610	-	-	279	340
	Tons	25	31	150	183	-	-	112	136
Malawi	Nos.	38	46	900	1,100	477	580	1,300	2,213
	Tons	45	55	270	330	205	249	728	886
Mozambique	Nos.	189	230	1,000	1,220	1,539	1,873	699	851
	Tons	227	276	300	366	659	802	279	340
Swaziland	Nos.	86	105	500	610	840	1,022	141	171
	Tons	104	127	150	183	360	438	57	69
Tanzania	Nos.	254	309	5,100	6,200	980	1,192	2,239	2,724
	Tons	306	372	1,530	1,860	420	511	897	1,091
Zambia	Nos.	150	182	1,400	1,700	336	409	1,260	1,533
	Tons	179	218	420	510	144	175	504	613
Zimbabwe	Nos.	598	728	5,600	6,800	840	1,022	2,241	2,726
	Tons	717	872	1,680	2,040	360	438	897	1,091
Total	Nos.	1,741	2,118	16,220	19,730	5,432	6,609	8,790	11,957
	Tons	2,089	2,542	4,866	5,919	2,327	2,831	3,726	4,533

4.9. Table 4.4 presents a summary picture of demand for agricultural equipment segregated by major types, estimated for the year 1986 for each of the SADCC countries.

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Table 4.4 BREAKDOWN OF DEMAND BY TYPE OF EQUIPMENT AND COUNTRY: 1986

	HANDTOOLS		OXEN IMPLEMENTS		TRACTOR IMPLEMENTS			HAULAGE & PROCESSING EQUIPMENT			
	Hoes (000 pcs)	OTHER (000 pcs)	PLOUGHS (pcs)	OTHER (pcs)	TILLAGE (pcs)	PLANTING SEEDING (pcs)	SPRAYERS MOWERS etc (pcs)	CRUSHER	GRAIN/ RICE MILLS (pcs)	TRAILERS (pcs)	OX CARTS (pcs)
Angola	990	1,839	6,900	6,900	2,235	415	542	511	682	409	880
Botswana	42	78	650	650	580	110	140	-	85	84	610
Lesotho	213	395	2,050	2,050	295	55	70	-	340	25	610
Malawi	905	1,680	7,150	7,150	770	145	185	580	1,581	46	1,100
Mozambique	1,597	2,965	12,400	12,400	1,700	315	405	1,873	851	230	1,220
Swaziland	85	158	850	850	665	125	160	1,022	171	105	610
Tanzania	2,946	5,400	27,800	27,800	1,600	300	380	1,192	2,724	309	6,200
Zambia	660	1,225	7,500	7,500	1,160	215	285	409	1,533	182	1,700
Zimbabwe	1,054	1,957	21,500	21,500	6,140	1,040	1,470	1,022	2,726	728	6,800
Total Nos.	8,492	15,697	86,800	86,800	15,143	2,720	3,637	6,609	11,325	2,118	19,730
Total tons	12,760	15,680	3,480	4,350	13,630	1,360	2,910	2,831	4,533	2,542	5,919
Average Unit Weight	1.5kg	1.0kg	40kg	50kg	900kg	500kg	800kg	430kg	400kg	1.2ton	300kg

5. DEMAND - SUPPLY ANALYSIS

5.1. Table 5.1 presents a picture of major enterprises producing farm equipment and the plans and programmes for additional projects under consideration /implementation.

5.2. Based on Tables 3.1 and 5.1 and the other data compiled and discussions held with various officials in the SADCC member States, the best estimates of supply capacities in 1986 are given in Table 5.2. The demand estimates, as computed earlier, have also been included.

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Table 5.1 MAJOR ENTERPRISES IN SADCC PRODUCING FARM EQUIPMENT

	ENTERPRISE	PRODUCT-MIX	PLANS AND PROSPECTS	ASSISTANCE NEEDED
ANGOLA		Hand tools Animal-drawn implements Tractor implements	* Setting up of capacity at Malange for producing 0.6 million units of farm equipment. - a $6 million project with external financing	* Supply of capital goods * Supply of steel components * Technical expertise
BOTSWANA	*General Engineering Works *Vocational training institutes	Plough planters & single row planters	Production has been initiated in 1982. Growth rates of 10% p.a. are projected.	
LESOTHO	Vocational training institute	Animal-drawn equipment	Govt. keen on setting up a unit to produce tools and implements. Feasibility studies made by UNIDO in 1979 and 1982. Related studies undertaken by CID (EEC) in 1982.	* Action plan for setting up a commercially viable unit.

ENTERPRISE	PRODUCT-MIX	PLANS AND PROSPECTS	ASSISTANCE NEEDED
MALAWI			
* Agrimal (Malawi) Limited	Hand tools - hoes Animal-drawn implements	Diversification to use spare capacity for making axes, slashers, cane knives, matchetes, and wheelbarrows	* Balancing equipment
* Farming & Engineering Services	Tractor-drawn implements		
MOZAMBIQUE			
Agro-Alfa, Maputo - 3 factories	Hand tools Animal drawn equipment	Renovation & expansion of industry. New capacity at Beira to provide for an output of 30000 tonnes pa	* Project financing * Technical expertise.
Beira plant	Hand tools & non self-propelled equipment	- a $50 million project, civil works under study	
SWAZILAND			
Tinkabi International	Tractors and tractor drawn implements & powered equipment	Commercialisation of the pilot project - project cost $ 2m.	* Financing * Marketing

ENTERPRISE	PRODUCT-MIX	PLANS AND PROSPECTS	ASSISTANCE NEEDED
TANZANIA			
* Ubungo Farm Implements Manufacturing Ltd - Chinese assisted	Hand tools Animal drawn implements - ploughs	Improvement of capacity utilisation	* Supply of raw materials * Supply of spare parts * Technical expertise
* Mbeya Implement project	Hand tools Animal drawn implements Tractor drawn implements	Full commissioning	* Supply of raw materials * Supply of spare parts * Technical expertise
* Project at Mwaza	Hand tools Animal drawn implements Tractor drawn implements Irrigation equipment	Under implementation with Bulgarian assistance - a $35 million project	* Project financing
ZAMBIA			
* Northland Engineering	Hand tools Animal drawn implements	Expansion is envisaged that will also include production of tractor drawn implements	* Financing * Capital goods
* Shonga Steel	Hand tools Animal drawn implements		
* Lenco	Trailers		

ENTERPRISE	PRODUCT-MIX	PLANS AND PROSPECTS	ASSISTANCE NEEDED
ZIMBABWE			
* Tinto Industries	Hand tools		
* Zimplow Limited	Animal drawn implements		
* Bulawayo Steel Products	Tractor implements and small powered equipment		
* United Spring & Forging			

Table 5.2 ESTIMATED DEMAND-SUPPLY POSITION OF AGRICULTURAL EQUIPMENT IN SADCC : 1986

Equipment	DEMAND						SUPPLY (in tonnes)					
	Hand tools	Oxen impl.	Tractor impl.	Power process eqpt	Trailer carts	Other manually operated eqpt.	Hand tools	Oxen impl	Tractor impl.	Power process eqpt.	Tractors carts	Other manually operated eqpt
Category no.	1	2	3	2,3	2,3	1,2	1	2	3	2,3	2,3	1,2
Angola	3,324	620	2,650	491	754	133	1550	600	800	200	200	50
Botswana	145	58	690	34	284	6	10	10	-	-	-	-
Lesotho	715	184	350	136	214	28	10	-	-	-	4	-
Malawi	3,038	643	910	1,135	385	121+	2540	1000	-	-	50	100
Mozambique	5,362	1,114	2,000	1,142	642	214	10,000+	10,000+	10,000+	500	200	-
Swaziland	286	75	790	507	310	12	10	10	-	-	-	-
Tanzania	9,818	2,505	1,900	1,602	2,232	392	5,300	2,725	5,024	640	560	88
Zambia	2,214	678	1,380	788	728	88+	1,050	500	-	-	100	20
Zimbabwe	3,538	1,958	7,230	1,529	2,912	142	13,600	2,000	8,000	1,500	3,000	150
TOTALS	28,440	7,830	17,900	7,364	8,461	1,136+	24,000+	17,000+	24,000+	2,840	4,114	408

Notes: 1) Other manually operated equipment (taken as 4% of hand groundnut sheller, planter, chaff cutter, paddy weeder, hand wheel hoe, winnower, thresher, groundnut lifter, etc.
2) The proposed Beira plant expansion in Mozambique has been taken into account.

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SUPPLY ANALYSIS

5.3 Perusal of Tables 3.1 and 5.1 shows that most of the farm equipment production capacity is concentrated in medium/large scale industrial sector. However, some artisan production is known to exist in most SADCC countries, including production of specialised handtools for specific local conditions (e.g. planting hoes) where large scale production may not be justified. An allowance has been made for such production, and it is assumed that efforts will continue to upgrade artisan production into small workshops with higher levels of equipment. A similar situation exists with regard to small industries and medium/large units. However, small scale factories appear to be more significant in the production of processing equipment (grain mills etc), ox carts and tractor trailers.

CERTAIN ASPECTS

5.4. Table 5.2 has a risk of conveying an optimistic picture - by indicating supply in excess of demand, in certain cases - which may not be the case in reality. There are certain aspects which must be emphasised and given an analytical look.

5.5. First is a fundamental characteristic of the engineering industry in general which is its need for continual renewal and updating of capital facilities. Experience throughout both developed and developing countries suggests engineering industries are prone to sickness if such updating and modernisation is not taken and facilities allowed to age. 'Rated' capacities get eroded to reduced 'effective' capacities. (The converse is also true regular modernisation and motivation can result in output higher than the rated capacity.) It is a moot point whether the present underutilisation of farm implements capacity in SADCC (30-40% in some countries) is due only to limited raw material inputs because of foreign exchange difficulties. Enhanced supply of raw materials and spare parts would certainly raise production, but it is probable (as some factory visits indicate) that real effective capacities are less than the rated capacities on paper, perhaps because of inadequate capital investments in the past. Thus the actual output may not match the indicated capacities even if raw material supply is adequate.

5.6. The second aspect relates to tractor drawn implements. The demand for these implements, unlike the first two categories (of hand tools and animal- drawn implements), depends on tractors whose present supply is constrained by limited imports. As suggested elsewhere, indigenous production of tractors, to any significant extent, is likely to take place in the late eighties, which would create a surge in demand for tractor drawn implements. Therefore, by then the supply surplus may not be there. Co-planning of production of tractors and tractor implements is thus necessary, as is possibly being done by Mozambique.

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SADCC Regional Linkages

5.7. The demand-supply analysis in Table 5.2 suggests the following linkages:

* There is likely to be a shortage of handtools production in all countries except Mozambique and Zimbabwe. The latter may just be self-sufficient.

  The supply deficit could partly be met from Mozambique.

* Tanzania & Zimbabwe will be near self-sufficiency in the case of animal drawn implements. Malawi and Mozambique can partly meet the deficits in other countries.

* Tanzania and Mozambique are likely to have surplus capacities for tractor drawn implements which can go towards meeting the requirements of countries other than Zimbabwe.

* Almost all countries are likely to have supply of other equipment such as trailers, carts, etc. less than the demands.

5.8. This brings us to the issue of Product-mix. It is assumed that certain switching is done within the available capacity to produce the kind of imple ments demanded by the market. As many of the manufacturers of agricultural equipment have general engineering and fabrication facilities, the productive apparatus could be utilised to make allied equipment, for example, haulage and processing equipment or even non-agricultural engineering goods. Thus excess capacity for any one type of equipment could be used to fabricate other equipment in short supply (for instance, the diversification by the manufacturer in Malawi), possibly with only balancing equipment, depending on case to case.

5.9. The operational capacity utilisation would also tend to reduce the actual output available.

5.10. Table 5.3 summarises the estimated supply deficits.

Table 5.3 APPROX SUPPLY DEFICITS (mid-1980s)

Item of equipment	Hand Tools	Oxen Impl	Tractor Impl	Power process eqpt	Trailers carts	Other manually operated eqpt
Category No	1	2	3	2,3	1,3	1,2
Angola	1800	-	1850	250	500	80
Botswana	140	40	690	30	280	6
Lesotho	700	180	350	130	10	25
Malawi	500	*	910	1000	300	100
Mozambique	*	*	*	500	400	200
Swaziland	270	60	790	500	300	12
Tanzania	4500	-	*	960	1760	390
Zambia	1000	150	1380	750	600	100
Zimbabwe	-	-	*	-	-	-
Total	4810	430	5970	4120	4150	913

= 20,393 tonnes
= 4,000 tonnes to be met by surplus capacities indicated by * above

Approx Net Deficit 16,393 tonnes, say 17,000 tonnes

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6. MEETING THE DEFICITS : SUGGESTED ACTION

6.1. It is proposed to meet the demand of various agricultural equipment in SADCC from the productive capacities within the region keeping in view the philosophy of SADCC Industrial Cooperation. The objectives of attaining self-reliance, decentralisation, increasing employment and the spread of industrialisation are also shared by all the SADCC member states.

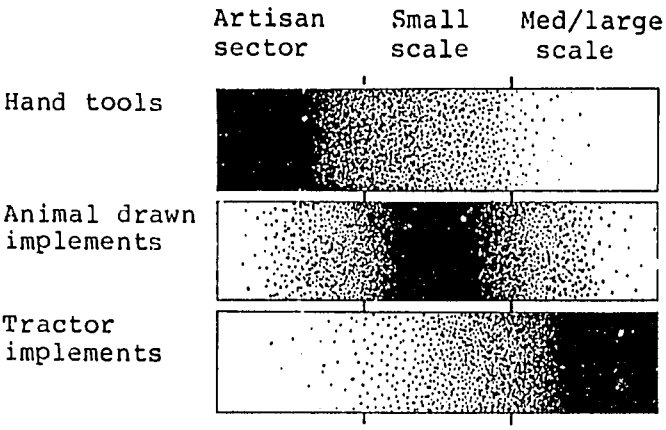
6.2. It is in this context that any new capacities proposed are suggested to be started in the following framework (see Exhibit 6.1):

Category I	Hand Tools	Artisan sector (blacksmithy)
Category II	Animal-drawn implements including simple haulage & irrigation equipment	Small scale sector
Category III	Tractor implements including other powered equipment	Medium/large units

6.3. The above emphasis will also be in tune with the technological and investment parameters associated with each. It is important, however, to recognise that choice of industrial sector to promote would depend on the desired product-mix.

6.4. Exhibits 6.2, 6.3 and 6.4 illustrate the characteristics of each industrial sector for the three categories of agricultural implements and equipment.

Exhibit 6.1



Product-Industrial Sector Mix

The terms small, medium/large are relative, within this particular industry.

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Exhibit 6.2 CHARACTERISTICS OF HAND TOOLS PRODUCTION

Artisan/blacksmithy Units	Small Scale Units	Medium/large Plants
PRODUCTS		
Hoes, slashers, spade forks, sickles	All hand tools, Hoes, slashers, spade forks, sickles - some animal-drawn implements	Hoes, slashers, spades, forks, Sickles - some animal-drawn impelements
Some simple manually operated machinery	All simple manually operated machinery as hand planters, shellers, threshers	High quality manually operated machinery
ANNUAL OUTPUT		
12000 units	50,000-100,000 units	1-2 million units
TECHNOLOGY		
Simple design Production according to demand	Simple design Production in large batches	Simple design and sophisticated mass production technology. Large batch production for animal drawn implements.
INVESTMENT		
$ 5-20,000	US$500,000 to 1 million	US$ 2-3 million
EQUIPMENT		
Coal fired hand-blown forge	Forging facility Welding facility	Material preparation Forging unit Welding facility Heat treatment Machine shop, including special lines. Paint shop. Tool room, quality control, storing and shipping.
MANPOWER		
5-9 skilled workers	Skilled labour 100	Skilled labour Production engineers Managers 200 plus

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Exhibit 6.3 CHARACTERISTICS OF PRODUCING ANIMAL-DRAWN & RELATED IMPLEMENTS

Artisan/blacksmithy Units	Small Scale Units	Medium/large Plants
PRODUCTS		
Simple tillage equipment (wood or steel) Simple manually operated machines	Tillage equipment sprayers, seeders manually operated machines as shellers, threshers	Tillage equipment sprayers, seeders manually operated machines, as shellers, threshers, mills and pumps
ANNUAL OUTPUT		
4-1200 units	20,000 units	More than 50,000 units
TECHNOLOGY		
Simple product design Small batch production according to demand	Product design Production technology	Product design Production technology for large batch. Production planning.
INVESTMENT		
US$ 20-50,000	US$ 1-2 million	US$ 2-3 million
EQUIPMENT		
Similar to hand tools production equipment at stage 1	Similar to hand tools Production equipment at stage 2 but more complete. Forging and foundry facility (external)	Similar to hand tools production equipment at stage 3 but more complete (but excepting special purpose lines) Forging and foundry facilities
MANPOWER		
4-9 skilled workers	Skilled labour management 100	Skilled labour production engineers management 200 plus

Exhibit 6.4 CHARACTERISTICS OF TRACTOR DRAWN AND RELATED EQUIPMENT PRODUCTION

Artisan/blacksmithy Units	Small Scale Units	Medium/large Plants
PRODUCTS		
Tractor drawn implements are not produced at this stage	Ploughs, seed drills cultivators, harrows disc harrows, harvester and some powered machinery	Complete line of tractor drawn implements and powered machinery, pumps.
ANNUAL OUTPUT		
-	3,500 units 500-1,000 tonnes/year	7,000 units 4,000 tonnes/year
TECHNOLOGY		
-	Product design Production in batches possible combination with animal-drawn implements	Product design Production in large batches. Production planning.
INVESTMENT	US$ 3-4 million	US$ 4-5 million
EQUIPMENT		
	Same as stage 2 plus structural welding and machining Forging and Foundry facility (external)	Material preparing machines, power saws machine tools welding machines sheet metal sheers, roll form-ing press shop, mechanized paint line tool room. Quality control receiving and shipping Foundry facility (external) or within plant depending on load.

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SUGGESTED COURSE OF ACTION

6.5. The course of action to meet the supply deficits for various equipment is suggested below:

HAND TOOLS

6.6. It is proposed that each SADCC Member State aim at meeting its own requirements. This could be achieved by building on the present productive base existing in the SADCC countries and by encouraging new production in the artisan and small scale sectors, especially for items with lower technological complexity. Adjustments in product-mix to utilise spare capacity of large units so as to produce more handtools is suggested in the case of Tanzania. Augmentation of productive capacities are proposed in the case of all countries - about 10% in artisan sector, 20% in small scale and remaining with existing large units.

ANIMAL-DRAWN IMPLEMENTS AND RELATED EQUIPMENT

6.7. Mozambique is expected to be a major source of supply for animal-drawn implements once the Beira expansion is completed. Additional capacity would be needed for the haulage, processing and related equipment. These capacities are proposed in all the countries - mostly (80-90%) in small scale sector.

TRACTOR-DRAWN IMPLEMENTS AND RELATED EQUIPMENT

6.8. Mozambique again could be a major source of supply. Augmentation of capacities are proposed in the case of all except Lesotho and Zimbabwe because of the small market in the case of the former and existing capacity in the latter case. Choice of product-mix would be an important factor. Nearly two-thirds of additional capacity proposed is in the medium/large sector.

Table 6.1 represents the proposed scheme of achieving the required output.

ARTISAN/BLACKSMITHY SECTOR

6.9. A total of 163 units at a capital cost of about $2.6 million are proposed. Each unit will produce about 6-10 tonnes of output, employ 7-8 people and cost around $15,000. These approximate norms have been taken from UNIDO/FAO documentation.

Exhibit 6.5. gives a profile of a typical unit in this sector.

SMALL SCALE SECTOR

6.10. A total of 35 units at a capital cost of about $28.5 million are proposed. Their size and output would vary from country to country. Typical averages would be:

Output	- 200 - 500 tonnes
Employment	- 100 - 200
Capital	- $ 1 million

Table 6.1. PLAN OUTLINE FOR MEETING PROJECTED DEFICIT: MID EIGHTIES

COUNTRY	INDUSTRY SECTOR	CATEGORY 1 HAND TOOLS, CARTS SIMPLE OUTPUT (tonnes)	CATEGORY 2 DRAFT IMPLEMENTS, CARTS MANUAL EQUIPMENT, OUTPUT (tonnes)	CATEGORY 3 TRACTOR IMPLEMENTS, POWER PROCESSING EQPT. TRAILERS OUTPUT (tonnes)	TOTAL OUTPUT (tonnes)	PRODN UNITS	CAPITAL US$ 000	EMPLOY-MENT
Angola	I Artisan units	170	50	-	220	30	430	
	II Small scale	410	250	150	810	5	4500	
	III Med/large scale	1300	70	1800	3170		15500	1450
	TOTAL	1880	370	1950	4200		20430	
Botswana	I Artisan units	10	20	-	30	5	75	
	II Small scale	100	120	-				
	III Med/large scale	-	-	200	420	1 med	2250	260
	TOTAL	110	140	200	450		2325	
Lesotho	I Artisan units	50	10	-	60	8	115	
	II Small scale	-	180	-	180			265
	III Med/large scale	500	-	-	500	1 med	3700	
	TOTAL	550	190	-	740		3815	
Malawi	I Artisan units	50	20	-	70	10	145	
	II Small scale	240	640	700	1580	7	7000	1375
	III Med/large scale	250	-	200	450		4000	
	TOTAL	540	660	900	2100		1145	
Mozambique	I Artisan units	20	70	-	90	12	190	
	II Small scale	50	210	-	260			300
	III Med/large scale	-	-	250	250		2400	
	TOTAL	70	280	250	600		2590	
Swaziland	I Artisan units	30	20	-	50	8	100	
	II Small scale	200	540	300		5		1050
	III Med/large scale	-	-	200	1240		5000	
	TOTAL	230	560	500	1290		5100	
Tanzania	I Artisan units	340	160	-	500	50	950	
	II Small scale	800	1150	660	2610	10	9500	2050
	III Med/large scale	-	-	1000	1000		3200	
	TOTAL	1140	1310	1660	4110		13650	
Zambia	I Artisan units	140	110	-	250	30	460	
	II Small scale	100	1100	540	1740	8	7500	
	III Med/large scale	900	-	400	1300		4500	2120
	TOTAL	1140	1210	940	3290		12460	
Zimbabwe	I Artisan units	-	60	-	60	10	125	
	III Med/large scale	-	-	160	160	2000	2000	250
	TOTAL	-	60	160	220	2125	2125	
Grand Total		5660	4780	6560	17000	200	73640	9120

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Exhibit 6.5 A TYPICAL ARTISAN UNIT

PRODUCTION FEATURES

Machining:	no machining pedestal grinder
Forging:	hand forging blacksmith hand tools, charcoal fired furnace with hand-blown bellows.
Heat-treatment:	simple quenching quenching tanks
Welding:	possibly arc welding

CAPITAL FACILITIES

Shop area: 30 to 120 sq. metres

Capital equipment:

1. 50 kg anvil
2. Mechanical hand operated forge
3. Vice
4. Files
5. Bolt die set for thread forming
6. Hand drills & drill bits
7. Hand grinder
8. Metal saw and blades
9. Square and tape rule
10. Wood saw
11. Brace and bit
12. Oxyacetylene welder

Estimated cost = $ 12,500

Raw Material Requirements:

The steel required for agricultural hand tools should be suitable for forging and heat treatment. The following standards should preferably be conformed to:

American : SAE 1078
British : BS2094 Part 6: forging and drop forging Graue 4

or equivalent
DIN/ISO standards

Such steel would have an approximate composition of:

Carbon : 0.72 - 0.85%
Manganese : 0.30 - 0.60%

Value of Production

For an output of 4,000 to 12,000 units per annum, the value of production could amount to $ 10,000 to $ 30,000 per annum. The raw material cost would be around one-third of the cost of production.

6.11. Exhibit 6.6 provides a profile of a typical small/medium sized unit.

Medium/Large Sector

6.12. A medium sized unit each is proposed in Botswana and Lesotho at a total cost of about $6 million, giving an output of about 1,100 tonnes.

6.13. In case of other countries, it is suggested that existing capabilities of industry in medium/large sector be strengthened to provide the additional output to meet the projected deficit. A total capital cost of about $ 36 million is estimated on this account.

6.14. Table 6.2 presents the summary picture of the line of action proposed. It should be noted here that this takes into account the projects already under implementation which, of course, should have priority in any assistance towards their implementation.

Supply of Material Inputs

6.15. The production of farm implements would call for increasing requirements of castable billets and tool steel. It will be appropriate that existing nucleus of steel industry in the SADCC region be strengthened and expanded to produce these initial material inputs.

Exhibit 6.6. A TYPICAL SMALL/MEDIUM SIZED UNIT

PRODUCTION FEATURES

Batch quantity:	small batch
Machining:	simple machining lathe, milling, drilling and shaping machines/grinding
Fabrication:	simple sheet metal work power shear, manually operated and power-operated roll-form machines, nibbling machines
Forging:	small scale forging oil fired forging hearth, tilting furnace, pneumatic forging hammer or spring forge without fixed dies
Heat-treatment:	simple salt bath
Welding:	arc welding with electrodes/shielded arc welding with wire
Casting:	few castings required, in-plant casting facility not required.

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CAPITAL FACILITIES

Cutting shop

- Hack saw
- Hand shear

Forge & heat treatment shop

- Mechanical drop Press forge 150 tons
- Oil fired furnace
- Water quenching tanks
- Blacksmiths tools
- Shearing machine
- Abrasive grinders
- Dies & tools

Fabricating & press shop

- Eccentric press 150 tonnes
- Press brake 200 tonnes
- Manual bending machine
- Arc welding machine 300 amps
- Nibbling machines to cut 6 mm MS
- Welding fixtures etc
- Pedestal grinding machine
- Oxy-actelyene & brazing equipment
- Upright drilling machine 12 mm dia in MS
- Dies and press tools

Machine shop

- Pedestal grinder double ended
- Upright drilling machine 25mm dia in MS
- Lathe, maximum bore 75mm, swing 46 cm, length 92 cm
- Capstan lathe with accessories maximum collect size 4 cm. swing 30 cm, maximum work piece length 16 cm.
- Jigs, tools and fixtures
- Hydraulic press 1 tonne capacity
- Gauges, inspection tools & equipment
- Portable drill 12 mm in MS
- Portable grinder 15 cm diameter

Assembly Shop

- Assembly fixtures
- Upright drilling machine 12cm in MS
- Portable drilling machine 12mm in MS
- Portable grinder 15 cm diameter

Paint Shop

- Degreasing vat
- Dipping plant & conveyors etc.

Tool Room & Maintenance

- Universal milling machine 5HP
- Universal cutter grinder 1½ HP
- Double ended grinding machine
- Surface table
- Gauges and tools
- Precision Lathe
- Maintenance tools & equipment

Mechanical Handling

- Hydraulic pallet truck (hand operated)
- Racks, stillages & bins
- Conveyors, etc.

Estimated cost : $ 500,000 to$ 1 million

Raw Material Requirements

6.18. The material specifications for some of the major components of animal-drawn implements are suggested as:

Major Implement Components	SAE No.	Carbon (%)	Manganese (%)
Implement frame (MS)	1006-1008 1010-1015	0.08-0.18	0.24-0.60
Springs	1065	0.60-0.70	0.60-0.90
Plough beam or tool bar	1070	0.65-0.75	0.60-0.90
Plough (plates)	1074	0.70-0.80	0.50-0.80
Rake teeth	1078	0.72-0.85	0.30-0.60
Scraper, blades, discs, spring tooth harrow	1085	0.80-0.93	0.70-1.00
Mower and binder section	1086	0.82-0.95	0.30-0.50
Tin holders, knotter discs	1090	0.85-0.98	0.60-0.90

Value of Production

6.19. For an output of 570 tonnes a year of animal-drawn implements, the turnover could be $2-3 million with material cost accounting for nearly half. The choice of product-mix will, of course, determine the actual operations.

Table 6.2. SUMMARY OF PROPOSED PLAN

	Medium/large scale	Small	Artisan	Total
Production Units (Nos.)	2 medium units and build up of existing industry	35	163	200 And build up of existing units
Output (tonnes)	7,690	7,980	1,330	17,000
Capital ($000)	6,000 plus 36,550	28,500	2,590	73,640
Employment (nos.)	3,200	4,600	1,320	9,120

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ANGOLA

CROPPING PATTERN

Principal crops include maize, coffee and sugar. In addition, palm, cotton, cocoa, tobacco, and sisal are also grown. Cereal production per capita is low at 70 kgs per annum (FAO 1980). The tractor stock is relatively high per capita, according to FAO data, reflecting the existence of a significant commercial sector, especially in coffee. Agricultural implement usage would be expected to involve a high share of tractor implements by SADCC standards.

The areas and production for major crops are given below:

	1979		1980	
	Area (Ha 000)	Production (tons 000)	Area (Ha 000)	Production (tons 000)
Cereals	713	378	713	400
of which maize	600	300	600	320
Roots, tubers	155	2020	155	2070
of which cassava	130	1800	130	1850
Pulses	120	55	110	42
Groundnuts	40	20	40	20
Sunflower	15	10	15	10
Vegetables, fruit, etc.	655	430	655	430
Sugarcane	15	420	15	450
Coffee	200	60	200	40
Cotton	13	n.a.	11	n.a.

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AGRICULTURAL IMPLEMENTS

Existing capacities and production of various categories of agricultural implements include:

	Installed capacity	Actual Production	Capacity Utilisation
Hand tools in nos.	1 million	0.5 million	50%
Animal drawn implements in nos.	10,000	1,200	12%
Tractor implements	1,000	120	72%

Plans include:

* An agricultural implements project at Malange with an annual capacity of 600,000 units. This $6 million project is currently under implementation and part of the output is for export. Capital equipment financing and technical assistance is being sought.

* Preliminary studies are underway for setting up capacity at Malange to make 1,000 pumps per annum.

TRACTORS

The total stock is estimated at 10,000. The FAO data indicates the following import levels:

1978 : 850 units
1979 : 770 units

Trade statistics suggest $8.6 million worth of imports of cultivation machinery. A project for the production capacity of 6,000 tractors a year is under consideration.

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BOTSWANA

CROPPING PATTERN

Agriculture in Botswana is split into traditional and commercial sectors. In 1980 the traditional sector produced about 85 percent of the food crop and 32 percent of the cash crop. It accounts for nearly 94 percent of the area under crop.

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Total Farms, Livestock Held, and Food and Cash Crop Production - Traditional versus Commercial Farm Sectors, 1980

Category	Traditional	Commercial	Total
Total farms (number)	80,000 (99.6%)	360 (0.4%)	80,360 (100.0%)
Total smallstock (number)	758,000 (96.4%)	28,000 (3.6%)	786,000 (100.0%)
Total Food Crop Production (metric tonnes) 1/	38,105 (85.1%)	6,695 (14.9%)	44,800 (100.0%)
Total Cash Crop Production (metric tonnes) 2/	903 (32.2%)	1,897 (67.8%)	2,800 (100.0%)

1/ Includes sorghum, maize, millet and beans/pulses.

2/ Includes groundnuts and sunflowers only. Commercial farmers enjoy a virtual monopoly in the production of other cash crops such as cotton, citrus, etc.

SOURCE: Traditional versus commercial agriculture in Botswana, Planning and Statistics Department, Ministry of Agriculture: June 1981

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Area planted by type of crop in the traditional and commercial sectors, 1980

Type of crop	Area Planted		
	Traditional	Commercial	Total
	----------(1,000 hectares)----------		
I Food Crops:			
Sorghum	142.5 (97.1%)	4.3 (2.9%)	146.8 (100.0%)
Maize	74.9 (93.3%)	5.4 (6.7%)	80.3 (100.0%)
Millet	16.9 (100.0%)	-	16.9 (100.0%)
Beans/Pulses	23.4 (99.2%)	0.2 (0.8%)	23.6 (100.0%)
Subtotal (Foodcrops)	257.7 (96.3%)	9.9 (3.7%)	267.6 (100.0%)
II Main Cashcrops:			
Groundnuts	2.4 (49.0%)	2.5 (51.0%)	4.9 (100.0%)
Sunflowers	5.2 (73.2%)	1.9 (26.8%)	7.1 (100.0%)
Subtotal	7.6 (63.3%)	4.4 (36.7%)	12.0 (100.0%)
III All Other Crops	5.4 (76.1%)	1.7 (23.9%)	7.1 (100.0%)
TOTAL ALL CROPS	270.7 (94.4%)	16.0 (5.6%)	286.7 (100.0%)

Source: Traditional versus commercial agriculture in Botswana, Planning and Statistics Department, Ministry of Agriculture, June 1981

Cattle are the major source of draught power on traditional farms but tractors are also used. Tractors are the main source of power on commercial farms.

PLAN PRIORITIES

In 1980 the government embarked on an Arable Lands Development Programme (ALDEP) which aims to increase arable production by 4-6 percent per year. One of the major components of the programme is farm investment schemes - in the form of credit and subsidies. These include, for instance:

(i) animal draught power scheme provides assistance for the purchase of 2-3 oxen or a span of donkeys;

(ii) implements scheme provides assistance for the purchase of an implement package (single row planter and cultivators) and also ploughs and harrows.

A direct subsidy of 35% and loans are provided, payable over 5 years.

Implements : Animal drawn & hand tools

Data suggests the following:

Implement	Demand per annum	Stock
Single furrow plough	250	50,000
2 furrow plough	75	2,000
Single row planter	450	1,500
Cultivators	350	2,500
Hoes (hand)	100,000	240,000

Implements : Tractor Drawn

Implement	Demand per annum	Stock
Plough	250	1,300
Harrow	150	1,000
Planter	200	700
Other	200	800

Tractors

Year	New Registrations	Renewals Government	Renewals Private	Total
1977	204	399	1,286	1,889
1978	228	439	1,409	2,076
1979	195	447	1,473	2,115
1980	255	532	1,727	2,514
1981	325	307	1,799	2,686

Source: Transport Statistics, 1980. Statistics Unit, Ministry of Works and Communications.

The size mix is estimated as:

* 50-70 hp (37 - 52 kw) - 70% of total
  40-50 hp (30 - 37 kw) - 20% of total
Less than 40 hp (30 kw) - 5% of total
More than 70 hp (52 kw) - 5% of total

MANUFACTURE OF IMPLEMENTS AND TRACTORS

IMPLEMENTS

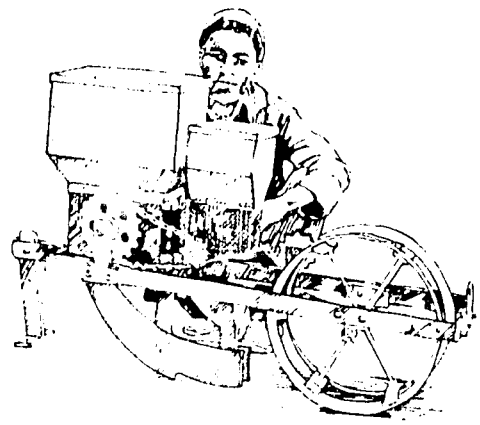
Until this year there was no manufacture of either tractor or animal drawn implements in Botswana. The demand has been met by imports. This year a general engineering works and 2 vocational training institutions have been asked by ALDEP to make 150 plough planters and conventional single row planters designed by a team of engineers on Evaluation of Farming Systems and Agricultural Implements Project (EFSAIP). Tractor, animal-drawn and truck trailers are also made in the country. There are artisan units producing animal drawn carts and hand tools.

TRACTORS

No tractors are manufactured in Botswana. All tractors sold in Botswana are imported from South Africa.

The market for farm machinery in Botswana is very small and the only way of establishing manufacturing of farm implements is by using existing engineering works. Demand for hand tools could be met by encouraging artisan production. The market for farm machinery is likely to grow at a fast pace because of the Government's policy of aiming for food self-sufficiency within the next five years. Ministry of Agriculture estimates an annual growth rate of 10 percent for tractors and implements and 5 to 10 percent for animal drawn implements over the next 5 years.

MOCHUDI SEEDER



Manufactured by:

Mochudi Brigade
PO Box 248
MOCHUDI
Botswana

Telephone: Mochudi 912

Telegrams: BRIGADES, MOCHUDI

Description: The planter is based on a 'seed and agitator' design of seed hopper, which will meter and plant a wide range of seed sizes without blockage. It can be used with ungraded seed, and good results have been obtained with millet, sorghum, cowpeas, sunflowers and maize, although it should be noted that it is not a precision spacing planter. Seed depth is controlled either by an adjustable mounting on a toolbar, or by skids in the single row version. Seed-covering is achieved by the 40cm. diameter split-rim wheel.

MAKGONATSOTLHE TOOL-BAR

Manufactured by:

Kgatleng Development Board
PO Box 208
MOCHUDI
Botswana

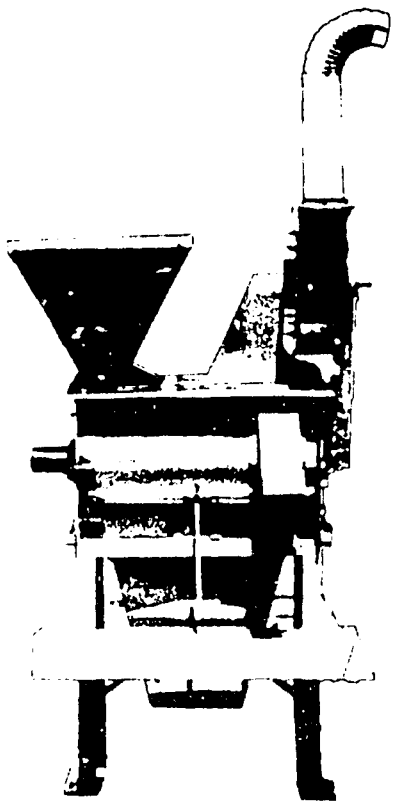
Telephone: Mochudi 356

Description: The Makgonatsothlhe Tool-Bar has been developed from designs of existing multi-purpose tool-bars. It is perhaps unique in that it has been designed for either ox or donkey draught.

It is designed to be fitted with: planter, disc-cultivator, sweeps for minimum tillage, fertilizer applicator, water-drums (for water transport) and a scotch-cart frame.

The basic frame of the tool-bar is made from heavy angle iron, and the rubber-tyred wheels are mounted on stub-axles. Implements are attached to the main frame with sub-frames which can be positioned variably at any position on the main frame. This enhances the adaptability of the machine: e.g. by being capable of bearing either one or two planter units for single or double row planting.

RIIC SORGHUM DE-HULLER AND MILL



Manufactured by:

Rural Industries Innovation Centre
Private Bag 11
KANYE
Botswana

Telephone: Kanye 392/3

Description: In cooperation with the International Development Research Centre (IDRC) of Canada, RIIC at Kanye have developed a package of machinery that is of suitable scale for village operation in the making of sorghum flour.

The package consists of a de-huller and a hammer-mill and both are supplied together with extensive advice and operational brochure. The de-huller consists of a barrel-shaped container. The hammer-mill is of standard design, with interchangeable screens for different grades of flour.

Both can be powered with a single power source and whether petrol or diesel, it should be of a 24HP rating. The package of machinery is designed to operate either by batch method or continuous flow, and can thus be used either for milling individual lots or for commercial quantity milling.

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LESOTHO

CROPPING PATTERN

The agricultural sector is dominated by small-holders. Cropped area has declined from 318,900 hectares in 1973/74 to 221,900 hectares in 1977/78, a reduction of 30 percent. This is attributed mainly to relative unatractiveness of returns from farming. The average size of holding is about 2 hectares and the majority of the farmers use draught animals. The major crops grown are maize, sorghum, wheat, beans and peas.

PLAN PRIORITIES

The expansion of agricultural output is a priority, both as a means of raising rural incomes and as a method of reducing the current dependence on imported basic foodstuffs. The long term objective is to transform crop farming, at present mainly subsistance farming, to the production of cash crops for import substitution and export, with forage crop areas in support of livestock production.

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CROP STATISTICS

	1973/74	1974/75	1975/76	1976/77	1977/78
Area planted ('000 ha)					
Maize	129.7	107.8	115.5	92.6	111.5
Sorghum	83.3	54.8	55.4	46.8	62.0
Wheat	76.0	55.1	59.7	43.9	39.6
Beans	19.7	28.1	35.1	17.2	14.3
Peas	10.2	10.0	13.1	9.7	4.5
Total	318.9	255.8	278.8	210.2	221.9
Production ('m. tonnes)					
Maize	122.5	70.3	49.1	125.9	143.2
Sorghum	84.0	37.4	24.5	62.3	85.8
Wheat	57.1	45.3	44.6	61.4	57.9
Beans	7.5	13.4	8.7	14.7	10.8
Peas	7.2	5.8	5.8	7.0	4.4
Average yield (kg per ha)					
Maize	944.0	652.0	577.0	1567.0	1407.0
Sorghum	1008.0	682.0	591.0	1466.0	1446.0
Wheat	745.0	822.0	740.0	1247.0	1358.0
Beans	381.0	477.0	292.0	1379.0	974.0
Peas	706.0	580.0	548.0	844.0	1018.0

Source: Bureau of Statistics and data provided by the Lesotho authorities

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To fulfil the above objectives the Government has embarked on various projects. Recently a Basic Agricultural Services Programme (BASP) has been launched. BASP is designed to increase crop output in the lowlands through training and technical assistance, providing equipment repair facilities, marketing, upgrading rural roads and providing credit for both machinery and crop inputs. About 2 years ago a Food Self-Sufficiency Programme (FSSP) was embarked on under the Technical Operations Unit (TOU) of the Ministry of Agriculture. The programme provides a management package to participating farmers, including machinery services and inputs. In 1979/80 8,000 hectares were serviced which have increased to 30,000 hectares in 1980/81. The programme has 295 tractors, 95 ploughs, 186 disc harrows, 246 planters, 10 sprayers, 40 combines, 5 stationary threshers and other equipment.

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Tractors

The stock of tractors is estimated as:

Year	New	Government Renewals	New	Private Renewals	Total
1974	NA	NA	-	-	600
1975	44	46	160	412	662
1976	31	97	185	840	1,153
1977	27	113	174	989	1,303
1978	32	173	162	1,060	1,427

MANUFACTURE OF IMPLEMENTS, TRACTORS AND COMPONENTS

IMPLEMENTS

There is no manufacturing of hand tools; animal and tractor drawn implements. The only production has been at a vocational (agricultural) training institute where they have made prototypes of, among others, an animal drawn plough, weeder, cultivator, potato lifter. All implements are imported from South Africa.

In 1979 UNIDO carried out a feasibility study on establishing a manufacturing plant for agricultural tools and implements and came to the conclusion that the manufacture of agricultural tools and implements was unecomomic due to the low volume of market but could be viable if undertaken in an existing facility. In 1981/82 UNIDO carried out a prefeasibility study on the establishment of a forging/casting industry. Lesotho National Development Corporation feels that the two, manufacturing of agricultural tools and implements and a forging/casting works, together have more chance of being economically viable. In 1981/82 CID (EEC) did a study on metallurgical small industries.

The agricultural equipment presently produced by artisans and engineering works in Lesotho are ox carts, trailers and tankers.

TRACTORS

There is no production of tractors in Lesotho. All tractors are imported from South Africa.

Given the governments's policy towards agriculture, there is going to be a high rate of demand for both tractors and implements and animal drawn implements.

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MALAWI

CROPPING PATTERN

Malawi's agriculture comprises both smallholder and estate sectors. The smallholder agriculture is semi-subsistence, producing nearly half of the agricultural exports as well as the majority of the country's basic food requirements. The estate sector produces mainly export crops. The small-holder sector accounts for 91 percent of the cultivated area and its main feature is fragmentation of the holdings. Maize, groundnuts, tobacco, tea, cotton and rice are the main crops grown with maize accounting for almost 70 percent of the cultivated area.

Crop	% output grown by farms under 100 ha (approx.)	% output grown by farms over 100 ha (approx.)
Tea	6	94
Maize	87	13
Tobacco	38	62
Cotton	100	0
Rice	100	0
Sugarcane	0.0	100

Source: National Sample Survey of Agriculture

Average of Principal Crops (in 000 ha, 1970s)

Maize	1,070
Sorghum & millet	500
Pulses	480
Groundnut	450
Cassava	300

PLAN PRIORITIES

The Ministry of Agriculture encourages labour intensive methods of production. Tractor hire schemes for smallholders have been tried. Currently mechanised services are provided for tenants on large estates by the estates themselves. There is also usage of power tillers by the farmers on irrigated projects.

IMPLEMENTS

The production of hand tools and animal drawn implements by the main plant of Agrimal (Malawi) Limited has been as follows:

Year	Hoes Local	Hoes Export	Hoes Total	Animal Drawn Implements Local	Animal Drawn Implements Export	Animal Drawn Implements Total
1977	623,611	5,000	628,611	2,010	1,141	3,151
1978	646,579	42,000	688,579	3,400	3,000	6,400
1979	548,230	22,000	570,230	3,569	2,500	6,069
1980	395,382	0	395,382	1,700	1,195	2,895
1981	379,000	9,000	469,000	779	0	779
Plant Capacity	1.5 million			30,000		

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The stock of tractor drawn implements is estimated below:

Year	Tillage Equipment	Planting & Seeding	Other (sprayer, movers threshers, etc.)
1969	290	85	15
1970	320	95	20
1971	630	180	30
1972	630	180	30
1973	630	180	30
1974	770	220	35
1975	770	220	35
1976	1,000	260	45
1977	1,100	280	55
1978	1,300	300	60
1979	1,500	300	60

TRACTORS

The stock and imports of tractors are given below:

	Tractors licenced				
Year	Government	Private	Total	Percent Increase	Imported
1969	228	424	652	-	-
1970	283	466	749	15	-
1971	318	924	1,242	66	-
1972	368	540	908	-27	-
1973	378	503	881	- 3	-
1974	453	1,133	1,586	80	-
1975	442	972	1,414	-11	-
1976	458	1,733	2,191	55	-
1977	808	2,119	2,927	34	236
1978	1,031	2,570	3,601	23	365
1979	428	2,719	3,147	-13	400
1980	-	-	-	-	213
1981	-	-	-	-	43

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MANUFACTURE OF IMPLEMENTS, TRACTORS AND COMPONENTS

IMPLEMENTS

Hand tools, mainly hoes, are produced by Agrimal (Malawi) Limited. The plant has a capacity of 1.5 million hoes per year but the capacity utilisation has averaged one-third. Major raw materials are imported from Zimbabwe.

Animal drawn implements are produced by Agrimal (Malawi) Limited. They make single furrow ploughs and ridgers, harrows, single row planters, cultivators and groundnut lifters. They can also make shellers and rice threshers. This year they have programmed to produce animal drawn toolbars developed at Chitezde Machinery Testing Unit. The plant has a capacity of 30,000 units per year. Ox carts are produced in the small scale sector.

Tractor drawn implements are assembled by Farming and Engineering Services. They make ploughs, harrows, ridgers and rippers from precast frames imported from Zimbabwe who also supply the jigs on which they are welded. Discs for the implements are imported from South Africa. The number of implements produced in 1975 were 438.

TRACTORS

There are two companies for assembling tractors in Malawi, viz. Farming and Engineering Services and Mandala Tractor Division. Farming and Engineering Services assemble partly knocked down (PKD) units of Massey Ferguson tractors imported from the UK. The company is owned by LONHRO subsidiaries in Malawi. It has a capacity of 3 units per day. Mandala Tractor division assembles Ford tractors (PKD) from the UK and is privately owned by Mandala Limited (previously known as African Lakes Corporation). Both companies assemble on demand and the staff is used for service work in between assembly. The extent of local value added is minimal.

COMPONENTS

The only tractor component made locally are batteries, radiators and front end weights but none of them are used in the assembly of the PKD units.

PROSPECTS

Malawi's manufacture of hoes is averaging 35 percent of capacity and that of animal drawn implements is 13 percent. The excess capacity can be utilised to supply other SADCC member countries. The Agrimal plant is planning to diversify its production range to utilise the idle capacity by manufacturing axes, slashers, cane knives, matchetes and wheelbarrows which are all imported at the moment. This would improve their profitability.

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MOZAMBIQUE

CROPPING PATTERN

About half of the soil area in Mozambique is said to be suitable for agriculture. The land utilisation pattern is broadly as follows:

	Million hectares
Total land area	76.5
Arable & permament crops of which:	3.1
Arable	2.9
Permanent pasture	44.0
Forest & woodland	19.4
Other land	10.1
Irrigation, in 000 hectare	68.0

(Source: Southern Africa: Towards Economic Liberation)
Figures estimates for 1977

Note:

Arable Land refers to land under temporary crops, temporary meadows, market gardens and grass and temporary fallow. Permanent Crop refers to crops which occupy the land for long periods and need not be replanted after each harvest such as coffee, fruit trees, nut trees and vines. It excluded land under trees for wood or timber. Permanent Pasture refers to land used for five years or more for herbaceous forage crop either cultivated or wild. Forest and woodland refers to land under natural or planted stands of trees, whether or not productive, and forest which have been cleared but which will be replanted in the foreseeable future. Other Land refers to potentially productive land, built on areas, parks, roads, etc.

The present pattern of crop production is broadly as follows:

Small holdings: Maize, beans, cashewnuts, sweet potatoes, groundnuts.

Large holdings: Sugar, sisal, cotton and tobacco

State farming: Wheat, rice, sugar, tea, citrus

Cooperative farming: Maize, beans, sorghum, cashewnuts, groundnuts, etc.

PLAN PRIORITIES

The major emphasis of Mozambique's 10 year plan is on agricultural development to be achieved through two programmes:

1. Progressive co-operativisation of traditional agriculture.

   In the first phase, co-operatives would be established in each of the 100 districts. This would then be broadened onto a countrywide programme of rural co-operativisation in the second phase.

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At present, co-operatives account for about half a percent of marketed agricultural production. Nearly 80% comes from the family farms and about 15% from the State farms.

2. Expansion of State farming to establish at least one agro-industrial complex in each province by 1990.

The growth rate of agricultural sector in 1981 has been 13% with crop production increasing by 12%. The target rate of agricultural growth in 1982 is 32% with crop production to increase by 36%. The agricultural output in the Limpopo-Incomati region is targetted to increase by 79% with crop production increasing by 91%.

With the implementation of irrigation programmes, the area under cultivation would increase considerably from the present barely 5%.

Irrigation programmes for Koomali Valley and Limpopo, Oliphant, Ruvoma and Zambezi River areas alone, for example, would develop 60,000 hectares for cultivation.

IMPLEMENTS

Please see the main text.

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IMPLEMENTS AND TRACTORS

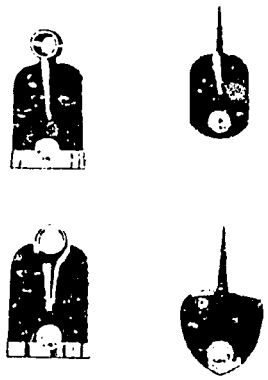
Implements

The demand for agricultural implements is estimated by UNIDO (1979) as:

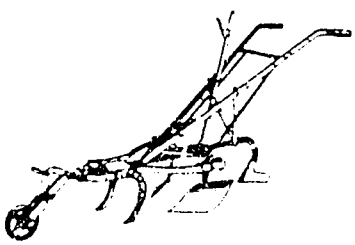
	Annual Sales - Units (approximate)					
	1979/80	1982	1984	1986	1988	1990
Tractor chisel ploughs	0	25	50	100	200	300
Animal drawn mouldboard plough	1700	1800	1800	1500	1200	800
Animal drawn harrows (sections)	730	750	800	800	800	800
Animal drawn single row planters	1100	1200	1200	1000	800	600
Animal drawn inter row cultivators	790	1200	1300	1400	1400	1400
Animal drawn ridgers	0	20	25	50	100	100
Animal drawn trailers (carts)	400	500	500	500	400	300
Tractor drawn trailers	125	100	100	125	150	150

Source: UNIDO/UNDP Feasibility Study on the Establishment of a Manufacturing Plant for the Production of Agricultural Tools and Implements in the Kingdom of Lesotho. November, 1979

AGRICULTURAL HAND TOOLS

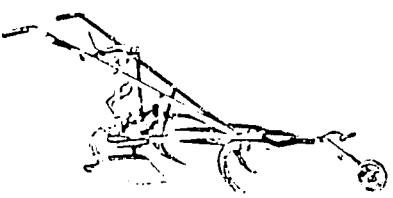


STANDARD CULTIVATOR SST



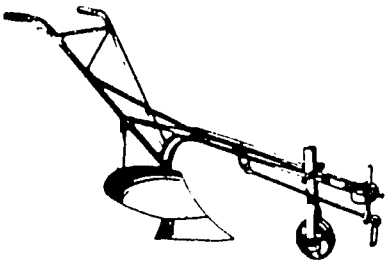
Description: The Standard Cultivator is an all-purpose cultivator which is designed to weed between rows of varying widths - from 60 cm. to 100 cm. It is equipped with 3 different types of tine; 2 reversible shares in the front, 2 mouldboard hillers in the centre and a 25 cm. sweep in the rear

5 TINE CULTIVATOR MC5



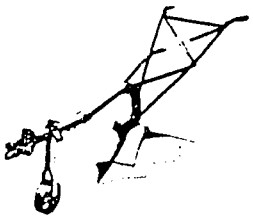
Description: The MC5 is designed for lighter cultivation than the Standard cultivator, although it is of similar configuration, with tines, tillers and a sweep. The width is adjustable by means of a crank-handle, whereas on the Standard it is by lever.

SINGLE-FURROW PLOUGH



Description: A single-furrow mouldboard plough of conventional design with a share made from heat-treated steel.

RIDGER

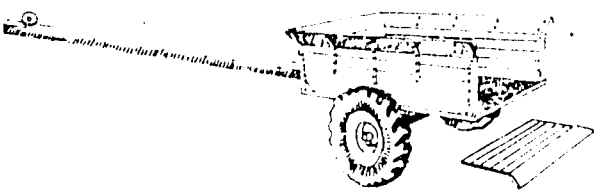


Description: This animal-drawn ridger/cultivator is suitable for ridging crops of maize, cotton, tobacco and potatoes. The wings of the ridging share can be adjusted to cultivate rows varying from 40 cm. to 75 cm. in width.

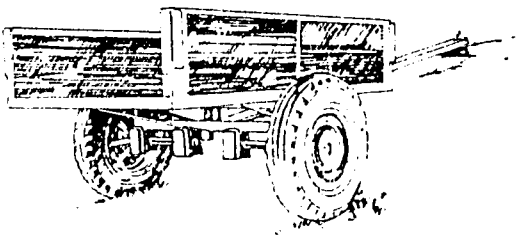
Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi

OX-CART



NGOLO OX-CART



Description: The B&C ox-cart is a strong heavy-duty cart, mounted on a single axle fitted with tyred wheels. The front and rear panels of the body can be removed for taking long loads, and a 600 litre galvanized water tank is available as an extra.

Manufactured by:

Brown & Clapperton Ltd
PO Box 52
BLANTYRE
Malawi

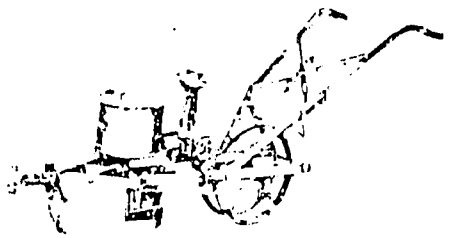
Manufactured by:

Ngolo Industries
LILONGWE

SINGLE-ROW PLANTER

Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi



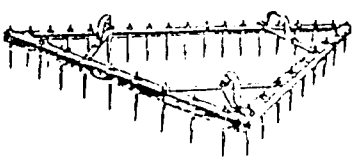
Description: The Agrimal planter is of simple and rugged construction and a double pitman drive operates the planting wheel, which ensures positive seeding. Several optional extras are available for the planter: fertiliser spreader, cotton-seed planter and a range of seed plates suitable for all sizes of maize, millet, sorghum and legume seeds.

HARROWS

Triangular, Diamond and Zig-zag

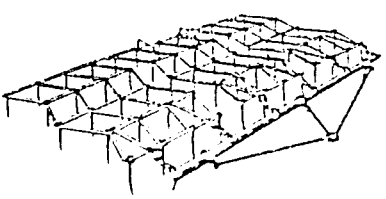
Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi

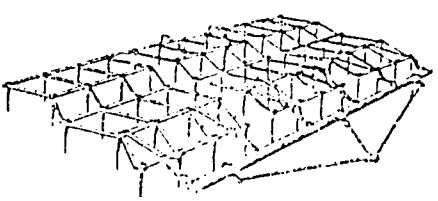


Triangular Harrow

Description: Triangular, Diamond and Zig-zag Harrows are produced by Agrimal. The Diamond and Zig-zag harrows are available in sets of 2, 3 or 4 depending on the power source available and the type of cultivation.



Diamond Harrow



Zig-Zag Harrow

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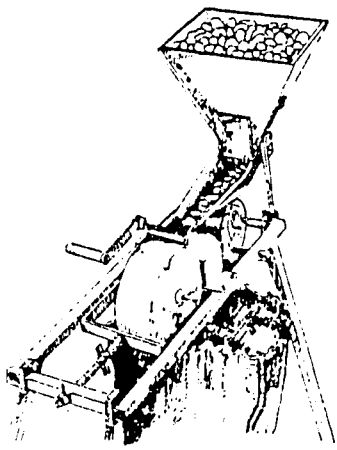
CHITEDZE GROUNDNUT CRACKER



Manufactured by:

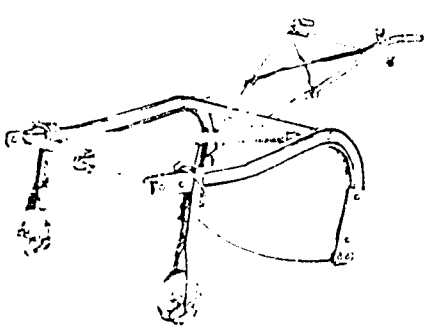
Chitedze Research Station
Ministry of Agriculture &
Natural Resources
PO Box 158
LILONGWE
Malawi

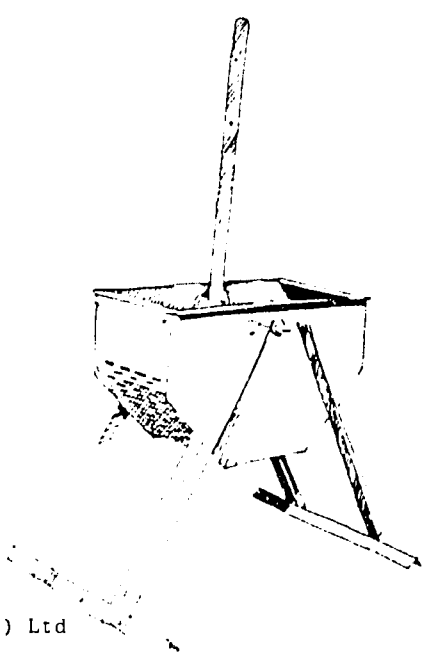
Telephone: Lilongwe 721855

Description: The groundnut cracker has been developed for cracking the shells of groundnuts before hand-shelling, as Malawi produces a large amount of 'Chalimbana' groundnuts for the confectionery trade. These are larger than the ordinary groundnut and can be damaged when processed with available groundnut shellers. 10% would be the maximum acceptable level of damage for these nuts: therefore they are shelled by hand.

The machine consists of 2 wheels, held together by spring-tension, which are covered with rubber from old inner-tubes. A hopper feeds the nuts between the wheels, which are cranked steadily to process the nuts. In setting the spring-loading, a balance must be struck between 100% undamaged nuts and 100% cracked shells: obviously a strong loading would crack all shells, but damage some nuts whereas a weak loading would damage no nuts but leave some shells uncracked. Tests have shown that 5% damage can be matched with 8% uncracking: whilst 12kg. of nuts can be cracked per hour.

GROUNDNUT LIFTER



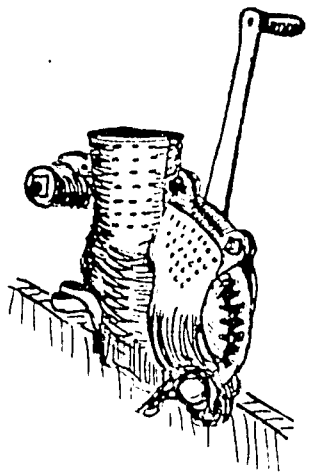


Description. Agrimal manufacture a robust groundnut lifter, whose design incorporates 2 plough beams spaced apart with a groundnut lifting blade. The weight of the implement is 54 kg.

Manufactured by:

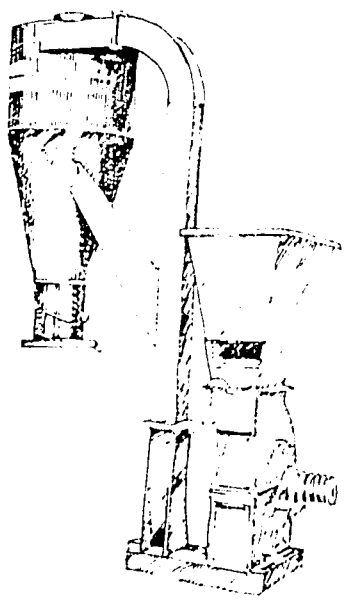
Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE

HAND MAIZE SHELLER



Description: A compact maize-sheller for hand-operation that can be fitted to the side of a container, allowing the kernels to drop into the container, and passing the shelled cobs out to the side. Tension is adjustable according to the diameter of the maize cobs.

KUSINJA MAIZE-MILL



Description: The Kusinja Maize Mill is designed to be powered by diesel motors of between 10-20HP, and the milling capacity will vary according to the power source. With a 10HP motor, the capacity would be 150kg/hour, with a 20HP motor, 400kg/hour.

ATOM MAIZE MILL

Descriptions: The Atom maize-mill is a small size hammer-mill designed to be powered by a 5-7HP diesel engine. It is fitted with reversible hammers, screens and sealed bearings. The average capacity is about 180kg per hour.

Manufactured by: Brown & Clapperton
PO Box 52
BLANTYRE
Malawi

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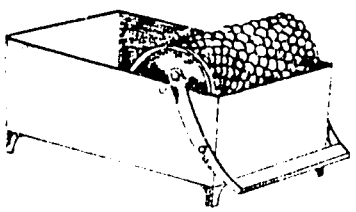
PADDY THRESHER



Description: The threshing drum is mounted in an oblong box and is operated by means of a foot treadle, allowing the operator to feed the sheaves of paddy by hand. The capacity of the thresher is about 200kg. of paddy per hour.

Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi

TRACTORS

The above outlined thrust of Mozambique's planning towards agricultural development would have major impact on the provision of industrial inputs, especially farm machinery and implements.

Average imports over the last 3/4 years have amounted to 400 to 500 tractors per year:

Imports of Tractors

1973	880
1977	900
1978	594
1979	146
1981	409
1982	509 (envisaged)

Mostly, their average size is around 80 HP. Since 1977, there have been no imports of lower sized tractors. The main sources of origin are GDR, USSR, Romania, Bulgaria, Brazil and England. The tractors imported are essentially for the requirements of co-operative and state farming sectors.

PRODUCTION PLAN

In view of the main thrust of Mozambique's planning on agricultural development through the introduction of modern farming practices, including mechanisation, the Government has been considering the establishment of tractor production facilities in the country. Various proposals have been considered over the last 5-6 years.

Currently a feasibility study for establishing a tractor factory, near Beira, is under preparation. The project is be set up with Soviet assistance and envisages a production capacity of 3,500 tractors a year to be built up in stages. The tractor size is expected to be 60 - 80 HP. According to present indications, the project is likely to be commissioned towards the late eighties. Existing engineering industry facilities including foundry at Beira would be utilised for the tractor project to the extent practicable.

SWAZILAND

CROPPING PATTERN

Under the prevailing system of land distribution, nearly 60 percent of land is held in trust as Swazi Nation Land, and distributed according to traditional arrangements. Subsistence farming, carried out mainly on small plots (averaging 2.6 ha of crop land per household), contributes about 13 percent of the GDP. Maize is the main staple food crop; other major crops include cotton and groundnuts.

SWAZI NATION LAND : AREA AND PRODUCTION OF MAJOR CROPS
1975/76 - 1977/78

Crop	Area ha.	Quantity produced m.tonnes	Area ha.	Quantity produced m.tonnes	Area ha.	Quantity produced m.tonnes
Maize	59,799	86,105	53,902	68,764	53,902	96,329
Groundnuts (nuts)	4,142	1,976	2,812	1,584	2,812	1,589
Cotton (see cotton)	10,130	6,317	7,013	7,400	7,013	11,886
Jugo beans	1,603	1,301	1,766	1,138	1,766	2,744
Sorghum	2,826	3,216	1,007	596	1,007	538
Beans	2,167	1,018	2,116	694	2,116	575
Sweet Potatoes	1,803	10,283	550	3,137*	-	-
Tobacco	561	425	582	441*	582	438*

Source: Central Statistical Office

The principal items in the commercial agricultural sector are sugar, wood pulp, citrus, pineapples, cotton and rice produced on 790 plantations with an average size of 800 ha.

PLAN PRIORITIES

The Government is pursuing a programme of developing the traditional sector gradually to a semi-commercial mode of production, through land purchase, irrigation and settlement schemes. The establishment of rural development areas (RDA) in the early 1970s was designed to improve both productivity and incomes of the traditional farmer. RDAs cover a total area of 76,700 ha. The RDA programme has provided tractor hire service, agricultural machinery extension, general extension, rural roads and credit assistance.

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IMPLEMENTS

STOCK OF HAND AND ANIMAL DRAWN IMPLEMENTS

Implement/Tool	Number
Hoe	126,800
Plough	35,000
Cultivator	15,000
Matchet	21,500
Planter	11,680
Harrow	9,400
Sprayer	1,800

Source: Agricultural Sample Census (Swazi Nation Land) 1971/72.

STOCK OF TRACTOR DRAWN IMPLEMENTS

Implement	Swazi Nation Land	Individual Tenure (Freehold) Land	Total
Plough	788	571	1,359
Harrow	279	364	643
Planter	382	345	727
Cultivator	341	553	894
Sprayer	132	228	360
Trailer	386	1,160	1,546
Harvestor	-	56	56
Maize Sheller	-	113	113

Source: Census of Individual Tenure (Freehold) Farms 1975-76.
Annual Survey of Swazi National Land (Smallholder) 1976-77.

TRACTORS

Year	Government	Private	Total
1978	321	2,239	2,551
1979	349	2,357	2,700

Source: Annual Statistical Bulletin, 1979.

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MANUFACTURE OF IMPLEMENTS, TRACTORS AND COMPONENTS

IMPLEMENTS

There are no manufacturing facilities and all the implements are imported.

TRACTORS

While the higher HP rated tractors are imported, Swaziland has pioneered the development of a small, 16 HP tractor.

Tinkabi tractor project

The Tinkabi tractor project was embarked on for the purpose of introducing a low cost mechanised farming system to the smallholder farmer. Since 1972 it has been funded by the Swaziland Government as a development and prototype production unit. Commercialisation of the project is currently under consideration. It is estimated that E2 million will be needed for capital equipment and initial working capital.

The project has facilities at Matsapa with a production capacity of 1,500 tractor units per annum. The tractor is supplied as a package with ploughs, disc harrow, cultivator, planter and ridger. The implements are made by the project under agreement with International Harvester.

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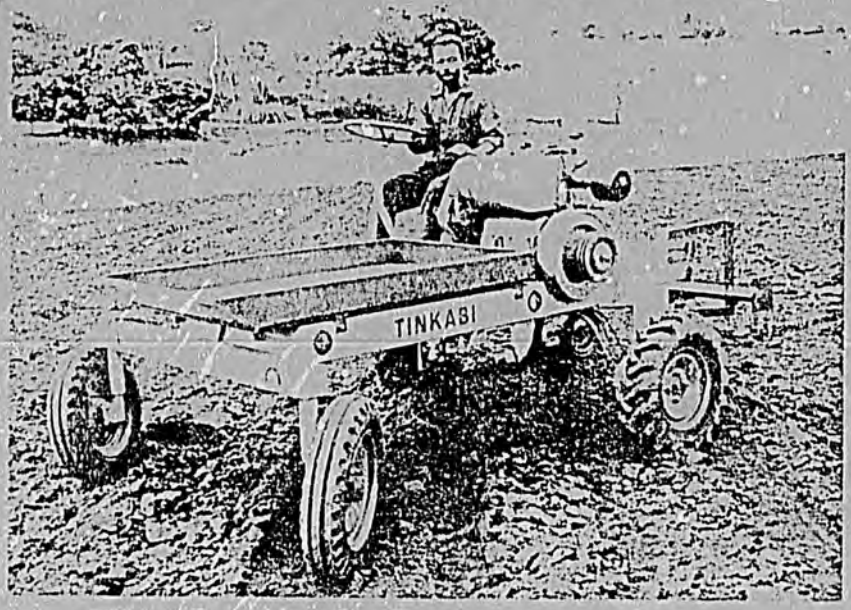
TINKABI TRACTOR



Technical data on tractor

SPECIFICATION
The tractor consists of a fabricated chassis with integral oil reservoir and fuel tank. Four wheels are positioned, one at each corner of the chassis with the front steering wheels attached to a central pivoting axle. The engine, hydrostatic unit and driver are positioned at the rear of the tractor and a load pan with a capacity of 1 000 kg is situated immediately in front of the driver and extends over the front. The unit is built high off the ground with a relatively wide track to compensate for stability on sloping ground. Weight distribution is in the ratio of 7:2 on the rear and front axles respectively.

ENGINE:
Diesel Type TA 132, cold starting, vertical, air cooled, totally enclosed, compression ignition, four stroke cycle, two cylinder, hand started diesel engine.

Bore: 87,5 mm
Stroke: 110 mm
Cylinder Capacity: 1318 cc
Ratio: 17:1
Torque: At 1500 rpm on full load: [illegible] Kg. M
Fuel Consumption: (Full load, 1500 rpm) 203 gm/bhp/hr (,42 lb/bhp/hr)
Lubrication: Force feed lubrication Full flow filter
Lub. oil sump capacity: 10 litres

HORSE POWER:
Maximum Continuous
BS 649: 1958 16,2 BHP
Maximum Speed 2000 RPM
Weight 238 Kg.

AIR INTAKE:
Type — Replaceable dry paper element.

STEERING:
Re-circulated ball type ratio 17:1 all joints pre-lubricated spherical bearings and vesco self lubricating bushes.

TRANSMISSION:
Hydrostatic with bi-direction variable displacement pump directly mounted on engine driven at crankshaft speed with hand/foot control lever. Radial piston motors directly mounted on each driving wheel. Oil supply reservoir integral part of chassis capacity 50 litres with full flow 10 micron suction filter.

PUMP:
Bi-directional axial piston variable displacement with integral vane auxiliary pump. Displacement main pump — 41 cc per rev. Maximum pressure — 350 bar.
Maximum speed — 3600 rpm.
Displacement auxiliary pump — 70 l/pm at 3000 rpm.
Maximum pressure — 140 bar.

MOTORS:
Bi-directional direct wheel mounted 5 radial piston with 4:1 epicyclic final drive, through lubrication. Maximum output — 219 kgf/m at 300 bar. Maximum speed — 300 rpm.

DIMENSIONS:
Wheel base — 2,2 m
Wheel track — 1,80 m
Ground clearance front — 0,60 m
Ground clearance rear — 0,65 m
Overall width — 2,10 m
Overall length — 2,70 m
Weight unballasted — 1 050 kg
Front wheels — 500 x 15 x 4 ply ribbed
Rear wheels — 600 x 14 x 4 ply traction
Fuel tank capacity — 25 litres
Speed — Infinitely variable up to 10 KPH.
Drawer pull — maximum 818 kg

IMPLEMENT LIFT:
Four point over centre mechanical type. Depth controlled by chains. Mechanical advantage 3:1.

SERVICING:
Every 250 hours or 6 months whichever is earlier change engine oil, engine filter, air filter unit and fuel element.

MOULDEDBOARD PLOUGH:
Single furrow 350 wide x 250 deep. Average working capacity 1 ha per day.

PLANTER:
Single row placement type suitable for maize, beans, groundnuts and acid delinted cotton. Complete with fertiliser applicator. Average working capacity 7,5 ha per day in 1 metre rows.

CULTIVATOR:
Four tine, rigid shank with either straight or wing points. Average capacity 10 ha. per day.

RIDGER:
Single row one piece body rigid mounting in centre of drawbar for 0,75 rows. Average capacity 8 ha. per day.

HARROW:
1,5 m spiked tooth triangular type.

OPTIONAL EQUIPMENT:
Belt driven power take off
Trailer — capacity 1½ tonne
Water bowser capacity 700ℓ
Water pump — various capacities
Hammermill — up to 1 tonne per hour
Crop sprayer
Circular saw.
Hydraulic lift
Cat. one hydraulic lift
Hydraulic P.T.O.

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TANZANIA

Nearly two-thirds of Tanzania's total land area of 883,600 sq km is suitable for agriculture. At present hardly 6-7% is used for farming. Table 1 provides a picture of land utilisation in Tanzania as in 1985. Present area of cultivated land is estimated at around 6 million hectares. Traditional methods of cultivation predominate:

Type of cultivation	Estimated area in hectares
Traditional, by hand	4.2 million, 70%
Plough	1.2 million, 20%
Tractor	0.6 million, 10%

TABLE 1 - LAND UTILISATION IN TANZANIA (1975)

	Sq km	%
Grazing	442,450	50.08
High altitude forest	3,900	0.44
Other forest	376,600	42.62
Total forest	380,500	43.06
Smallholdings cultivation	38,800	4.39
Largeholdings cultivation	5,850	0.66
Total cultivated	44,650	5.05
Other: urban, swamp, rocks, etc.	16,000	1.81
Total	883,600	

Due to increasing emphasis being placed on agricultural development, the eighties will see an expansion in the area under cultivation and an average growth rate of 5% per annum is foreseen.

About a quarter of the land lies in the Uhru corridor comprising the four regions of Coast, Morgoro, Iringa and Mbeya. Hardly 4% of this area is cultivated. This area is considered especially suitable for growing rice and sugar. The Kilombero-Rufiji basin has a potential of 400,000 hectares of land that could be irrigated (at an estimated cost of around $1 billion) and another 120,000 hectares of potential irrigable land in the Usangu plains.

The major food crops of Tanzania are:

Maize, Sorghum, Rice, Millet, Cassava and Wheat.

The major cash crops grown are:

Cotton, coffee, sisal, tea, tobacco, pyrethum, sugar, cashewnuts, groundnuts, coconuts and cloves.

The average yield of maze, wheat and cotton varies between 1,200 to 1,700 kg per hectare and that of coffee and millet between 750 to 1,200 kg per hectare.

Table 2 indicates the percentage of cultivated land for the major crops and the contribution of this output from the smallholders (10 hectares or less). Production targets for 1982-83 are also indicated.

Table 2

Crop	Average % of cultivated land	Average % coming from smallholders	Production Target in 000 tons 1982-83
Maize	25-27%	90%	2,116
Millet	10-12%	100%	
Rice	5-6%	80%	339
Sisal	5%	3%	108
Wheat	1%	15%	84
Cotton)		100%	71
Coffee)	50%	75%	61
Tobacco)		75%	23

TRACTOR USAGE

As mentioned earlier, the bulk of agriculture in Tanzania is in smallholdings with 70% of the cultivation based on traditional methods of hand tools application. With increasing irrigation and the coming into being of various parastatals, especially for cash crops, the extent of mechanisation is increasing.

Present estimates of total tractor stock in the country are around 6,000-7,000. However, a large proportion of it is out of use becauseof spares and maintenance difficulties. The average life of a tractor is said to be barely 3-4 years, almost half the African average. According to one estimate, the output of tractors used in Tanzania has been only 70-80 hectares a year.

The regions with major tractorisation are Arusha, Kilimanjaro, Morogoro, Mara Iringa, Mbeya and Shinyanga. The majority of tractors in use are in the size range 50-80 Hp with 60 HP as a good average:

Tractor Size Structure

Below 50 HP	15-20%
50 to 80 HP	75-80%
Above 80 HP	3-5%

In the initial stages, especially for the cotton growing region in the uplands of Tanzania, use of medium sized tractors has been favoured. It is surmised that soil conditions in the coastal area of the country - especially favourable for paddy - are such as to warrant more usage of tractors of below 50 HP.

A variety of tractor models have been imported - Massey Ferguson, Ford, International Harvester, John Deeres, Swaraj, Fiat and Chinese with Massey Ferguson's model accounting for the bulk of the market:

Market share of various models (1969-72)

Massey Ferguson	54%
Ford	31%
John Deere	12%
International	3%

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PRODUCTION OF IMPLEMENTS, TRACTORS AND COMPONENTS

The agricultural implements sector is currently dominated by one large-scale unit and two additional large-scale factories are under implementation. Approximately 600 tonnes of handtools are produced in the large-scale sector, including 400,000 hoes, 300,000 machete, 80,000 axes. Ox ploughs production is currently at 10,000 per annum. Present production is insufficient to meet local demand.

Besides the large-scale sector a number of small factories are also in operation producing items such as trailers, ox carts, maize and rice mills. In the artisan sector, surveys have revealed that roughly 300 tonnes of metal implements may be produced per annum by rural blacksmiths - particularly implements with specialised local use. Ox cart production is also actively being encouraged at village level.

A tractor project, starting with assembly and adding on local components as the industry develops, is under implementation. Details of implements and tractor industry have been included in the respective chapters.

Manufactured by:

Ubungo Farm Implements Ltd (UFI)
PO Box 20126
DAR es SALAAM
Tanzania

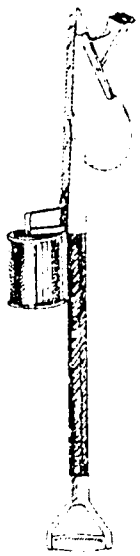
AGRICULTURAL HAND TOOLS

Description: UFI manufacture both Round-eyed and Tanged Hoe Blades, in weights of 0.9 kg., 1.1 kg. and 1.3 kg.

Manufactured by:

TAMTU
PO Box 1389
ARUSHA
Tanzania

TAMTU HAND PLANTER

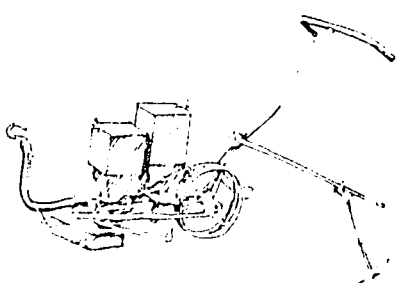


Description: The hand planter is a jab planter with wooden handles and a wooden slide seed metre. The jabbing action automatically meters seeds into the planting hole.

N'GOMBE OX-PLOUGH

Description: The N'gombe ox-plough is a single furrow mould-board plough of standard design. It is of all steel fabrication and the share is of heat-treated steel

TAMTU OX-DRAWN PLANTER

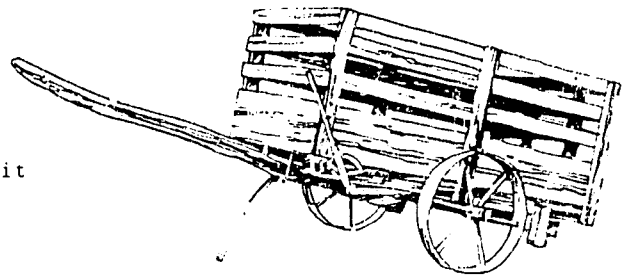


Description: The TAMTU ox-drawn planter is a heavy duty ox-drawn planter with 2 hoppers mounted in tandem ; one for seed, the other for fertiliser. The frame is made from welded tubular steel.

422

TAMTU OX-CART

(metal or rubber wheeled)



Manufactured by:

Tanzania Agricultural
Machinery Testing Unit
PO Box 1389
ARUSHA
Tanzania

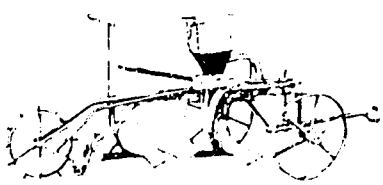
Telephone: Arusha 3666

Description: A 2 wheel ox-cart that can be built with either metal or rubber wheels. The model as shown is designed for oxen: a derivative can be constructed for donkey draught, in which case the shafts can be lighter and attached laterally to the front of the cart rather than centrally. The cart is fitted with wooden bushes and brakes, can be serviced quite simply by lubricating the bearing grease-cup, and can carry up to 750kg.

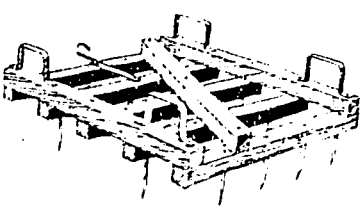
Manufactured by:

TAMTU
PO Box 1389
ARUSHA
Tanzania

KIFARU PLOUGH



RECTANGULAR HARROW



Description: The Kifaru is a heavy duty, double-furrow mouldboard plough, manufactured from locally available steel components. The frame is mounted on 3 wheels, 2 forward and one rear.

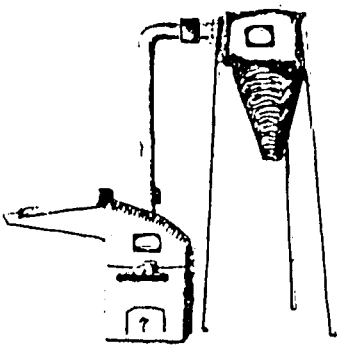
As cultivation with the Kifaru is usually carried out twice prior to planting, the Kifaru can be fitted with a metered seeding unit, for planting during the second cultivation pass. The whole seeding unit includes a metering wheel which trails.

Description: The TAMTU harrow is made from a heavy 10cm x 10cm timber frame, fixed with cross-members. To these are attached heavy duty steel spikes that protrude 15cm. On the top of the frame are fixed steel slides so that the harrow can be inverted for transport as a sled.

423

UNITED MAIZE MILLS

NM 25, NM 50, NM 75, NM 100



Manufactured by:

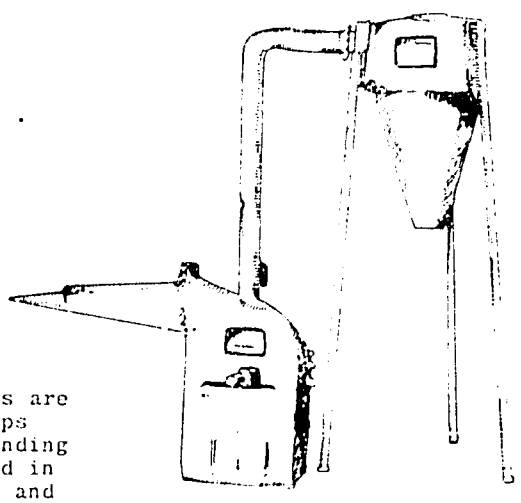
United Engineering Works Ltd
PO Box 3082
ARUSHA
Tanzania

Telephone: Arusha 3424

Description: United makes 4 sizes of hammer-mills with different capacities. The casing of each is made from durable heavy welded steel, inside which the steel shaft is mounted on sealed bearing units. The steel hammers are reversible and replaceable.

MANIK GRINDING MILLS

MGM2, MGM 5, MGM 7 and MGM 10



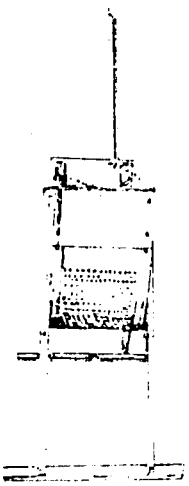
Manufactured by:

Manik Engineers
PO Box 1274
ARUSHA
Tanzania

Telephone: Arusha 3520

Description: Manik grinding mills are designed to mill a variety of crops but are especially useful for grinding maize. The mills are manufactured in 4 sizes: small, medium, standard and large. Construction of all models is from heavy welded steel, and the grinding mechanism is mounted on imported sealed bearing units. The hammers are reversible, and can be used on 4 different faces before replacement.

GROUNDNUT SHELLER



Description: The groundnut sheller is a hand-operated reciprocating design, with interchangeable screens. The potential capacity is 25-30kg./hour.

Manufactured by:

Ubungo Farm Implements Ltd (UFI)
PO Box 20126
DAR es SALAAM
Tanzania

425

ZAMBIA

CROPPING PATTERN

The cropping pattern, as in most SADCC countries, is oriented towards cereal crops, notably maize which accounts for about 55% of total production of principal crops. Other major crops include sugar cane, cassava and groundnuts. Rice, wheat, soyabeans, tobacco, sunflower and cotton are also grown. Nearly 70% of the rural population have small-holdings of below 2 Ha. The 'large farm' sector (over 20 Ha.) is confined to 10% of the population. Most of the tractors in use are in the large farm sector. Oxen ploughing takes place to a limited extent.

	1979		1980	
	Area (Ha 000)	Production (tons 000)	Area (Ha 000)	Production (tons 000)
Cereals	1105	798	1215	905
of which maize	900	700	1000	800
Roots, tubers	58	198	59	200
of which cassava	55	175	56	177
Pulses	13	12	15	14
Groundnuts	138	74	145	80
Sunflower seed	25	13	25	13
Vegetables, fruit, etc.	202	72	209	74
Sugarcane	10	1024	12	1150
Tobacco	6	5	6	5

426

AGRICULTURAL IMPLEMENTS

Agricultural equipment production is not as yet developed towards self-sufficiency. However, handtools and ox implements are manufactured in 2 enterprises and plans are in hand for expansion of a major unit, Northland Engineering. Imports of ox ploughs are no longer required. Estimates of average local production are as follows:

Ox ploughs	5,000 pcs/year
Hoes	500,000 pcs/year

Agricultural tools and implements have been selected as a priority area in the current 5 year plan. Imports until recently were put at 15,000 ploughs per annum, and 200,000 hoes per annum. It is expected that local production will expand fairly rapidly for these items. Some limited capacity also exists for maize mills, trailers and harrows, including one unit producing approximately 2,000 pieces per annum. At the artisan level a UNDP/FAO project has been started to set up village workshops. About 12 small scale enterprises exist which supply agriculture-related equipment.

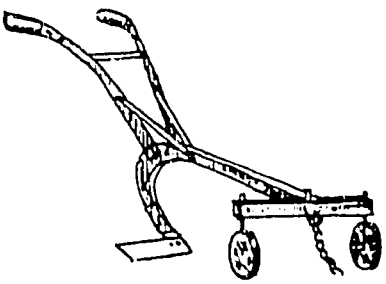
TRACTORS

There are no manufacturing facilities though assembly of Swaziland's Tinkabi tractor under licence has been considered. FAO/UNIDO data indicates average imports of 700-900 a year. There is a significant demand for tractors in the range below 50 HP.

Details of agricultural implements and tractor sectors have been included under the respective chapters earlier.

427

'BORNU' GROUNDNUT-LIFTER



Designed by:

Farm Machinery Research Unit
Regional Research Station
PO Box 11
MAGOYE
Zambia

Telephone: Magoye, 420

Description: The 'Bornu' Groundnut-lifter is merely a blade that can be attached to the standard 'Victory' mouldboard type of ox-plough frame. The adaption, therefore, is limited to the blade, which can be bolted on in place of a mouldboard, and an extra wheel and axle-bar in place of the single wheel of a plough.

The lifter was originally developed in Nigeria, hence the name, where it is used, and the design was brought to Zambia. It is designed for lifting groundnuts which have been planted in 1 metre ridges, and in normal use can harvest about 1.2 hectares per day.

428

ZIMBABWE

CROPPING PATTERN

The most important factor in the Zimbabwe agricultural sector relating to implement usage is the relatively high proportion of output originating from large-scale commercial agriculture. The average size of holding in the commercial sector is about 100 hectars. This situation has resulted in a relatively high usage of tractors and tractor-based farm implements compared to other SADCC countries. Handtools and animal drawn implements provide the main power inputs in the non-commercial agricultural sector with an average holding of 3-4 hectares.

The cropping pattern both within and outside the commercial sector is weighted towards maize and cereal crops (over 60%); the next largest single item is sugarcane (15%). A wide range of other crops are grown including tobacco, cotton, tea, coffee, oilseeds and horticultural crops. The bulk of the demand for agricultural equipment is estimated to be for the tillage, maintenance and processing of maize, other cereals and sugarcane.

Principal Crops

	1979		1980	
	Area (Ha 000)	Production (tons 000)	Area (Ha 000)	Production (tons 000)
Cereals	1323	1781	1697	2038
of which maize	800	1200	1146	1600
Roots, tubers	20	76	21	82
of which cassava	18	54	19	60
Pulses	50	24	50	24
Groundnuts	161	113	120	84
Vegetables, fruit, etc.	125	n.a.	212	177
Sugarcane	29	2614	29	2700
Tobacco	60	85	62	114
Cotton		55		61

The large commercial sector is capital intensive, and consequently demand for irrigation equipment is also relatively high. The irrigated area is relatively extensive in relation to arable land.

IMPLEMENTS, TRACTORS & COMPONENTS

Zimbabwe is more or less self-sufficient in almost all types of agricultural equipment. Three major producing units specialising in agricultural equipment are operating in Zimbabwe. There are a number of other enterprises manufacturing agricultural equipment or components, or with engineering capacity to do so. This includes the manufacture of processing equipment, pumps and haulage equipment.

A wide range of equipment is exported; the following table shows 1980 trade figures:

1980 Agricultural equipment

Imports		Exports	
Agricultural handtools (tonnes)	200 (approx)	Harvesting machinery (nos)	104
Binders, reapers, harvesters (nos)	59	Cultivator, rotary hoe (nos)	2102
Harvesting/threshing equipment (tonnes)	25	Harrows (nos)	1811
Tractors (nos)	1590	Mould board ploughs (nos)	6586
Tractor parts, spares (tonnes)	407	Planters, etc (tonnes)	71
Soil cultivator parts (tonnes)	11	Harrow, cultivator parts (tonnes)	37
Other equipment (tonnes)	228	Plough parts (tonnes)	332
Water pumps (nos)	4642	Other agricultural equipment & spares (tonnes)	483
Pump parts (tonnes)	154		
Sprayers (tonnes)	10		
		Axes, hatchets (nos)	24000
		Hoes (nos)	65000
		Picks/mattocks (nos)	55000
		Forks (nos)	34000
		Other handtools (nos)	34000

420

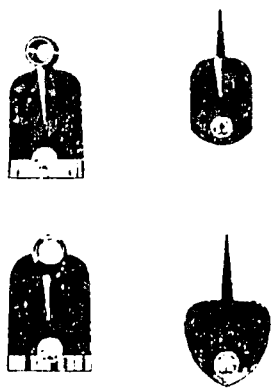
From the above figures it may be estimated that a total of 1,800 - 2,000 tonnes of equipment were exported and a total of about 600 tonnes imported during 1980.

The tractor assembly data is included in the main report. Considering the state of engineering industries in Zimbabwe, the country could well emerge as a significant source of tractor components in the SADCC. The current assembly operations (at PKD stage) also need to be upgraded.

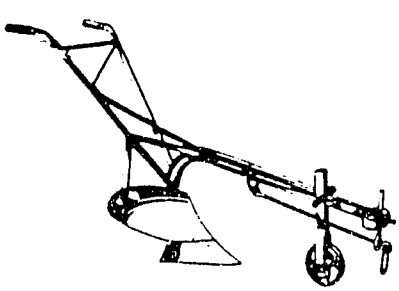
Manufactured by:

Rhoplow Ltd
PO Box 1039
BULAWAYO
Zimbabwe

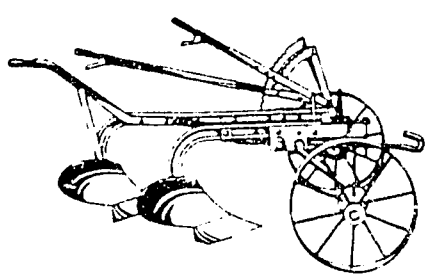
"MEALIE BRAND" HOES



SINGLE FURROW PLOUGH



TWO-FURROW PLOUGH

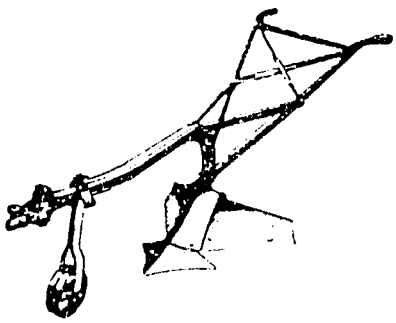


1 Description: A standard design light-weight mouldboard plough, weighing 38 kg.

2 Description: The two beams are mounted on an axle between 2 widely spread metal-rimmed wheels. One beam is shorter, which presents the two shares in an off-set pattern to the land. The hand-levers are used to adjust the angle of the shares.

437

HIGH-WING RIDGER



Manufactured by:

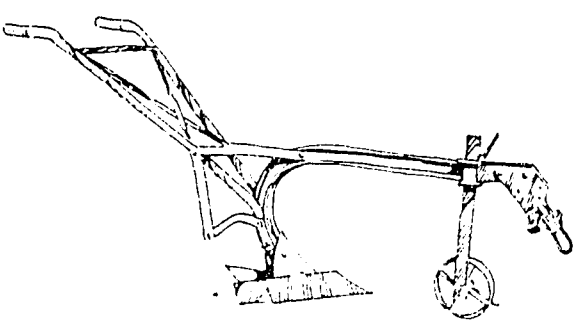
Rhoplow Ltd
PO Box 1059
BULAWAYO
Zimbabwe

Description: The same beam and handle assembly of the Rhoplow ox-plough is fitted with adjustable ridging blades.

SILVER MEDAL OX-PLOUGH

Manufactured by:

Bulawayo Steel Products
8 Ironbridge Road
Donnington
PO Box 1603
BULAWAYO
Zimbabwe

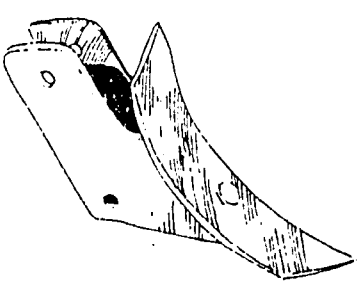


Description: The standard ox-plough design has been modified to eliminate the need for spanners to adjust the blade and handle setting. The wheel adjustment and linkage have also been modified, and the frog has been strengthened. The Institute of Agricultural Engineering in Harare have designed alternative attachments which can be fitted in place of the mould-board. These are:

(a) a single tine for reduced tillage;

(b) a ridger blade; and

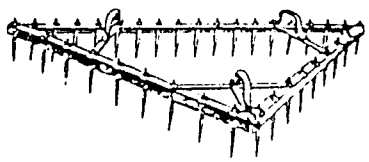
(c) a groundnut-lifting blade.



Manufactured by:

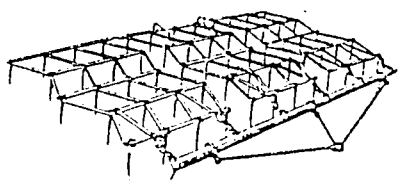
Rhoplow Ltd
PO Box 1059
BULAWAYO
Zimbabwe

HARROWS

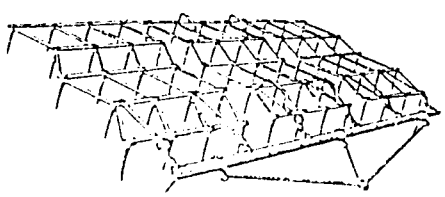


Trigular Harrow

Description: A standard range of harrows, of which the diamond and the zig-zag are available in sets of 2, 3 or 4 sections.

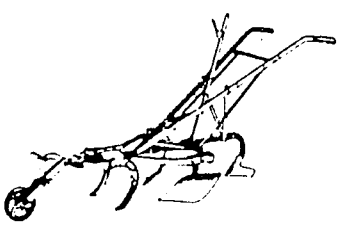


Diamond Harrow



Zig-Zag Harrow

5-TINE CULTIVATOR



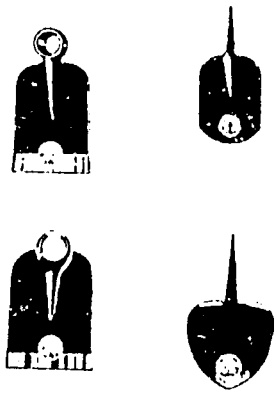
Description: The cultivator comes in 2 forms:-

(a) S 51 cultivator - fitted with 1 sweep, 2 hillers and 2 tines (as in the illustration).

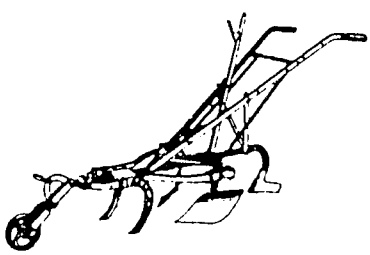
(b) Light cultivator - fitted with 1 sweep and 4 tines.

The light cultivator is for lighter cultivation and inter-row weeding, whilst the S51 can be used for heavier work. A ratchet and lever mechanism enables adjustment of the cultivator span.

AGRICULTURAL HAND TOOLS

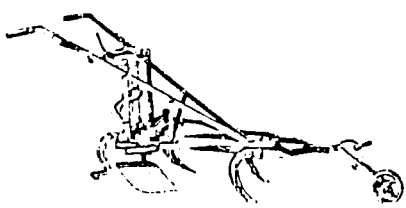


STANDARD CULTIVATOR S51



Description: The Standard Cultivator is an all-purpose cultivator which is designed to weed between rows of varying widths - from 60 cm. to 100 cm. It is equipped with 3 different types of tine; 2 reversible shares in the front, 2 mouldboard hillers in the centre and a 25 cm. sweep in the rear

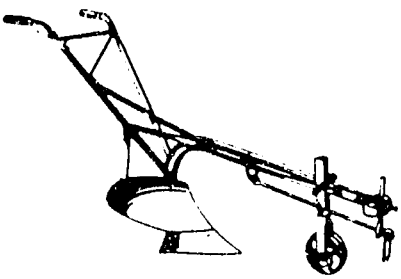
5 TINE CULTIVATOR MC5



Description: The MC5 is designed for lighter cultivation than the Standard cultivator, although it is of similar configuration, with tines, tillers and a sweep. The width is adjustable by means of a crank-handle, whereas on the Standard it is by lever.

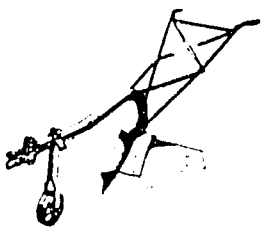
435

SINGLE-FURROW PLOUGH



Description: A single-furrow mouldboard plough of conventional design with a share made from heat-treated steel.

RIDGER

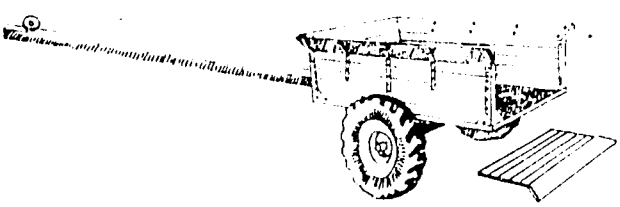


Description: This animal-drawn ridger/cultivator is suitable for ridging crops of maize, cotton, tobacco and potatoes. The wings of the ridging share can be adjusted to cultivate rows varying from 40 cm. to 75 cm. in width.

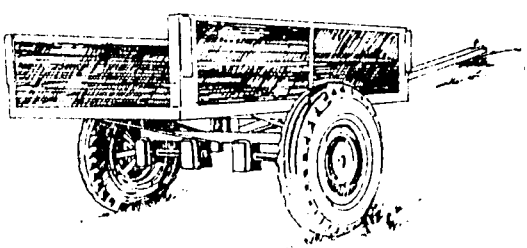
Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi

OX-CART



NGOLO OX-CART



Description: The B&C ox-cart is a strong heavy-duty cart, mounted on a single axle fitted with tyred wheels. The front and rear panels of the body can be removed for taking long loads, and a 600 litre galvanized water tank is available as an extra.

Manufactured by:

Brown & Clapperton Ltd
PO Box 52
BLANTYRE
Malawi

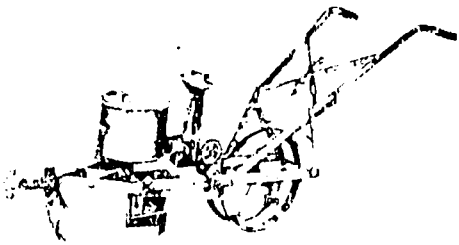
Manufactured by:

Ngolo Industries
LILONGWE

SINGLE-ROW PLANTER

Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi



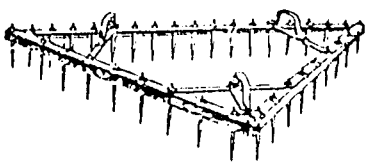
Description: The Agrimal planter is of simple and rugged construction and a double pitman drive operates the planting wheel, which ensures positive seeding. Several optional extras are available for the planter: fertiliser spreader, cotton-seed planter and a range of seed plates suitable for all sizes of maize, millet, sorghum and legume seeds.

HARROWS

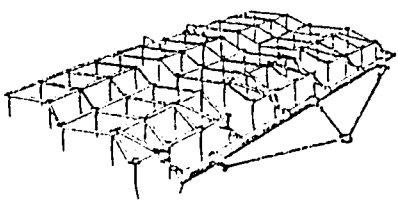
Triangular, Diamond and Zig-zag

Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi

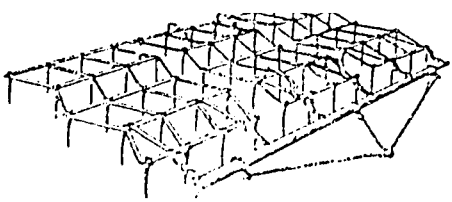


Triangular Harrow



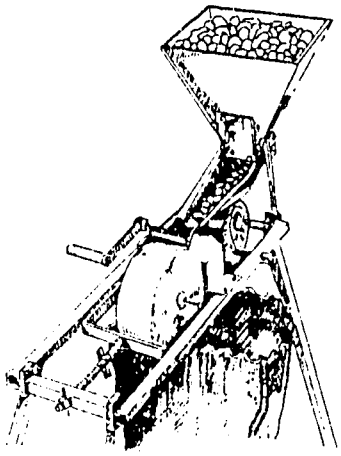
Diamond Harrow

Description: Triangular, Diamond and Zig-zag Harrows are produced by Agrimal. The Diamond and Zig-zag harrows are available in sets of 2, 3 or 4 depending on the power source available and the type of cultivation.



437

CHITEDZE GROUNDNUT CRACKER



Manufactured by:

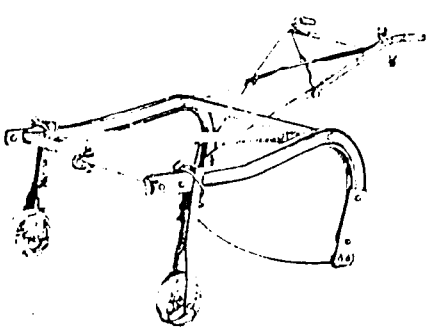
Chitedze Research Station
Ministry of Agriculture &
Natural Resources
PO Box 158
LILONGWE
Malawi

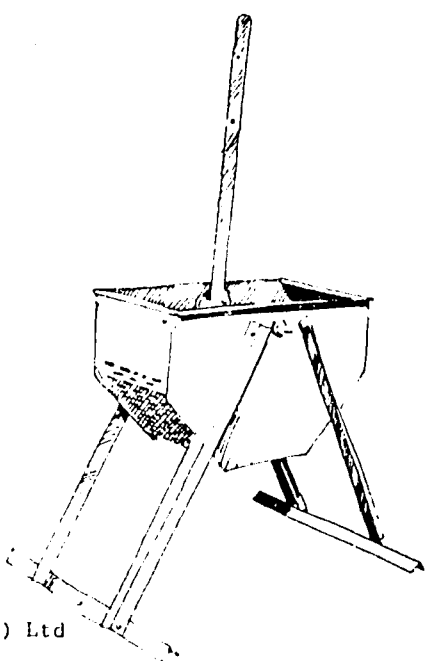
Telephone: Lilongwe 721855

Description: The groundnut cracker has been developed for cracking the shells of groundnuts before hand-shelling, as Malawi produces a large amount of 'Chalimbana' groundnuts for the confectionery trade. These are larger than the ordinary groundnut and can be damaged when processed with available groundnut shellers. 10% would be the maximum acceptable level of damage for these nuts: therefore they are shelled by hand.

The machine consists of 2 wheels, held together by spring-tension, which are covered with rubber from old inner-tubes. A hopper feeds the nuts between the wheels, which are cranked steadily to process the nuts. In setting the spring-loading, a balance must be struck between 100% undamaged nuts and 100% cracked shells: obviously a strong loading would crack all shells, but damage some nuts whereas a weak loading would damage no nuts but leave some shells uncracked. Tests have shown that 5% damage can be matched with 8% uncracking: whilst 12kg. of nuts can be cracked per hour.

GROUNDNUT LIFTER



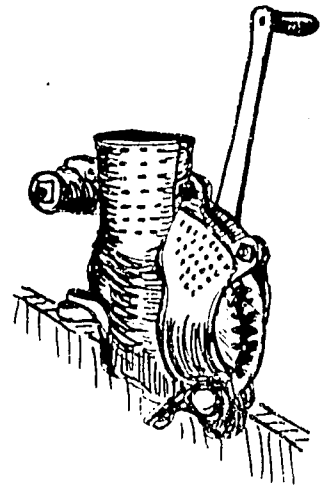


Description: Agrimal manufacture a robust groundnut lifter, whose design incorporates 2 plough beams spaced apart with a groundnut lifting blade. The weight of the implement is 54 kg.

Manufactured by:

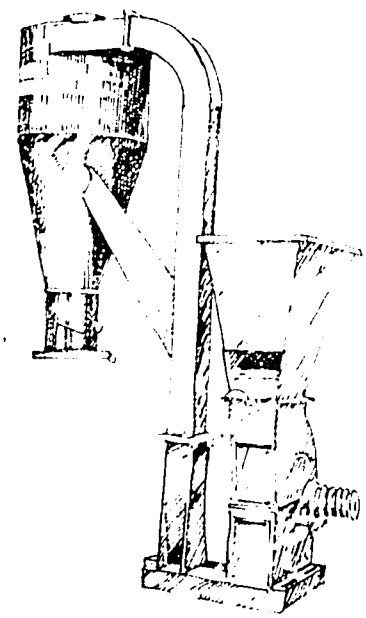
Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE

HAND MAIZE SHELLER



Description: A compact maize-sheller for hand-operation that can be fitted to the side of a container, allowing the kernels to drop into the container, and passing the shelled cobs out to the side. Tension is adjustable according to the diameter of the maize cobs.

KUSINJA MAIZE-MILL



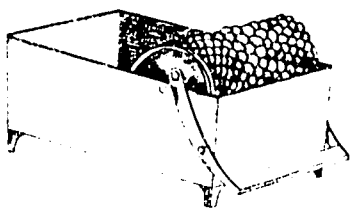
Description: The Kusinja Maize Mill is designed to be powered by diesel motors of between 10-20HP, and the milling capacity will vary according to the power source. With a 10HP motor, the capacity would be 150kg/hour, with a 20HP motor, 400kg/hour.

ATOM MAIZE MILL

Descriptions: The Atom maize-mill is a small size hammer-mill designed to be powered by a 5-7HP diesel engine. It is fitted with reversible hammers, screens and sealed bearings. The average capacity is about 180kg per hour.

Manufactured by: Brown & Clapperton
PO Box 52
BLANTYRE

PADDY THRESHER



Description: The threshing drum is mounted in an oblong box and is operated by means of a foot treadle, allowing the operator to feed the sheaves of paddy by hand. The capacity of the thresher is about 200kg. of paddy per hour.

Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi

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TINKABI TRACTOR

Technical data on tractor

SPECIFICATION
The tractor consists of a fabricated chassis with integral oil reservoir and fuel tank. Four wheels are positioned, one at each corner of the chassis with the front steering wheels attached to a central pivoting axle. The engine, hydrostatic unit and driver are positioned at the rear of the tractor and a load pan with a capacity of 1 000 kg is situated immediately in front of the driver and extends over the front. The unit is built high off the ground with a relatively wide track to compensate for stability on sloping ground. Weight distribution is in the ratio of 7:2 on the rear and front axles respectively.

ENGINE:
Diesel Type TA 132, cold starting, vertical, air cooled, totally enclosed, compression ignition, four stroke cycle, two cylinder, hand started diesel engine

Bore: 87,5 mm
Stroke: 110 mm
Cylinder Capacity: 1318 cc
Ratio: 17:1
Torque: At 1500 rpm on full load 7 Kg M
Fuel Consumption: (Full load, 1500 rpm) 203 gm/bhp/hr (.42 lb/bhp/hr).
Lubrication: Force feed lubrication Full flow filter
Lub. oil sump capacity: 10 litres

HORSE POWER:
Maximum Continuous
BS 649: 1958 16,2 BHP
Maximum Speed 2000 RPM
Weight 238 Kg

AIR INTAKE:
Type — Replaceable dry paper element.

STEERING:
Re-circulated ball type ratio 17:1 all jounts pre-lubricated spherical bearings and vesco self lubricating bushes.

TRANSMISSION:
Hydrostatic with bi-direction variable displacement pump directly mounted on engine driven at crankshaft speed with hand/foot control lever. Radial piston motors directly mounted on each driving wheel. Oil supply reservoir integral part of chassis capacity 50 litres

PUMP:
Bi-directional axial piston variable displacement with integral vane auxiliary pump. Displacement main pump — 41 cc per rev. Maximum pressure — 350 bar.
Maximum speed — 3600 rpm.
Displacement auxiliary pump — 70 cc/rpm at 3000 rpm.
Maximum pressure — 140 bar.

MOTORS:
Bi-directional direct wheel mounted 5 radial piston with 4:1 epicyclic final drive, through lubrication. Maximum output — 219 kgf/m at 300 bar. Maximum speed — 300 rpm.

DIMENSIONS:
Wheel base — 2,2 m
Wheel track — 1,80 m
Ground clearance front — 0,60 m
Ground clearance rear — 0,65 m
Overall width — 2,10 m
Overall length — 2,70 m
Weight unballasted — 1 050 kg
Front wheels — 500 x 15 x 4 ply ribbed
Rear wheels — 600 x 14 x 4 ply traction
Fuel tank capacity — 25 litres
Speed — Infinitely variable up to 10 KPH.
Drawer pull — maximum 818 kg

IMPLEMENT LIFT:
Four point over centre mechanical type. Depth controlled by chains. Mechanical advantage 3:1.

SERVICING:
Every 250 hours or 6 months whichever is earlier change engine oil, engine filter.

MOULDEDBOARD PLOUGH:
Single furrow 350 wide x 250 deep. Average working capacity 1. ha per day.

PLANTER:
Single row placement type suitable for maize, beans, groundnuts and acid delinted cotton. Complete with fertiliser applicator. Average working capacity 7,5 ha per day in 1 metre rows.

CULTIVATOR:
Four tine, rigid shank with either straight or wing points. Average capacity 10 ha. per day.

RIDGER:
Single row one piece body rigid mounting in centre of drawbar for 0,75 rows. Average capacity 8 ha. per day.

HARROW:
1,5 m spiked tooth triangular type.

OPTIONAL EQUIPMENT:
Belt driven power take off
Trailer — capacity 1½ tonne
Water bowser capacity 700ℓ
Water pump — various capacities
Hammermill — up to 1 tonne per hour
Crop sprayer
Circular saw.
Hydraulic lift
Cat. one hydraulic lift
Hydraulic P.T.O.

Manufactured by:

Ubungo Farm Implements Ltd (UFI)
PO Box 20126
DAR es SALAAM
Tanzania

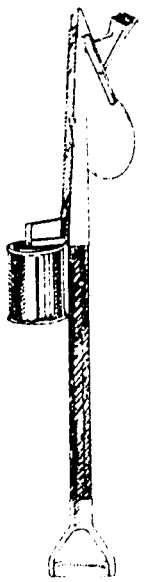
AGRICULTURAL HAND TOOLS

Description: UFI manufacture both Round-eyed and Tanged Hoe Blades, in weights of 0.9 kg., 1.1 kg. and 1.3 kg.

Manufactured by:

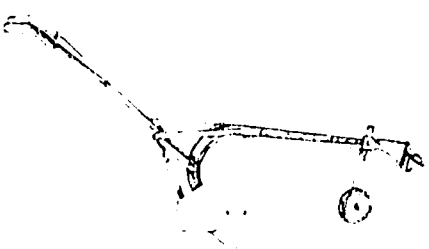
TAMTU
PO Box 1389
ARUSHA
Tanzania

TAMTU HAND PLANTER



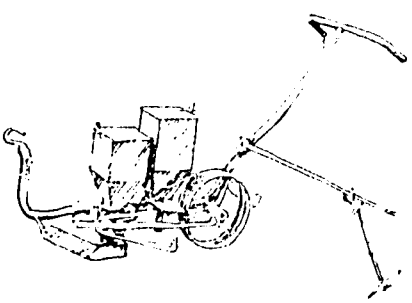
Description: The hand planter is a jab planter with wooden handles and a wooden slide seed metre. The jabbing action automatically meters seeds into the planting hole.

N'GOMBE OX-PLOUGH



Description: The N'gombe ox-plough is a single furrow mould-board plough of standard design. It is of all steel fabrication and the share is of heat-treated steel

TAMTU OX-DRAWN PLANTER



Description: The TAMTU ox-drawn planter is a heavy duty ox-drawn planter with 2 hoppers mounted in tandem : one for seed, the other for fertiliser. The frame is made from welded tubular steel.

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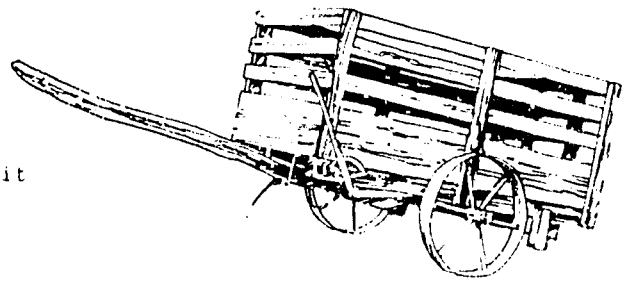
TAMTU OX-CART

(metal or rubber wheeled)



Manufactured by:

Tanzania Agricultural
Machinery Testing Unit
PO Box 1389
ARUSHA
Tanzania

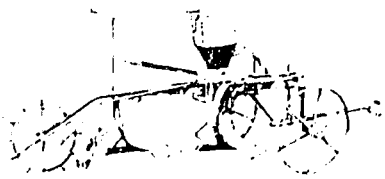
Telephone: Arusha 3666

Description: A 2 wheel ox-cart that can be built with either metal or rubber wheels. The model as shown is designed for oxen: a derivative can be constructed for donkey draught, in which case the shafts can be lighter and attached laterally to the front of the cart rather than centrally. The cart is fitted with wooden bushes and brakes, can be serviced quite simply by lubricating the bearing grease-cup, and can carry up to 750kg.

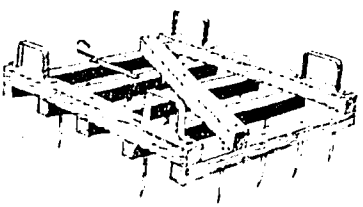
Manufactured by:

TAMTU
PO Box 1389
ARUSHA
Tanzania

KIFARU PLOUGH



RECTANGULAR HARROW



Description: The Kifaru is a heavy duty, double-furrow mouldboard plough, manufactured from locally available steel components. The frame is mounted on 3 wheels, 2 forward and one rear.

As cultivation with the Kifaru is usually carried out twice prior to planting, the Kifaru can be fitted with a metered seeding unit, for planting during the second cultivation pass. The whole seeding unit includes a metering wheel which trails.

Description: The TAMTU harrow is made from a heavy 10cm x 10cm timber frame, fixed with cross-members. To these are attached heavy duty steel spikes that protrude 15cm. On the top of the frame are fixed steel slides so that the harrow can be inverted for transport as a sled.

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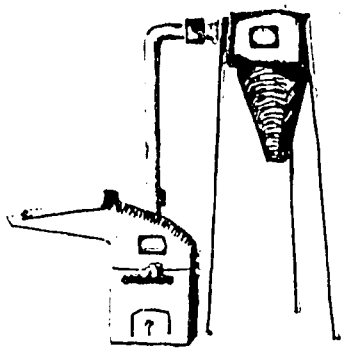
UNITED MAIZE MILLS

NM 25, NM 50, NM 75, NM 100



Manufactured by:

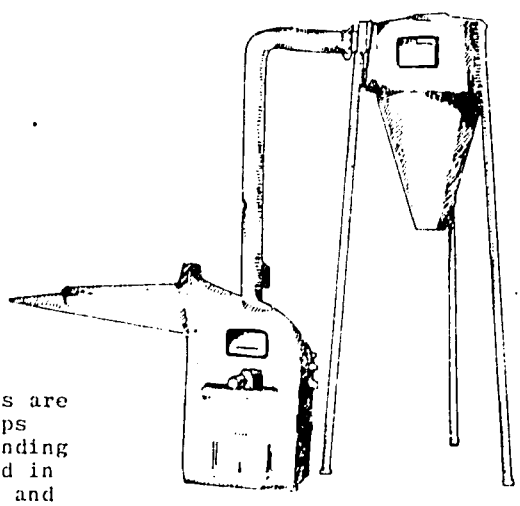
United Engineering Works Ltd
PO Box 3082
ARUSHA
Tanzania

Telephone: Arusha 3424

Description: United makes 4 sizes of hammer-mills with different capacities. The casing of each is made from durable heavy welded steel, inside which the steel shaft is mounted on sealed bearing units. The steel hammers are reversible and replaceable.

MANIK GRINDING MILLS

MGM2, MGM 5, MGM 7 and MGM 10



Manufactured by:

Manik Engineers
PO Box 1274
ARUSHA
Tanzania

Telephone: Arusha 3520

Description: Manik grinding mills are designed to mill a variety of crops but are especially useful for grinding maize. The mills are manufactured in 4 sizes: small, medium, standard and large. Construction of all models is from heavy welded steel, and the grinding mechanism is mounted on imported sealed bearing units. The hammers are reversible, and can be used on 4 different faces before replacement.

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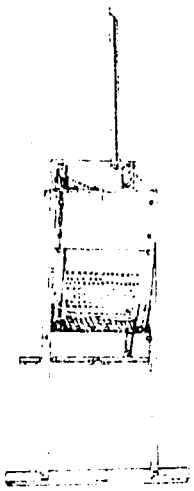
GROUNDNUT SHELLER



Description: The groundnut sheller is a hand-operated reciprocating design, with interchangeable screens. The potential capacity is 25-30kg./hour.

Manufactured by:

Ubungo Farm Implements Ltd (UFI)
PO Box 20126
DAR es SALAAM
Tanzania

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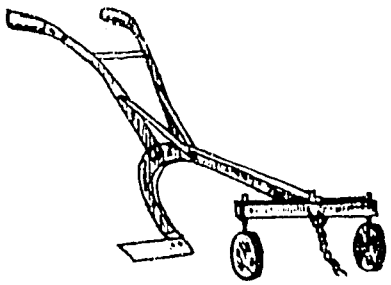
'BORNU' GROUNDNUT-LIFTER



Designed by:

Farm Machinery Research Unit
Regional Research Station
PO Box 11
MAGOYE
Zambia

Telephone: Magoye 420

Description: The 'Bornu' Groundnut-lifter is merely a blade that can be attached to the standard 'Victory' mouldboard type of ox-plough frame. The adaption, therefore, is limited to the blade, which can be bolted on in place of a mouldboard, and an extra wheel and axle-bar in place of the single wheel of a plough.

The lifter was originally developed in Nigeria, hence the name, where it is used, and the design was brought to Zambia. It is designed for lifting groundnuts which have been planted in 1 metre ridges, and in normal use can harvest about 1.2 hectares per day.

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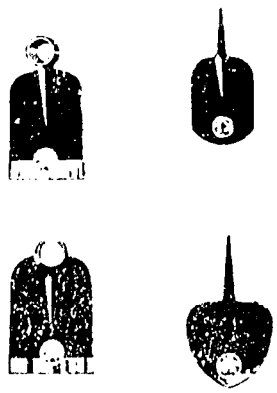
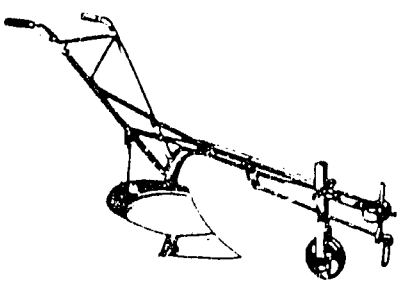
Manufactured by:

Rhoplow Ltd
PO Box 1059
BULAWAYO
Zimbabwe

"MEALIE BRAND" HOES

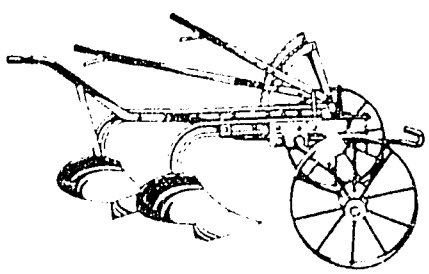


SINGLE FURROW PLOUGH



1.

TWO-FURROW PLOUGH



2.

1. Description: A standard design light-weight mouldboard plough, weighing 38 kg.

2. Description: The two beams are mounted on an axle between 2 widely spread metal-rimmed wheels. One beam is shorter, which presents the two shares in an off-set pattern to the land. The hand-levers are used to adjust the angle of the shares.

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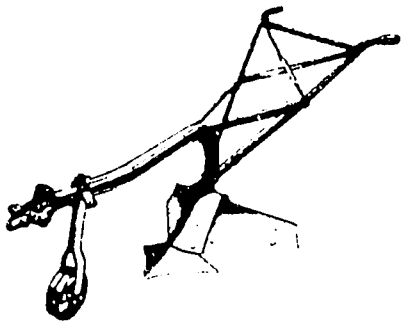
HIGH-WING RIDGER



Manufactured by:

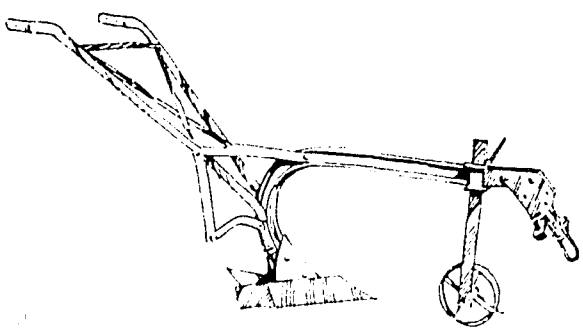
Rhoplow Ltd
PO Box 1059
BULAWAYO
Zimbabwe

Description: The same beam and handle assembly of the Rhoplow ox-plough is fitted with adjustable ridging blades.

SILVER MEDAL OX-PLOUGH

Manufactured by:

Bulawayo Steel Products
8 Ironbridge Road
Donnington
PO Box 1603
BULAWAYO
Zimbabwe

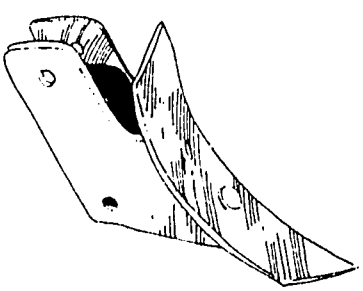


Description: The standard ox-plough design has been modified to eliminate the need for spanners to adjust the blade and handle setting. The wheel adjustment and linkage have also been modified, and the frog has been strengthened. The Institute of Agricultural Engineering in Harare have designed alternative attachments which can be fitted in place of the mould-board. These are:

(a) a single tine for reduced tillage;

(b) a ridger blade; and

(c) a groundnut-lifting blade.



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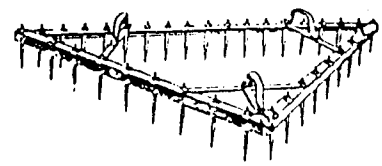
Manufactured by:

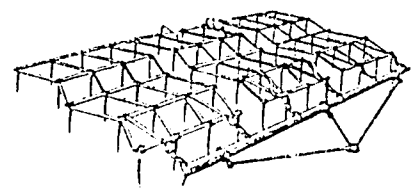
Rhoplow Ltd
PO Box 1059
BULAWAYO
Zimbabwe

HARROWS

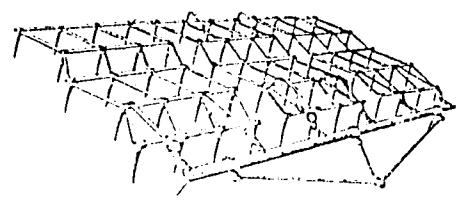


Trigular Harrow

Description: A standard range of harrows, of which the diamond and the zig-zag are available in sets of 2, 3 or 4 sections.

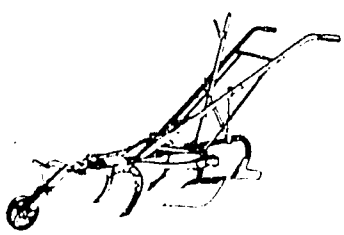


Diamond Harrow



Zig-Zag Harrow

5-TINE CULTIVATOR



Description: The cultivator comes in 2 forms:-

(a) S 51 cultivator - fitted with 1 sweep, 2 hillers and 2 tines (as in the illustration).

(b) Light cultivator - fitted with 1 sweep and 4 tines.

The light cultivator is for lighter cultivation and inter-row weeding, whilst the S51 can be used for heavier work. A ratchet and lever mechanism enables adjustment of the cultivator span.

EXPANSION OF FARM IMPLEMENTS FACTORY IN ZAMBIA

4,50

1. PRODUCT RANGE

Existing product-mix comprises handtools and animal drawn implements.

The proposed expansion is to include production of tractor drawn implements and power process equipment of related technology also in the product mix.

2. SADCC MARKET POSITION AND EXISTING CAPACITY

Please see Table I.

3. TECHNOLOGY PACKAGE

Manufacturing technology is closely related to existing technology for animal drawn implements. Tractor implements are generally larger, heavier and subject to greater loading and stress.

Manufacturing processes involve the use of mild steel, castings and forgings, machined parts, welding and assembly. Because of heavier loads, there would be a need for additional material handling facilities. Larger capacities would be needed for machine tools and forging facilities such as capstan lathe, pedestal grinder, drilling and tapping machine, press forge, etc.

Jigs, tools and fixtures, especially for welding are also required to be upgraded.

4. RAW MATERIAL SITUATION

Existing sources of supply for the production of hand tools and animal drawn equipment will be used. The steel specifications for major components are as follows:-

Major implement components	SAE No.	Carbon (%)	Manganese (%)
Implement frame (MS)	1006-1008 1010-1015	0.08-0.18	00.25-0.60
Springs	1065	0.60-0.70	0.60-0.90
Plough beam or tool bar	1070	0.65-0.75	0.60-0.90
Plough shares	1074	0.70-0.80	0.50-0.80
Rake teeth, beater	1078	0.72-0.85	0.30-0.60
Scraper, blades, shovel	1085	0.80-0.93	0.70-1.00
Discs	1085	0.80-0.93	0.70-1.00
Brackets & binder sections	1086	0.82-0.95	0.30-0.50
Shafts	1090	0.85-0.98	0.60-0.90
Casting parts, wheels, hubs, etc	BS 1452 Gr 4 1961	-	-

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5. Additional investments of the order of $2 million are foreseen.

6. **SADCC TRADING LOGISTICS**

This project relates to upgradation of existing production.

7. **PROMOTION INSTITUTION**

Northland Engineering Limited.

8. **INTENDED IMPLEMENTATION SCHEDULE**

12 months

9. **INPUTS REQUIRED FROM DONORS**

* Project engineering
* Capital goods
* Manufacturing technology

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Table 1. SADCC TRACTOR DEMAND-SUPPLY ANALYSIS

Country	Present Estimated Stock	Present Production p.a.	Present Average Imports p.a.	Present Estimated Demand p.a.	Likely Demand late eighties p.a.	Capacity Under Consideration p.a.	Remarks
1 Angola	10,000	-	700-800	1000	2000-3000	6000	Preliminary stage, technical paramaters to be selectad
2 Botswana	2,500	-	200	200-250	400-500	-	
3 Lesotho	1,500	-	125	100-150	250-300	-	
4 Malawi	3000-3500	-	250-300	300	350-400	-	
5 Mozambique	6000-7000	-	400-500	700-800	1,500	3,500	Feasibility report under preparation by USSR.
6 Swaziland	3,000	(700-800 of 16 HP)	200 of 30HP	200-300 of 30 HP	500 of 30 HP	(2,500) of 16HP	Financing package for commercialisation under consideration
7 Tanzania	7,000	-	300-400	800-1000	1500-2000	500-1500	$32 m project with Valmet of Finland under implementation - finances to be arranged
8 Zambia	5,000	-	700-800	1,000	1500-2000	-	
9 Zimbabwe	18000-20000	-	1,200	2,000	3,000	-	
Total	56000-59500				11000-13700		

AGRICULTURAL IMPLEMENTS UNITS IN ANGOLA

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INTRODUCTION

Analysis of the study report shows substantial deficits in hand tools, animal drawn implements and other manually operated equipment in Angola by mid-eighties.

It is proposed to meet this deficit by setting up a plant with a capacity of around 3,000 tonnes per annum of hand tools and animal drawn implements.

Product Range

* Hand Tools

Forges hoes	1,200	tonnes/year
Picks	700	" "
Machettes	100	" "
	2,000	tonnes/year

* Animal - Draught Implements

Mould board plough	300	tonnes/year
Harrow	400	" "
Ridgers	150	" "
Other implements	150	" "
	1,000	tonnes/year

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Table 1 ESTIMATED DEMAND-SUPPLY POSITION OF AGRICULTURAL EQUIPMENT IN SADCC : 1986

Equipment	DEMAND						SUPPLY (in tonnes)					
	Hand tools	Oxen impl.	Tractor impl.	Power process eqpt	Trailer carts	Other manually operated eqpt.	Hand tools	Oxen impl	Tractor impl.	Power process eqpt.	Tractors carts	Other manually operated eqpt
Category no.	1	2	3	2,3	2,3	1,2	1	2	3	2,3	2,3	1,2
Angola	3,324	620	2,650	491	754	133	1550	600	800	200	200	50
Botswana	145	58	690	34	284	6	10	10	-	-	-	-
Lesotho	715	184	350	136	214	28	10	-	-	-	4	-
Malawi	3,038	643	910	1,135	385	121	2540	1000	-	-	50	100
Mozambique	5,362	1,114	2,000	1,142	642	214	10,000+	10,000+	10,000+	500	200	-
Swaziland	286	75	790	507	310	12	10	10	-	-	-	-
Tanzania	9,818	2,505	1,900	1,602	2,232	392	5300	2725	5024	640	560	38
Zambia	2,214	678	1,380	788	728	88	1050	500	-	-	100	20
Zimbabwe	3,538	1,958	7,230	1,529	2,912	142	13,600	2,000	8,000	1,500	3,000	150
TOTALS	28,440	7,830	17,900	7,364	8,461	1,136+	24,000+	17,000+	24,000+	2,840	4,114	408

Notes: 1) Other manually operated equipment (taken as 4% of hand groundnut sheller, planter, chaff cutter, paddy weeder, hand wheel hoe, winnower, thresher, groundnut lifter, etc.
2) The proposed Beira plant expansion in Mozambique has been taken into account.

Technology Package

The hand tools manufacturing process includes the following steps:

1. Blanking by press or cutting to size by shearing machine (dies and press tools are used).

2. Pre-heating to 900°C by oilfired furnace.

3. Drop-forging to obtain primary shape by 3/4 tonnes strikers. (Open die tools are used).

4. Press forging to final shape - by 150 tonnes hydraulic press. (Closed die tools are used).

5. Trimming by press or shearing machine.

6. Heat treatment to 750°C by oil fired furnace.

7. Quenching in oil or water to obtain required hardness.

8. Removing of scale by grinding wheels.

9. Assembly of handles etc. (Parts are generally bought out).

10. Inspection

11. Painting

2. Finished Product

Forging equipment is multi-purpose in that implement forgings and cutting tools can be formed over the same equipment with die changes for each particular forging. Conveyors are used between operations.

Cutting tools are finished after forging by hardening and sharpening processes.

The forging operations are supported by a tool room capable of manufacturing and maintaining the forging dies. The tool room also provides a base for plant maintenance operations.

Equipment

* Forging Shop

1- 500 tonnes hydraulic forging press
2- Oil fired muffle furnace
2- 300 tonnes hydraulic forging press
2- Forming mills
1- Blanking press
4- Grinding machines

* Hardening & Whetting Shop

1- Salt bath
2- Rinse tanks
4- Grinding/whetting machines

* Machine shop & cutting shop

1- Screw machine
5- Drill presses
4- Lathes
2- Shapers
2- Milling machines
2- Power metal saws
2- Shears
2- Grinding machines
1- Hydraulic press - 1 tonne
Gauges & Tools

* Tool Room

1- Grinding lathe
1- Surface grinder
1- Shaper
1- Pedestal grinder
1- Lathe
1- Universal milling machine 5 hp
1- Band saw
1- Jig boring machine
1- Hardening furnace

* Welding Shop

4- Mig welders
2- Arc welders 300 amps

* Assembly Shop

2- Paint dip tanks & conveyors
Racks, pallets, bins, etc.

* Inspection

1- Hardness tester
1- Tensile tester

* Mechanical Handling

2- Fork lift trucks
8- Hydraulic pallet trucks

Raw Material Situation

The material specification for major implement components are the following:

* Tool Room

1- Grinding lathe
1- Surface grinder
1- Shaper
1- Pedestal grinder
1- Lathe
1- Universal milling machine 5 hp
1- Band saw
1- Jig boring machine
1- Hardening furnace

* Welding Shop

4- Mig welders
2- Arc welders 300 amps

* Assembly Shop

2- Paint dip tanks & conveyors
Racks, pallets, bins, etc.

* Inspection

1- Hardness tester
1- Tensile tester

* Mechanical Handling

2- Fork lift trucks
8- Hydraulic pallet trucks

Raw Material Situation

The material specification for major implement components are the following:

Major implement components	SAE No.	Carbon (%)	Manganese (%)
Implement frame (MS)	1006-1008 1010-1015	0.08-0.18	0.25-0.60
Springs	1065	0.60-0.70	0.60-0.90
Plough beam or tool bar	1070	0.65-0.75	0.60-0.90
Plough shares, (plates)	1074	0.70-0.80	0.50-0.80
Rake teeth	1078	0.72-0.85	0.30-0.60
Scraper, blades, discs, spring tooth harrow	1085	0.80-0.93	0.79-1.00
Mower and blinder section	1086	0.82-0.95	0.30-0.50
Tine holders, knotter discs	1090	0.85-0.99	0.60-0.90

Castings can be purchased locally. Wood parts (handles) will also be purchased locally.

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Purchased parts - fasteners, springs, tines, sprockets, chains, gears, bushings are purchased from local source. Sheet metal parts are usually purchased locally.

Estimated Project Costs (US-$)

* Capital Cost

Land & Buildings	320,000
Machinery Production and Tool Room	2,200,000
Toolage	100,000
Transport Equipment	80,000
Pre-Production Expense	350,000
Total Capital	3,050,000
Working Capital	1,200,000

* Production Cost

	US $
Materials	3,825,000
Factory Supplies	300,000
Wages & Salaries	582,000
Depreciation @ 10%	305,000
Interest on working capital	180,000
Total Costs	4,652,000
Gross Revenue	5,200,000
Net Revenue	548,000

Trading Logistics

The project will meet the requirements of Angola and thus reduce the dependence of SADCC on other outside sources.

Intended Implementation Schedule

18 months

Inputs required from donors

* Project engineering
* Financing of capital goods
* Technology

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AGRICULTURAL IMPLEMENTS UNITS IN BOTSWANA

INTRODUCTION

As shown in Table 1, there is a considerable deficit in the availability of farm implements such as animal drawn implements, trailers, carts, and manually operated equipment which could be manufactured in a small scale sector. The plan of action outlined in the study report on farm implements in the SADCC region envisages the setting up of a small/medium sized plant with a capacity of about 700 tonnes per annum.

Product Range

Hand tools like hoes
Animal drawn harrow
Animal drawn ploughs
Carts
Manually operated tools and equipment

SADCC Market Position and Existing Capacity

Please see table 1.

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Table 1 ESTIMATED DEMAND-SUPPLY POSITION OF AGRICULTURAL EQUIPMENT IN SADCC : 1986

	DEMAND						SUPPLY (in tonnes)					
Equipment	Hand tools	Oxen impl.	Tractor impl.	Power process eqpt	Trailer carts	Other manually operated eqpt.	Hand tools	Oxen impl	Tractor impl.	Power process eqpt.	Tractors carts	Other manually operated eqpt
Category no.	1	2	3	2,3	2,3	1,2	1	2	3	2,3	2,3	1,2
Angola	3,324	620	2,650	491	754	133	1550	600	800	200	200	50
Botswana	145	58	690	34	284	6	10	10	-	-	-	-
Lesotho	715	184	350	136	214	28	10	-	-	-	4	-
Malawi	3,038	643	910	1,135	385	121	2540	1000	-	-	50	100
Mozambique	5,362	1,114	2,000	1,142	642	214	10,000+	10,000+	10,000+	500	200	-
Swaziland	286	75	790	507	310	12	10	10	-	-	-	-
Tanzania	9,818	2,505	1,900	1,602	2,232	392	5300	2725	5024	640	560	88
Zambia	2,214	678	1,380	788	728	88	1050	500	-	-	100	20
Zimbabwe	3,538	1,958	7,230	1,529	2,912	142	13,600	2,000	8,000	1,500	3,000	150
TOTALS	28,440	7,830	17,900	7,364	8,461	1,136+	24,000+	17,000+	24,000+	2,840	4,114	408

Notes: 1) Other manually operated equipment (taken a 4% of hand groundnut sheller, planter, chaff cutter, paddy weeder, hand wheel hoe, winnower, thresher, groundnut lifter, etc.
2) The proposed Beira plant expansion in Mozambique has been taken into account.

Forging and heat treatment shop

Forging hearth
Oil fired tilling furnace
Pneumatic forging hammer
Press forge
Water quenching tanks
Blacksmith tools
Dies & grinders

Paint shop

Degreasing vat
Dipping plant and conveyors

Stores, Maintenance and material handling services

Tools and gauges
Precision lathe
Fork lift truck, 1 tonne
Racks, stillages and bins etc.

Raw Material Situation

The main materials required would be:

Mild steel flat bar
Mild steel angle bar, square bar and sound bars
Mild steel rod
Mild steel pipes and plates
Forging beam and frogs
Bolts and nuts

These materials would have to be imported. Zimbabwe within SADCC could be a good source of supply.

Project Costs

	$
Buildings	900,000
Furniture, fittings, racks etc.	70,000
Machinery and equipment	1,000,000
Electrical installations	100,000
Transport equipment	40,000
Freight, contingencies, etc.	200,000
Fixed Capital	2,310,000
Working Capital needs	690,000
Total Capital $ 3 million	

Sales revenue is estimated to be $2.5 million per annum and a return of about 20% on capital.

Trading Logistics

Output would be consumed mostly locally. Raw material and parts supply linkages exist with other SADCC countries.

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Implementation Schedule

18 months

Inputs from donors

* Project engineering
* Assistance towards capital financing
* Manufacturing technology

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AGRICULTURAL IMPLEMENTS UNITS IN LESOTHO

INTRODUCTION

As shown in Table 1, there is a considerable deficit in the availability of farm implements such as animal drawn implements, trailers, carts, and manually operated equipment which could be manufactured in a small scale sector. The plan of action outlined in the study report on farm implements in the SADCC region envisages the setting up of a small/medium sized plant with a capacity of about 700 tonnes per annum.

Product Range

Hand tools like hoes
Animal drawn harrow
Animal drawn ploughs
Carts
Manually operated tools and equipment

SADCC Market Position and Existing Capacity

Please see table 1.

Table 1 ESTIMATED DEMAND-SUPPLY POSITION OF AGRICULTURAL EQUIPMENT IN SADCC : 1986

	DEMAND						SUPPLY (in tonnes)					
Equipment	Hand tools	Oxen impl.	Tractor impl.	Power process eqpt	Trailer carts	Other manually operated eqpt.	Hand tools	Oxen impl	Tractor impl.	Power process eqpt.	Tractors carts	Other manually operated eqpt
Category no.	1	2	3	2,3	2,3	1,2	1	2	3	2,3	2,3	1,2
Angola	3,324	620	2,650	491	754	133	1550	600	800	200	200	50
Botswana	145	58	690	34	284	6	10	10	-	-	-	-
Lesotho	715	184	350	136	214	28	10	-	-	-	4	-
Malawi	3,038	643	910	1,135	385	121	2540	1000	-	-	50	100
Mozambique	5,362	1,114	2,000	1,142	642	214	10,000+	10,000+	10,000+	500	200	-
Swaziland	286	75	790	507	310	12	10	10	-	-	-	-
Tanzania	9,818	2,505	1,900	1,602	2,232	392	5300	2725	5024	640	560	88
Zambia	2,214	678	1,380	788	728	88	1050	500	-	-	100	20
Zimbabwe	3,538	1,958	7,230	1,529	2,912	142	13,600	2,000	8,000	1,500	3,000	150
TOTALS	28,440	7,830	17,900	7,364	8,461	1,136+	24,000+	17,000+	24,000+	2,840	4,114	408

Notes: 1) Other manually operated equipment (taken as 4% of hand groundnut sheller, planter, chaff cutter, paddy weeder, hand wheel hoe, winnower, thresher, groundnut lifter, etc.
2) The proposed Beira plant expansion in Mozambique has been taken into account.

Technology Package

The implements are fabricated from mild steel structural shapes. Parts are produced in small batches and then processed to the sub-assembly stage by welding. Jigs, templates and simple fixtures would need to be employed.

Capital facilities

The major equipment required would be as follows:

Cutting Shop

Hack saw
Hand shear

Machine Shop

Lathes
Capstan lathe
Upright drilling machine
Pedestal grinder, double ended
Portable grinder
Universal milling machine
Jigs, tools and fixtures

Fabricating & press shop

Press brake
Manual bending machine
Nibbling machines to cut 6mm MS
Welding fixtures and a welding machine
Oxyacetylene equipment
Dies and press tools

Forging and heat treatment shop

Forging hearth
Oil fired tilling furnace
Pneumatic forging hammer
Press forge
Water quenching tanks
Blacksmith tools
Dies & grinders

Paint shop

Degreasing vat
Dipping plant and conveyors

Stores, Maintenance and material handling services

Tools and gauges
Precision lathe
Fork lift truck, 1 tonne
Racks, stillages and bins etc.

Raw Material Situation

The main materials required would be:

Mild steel flat bar
Mild steel angle bar, square bar and sound bars
Mild steel rod
Mild steel pipes and plates
Forging beam and frogs
Bolts and nuts

These materials would have to be imported. Zimbabwe within SADCC could be a good source of supply.

Project Costs

	$
Buildings	900,000
Furniture, fittings, racks etc.	70,000
Machinery and equipment	1,000,000
Electrical installations	100,000
Transport equipment	40,000
Freight, contingencies, etc.	200,000
Fixed Capital	2,310,000
Working Capital needs	690,000
Total Capital $ 3 million	

Sales revenue is estimated to be $2.5 million per annum and a return of about 20% on capital.

Trading Logistics

Output would be consumed mostly locally. Raw material and parts supply linkages exist with other SADCC countries.

Implementation Schedule

18 months

Inputs from donors

* Project engineering
* Assistance towards capital financing
* Manufacturing technology

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AGRICULTURAL IMPLEMENTS UNITS IN MALAWI

471

SMALL SCALE IMPLEMENTS UNITS IN MALAWI

INTRODUCTION

To meet a part of the projected deficit in the supply of farm implements, it is proposed to set up about 7 small scale units in Malawi giving an estimated output of about 2,000 tonnes per annum of animal drawn implements, trailers, carts, hand tools and other manually operated equipment.

Product Range

Animal drawn implements
Trailer/carts
Hand tools
Other manually operated equipment

SADCC Market Position & Existing Capacity

Please see Table 1.

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Table 1 ESTIMATED DEMAND-SUPPLY POSITION OF AGRICULTURAL EQUIPMENT IN SADCC : 1986

Equipment	DEMAND						SUPPLY (in tonnes)					
	Hand tools	Oxen impl.	Tractor impl.	Power process eqpt	Trailer carts	Other manually operated eqpt.	Hand tools	Oxen impl	Tractor impl.	Power process eqpt.	Tractors carts	Other manually operated eqpt
Category no.	1	2	3	2,3	2,3	1,2	1	2	3	2,3	2,3	1,2
Angola	3,324	620	2,650	491	754	133	1550	600	800	200	200	50
Botswana	145	58	690	34	284	6	10	10	-	-	-	-
Lesotho	715	184	350	136	214	28	10	-	-	-	4	-
Malawi	3,038	643	910	1,135	385	121	2540	1000	-	-	50	100
Mozambique	5,362	1,114	2,000	1,142	642	214	10,000+	10,000+	10,000+	500	200	-
Swaziland	286	75	790	507	310	12	10	10	-	-	-	-
Tanzania	9,818	2,505	1,900	1,602	2,232	392	5300	2725	5024	640	560	88
Zambia	2,214	678	1,380	788	728	88	1050	500	-	-	100	20
Zimbabwe	3,538	1,958	7,230	1,529	2,912	142	13,600	2,000	8,000	1,500	3,000	150
TOTALS	28,440	7,830	17,900	7,364	8,461	1,136+	24,000+	17,000+	24,000+	2,840	4,114	408

Notes: 1) Other manually operated equipment (taken as 4% of hand groundnut sheller, planter, chaff cutter, paddy weeder, hand wheel hoe, winnower, thresher, groundnut lifter, etc.
2) The proposed Beira plant expansion in Mozambique has been taken into account.

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Forging and heat treatment shop

Forging hearth
Oil fired tilling furnace
Pneumatic forging hammer
Press forge
Water quenching tanks
Blacksmith tools
Dies & grinders

Paint shop

Degreasing vat
Dipping plant and conveyors

Stores, Maintenance and material handling services

Tools and gauges
Precision lathe
Fork lift truck, 1 tonne
Racks, stillages and bins etc.

Raw Material Situation

The main materials required would be:

Mild steel flat bar
Mild steel angle bar, square bar and sound bars
Mild steel rod
Mild steel pipes and plates
Forging beam and frogs
Bolts and nuts

These materials would have to be imported. Zimbabwe within SADCC could be a good source of supply.

Project Costs

	$
Buildings	900,000
Furniture, fittings, racks etc.	70,000
Machinery and equipment	1,000,000
Electrical installations	100,000
Transport equipment	40,000
Freight, contingencies, etc.	200,000
Fixed Capital	2,310,000
Working Capital needs	690,000
Total Capital $ 3 million	

Sales revenue is estimated to be $2.5 million per annum and a return of about 20% on capital.

Trading Logistics

Output would be consumed mostly locally. Raw material and parts supply linkages exist with other SADCC countries.

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Implementation Schedule

18 months

Inputs from donors

* Project engineering
* Assistance towards capital financing
* Manufacturing technology

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AGRICULTURAL IMPLEMENTS UNITS IN SWAZILAND

476

INTRODUCTION

To meet a part of the projected deficit in the supply of farm implements, it is proposed to set up about 5 small scale units in Swaziland giving an estimated output of about 1,250 tonnes per annum of animal drawn implements, trailers, carts, hand tools and other manually operated equipment.

Product Range

Animal drawn implements
Trailer/carts
Hand tools
Other manually operated equipment

SADCC Market Position & Existing Capacity

Please see Table 1.

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Table 1 ESTIMATED DEMAND-SUPPLY POSITION OF AGRICULTURAL EQUIPMENT IN SADCC : 1986

Equipment	DEMAND						SUPPLY (In tonnes)					
	Hand tools	Oxen impl.	Tractor impl.	Power process eqpt	Trailer carts	Other manually operated eqpt.	Hand tools	Oxen impl	Tractor impl.	Power process eqpt.	Tractors carts	Other manually operated eqpt
Category no.	1	2	3	2,3	2,3	1,2	1	2	3	2,3	2,3	1,2
Angola	3,324	620	2,650	491	754	133	1550	600	800	200	200	50
Botswana	145	58	690	34	284	6	10	10	-	-	-	-
Lesotho	715	184	350	136	214	28	10	-	-	-	4	-
Malawi	3,038	643	910	1,135	385	121	2540	1000	-	-	50	100
Mozambique	5,362	1,114	2,000	1,142	642	214	10,000+	10,000+	10,000+	500	200	-
Swaziland	286	75	790	507	310	12	10	10	-	-	-	-
Tanzania	9,818	2,505	1,900	1,602	2,232	392	5300	2725	5024	640	560	88
Zambia	2,214	678	1,380	788	728	88	1050	500	-	-	100	20
Zimbabwe	3,538	1,958	7,230	1,529	2,912	142	13,600	2,000	8,000	1,500	3,000	150
TOTALS	28,440	7,830	17,900	7,364	8,461	1,136+	24,000+	17,000+	24,000+	2,840	4,114	408

Notes: 1) Other manually operated equipment (taken as 4% of hand groundnut sheller, planter, chaff cutter, paddy weeder, hand wheel hoe, winnower, thresher, groundnut lifter, etc.
2) The proposed Beira plant expansion in Mozambique has been taken into account.

Forging and heat treatment shop

Forging hearth
Oil fired tilling furnace
Pneumatic forging hammer
Press forge
Water quenching tanks
Blacksmith tools
Dies & grinders

Pai ι shop

Degreasing vat
Dipping plant and conveyors

Stores, Maintenance and material handling services

Tools and gauges
Precision lathe
Fork lift truck, 1 tonne
Racks, stillages and bins etc.

Raw Material Situation

The main materials required would be:

Mild steel flat bar
Mild steel angle bar, square bar and sound bars
Mild steel rod
Mild steel pipes and plates
Forging beam and frogs
Bolts and nuts

These materials would have to be imported. Zimbabwe within SADCC could be a good source of supply.

Project Costs

	$
Buildings	900,000
Furniture, fittings, racks etc.	70,000
Machinery and equipment	1,000,000
Electrical installations	100,000
Transport equipment	40,000
Freight, contingencies, etc.	200,000
Fixed Capital	2,310,000
Working Capital needs	690,000
Total Capital $ 3 million	

Sales revenue is estimated to be $2.5 million per annum and a return of about 20% on capital.

Trading Logistics

Output would be consumed mostly locally. Raw material and parts supply linkages exist with other SADCC countries.

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Implementation Schedule

18 months

Inputs from donors

* Project engineering
* Assistance towards capital financing
* Manufacturing technology

AGRICULTURAL IMPLEMENTS UNITS IN TANZANIA

SMALL SCALE IMPLEMENTS UNITS IN TANZANIA

INTRODUCTION

To meet a part of the projected deficit in the supply of farm implements, it is proposed to set up about 10 small scale units in Tanzania giving an estimated output of over 2,600 tonnes per annum of animal drawn implements, trailers, carts, hand tools and other manually operated equipment.

Product Range

Animal drawn implements
Trailer/carts
Hand tools
Other manually operated equipment

SADCC Market Position & Existing Capacity

Please see Table 1.

Technology Package

Batch quantity: small batch

Machining: simple machining
lathe, milling, drilling and shaping machines/grinding

Fabrication: simple sheet metal work
power shear, manually operated and power-operated roll-form machines, nibbling machines

Forging: small scale forging
oil fired forging hearth, tilting furnace, pneumatic forging hammer or spring forge without fixed dies

Heat-treatment: simple salt bath

Welding: arc welding with electrodes/
shielded arc welding with wire

Casting: few castings required, in-plant casting facility not required.

Raw material situation

The requirements of scrap and steel are proposed to be met substantially from within the SADCC region.

The material specifications for some of the major components of animal-drawn implements are suggested as:

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Table 1 ESTIMATED DEMAND-SUPPLY POSITION OF AGRICULTURAL EQUIPMENT IN SADCC : 1986

Equipment	DEMAND						SUPPLY (in tonnes)					
	Hand tools	Oxen impl.	Tractor impl.	Power process eqpt	Trailer carts	Other manually operated eqpt.	Hand tools	Oxen impl	Tractor impl.	Power process eqpt.	Tractors carts	Other manually operated eqpt
Category no.	1	2	3	2,3	2,3	1,2	1	2	3	2,3	2,3	1,2
Angola	3,324	620	2,650	491	754	133	1550	600	800	200	200	50
Botswana	145	58	690	34	28	6	10	10	-	-	-	-
Lesotho	715	184	350	136	214	28	10	-	-	-	4	-
Malawi	3,038	643	910	1,135	385	121	2540	1000	-	-	50	100
Mozambique	5,362	1,114	2,000	1,142	642	214	10,000+	10,000+	10,000+	500	200	-
Swaziland	286	75	790	507	310	12	10	10	-	-	-	-
Tanzania	9,818	2,505	1,900	1,602	2,232	392	5300	2725	5024	640	560	88
Zambia	2,214	678	1,380	788	728	88	1050	500	-	-	100	20
Zimbabwe	3,538	1,958	7,230	1,529	2,912	142	13,600	2,000	8,000	1,500	3,000	150
TOTALS	28,440	7,830	17,900	7,364	8,461	1,136	24,000+	17,000+	24,000+	2,840	4,114	708

Notes: 1) Other manually operated equipment (taken as 4% of hand groundnut sheller, planter, chaff cutter, paddy weeder, hand wheel hoe, winnower, thresher, groundnut lifter, etc.
2) The proposed Beira plant expansion in Mozambique has been taken into account.

Major Implement Components	SAE No.	Carbon (%)	Manganese (%)
Implement frame (MS)	1006-1008 1010-1015	0.08-0.18	0.24-0.60
Springs	1065	0.60-0.70	0.60-0.90
Plough beam or tool bar	1070	0.65-0.75	0.60-0.90
Plough (plates)	1074	0.70-0.80	0.50-0.80
Rake teeth	1078	0.72-0.85	0.30-0.60
Scraper, blades, discs, spring tooth harrow	1085	0.80-0.93	0.70-1.00
Mower and binder section	1086	0.82-0.95	0.30-0.50
Tin holders, knotter discs	1090	0.85-0.98	0.60-0.90

Project Costs

	$
Buildings and unit works	250,000
Plant and equipment	450,000
Working capital needs	300,000

Total about $ 1 million

SADCC trading logistics

The output will contribute to total SADCC production of farm implements and reduce dependence on imports. Raw material and component supply linkages exist within the SADCC region. No transport problems are foreseen.

Intended Implementation Schedule

18 months

Inputs required from donors

* Project engineering
* Project financing
* Training in manufacturing technology

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AGRICULTURAL IMPLEMENTS UNITS IN ZAMBIA

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SMALL SCALE IMPLEMENTS UNITS IN ZAMBIA

INTRODUCTION

To meet a part of the projected deficit in the supply of farm implements, it is proposed to set up about 8 small scale units in Zambia giving an estimated output of about 1,750 tonnes per annum of animal drawn implements, trailers, carts, hand tools and other manually operated equipment.

Product Range

Animal drawn implements
Trailer/carts
Hand tools
Other manually operated equipment

SADCC Market Position & Existing Capacity

Please see Table 1.

Technology Package

Batch quantity: small batch

Machining:	simple machining lathe, milling, drilling and shaping machines/grinding
Fabrication:	simple sheet metal work power shear, manually operated and power-operated roll-form machines, nibbling machines
Forging:	small scale forging oil fired forging hearth, tilting furnace, pneumatic forging hammer or spring forge without fixed dies
Heat-treatment:	simple salt bath
Welding:	arc welding with electrodes/ shielded arc welding with wire
Casting:	few castings required, in-plant casting facility not required.

Raw material situation

The requirements of scrap and steel are proposed to be met substantially from within the SADCC region.

The material specifications for some of the major components of animal-drawn implements are suggested as:

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Table i ESTIMATED DEMAND-SUPPLY POSITION OF AGRICULTURAL EQUIPMENT IN SADCC : 1986

Equipment	DEMAND						SUPPLY (in tonnes)					
	Hand tools	Oxen impl.	Tractor impl.	Power process eqpt	Trailer carts	Other manually operated eqpt.	Hand tools	Oxen impl	Tractor impl.	Power process eqpt.	Tractors carts	Other manually operated eqpt
Category no.	1	2	3	2,3	2,3	1,2	1	2	3	2,3	2,3	1,2
Angola	3,324	620	2,650	491	754	133	1550	600	800	200	200	50
Botswana	145	58	690	34	284	6	10	10	-	-	-	-
Lesotho	715	184	350	136	214	28	10	-	-	-	4	-
Malawi	3,038	643	910	1,135	385	121	2540	1000	-	-	50	100
Mozambique	5,362	1,114	2,000	1,142	642	214	10,000+	10,000+	10,000+	500	200	-
Swaziland	286	75	790	507	310	12	10	10	-	-	-	-
Tanzania	9,818	2,505	1,900	1,602	2,232	392	5300	2725	5024	640	560	88
Zambia	2,214	678	1,380	788	728	88	1050	500	-	-	100	20
Zimbabwe	3,538	1,958	7,230	1,529	2,912	142	13,600	2,000	8,000	1,500	3,000	150
TOTALS	28,440	7,830	17,900	7,364	8,461	1,136	24,000+	17,000+	24,000+	2,840	4,114	708

Notes: 1) Other manually operated equipment (taken as 4% of hand groundnut sheller, planter, chaff cutter, paddy weeder, hand wheel hoe, winnower, thresher, groundnut lifter, etc.
2) The proposed Beira plant expansion in Mozambique has been taken into account.

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Major Implement Components	SAE No.	Carbon (%)	Manganese (%)
Implement frame (MS)	1006-1008 1010-1015	0.08-0.18	0.24-0.60
Springs	1065	0.60-0.70	0.60-0.90
Plough beam or tool bar	1070	0.65-0.75	0.60-0.90
Plough (plates)	1074	0.70-0.80	0.50-0.80
Rake teeth	1078	0.72-0.85	0.30-0.60
Scraper, blades, discs, spring tooth harrow	1085	0.80-0.93	0.70-1.00
Mower and binder section	1086	0.82-0.95	0.30-0.50
Tin holders, knotter discs	1090	0.85-0.98	0.60-0.90

Project costs

	$
Buildings and unit works	250,000
Plant and equipment	450,000
Working capital needs	300,000

Total about $ 1 million

SADCC trading logistics

The output will contribute to total SADCC production of farm implements and reduce dependence on imports. Raw material and component supply linkages exist within the SADCC region. No transport problems are foreseen.

Intended Implementation Schedule

18 months

Inputs required from donors

* Project engineering
* Project financing
* Training in manufacturing technology

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ARTISAN UNITS FOR THE MANUFACTURE OF FARM IMPLEMENTS
IN BOTSWANA

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INTRODUCTION

As per study report on farm implements in SADCC region, the demand of hand tool is estimated as follows;

	1981		1986	
	Nos. (000)	tonnes	Nos. (000)	tonnes
Hand tools	500	587.5	608	715

As against this demand, local production of farm implements in Botswana is negligible and almost all its implements are imported.

As a part of the total plan of action to reduce SADCC dependency for farm implements, it is proposed to set up 8 blacksmithy units in the artisan sector to produce 60 tonnes of hand tools etc. per annum.

Product range

Hoes
Pangas
Jembes

The annual capacity would be around 20,000 pieces amounting to 7 to 8 tonnes.

SADCC Market Position

This is shown in Table 1.

Existing Capacity

As mentioned earlier, there is no organised sector capacity presently. It is estimated that 10 tonnes of hand tools would be produced by 1986. The capacity figures are shown in Table 1.

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Table 1 SADCC REGION - FARM IMPLEMENT DEMAND

	HANDTOOLS				ANIMAL DRAWN IMPLEMENTS				TRACTOR DRAWN IMPLEMENTS			
	1981		1986		1981		1986		1981		1986	
	NOS. (000)	TONS	NOS. (000)	TONS	NOS. (000)	TONS	NOS. (000)	TONS	NOS.	TONS	NOS.	TONS
ANGOLA	2,325	2,732	2,829	3,324	10.8	486	13.8	620	2,500	2,080	3,190	2,650
BOTSWANA	100	120	120	145	1.0	45	1.3	58.5	650	540	820	690
LESOTHO	500	587.5	608	715	3.2	144	4.1	184	350	290	420	350
MALAWI	2,125	2,497	2,585	3,038	11.2	504	14.3	643	900	750	1,100	910
MOZAMBIQUE	3,750	4,407	4,562	5,362	19.4	873	24.8	1,114	1,820	1500	2,420	2,000
SWAZILAND	200	235	243	286	1.3	58.5	1.7	75	780	650	950	790
TANZANIA	6,849	8,077	8,346	9,818	43.6	1,962.5	55.6	2,505	1,785	1,490	2,280	1,900
ZAMBIA	1,549	1,820	1,885	2,214	11.8	531	15.0	678	1,300	1,080	1,660	1,380
ZIMBABWE	2,475	2,908	3,011	3,538	34.0	1,530	43.0	1,953	7,800	6,500	8,650	7,230
TOTAL	19,873	23,383	24,189	28,440	136.3	6,134	173.6	7,830	17,885	14,880	21,500	17,900

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ARTISAN UNITS FOR THE MANUFACTURE OF FARM IMPLEMENTS
IN LESOTHO

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INTRODUCTION

As per study report on farm implements in SADCC region, the demand of hand tool is estimated as follows;

	1981		1986	
	Nos. (000)	tonnes	Nos. (000)	tonnes
Hand tools	500	587.5	608	715

As against this demand, local production of farm implements in Lesotho is negligible and almost all its implements are imported.

As a part of the total plan of action to reduce SADCC dependency for farm implements, it is proposed to set up 8 blacksmithy units in the artisan sector to produce 60 tonnes of hand tools etc. per annum.

Product range

Hoes
Pangas
Jembes

The annual capacity would be around 20,000 pieces amounting to 7 to 8 tonnes.

SADCC Market Position

This is shown in Table 1.

Existing Capacity

As mentioned earlier, there is no organised sector capacity presently. It is estimated that 10 tonnes of hand tools would be produced by 1986. The capacity figures are shown in Table 1.

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Table 1 SADCC REGION - FARM IMPLEMENT DEMAND

	HANDTOOLS				ANIMAL DRAWN IMPLEMENTS				TRACTOR DRAWN IMPLEMENTS			
	1981		1986		1981		1986		1981		1986	
	NOS. (000)	TONS	NOS. (000)	TONS	NOS. (000)	TONS	NOS. (000)	TONS	NOS.	TONS	NOS.	TONS
ANGOLA	2,325	2,732	2,829	3,324	10.8	486	13.8	620	2,500	2,080	3,190	2,650
BOTSWANA	100	120	120	145	1.0	45	1.3	58.5	650	540	830	690
LESOTHO	500	587.5	608	715	3.2	144	4.1	184	350	290	420	350
MALAWI	2,125	2,497	2,585	3,038	11.2	504	14.3	643	900	750	1,100	910
MOZAMBIQUE	3,750	4,407	4,562	5,362	19.4	873	24.8	1,114	1,820	1500	2,420	2,000
SWAZILAND	200	235	243	286	1.3	58.5	1.7	75	780	650	950	790
TANZANIA	6,849	8,077	8,346	9,818	43.6	1,962.5	55.6	2,505	1,785	1,490	2,280	1,900
ZAMBIA	1,549	1,820	1,885	2,214	11.8	531	15.0	678	1,300	1,080	1,660	1,380
ZIMBABWE	2,475	2,908	3,011	3,538	34.0	1,530	43.0	1,953	7,800	6,500	8,650	7,230
TOTAL	19,873	23,383	24,189	28,440	136.3	6,134	173.6	7,830	17,885	14,880	21,500	17,900

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Technology Package

The blank material is cut to required size and specification. Then these pieces are heated in a charcoal hearth to red hot condition. These are then forged to the desired shape with the help of anvils and hand hammers. The heating and forging operations are repeated a number of times till the required shape is obtained. It is then finished by cutting and filing.

The hardening is done by heating the piece and quenching it in oil and water baths.

Thus the main production features are:

Machining: files
pedestal grinder

Forging: hand forging
blacksmith hand tools
charcoal fixed furnace with hand blown bellows

Heat treatment: simple quenching tanks.

The capital facilities would include the following:

Capital equipment:
1. 50 kg anvil
2. mechanical hand operated forge
3. vice
4. files
5. bolt die set for thread forming
6. hand drills & drill bits
7. hand grinder
8. metal saw and blades
9. square and tape rule
10. wood saw
11. brace and bit
12. oxyacetylene welder

Estimated cost: $ 5,000

Project Costs

Capital

I	Shed	$ 4,000
II	Tools & Equipment	$ 6,000
III	Working Capital for 3 months	$ 5,000
		$ 15,000

Rate of return on capital is estimated to be around 20%.

Raw Material Situation

It is proposed to utilise scrap to the extent possible and high carbon steel.

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Raw Material Requirements:

The steel required for agricultural hand tools should be suitable for forging and heat treatment. The following standards should preferably be conformed to:

American: SAE 1078
British: BS2094 Part 6: forging and drop forging Grade 4

or equivalent DIN/ISO standards

Such steel would have an approximate composition of:

Carbon: 0.72 - 0.85%
Manganese: 0.30 - 0.60%

Trading Logistics

The output is intended for local area consumption so as to reduce dependence on imports.

Intended Implementation Schedule

The artisan units are expected to start production within a year of the decision of their establishment.

Inputs required from donors

* Assistance towards financing the complete package
* Technology & training - could be obtained from other SADCC states.

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ARTISAN UNITS FOR THE MANUFACTURE OF FARM IMPLEMENTS IN TANZANIA

INTRODUCTION

The demand-supply analysis of farm implements in the SADCC region (pl. see Tables 5.2 and 5.3 in the enclosed study) show the following picture for Tanzania:

Farm Implements : Tanzania (mid 1980s) (in tonnes)

	Industry Category	Demand	Supply	Deficit
Hand tools	1	9,818	5,300	4,518
Animal drawn equipment	2	2,505	2,725	-
Tractor drawn implements	3	1,900	5,024	-
Power process equipment	2,3	1,602	640	962
Trailers/Carts	2,3	2,232	560	1,672
Other manually operated equipment	1,2	392	88	304

Industrial category 1 refers to artisan sector
2 refers to small scale units
3 refers to medium/large organised sector)

In the plan of action to meet the projected deficits, establishment of 50 blacksmithy units in the artisan sector has been proposed, giving an output of 500 tonnes per annum, generating employment and spreading industrialisation especially in rural areas.

Tanzania already has a substantial artisan sector producing handtools and thus the nucleus for further units already exists in this sector. The techno-economic description of an artisan unit is given below.

Product range:

Hoes
Jembes
Bill-hooks

The annual capacity of the blacksmithy unit is expected to be around 10 tonnes. Product mix can be as per market requirements.

An illustrative composition could be:

1,000 pieces of jembe per month
700 pieces of hoes and bill hooks per month

SADCC Market Position

This is shown in Table I below:-

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Table 1 SADCC REGION - FARM IMPLEMENT DEMAND

	HANDTOOLS				ANIMAL DRAWN IMPLEMENTS				TRACTOR DRAWN IMPLEMENTS			
	1981		1986		1981		1986		1981		1986	
	NOS. (000)	TONS	NOS. (000)	TONS	NOS. (000)	TONS	NOS. (000)	TONS	NOS.	TONS	NOS.	TONS
ANGOLA	2,325	2,732	2,829	3,324	10.8	486	13.8	620	2,500	2,080	3,190	2,650
BOTSWANA	100	120	120	145	1.0	45	1.3	58.5	650	540	830	690
LESOTHO	500	587.5	608	715	3.2	144	4.1	184	350	290	420	350
MALAWI	2,125	2,497	2,585	3,038	11.2	504	14.3	643	900	750	1,100	910
MOZAMBIQUE	3,750	4,407	4,562	5,362	19.4	873	24.8	1,114	1,820	1500	2,420	2,000
SWAZILAND	200	235	243	286	1.3	58.5	1.7	75	780	650	950	790
TANZANIA	6,849	8,077	8,346	9,818	43.6	1,962.5	55.6	2,505	1,785	1,490	2,280	1,900
ZAMBIA	1,549	1,820	1,885	2,214	11.8	531	15.0	678	1,300	1,080	1,660	1,380
ZIMBABWE	2,475	2,908	3,011	3,538	34.0	1,530	43.0	1,953	7,800	6,500	8,650	7,230
TOTAL	19,873	23,383	24,189	28,440	136.3	6,134	173.6	7,830	17,885	14,880	21,500	17,900

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Existing Capacity

The supply position, after taking into account the organised industry output has been indicated earlier. As against demand of 9,818 tonnes of hand tools, the capacity amounts to only about 5,300 tonnes a year.

Technology Package

The blank material is cut to required size and specification. Then these pieces are heated in a charcoal hearth to red hot condition. These are then forged to the desired shape with the help of anvils and hand hammers. The heating and forging operations are repeated a number of times till the required shape is obtained. It is then finished by cutting and filing.

The hardening is done by heating the piece and quenching it in oil and water baths.

Plant and Equipment

The blacksmithy units are proposed to be equipped with the following items of plant and equipment:

1. Hand lever shearing machine 500 mm blade manual operated
2. Hack saw frame standard
3. Hack saw blades single edge
4. Double edge hack saw blades
5. Forge blower 10" (manually operated) foot operated
6. Single beak knee type anvil 150 kg/125 kg
7. Forging hammer double face 2 kg
8. Forging hammer double face 4 kg
9. Forging hammer double face 8 kg
10. Forging hammer double face 10 kg cross pein
11. Forging chisel head 2 kg cross pein
12. Forging hammer chisel head 4 kg cross pein

13. Blacksmiths holding tongs of different shape and size
    a) Cross flat
    b) Flat jaw
    c) Round jaw
    d) Square and flat
    e) Round and flat
    f) Open mouth
    g) Hallow jaw

14. Flat file - bastard
15. Flat file - second cut
16. Flat file - smooth cut
17. Half round file bastard
18. Half round file second cut
19. Half round file smooth cut
20. Blacksmiths chisels cold cutting 1500 kg weight
21. Blacksmiths chisels hot cutting 1500 kg weight
22. Work shop chisels 8" cold cutting
23. Work shop chisels 8" hot cutting
24. Unbreakable vice malleable iron jaw width 140 mm spa. 180 mm height 280 mm width 560 mm

25. Heat treatment furnace charcoal type complete with furnace blown (manually operated) or foot operated 870 x 360 x 100 mm
26. Swage block - 45 kg
27. Flattener 5 kg - 8 kg
28. Grinding machine 10 wheel (manually operated or foot operated)
29. Blacksmith gloves
30. Measuring steel mule 600 mm.

Raw Material

To reduce the costs, scrap materials are to be used in these artisan units. Such scrap, for example, leaf springs of automobiles and from engineering industries in Tanzania like Ubongo Farm Implements factory are available.

The required raw materials for their output will be as follows:

0.5 tonnes of high carbon steel = 800 pieces of 2 lb jembe
0.25 tonnes of high carbon steel = 300 pieces of 1 lb jembe
500 kg of scrap material = 500 pieces of 1 lb jembe

Project Costs

		(in T.Sh.)
A. Cost of Shed 600 sq ft @ Sh 125	=	75,000
B. Tools and Equipment	=	60,000
C. Working Capital for 3 months	=	50,000
	Total	185,000
	about $	19,500

Financial Operations

Operating Costs per annum

1. Raw Materials		75,000
2. Labour Skilled blacksmiths (3) Semi skilled (3) Helpers (4)		12,000
3. Miscellaneous		20,000
	Total	215,000

		(in T.Sh.)
Depreciation on shed and plant & equipment	=	10,000
Interest on fixed and working capital	=	10,000

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Income per annum

Sales revenue by	
say, 10,000 pieces of jembe per year	150,000
5,000 pieces of hoes per year	125,000
3,000 pieces of bill hooks	50,000
Total revenue	325,000
Less all costs	245,000
Profit before tax	80,000
Taxes (say 50%)	40,000
Net Profit	40,000

representing 21.6% net return on capital

Trading Logistics

Hand tools to be produced by blacksmithy units are mainly for localised consumption and thus no trading and transport problems are foreseen. The regions where tools like hoes are mostly used are:

Kilimanjaro
Iringa
Tabora
Shinyanga
Mwanza
West Lake
Ruvuma
Tanga
Morogora
Mtwara
Mbeya
Kogoma
Arusha

Promoting Institutions

Small Industries Development Organisation (SIDO) has considerable experience in promoting industrial units in artisan and small scale sectors. It is intended that SIDO will be the promoting institution for the proposed artisan units.

Intended Implementation Schedule

The artisan units can go into operation within 12 months of the decision.

Inputs required from donors

Financial assistance towards complete package of establishing 50 units.

Contribution of promoting institution

Technology
Material specification and sourcing
Training
Operation sites

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EXTENSION OF CONTINUOUS CASTING FACILITY IN ZIMBABWE

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1. INTRODUCTION

As mentioned in paragraph 6.15 of the regional subsectoral plan, the production of farm implements would require augmented supplies of steel and other raw materials. This project relates to the setting up of continuous casting facilities at existing steel works.

The purposes of the continuous casting machine is to convert molten steel ingots into salable or re-rolling billets. This is a direct route with the hot metal being poured into water cooled copper moulds and converted into billets. The alternative method is through the outdated, heavy mill, whereby a series of press on the ingots are systematically reduced in size down to billet form.

The installation of this new machinery is aimed at providing a more economic way of processing the hot steel and to ensure that plans to produce leaden and other higher value billets at competitive prices for export can be met.

2. SADCC MARKET POSITION

The Marketing Division of Ziscosteel foresee opportunities for the sale of engineering billets.

All the SADCC countries, except Zimbabwe, import their billet requirements and if the project can be supported then Zimbabwe will be in a position to meet the requirements of SADCC.

3. EXISTING CAPACITY

Zisco's theoretical liquid steel capacity of 1 million tonnes per annum was based on a 75%/25% production split between conventional ingot casting and continuous casting. This necessitated 20,000 tonnes per month being processed through a continuous casting machine which was purchased in 1974/75 for this purpose. Due to the financial constraints at that time and the relatively limited choice of suppliers the type of machine eventually purchased was relatively unproven. They have since found serious design limitations, notably with the concept of "in-line reduction".

4. TECHNOLOGY PACKAGE

4 Strand Billet Machine with the following specifications machine type : curved mould; low head billet caster

No. of strands : 4 (provision for a 5th)
No. of tundish cars : 2
Section limits 100 - 140mm square
Machine equipped to cast; 110m
Casting radins : 6m
Strand centre lines : 1 100/1 100/1 100mm
Ladle support : ladle turret
Ladle type : slide gate
Capacity of ladle : Max 60t
Cut off lengths : 4,6m minimum
140m maximum
Strand cutting : shears
Discharge mechanisms : roller tables, mechanical cross transfers, hydraulic pushers onto a common cooling bed.

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5. MACHINE DETAILS

5.1. SUPPORT STRUCTURE

Of prefabricated steel construction erected independently of the building columns to prevent vibrations from the cranes being transmitted to the machine. Consisting of casting platform, intermediate platform, stairs and walkways.

5.2. COOLING CHAMBER

The cooling chamber is an integral part of the machine support structure and surrounds the secondary cooling zone.

5.3. LADLE TURRET

The turret takes a full casting ladle on one side of the supporting arm and centres it by a swivelling motion around the ladle turret axis above, the tundish in the casting position. This facility is required for the multi-sequential casting of up to 6 ladles per tundish.

The swivel drive is performed by electric motor with an alternative emergency drive by pneumatic motor.

5.4. TUNDISH

Two required of welded heavy plate construction.

5.5. TUNDISH CAR

The two tundish cars transfer from the preheating stations to the casting position as well as adjust the tundish position over the moulds.

They are of gantry construction in heavy steel plates and sections, equipped with an electric drive through power supply cable, motor gearbox and coupling. Final adjustment over the moulds in the direction of the track is performed by an inclung device whilst lateral adjustment is by handwheel. Protection for the casting crew is provided - mould lubricating oil is blown away by a compressed air installation.

5.6. TUNDISH NOZZLE PREHEATING STATION

Time stations are provided on the casting platform for the heating up of tundish nozzles prior to casting. Four coke oven gas burners with the necessary piping on a light stand are provided at each station.

5.7. SLAG LAUNDERS

Four slag launders are attached to each tundish car by a pivot on the crossbeam opposite the mould operator station. They can be swung under the tundish nozzles as required.

5.8. MOULD OSCILLATION MECHANISM

The short level system of mould oscillation guides the mould along an arc corresponding to the casting radius. The mechanism consists of the mould table equipped with connections for mould cooling water, mould lubrication system and spray water pipes, the rocking levers and the bearing support.

5.9. OSCILLATION DRIVE

The limiscidal oscillation is driven by a 3 phase pole changing motor with 2 speeds, at 100 or 150 strokes per minute. The mould stroke can be adjusted but is normally set at approximately 16mm.

5.10. MOULD ASSEMBLY

The total mould length of 1 120 mm is divided into two stages, the primary stage being a curved tabular mould whilst the secondary stage consists of four attached cooling plates.

The primary stage is made up of the housing, cooling jacket, lubrication plate cover and cool tube which is tapered copper with chrome-plated internal surfaces. The cooling plates of the secondary stage are matched to the strand curvature and suspended so that they can be pressed against the strand by springs cooling of the copper plates and strand corner cooling is effected by full cone spray nozzles from the secondary cooling system.

5.11. MOULD LUBRICATION UNIT

The mould walls are lubricated by rapeseed oil (or equivalent) supplied through 4 inlets per mould by a common distributor fed by an oil tank at high level. The required discharge rate is adjusted by means of a flow regulating valve.

5.12. SPRAY ZONE I

The water distributing ring with four spray pipes of stainless steel is fed by the secondary cooling system through the strand guide frame. The spray pipes are equipped with brass nozzles providing water cooling on the four billet faces.

5.13. STRAND GUIDE (SPRAY ZONE II)

The double-beam supporting frame is attached to the steel structure and carries the strand guide rolls on the inner and outer radius, the lateral guides and the stainless steel spray pipework for the second cooling zone.

5.14. RIGID DUMMY BAR

The dummy bar is inserted into the bottom of the mould before casting and loads the hot strand as it starts through the machine. The dummy bar is equipped with a permanent head that closes the mould at the start of the cast and connects the rigid dummy bar to the hot strand. Automatic disconnecting facilities are provided on the machine.

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5.15. WITHDRAWAL AND STRAIGHTENING UNIT

The rocker arm unit which withdraws and straightens the cast strand as well as inserting the dummy bar, has two top-driven rolls, and 3 bottom non-driven rolls. The upper rolls are pressure loaded by pneumatic cylinders and driven by DC motors through a speed reducer gear unit. The frame, rolls, rocker arms and drive heat guards are water cooled and arch connected to the machine cooling system.

5.16. MECHANICAL SHEARS

There are up cutting pendulum type shears where the blades are actuated via an eccentric shaft and controlled by a pneumatic clutch.

5.17. DISCHARGE ROLLER TABLES

The first two rolls are located in the shear stand, whilst the remainder are supported on both sides by the table frames. The rolls are divided into groups of 5 or 6 driven by a gear motor with chains to a peripheral speed of approximately 30 m/min.

5.18. CROSS-TRANSFER MECHANISM

The cross transfer mechanism transfers the billets from the discharge roller tables to the common pusher bed and is located at right angles to the discharge roller tables. The construction is of a pushing beam mounted on wheels in a welded beam construction and driven by an electric motor and gearbox through wire rope drums and wire ropes. Billets up to the normal Rod Mill length of 6,8m will be actuated by one individual cross transfer mechanism, whilst longer billets up to the 14,0m maximum length will be actuated by interconnecting two individual mechanisms together.

5.19. BILLET PUSHER

The billet pusher transports the billets from the inclined plane of the cross transfer mechanism to the common cooling bed and is a hydraulically actuated pushoff. Again, provision has been made to connect the two individual billet pushers together for the longer billets.

5.20. COOLING BED

Allowance has been made for a cooling bed length of 17m, giving a storage capacity of approximately 4 ladles. The construction is of a standard bank with slide rails mounted on a supporting structure. However allowance has been made in the estimates for a turnover bed to be installed for improved billet straightness.

5.21. HYDRAULIC SYSTEM AND UTILITIES

Hydraulics are provided for the operation of the two billet pushers and the four dummy bar storage units.

Water cooling systems are provided for the moulds (primary), the spray zones (secondary) and the machines. Compressed air, via a separate compressor station, is provided for various valves, cylinders and clutcher oxygen and coke oven gas will be supplied to the outlet points for general machine maintenance.

6. RAW MATERIALS SITUATION

From ore deposits which are available in and around Kwekwe.

7. ESTIMATED COSTS

From specified prices, converted at current exchange rate to Z$.

Machine supply	1,661,446
Automatic mould level control	773,092
Water treatment plant	571,888
Spares	318,875
Erection/commissioning/supervision	104,016
Sub-total	2,729,317
Add: Budget quotations for: Turnover	
Cooling bank	250,000
Induction	
Stirring	303,000
Sub-total	3,282,317
Allow contingency	400,683
Total	3,683,000
Total overseas supply	3,683,000
Add: Local supplies	4,317,000
Total project cost	$ 8,000,000

8. SADCC TRADING LOGISTICS

Though Zimbabwe is connected by railway and roads to all the nine SADCC countries, many roads need to be improved in terms of widening and tarring. Given an improvement in the rail and roads systems, few problems would arise in terms of exporting.

9. PROMOTING INSTITUTION

Ziscosteel will be responsible for promoting the products on its own, as it has been doing to date.

It is understood that German aid would be available for the continuous casting project; other countries are interested but in the assessment ZISCO are happy that West Germany should be approached for the caster. No firm information is available at present in this regard.

10. INTENDED IMPLEMENTATION SCHEDULE

The time from order to commissioning and full production is estimated at 18-20 months. Early agreement would enable the Billet Caster to be in full production from the beginning of 1984.

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MANUFACTURE OF TOOL STEEL IN ZIMBABWE

1. INTRODUCTION

Establishment of units for the production of farm implements as proposed in the SADCC sectoral plan will generate increased demands for tooled steel in the region. Zimbabwe has about 20 - 30 large and medium size foundry/forge units. A project proposal for a model foundry/forge unit is currently under joint consideration by ZISCO and Conolly Company, for the manufacture of the following special steels for both the local and the SADCC regional market.

(a) Hardening and tempering quality carbon steel sectors - B.S. 970 Part 2. 1970 GCr 8.

(b) Carbon Tool Steel B.S. 970 part I 1972 GCr 8.

(c) Case hardening quality carbon sulphur steel - B.S. 970 part 3 1971 GCr 8.

(d) High speed steel, HSS - 18 - 4 - 1 - 0,6.

(e) Other grades of alloy steel.

2. INPUTS REQUIRED

- wrought processing unit (forging machine)
- heat treat equipment
- metallurgical control facilities
- expert assistance
- other

3. ESTIMATED COSTS

The total cost of the project is estimated to be of the order of US$1.5 million, broken down as follows:

		U S $
(a) Machinery and equipment		1,000,000
(b) Expert assistance		300,000
(c) Training		200,000
	Total	1,500,000

4. SADCC MARKET POSITION

All of the SADCC countries import their special steels requirements, and if the project can be supported then Zimbabwe will be in a position to meet the requirements of the SADCC.

5. IMPLEMENTATION

About one year.

RATIONALISATION AND DEVELOPMENT OF FARM EQUIPMENT TESTING FACILITIES

1. TERMS OF REFERENCE FOR THE PROJECT STUDY

1. To assess the capabilities and facilities of existing farm equipment testing and research stations and establishments in the SADCC member states.

2. To suggest a scheme of rationalisation in terms of type of farm implements to be tested and developed at the testing and research establishments, taking into account particularly:

   - the cropping pattern
   - the characteristic farm implements in use
   - transportation logistics

3. To recommend a testing and research establishment in the SADCC region for upgradation to a regional centre and to draw up a plan of action for such upgradation including:

   - additional capital facilities required
   - inputs of technology and skills
   - costing and financing requirements
   - implementation schedule

4. To cost out the linkages between the envisaged regional centre and other testing and research establishments in the SADCC member states encompassing particularly the aspects of:

   - design and development of farm implements
   - field testing taking into account the variations in soil characteristics
   - standardisation and certification

The study is envisaged to cost $ 0.5 millions and should be completed in six months time.

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SECTION VII:
Tractors and Tractor Components

DEMAND ANALYSIS AND PRODUCTION OF
TRACTORS AND COMPONENTS

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1. INTRODUCTION

A UNIDO study (1979) on the Agricultural Machinery Industry observed that the African countries import 5 to 10 times the amount in value of foodgrains than of agricultural machinery which contributes to the local production of the same cereals. It is estimated that 80% of African farmers have at their disposal only traditional handtools, 15% make use of animal drawn equipment and 5% employ tractors.

The picture in SADCC countries is no better than the average African picture. In fact, even the supply of handtools is constrained by lack of adequate local production. And the problem of limited usage of other farm equipment including tractors is exacerbated by the foreign exchange difficulties. Investment in agricultural equipment is hardly one-hundredth of the value of agricultural output.

This picture however can be changed in only a few years by the adoption of suitable industry/technology mix and SADCC regional cooperation. The analysis in these preliminary studies shows that relatively modest investments can lead to self-reliance in the production of essential farm implements and equipment and spread of industrial activity in the SADCC region, in tune with the principal objectives of the Lagos Plan of Action and those of SADCC member States.

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2. FARMING IN SADCC REGION

2.1. An idea of the relative extent of major categories of equipment needed for various agricultural activities can be had from the import data of Table 2.1:

Table 2.1 IMPORTS INTO AFRICA, 1978

Equipment	Value in $ million	% of total value
Tractors	390	23
Pumps	326	19
Hand tools	298	18
Agricultural machines	180	11
Building equipment	317	19
Engines	114	7
Packaging & weighing	50	3
Total	1,675	100

2.2. The studies here are concerned mainly with the equipment needed for the operations specifically linked with agricultural production. Broadly, these activities are:

- Land preparation
- Nursery work
- Planting & applying fertilisers
- Seeding & banking
- Topping & spraying
- Harvesting
- Grading & Marketing
- Shelling
- Uprooting

2.3. Besides such modern practices as the use of high yielding variety of seeds and the application of fertilisers and other agricultural chemicals, timing is very critical to the success of an agricultural operation. The usage of tools and other agricultural equipment and machinery improves this timeliness of various activities in addition to performing operations that cannot be done by other means. Specifically, such usage is:

- to bring additional land under cultivation by clearing new areas and by utilising land unsuitable for hand cultivation

- to reduce labour requirements especially during peak periods and to increase labour employment during slack periods

- to improve the timing of operations so as to use optimum tillage and planting dates, to avoid unfavourable weather conditions, to reduce the effects of weeds and to harvest at the optimum time

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- to facilitate the introduction of intensive and multiple farming

- to reduce drudgery of agricultural operations

- to increase farm productivity and income

2.4. Up to 80% of a farmer's work in the cropping season is concerned with re-ridging (land preparation) and weeding, and these are the operations where he needs the assistance of tools and equipment most. Tractors and other engine powered machinery can especially be useful for activities like seed-bed preparation, general cultivation, plant protection, harvesting, threshing, water pumping and land reclamation.

TYPICAL SADCC CALENDAR OF CROPPING

2.5. The major crops of SADCC region include maize, groundnuts, cotton and tobacco. A typical calendar of various activities performed and the average man days spent on them for these four crops in one of the SADCC countries is given in Table 2.2.

2.6. It will be seen that seasonality of labour inputs is very critical. Peak inputs are required during land preparation and harvesting stages and, to an extent, at the weeding stage. Mechanisation of harvesting has been achieved only to a limited extent. Crop-distinct features of harvesting include:

Groundnut

Harvesting is labour-intensive; timing is critical since the nut starts deteriorating if left in the ground too long; and also the harvesting becomes increasingly harder as the soil dries.

Tobacco

Harvesting and curing are labour-intensive and timing is crucial as over or under-ripe means lower quality. Tobacco topping and picking is generally done by hand.

Cotton

Laborious harvesting. Though risk of deterioration is not great the harvest has to be completed in time so that the plants can be uprooted and burnt for pest control reasons.

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Table 2.2 TYPICAL AGRICULTURAL CALENDAR (MAN DAYS) IN ONE SADCC COUNTRY

Month	Maize	Groundnuts	Cotton	Tobacco
Sept.	Start land preparation (7.4)	Start land preparation (12.4)	Start land preparation (12.4)	Prepare Nursery (7.4) Land Preparation field (7.4)
Oct.	Continue land preparation (12.4)	Continue land preparation (14.9)	Continue land preparation (24.8)	Nursery work (17.3) Land preparation field (9.9)
Nov.	Finish land preparation Plant (21.0)	Finish land preparation Plant (17.3)	Finish land preparation Plant(29.7)	Nursery work (17.4) land preparation (9.9)
Dec.	Weed Fertilise (24.8)	Weed (22.3)	Weed (22.3)	Nursery work(7.4) Land preparation (7.4)Plant(11.1) Fertilise (3.7)
Jan.	Weed (16.1)	Weed (14.9)	Weed Spray (49.5)	Finish fertilise (3.7) Weed (27.2)
Feb.	Weed (9.9)	Weed (14.9)	Spray (7.4)	Weed(24.8, Prime Top & sucker (16.)
March	-	Harvest (14.9)	Spray (7.4)	Prime, Top and Sucker (17.3) Harvest & Cure (37.1)
April	Harvest (12.4)	Harvest (34.7)	Spray & Harvest (34.7)	Harvest & Cure (37.1)Uproot(5.0)
May	Finish (13.6)	Harvest (34.7)	Harvest (34.7)	Harvest & Cure (9.9) Grade & Sell (24.8) Uproot (5.0)
June	-	Shell (19.8)	Harvest & Uproot (44.6)	Grade & Sell (27.2) Uproot (5.0)
July	-	Shell (19.8)	Harvest & Uproot (52.0)	Grade & Sell (24.8)
Aug.	-	Shell (19.8)	Uproot (5.0)	-

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Maize

Relatively less labour intensive and less sensitive to exact timing. Susceptible to damage by pests if left too long in the field.

FARMING SYSTEMS IN SADCC

2.7. All the three major systems of farming - manual-based, animal-based and tractor-based - are prevalent in the SADCC Region to varying degrees. Their characteristics are shown in Exhibit 2.1 Table 2.3 estimates the average power inputs from the three sources of labour, animals and tractors, for some of the SADCC countries. It also shows the picture for Africa as a whole in 1980.

Table 2.3 PATTERN OF POWER INPUTS

	Labour %	Draught animals %	Tractors %
Angola	90.6	3.6	5.8
Malawi	94.5	3.2	2.3
Mozambique	90.4	4.4	5.2
Tanzania	81.6	16.4	2.0
Zambia	81.4	12.2	6.4
Zimbabwe	63.7	20.6	15.7
Africa - 1980	81	16	3
- 2000	81	11	8
Envisaged growth rate % p.a. - 1980-2000	3.0	1.3	8.0

(Based on FAO data)

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EXHIBIT 2.1 CHARACTERISTICS OF THE FARMING SYSTEMS IN SADCC REGION

Farming systems characteristics	Hand farming	Animal drawn farming	Tractorisation
Bases of the system	Agricultural system basically man-dependent, using human strength to accomplish all tasks either directly or with the aid of simple traditional tools.	Agricultural system based on the use of animals to carry out all or part of the agricultural work. This implies a complementary agriculture/husbandry system and the use of animal drawn equipment.	Agricultural system making use of the motor and more precisely of the tractor to carry out all or part of the agricultural work. This implies in particular a corresponding set up of the environment to ensure the operations of machines and sets of heavy equipment.
Machines used	* nil (picking) * simple tools (machette-hoe) * simple machinery to be carried (back carried sprayer) or pushed (cart-hoe) or stationary (sheller-pump)	* simple machine(cart-swing-plough - harrow) * more sophisticated machinery (plough - sower - multicultor)	* tractor with heavy equipment (plough - disk harrow - sower drill-trailer) * motorised fixed machinery (thresher-motopump) self-propelled machine
Initial investment level	* The purchase cost of the equipment corresponds to about: US$ 10/labourer/5 years for simple hand tools. less than US$ 100/labourer/5 years for simple machinery	* The purchase cost of the equipment is evaluated at US$325/5 years. To this is added the cost of purchase and rearing and training an animal evaluated at US$ 400/animal (ox).	* The cost of motorised set of equipment including one tractor (45 HP) is evaluated at US$ 11,000/5 years and US$ 16,000 if a thresher is included.
Agricultural operations performed with appropriate equipment	* partial clearing * light preparation of soil upkeep and protection of cultures * help to harvesting and to the transformation of products	* light preparation of soil * sowing * upkeep of cultures * light transportation	* preparation of soil * sowing * transportation * accessorily: threshing - irrigation
	* All crops: - food crops based on cereals roots or fruit - cash crops, annual (cotton - groundnut) or perennial (palm tree - sugar cane) - for export (coffee - cocoa - citrus fruit)	* Crops based on cereals (rice - corn - millet - wheat) Annual cash crops (cotton - groundnut - tobacco)	* Crops based on cereals (rice - corn - wheat) Annual cash crops (cotton - soya) or pluriannual (sugar cane - bananas) Perennial crops (palm tree - coffee - cocoa)

EXHIBIT 2.1 CHARACTERISTICS OF THE FARMING SYSTEMS IN SADCC REGION (cont)

Farming systems characteristics	Hand farming	Animal drawn farming	Tractorisation
Categories of farmers and farming units affected	* Small individual farming of the family type (less than 5 Ha), but also medium and large plantations, where much of the work is still manual.	* Medium size family type (less than 20 ha) the agricultural production of which is especially based on cereals.	* Middle or large size farming where production is based on cereals or cash crops including: - some family farming of more than 20 ha. - large private farming - private, mixed or State agro-industrial units - State farms production co-operatives
Positive aspects of different systems	* low level of investment with direct supply available to farmers from local blacksmiths * the system is adapted to the agro-ecological environment (cultivation on ridges with several types of plants on the same parcel) * the conditioning of the land concerns basically the control of water * no training is essential	* introducing animal drawn farming allows to relieve some bottlenecks (preparation of soil) and makes transportation easier * the investment level is limited and made profitable by an increase in production conditioning is easily feasible by farmers (partial grubbing and land clearning) * maintenance can be carried out by local artisans and blacksmiths * production can be by craftsmen or industrial without requiring major investments in equipment * the low degree of complexity requires little supervision * the system adapts to the agro-ecological environment without disturbing it.	* introducing heavy mechanisation allows: . to valorise waste land . to increase production by expanding arable land . to carry out some arduous work (deep tillage) . eventually to improve the value of inputs by introducing modern farming techniques. * Very high attractiveness of the tractor, as a synonym of modernity * Can compensate for a lack or absence of farm labourers.

for Africa as a whole in 1980, the targetted percentage power from the three sources in 2000 and the annual growth rate required to achieve the targetted percentage mix of power inputs.

Potential for increasing output

2.8. According to the documentation compiled for SADCC 'Regional Coordination in Food and Agriculture' the extent of cultivation practised in the Region is as shown in Table 2.4.

Table 2.4 LAND RESOURCES OF THE REGION (1977)

Country	Land Utilisation (millions of ha) Total Land	Arable	Other	Other land as a % of total land	Inhabitants per hectare of arable land
Angola	124.7	1.8	122.9	98.6	3.7
Botswana	58.5	1.4	57.1	97.6	0.5
Lesotho	3.0	0.4	2.6	86.7	3.0
Malawi	9.4	2.3	7.1	75.5	2.2
Mozambique	76.5	3.1	73.4	95.9	3.1
Swaziland	1.7	0.2	1.5	88.2	2.5
Tanzania	88.6	6.3	82.3	93.9	2.6
Zambia	74.1	5.0	69.1	93.3	1.1
Zimbabwe	38.7	2.5	36.2	93.5	2.7

Note: Arable land refers to land currently under cultivation.

2.9. Not only the percentage of arable land needs to be improved, the group on 'Food & Agriculture' also emphasised that considerable scope existed for improving the output per hectare of the presently utilised land area as is evident from Table 2.5.

Table 2.5 YIELDS FOR TWO SAMPLE CROPS

Country	Average yield per year (1975-77) in tonnes per hectare: Maize	Shelled groundnuts
Angola	0.746	0.542
Botswana	0.683	1.119
Lesotho	0.928	-
Malawi	1.117	0.627
Mozambique	0.538	0.467
Swaziland	1.332	-
Tanzania	0.728	0.595
Zambia	0.962	1.017
Zimbabwe	2.831	0.716

2.10. Appendices I to IX provide a profile of each of the SADCC member states on their land resource, cropping pattern, and the stock, imports and production of farm implements and machinery.

3. TRACTORS: PRESENT POSITION IN SADCC

3.1. In view of the lack of any major tractor manufacturing capacity in the region SADCC countries have been depending entirely on imports of tractors - either in SKD condition or fully built up. Local assembly operations have been only of preliminary nature limited by the lack of any significant component manufacturing industry. The production so far of the low powered Tinkabi (Swaziland) tractor has been essentially in the protocype stage and that too is more an assembly operation. Foreign exchange difficulties, especially severe for some of the countries, have constrained the level of imports. The net result has been a very low tractorisation of SADCC agriculture - variously termed as 'under-investment', 'under-equipment' by FAO/UNIDO.

3.2. FAO has estimated the level of imports of tractors by SADCC countries as in Table 3.1.

Table 3.1 ESTIMATED IMPORTS OF TRACTORS IN SADCC

	1976		1977		1978	
Country	No.	Value in $000	No.	Value in $000	No.	Value in $000
Angola	830	7500	840	8000	850	8500
Lesotho	100	1057	130	1300	142	1500
Malawi	432	3341	248	1505	250	2000
Mozambique	111	702	150	1000	215	1500
Swaziland	70	731	100	1000	140	1402
Tanzania	491	4520	500	5000	560	9107
Zambia	811	4025	692	4411	860	5850

3.3. Our own field studies of SADCC countries (all except Angola) provide a picture given in Appendices I to IX. Briefly, this is summarised below:

Angola

Setting up of a tractor production plant with annual capacity of 6,000 units a year is under consideration.

Botswana

There is no assembly operation and all the tractors are imported.

Year	New Registrations	Renewals	Estimated Total Stock
1977	204	1,685	1,889
1978	228	1,848	2,076
1979	195	1,920	2,115
1980	255	2,259	2,514
1981	325	2,361	2,686
Average yearly	250	2,000	

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The size-mix is roughly:

Above 50 HP : 75%
Below 50 HP : 25%

Lesotho

As in the case of Botswana, there is no assembly operation and all tractors are imported:

Year	New Registrations	Renewals	Estimated Total Stock
1976	216	937	1,153
1977	201	1,102	1,303
1978	194	1,233	1,427

The sizemix is roughly the same as in Botswana - about three-quarters above 50 HP and remaining below.

Malawi

There are two service-cum-assembly enterprises:

i) Farming and Engineering Services has a capacity of assembling 3 tractor (Massey Ferguson) kits a day.

ii) Mandala tractor division undertakes the assembly of Ford tractor kits.

The licensing and import figures are as follows:

Year	Imports	Total licensed
1977	236	2,927
1978	365	3,601
1979	400	3,147
1980	213	
1981	43	

Mozambique

The number of tractors imported in the last few years has been as follows:-

1977 : 900
1978 : 594
1979 : 146
1981 : 409
1982 : 509 (envisaged)

Almost all of them are of higher size, around 70-80 HP.

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Swaziland

The stock of tractors was estimated at 2,700 units in 1979.

Tinkabi Tractor Project

'Tinkabi' tractor was designed in late sixties for meeting the requirements of small farmers with holdings up to 20 hectares. The facilities for prototype production were set up in early seventies at Matsapa.

The TA2 model has an air-cooled hand started twin cylinder diesel engine of 12 KW. It is fitted with a fluid transmission system and the speed, direction of travel and braking are controlled through a single hand lever. The tractor is fitted with a drawbar assembly for attaching the basic implements with the help of clamps.

The later model, TA5 (Exhibit 3.1) has a 29 kw, 3,000 RPM engine, a hydraulic drive pump with a delivery capacity of 130 litres/minute and fitted with a hydraulic lift which can either be mounted at the rear for conventional implements or mid-mounted for use such as grass cutters.

Engine, transmission system, hydraulic and all other major components are imported - so essentially the project is an assembly operation. The local value added is said to be 12-14%.

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Exhibit 3.1 TINKABI TRACTOR TA5

Technical specification

Engine

Diesel type T914, hand starting, two cylinder, four stroke, air cooled.

Bore - 95 mm

Stroke - 94mm

Cylinder capacity - 1 322 cc

Compression ratio - 17,8 : 1

Torque - maximum 1 800 RPM 7,8 Kgm

Fuel consumption - 280g/KW hour at 3 000 RPM

Oil sump capacity - 2,5L

Lubrication - full force feed with external full flow filter

Maximum continuous power - DIN 70 020 21 KW at 3 000 RPM

Maximum speed - 3 000 RPM

Weight - 132 kg.

Air intake - oil bath or dry paper element both with pre-cleaner

The tractor deliveries from this pilot project have been as below:

1973	62
1974	34
1975	31
1976	61
1977	26
1978	30
1979	74
1980	20 (est)

Nearly two thirds of the total sales (about 230 tractors over 1973-80) have been within Swaziland.

3.5. The capacity of the project is currently estimated at 1,500 units per annum and the order book is stated to be around 800 tractors, including orders from Tanzania (about 100), Zambia (about 500).

Tanzania

3.6. As against average imports per annum of 300-400 tractors, the demand is estimated to be 800-1,000 units. Non-usage of existing stock is also very severe - more than half of total fleet is said to be out of service because of repairs and maintenance difficulties.

Production Plan and Programme

3.7. Keeping in view the future demand prospects, the State Motor Corporation, a parastatal of Tanzania entered into an agreement with Valmet of Finland in September 1980 to form a joint venture for the assembly and production of tractors in Tanzania. Equity stakes in the enterprise, Tanzania Tractors Manufacturing Company Limited, are to be held by the State Motor Corporation (80%), FINNFUND (10%) and Valmet (10%). The technical specifications of the models to be assembled/produced (500-1500 p.a.) are shown in Exhibit 3.2.

Zambia

3.8. Average imports per annum amount to 700-800 units. There are at present no production facilities though the issue has been considered many times. For instance, licensed production of 'Tinkabi' tractor has been discussed. There is significant demand for tractors of below 50HP size and a tractor assembly plant has been under consideration.

Zimbabwe

3.9. The country has the following assembly facilities:

Tractor Model	Assembly capacity	SKD units/quarterly foreign exchange allocation
Fiat	80-90 per month	7
Ford	100 per month	50
Massey Ferguson	120 per month	30
John Deere		20

The assembly is done of imported SKD units.

3.10. In 1981, about 1,200 tractor units were imported. foreign exchange difficulties are constraining the current import levels. There are said to be about dozen makes in the market and most common size is stated to be in the 60-75 HP range.

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4. DEMAND-SUPPLY ANALYSIS

4.1. Table 2.3 provided an indication of the present mix of the power input from the three main sources - labour, animals and machines - and the likely mix by the year 2000. It is clear that the highest growth is to come from the third source. According to estimates made by FAO, the annual demand for tractors in Africa will increase from 40,000 units in 1980 to 174,000 units in two decades. The gross annual investment costs in tractors is estimated to increase from $500 million in 1980 to $880 million in 1990 and $2,100 million in 2000.

4.2. For sub-Saharan Africa which covers SADCC region, the FAO studies provide a growth rate of 4.8% per annum in the tractor stock.

DEMAND ESTIMATE

4.3. We estimate demand for tractors in the SADCC region taking into account the following:

i) Present import levels provide only lower bound indication and cannot be construed as a measure of current demand, in view of severe foreign exchange difficulties.

ii) The various projections and forecasts made in UNIDO/FAO documentation.

iii) Both the replacement and new demand components. The replacement period in SADCC region is shorter because of inadequate infrastructure for repair and maintenance services.

iv) Long lead time associated with setting up a tractor manufacturing plant and the start-up of production.

v) The initial stages of agricultural modernisation in the SADCC countries would call for growth rates higher than just 3-4% per annum. The plans, priorities and programmes of SADCC member States corroborate this. Average growth rates of 8-10% per annum over a period of time would be more realistic.

4.4. Finally, our estimates are based on the field discussions with the concerned officials in the SADCC member States and not merely secondary sources of information.

4.5. These estimates - of present stock, average imports, average current demand and average likely demand - are presented in Table 4.1.

4.6. The likely annual demand is presented for the late eighties (1987-1990) considering that any SADCC tractor production programme initiated now would start having an impact from that time. All the figures are rounded off and are averages to smooth out year to year fluctuations. Details of arriving at one of the SADCC country's estimates are given in Exhibit 4.1.

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Table 4.1 SADCC TRACTOR DEMAND-SUPPLY ANALYSIS

Country	Present Estimated Stock	Present Production p.a.	Present Average Imports p.a.	Present Estimated Demand p.a.	Likely Demand late eighties p.a.	Capacity Under Consideration p.a.	Remarks
1 Angola	10,000	-	700-800	1000	2000-3000	6000	Preliminary stage, technical parameters to be selected
2 Botswana	2,500	-	200	200-250	400-500	-	
3 Lesotho	1,500	-	125	100-150	250-300	-	
4 Malawi	3000-3500	-	250-300	300	350-400	-	
5 Mozambique	6000-7000	-	400-500	700-800	1,500	3,500	Feasibility report under preparation by USSR.
6 Swaziland	3,000	(700-800 of 16 HP)	200 of 30HP	200-300 of 30 HP	500 of 30 HP	(2,500) of 16HP	Financing package for commercialisation under consideration
7 Tanzania	7,000	-	300-400	800-1000	1500-2000	500-1500	$32 m project with Valmet of Finland under implementation - finances to be arranged
8 Zambia	5,000	-	700-800	1,000	1500-2000	-	
9 Zimbabwe	18000-20000	-	1,200	2,000	3,000	-	
Total	56000-59500			3300-4000	11000-13700		

Exhibit 4.1. Estimated Demand for Tractors in Tanzania

Recent imports, limited by foreign exchange availability, have averaged only 300-400 numbers a year. The average market price is also very high - above $ 20,000 a tractor. In view of this, it will not be proper to go by past supplies and project them into the future as indicative of demand.

Based on different sets of assumptions made, the demand for tractors in Tanzania is estimated to be:

	Estimate I	Estimate II	Estimate III
1982	1460	1152	1035
1983	1320	1221	1071
1984	1460	1280	1110
1985	1540	1356	1151
1986	1620	1433	1191
1987	1740	1511	
1988	1920	1589	

Estimate I: Source TISCO's study on Market Survey of Agricultural implements in Tanzania (1980)

Assumptions:

(i) stock of 7,000 tractors, end of 1981 built at a growth rate of 5% p.a.

(ii) tractor life 5 years, thus 20% replacement demand.

(iii) increase in tractor cultivated area at 5% p.a. with base tractor cultivated area taken as 0.6 million hectares in 1979 and tractor output taken as 80 hectares a year.

Estimate II: Source National Development Corporation, Dar es Salaam.

Assumptions:

(i) tractor population 4,800 in 1980

(ii) tractor life 10 years

(iii) present usage of tractor taken as 120 hectares per year to up to 150 hectares per year in 10 years

Estimate III: based on FAO data

Assumptions:

(i) tractor stock 6,400 in 1982

(ii) tractor life 7 years

(iii) additions based on growth rate of stock at 4.8% p.a.

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4.7. Considering the various estimates and discussions held, we take the following as indicative of tractor requirements in Tanzania:

Currently: 800-1000 tractors a year, average
By 1990: 1500-2000 tractors a year, average

4.8. The size composition is taken as:

Above 50 HP : 70 to 80%
Below 50 HP : 20 to 30%

DEMAND-SUPPLY ANALYSIS

4.9. The total demand for tractors in the SADCC region in the late eighties is expected to be in the range of 11,000 - 13,700 per annum. The size-mix is estimated as:

Above 50 HP : 70% (7,700 - 9,600 units p.a.)
Below 50 HP : 30% (3,300 - 4,100 units p.a.)

4.10. Though presently, higher sized tractors dominate the imports, a distinct trend towards increased usage of lower sized tractors (around 30-35 HP) is foreseen considering the holding pattern in SADCC member states. The above excludes the demand/supply of Tinkabi tractor 16.5HP which would have a distinct market of its own, variously estimated at 2,000 - 5,000 units a year in the SADCC region

4.11. Table 4.1 also shows the production capacity presently under consideration/implementation by three member States:

Angola	: 6,000	units p.a.
Mozambique	: 3,500	units p.a.
Tanzania	: 500 - 1,500	units p.a.
Total	10,000 - 11,000	units p.a.

4.12. Together, if they commercialise by late eighties, they would provide a capacity of around 10,000 units per annum. All of them are in the range of 60-80 HP. This capacity, if materialised, should suffice for the projected demand of 7,700 - 9,600 tractors per annum in the range above 50 HP.

4.13. This would leave an unfulfilled demand of about 3 - 4,000 tractors in the below 50 HP range.

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5. SUGGESTED COURSE OF ACTION

IMPLEMENTATION OF CURRENT PROJECTS

5.1. This obviously is the first priority.

* The Angolan project is at a preliminary stage. Thus, assistance would be needed in the preparation of project details to be followed later by financing, technology transfer and the supply of capital goods.

* The feasibility report for the tractor project in Mozambique is under preparation.

* Assistance would be required for financing of capital goods and for transfer of technology as soon as the project report is ready for implementation.

5.2. An idea of the possible assistance required for setting up a tractor plant could be had from Table 5.1. This is for tractors of size 60-70 HP, four wheel, rubber-tyred.

5.3. Most of the fixed assets in the form of plant and equipment would have to be imported in the SADCC region.

* The tractor project in Tanzania is under implementation and the project details are known.

Table 5.1 ESTIMATED MINIMUM INVESTMENT REQUIREMENT FOR TRACTOR IMPORT ASSEMBLY AND LOCAL MANUFACTURE

	Units/	Local content	Fixed assets	Working capital 4 months	Total investment
	No.	(%)	($mill)	($mill)	($ mill)
A. Imported tractors					
Fully assembled	300	0	1.0	1.0	2.0
SKD assembly 1/	300	3-5	1.5	1.5	3.0
CKD assembly 2/	1000	7-10	2.5	2.5	5.0
B. Local Manufacture3/					
1 Phase I	2000	20-25	7.0	4.5	11.5
2 Phase II	4000	40-50	34.0	11.0	45.0 4/
3 Phase III	7000	60-80	90.0	20.0	110.0 5/

Source: UNIDO, Supplementary Note No. 4, Global Preparatory Meeting for Consultations on Agricultural Machinery Industry, Vienna, 1979.

1/ SKD - shipped semi-knocked down
2/ CKD - shipped completely knocked down
3/ Based on a single working shift
4/ Phase I ($ 11.5 million) plus an additional $ 33.5 million for Phase II = $ 45 million.
5/ Phase I and Phase II plus an additional $65 million for Phase III = $ 110 million

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5.4. As per present understanding, the project is to be implemented in three phases:-

Phase I

Starting with assembly operations and test drive, this phase would culminate in establishing the following manufacturing operations:

1) Machining small parts

2) Heat treatment

3) Manufacturing of steel parts by means of:

- plate technology
- arc welding technology
- sand and shot blasting technics
- dip-painting technology

4) Manufacturing sheet metal parts by means of

- sheet metal technology
- spot welding technology

5) Component assembly including assembling of gear box, fuel tank, final drive, housing cover, and front axle and accessories for the lifting system

6) Main assembly

7) Surface treatment and painting operations:

- grease removing
- phosphatising
- neutralising
- drying
- painting
- furnace drying

8) Final adjustments

The repairs and reconditioning services will also be organised.

The total capital requirements in this phase are estimated at about $ 30 million.

Phase II

Manufacture of transmissions, shafts and gears.

Phase III

Manufacture of diesel engines.

Both Phase II and Phase III depend on feasibility studies to be undertaken later on.

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5.5. Initially about $15.5 million is proposed to be spent till 1984-85 as follows:

	(in $ million)
Land & buildings	1.7
Plant & machinery	2.7
Office equipment	0.2
Technical assistance	9.5
Working capital	1.4
Total	15.5

5.6. Out of this, nearly 80%, $12.2 million is in foreign exchange.

5.7. The investments estimates and financing arrangements have undergone a number of changes. Currently the premises of MTAVA and East African Motors Assemblers Co are being used on lease basis by the Project.

9.8. The capital expenditure to be incurred at leased EAMA premises is as follows:

(in $ 000)

	Local	Foreign
A. CIVIL WORKS		
Tractor service centre	23.65	6.45
Central Store	23.65	6.45
Assembly Hall	33.85	24.75
Assembly Store	43.00	5.35
	124.15	43.00
B. HOUSING	419.35	354.85
C. FURNITURE, PLANT AND EQUIPMENT		
Tractor Service Centre	30.10	354.85
Central Store	10.75	75.25
Assembly Hall	102.15	180.65
Assembly Store	10.70	-
	153.70	610.75
TOTAL	697.20	1008.60

5.9. However since the project entails large amounts of foreign exchange outgoings for the import of tractor kits in the initial phase (one estimate is $ 10 million a year), the present constraints of foreign exchange availability are getting in the way of planned schedule.

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COURSE OF ACTION

Above 50 HP tractors

5.10. Assistance towards speedy implementation of ongoing/under consideration projects in Angola, Mozambique and Tanzania is suggested. Together with upgrading of assembly facilities in Zimbabwe, these capacities should suffice for meeting the SADCC needs of large sized tractors in the late eighties.

Below 50 HP tractors

5.11. A market for around 4,000 tractors of below 50HP size is foreseen in the SADCC region. Zambia and Zimbabwe are likely to be the major consuming market segments.

5.12. It is suggested that a feasibility study be undertaken immediately for establishing a project with an annual capacity of 4,000 - 5,000 below 50 HP tractors. The terms of reference could include:

i) To determine the market in each of the SADCC countries for tractors of below 50 HP range in end eighties taking into account the current and potential usage.

ii) To forecast long term (during the nineties) demand estimates of low sized tractors in the SADCC region.

iii) To prepare a project report for setting up factilities for the production of below 50 HP tractors with an annual capacity of around 5,000 units. Such a study to encompass the aspects of:

- Product-mix, in terms of power range to be manufactured considering the demand para- meters as determined in (i) and (ii) above.

- Location, taking into account, especially, the demand configuration and SADCC logistics.

- Required investments - civil works, plant and equipment, working capital (in both total and foreign exchange components).

- Complete details of capital facilities including specification, plant layout and material flows.

- Technology sourcing including training inputs.

- Production programme including phase build-up of local value added content.

- Schedule of implementation (PERT network).

The report should take into account particularly the possible offloading of components and parts manufacturing to the engineering industry in the SADCC region.

iv) To provide financial analysis of the project including sensitivity analysis.

v) To draw up a plan of action.

5.13. It is suggested that the project study be completed in about 6 months at an estimated cost of $ 500,000.

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6. TRACTOR COMPONENTS

6.1. Development of tractor manufacturing industry in the SADCC region would depend significantly on the development of tractor ancillary industry for making parts and components.

6.2. Table 5.1 provided an indication of the extent of local value added as the production process proceeds in steps from pure assembly operation. The production of tractors, in fact, involves the assembly of a lot of bought-out components and the development of facilities for the production of components has to be a first priority.

6.3. Exhibit 6.1 gives an idea of the value added by various sub-assemblies and group of parts in a tractor. There are two points worth noting here:

1) The component production industry serves both the tractor production industry (original equipment, OE market) and the need for replacements (replacement market, RM) by the tractor-users.

2) Many of the tractor components have a common heritage with the automotive components in general. Thus the ancillary industry should be seen in the context of both automotive and agricultural tractor industries.

6.4. Country profiles in Appendices I to IX provide a picture of the current status of the tractor component industry. As would be seen, the lack of any tractor production enterprise has hindered the develpment of the component industry and vice versa.

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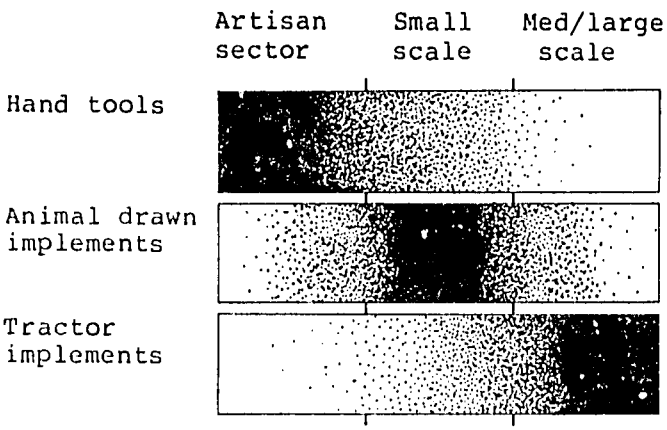
Exhibit 6.1



Product-Industrial Sector Mix

The terms small, medium/large are relative, within this particular industry.

SUGGESTED COURSE OF ACTION

6.5. Taking into account the setting up of tractor projects as outlined in the previous chapter, the development of tractor component industry in the SADCC region in the foreseeable future is seen in the following three segments:

With the main tractor plants

This would include:

- Assembly and testing of engine, sub-assembly of cylinder and cylinder head.
- Assembly and testing of transmission, shaft machining, gear train sub-assembly.
- Machining of linkages
- Machining of levers
- Chassis fabrication
- Press work, welding and general fabrication.

Ancillary Industries

- Production of gaskets, silencer, fan belt, fasteners and battery.
- Production of instruments and gauges.
- Production of oil seals, gaskets and fasteners.
- Production of pressure hose pipes, brake shoes and springs.
- Production of filters and radiators.
- Production of tyres and tubes.

Imports

High-technology components requiring sophisticated manufacturing techniques and large capital outlays are foreseen to be imported till the rest of the ancillary manufacturing comes of age. These components include:

- Engine parts such as fuel injection system, crankshaft, connecting rod, cam shaft, timing gears, bearings, etc.
- Hydraulics and control system
- Clutch assembly
- Steering box
- Brake cylinders
- Wheel centres

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6.6. Exhibit 6.2 shows the three-level proposed development of tractor component industry in the SADCC region.

6.7. It is suggested that local manufacture of fast replacement items, especially such items as air filters, oil filters, gaskets, seals, fasteners and rubber parts be strengthened. Batteries, tyres and tubes will provide relatively high local value added. Castings could also be bought-out. Table 6.1 lists the potential industries for development in the SADCC.

SADCC LINKAGES

6.8. It would promote the standardisation and improve the cost economies if the ancillary industries are developed keeping in view the needs of all potential tractor projects. For example:

- machining of gearbox and final drive housings could be specialised at one place

- press parts production could similarly be undertaken by one project - such a facility is coming up in Zambia.

6.9. The question of technology choice is important here considering the low volume runs. Conventional processes use separate machine dies for each pressing. This would be expensive for low runs of different pressings. Instead, the press dies could be made of a low melting point alloy.

6.10. Similarly, use of unit head unit operation special purpose machines, rather than conventional mass production techniques, may have to be encouraged. High technology and advanced capital equipment would indeed be very relevant in this context. Machining operations could preferably be undertaken with the help of multi-operation, numeric controlled machines with suitable hydraulic clamping devices.

Exhibit 6.2 : SUGGESTED DEVELOPMENT OF TRACTOR COMPONENT INDUSTRY IN SADCC

Major Component Groupings	At the tractor plants	Ancillary manufacture	Imports
1 Engine	* Assembly & testing * Machining of crank-case, cylinder & cylinder head	* Gaskets * Valve springs * Silencer * Fan belt * Engine mounting * Oil seals * Fasteners * Battery	* Piston * Crankshaft * Connecting rod * Fuel injection system * Cam shaft * Timing gears * Starter motor * Bearings
2 Hydraulic system	* Actuating mechanism		* Hydraulic power & control systems
3 Instru-mentation		* Instruments & gauges	
4 Cooling & filtering system		* Filter & radiator	
5 Transmission	* Assembly & testing * Machining of shaft * Housing & operating mechanism * Gear train assembly	* Oil seals * Gaskets * Fasteners	* Clutch assembly * Gears

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Exhibit 6.2

(cont.)

Major Component Groupings	At the tractor plants	Ancillary manufacture	Imports
6 Steering	* Machining of linkages	* Steering wheel	* Steering box
7 Brakes	* Machining of pedal & levers	* Pressure hose pipes * Brake shoes & springs	* Brake cylinders
8 Wheels		* Tyres & tubes	* Wheel centres & rims
9 Body & other pressings	* Press work & welding		
10 Chassis, final assembly	* Fabrication & machining * Painting & testing		
Estimated value added content	30 - 40%	30 - 40%	30 - 40%

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Table 6.1 POTENTIAL COMPONENT INDUSTRIES IN SADCC

1 Cylinder Head Gaskets

2 Other Gaskets

3 Valve Springs

4 Other Springs

5 Exhaust Systems

6 Fan Belts

7 Engine Mounting Pads

8 Oil Seals

9 Batteries

10 Wiring Harnesses

11 Fasteners

12 Steering Wheels

13 Pressure Hose Pipes

14 Brake Shoes

15 Tyres

16 Tubes

17 Air Filters

18 Oil Filters

19 Water Cooling Radiators

20 Oil Cooling Radiators

21 Instruments & Gauges such as Service Hour Meter Tachometer, Oil Pressure Gauge, Water Temperature Gauge etc.

22 Miniature Bulbs

23 Closed Die Forgings such as Levers, Linkages, etc.

24 Rubber mouldings such as bushes, pads, caps, etc.

6.11. Mozambique, Tanzania, Zambia and Zimbabwe and Swaziland, to an extent, offer major potential in this area considering the state of the development of engineering and automotive industries in those countries.

6.12. Initially, investments are foreseen on upgrading of existing industrial units for the production of tractor components depending on specific project requests. It is suggested that a plan of specific project investments be drawn up. An amount of $500,000 is estimated for this exercise to be completed over a period of six months.

FARM EQUIPMENT TESTING FACILITIES

6.13. Finally, mention must be made of a crucial element in the development of farm equipment industry in the SADCC region - testing and development facilities.

6.14. Present institutions include:

- Chitedze Agricultural Research Station at Lilongwe, Malawi
- Testing Station at Arusha, Tanzania
- Farm Machinery Research Unit, at Magoye, Zambia

6.15. It is suggested that in view of the facilities available at Zambia Station, this could be upgraded to provide advice and testing results on the introduction and usage of various farm implements and tractors in the SADCC region.

6.16. All the SADCC countries in fact should have some testing facilities considering the variations in soil conditions and cropping pattern; the availability of specialised facilities and skills at one place who will conduct the field investigations for SADCC Member States with the help of local counterparts, will avoid any duplication and also provide a seal of standard.

6.17. A sum of 0.5 million dollars is proposed for a six months study to draw up a plan of action for upgrading one of the agricultural equipment testing stations to a regional level, having linkages with other such stations in the SADCC member states.

ANGOLA

CROPPING PATTERN

Principal crops include maize, coffee and sugar. In addition, palm, cotton, cocoa, tobacco, and sisal are also grown. Cereal production per capita is relatively low at 70 kgs per annum (FAO 1980). The tractor stock is relatively high per capita, according to FAO data, reflecting the existence of a significant commercial sector, especially in coffee. Agricultural implement usage would be expected to involve a high share of tractor implements by SADCC standards.

The area and production for major crops are given below:

	1979		1980	
	Area (Ha 000)	Production (tons 000)	Area (Ha 000)	Production (tons 000)
Cereals	713	378	713	400
of which maize	600	300	600	320
Roots, tubers	155	2020	155	2070
of which cassava	130	1800	130	1850
Pulses	120	55	110	42
Groundnuts	40	20	40	20
Sunflower	15	10	15	10
Vegetables, fruit etc	655	430	655	430
Sugarcane	15	420	15	450
Coffee	200	60	200	40
Cotton	13	n.a.	11	n.a.

AGRICULTURAL IMPLEMENTS

Existing capacities and production of various categories of agricultural implements include:

	Installed capacity	Actual Production	Capacity Utilisation
Hand tools in nos.	1 million	0.5 million	50%
Animal drawn implements in nos.	10,000	1,200	12%
Tractor implements	1,000	120	12%

Plans include:

* An agricultural implements project at Malange with an annual capacity of 600,000 units. This $6 million project is currently under implementation and part of the output is for export. Capital equipment financin and technical assistance is being sought.

* Preliminary studies are underway for setting up capacity at Malange to make 1,000 pumps per annum.

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TRACTORS

The total stock is estimated at 10,000. The FAO data indicates the following import levels:

1978	: 850 units
1979	: 770 units

Trade statistics suggest $ 8.6 million worth of imports of cultivation machinery. A project for the production capacity of 6,000 tractors a year is under consideration.

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BOTSWANA

CROPPING PATTERN

Agriculture in Botswana is split into traditional and commercial sectors. In 1980 the traditional sector produced about 85 percent of the food crop and 32 percent of the cash crop. It accounts for nearly 94 percent of the area under crop.

Total Farms, Livestock Held, and Food and Cash Crop Production - Traditional versus Commercial Farm Sectors, 1980

Category	Traditional	Commercial	Total
Total farms (number)	80,000 (99.6%)	360 (0.4%)	80,360 (100.0%)
Total smallstock (number)	758,000 (96.4%)	28,000 (3.6%)	786,000 (100.0%)
Total Food Crop Production (metric tonnes) 1/	38,105 (85.1%)	6,695 (14.9%)	44,800 (100.0%)
Total Cash Crop Production (metric tonnes) 2/	903 (32.2%)	1,897 (67.8%)	2,800 (100.0%)

1/ Includes sorghum, maize, millet and beans/pulses.

2/ Includes groundnuts and sunflowers only. Commercial farmers enjoy a virtual monopoly in the production of other cash crops such as cotton, citrus, etc.

SOURCE: Traditional versus commercial agriculture in Botswana, Planning and Statistics Department, Ministry of Agriculture: June 1981

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Area planted by type of crop in the traditional and commercial sectors, 1980

Type of crop	Area Planted		
	Traditional	Commercial	Total
	----------(1,000 hectares)----------		
I Food Crops:			
Sorghum	142.5 (97.1%)	4.3 (2.9%)	146.8 (100.0%)
Maize	74.9 (93.3%)	5.4 (6.7%)	80.3 (100.0%)
Millet	16.9 (100.0%)	-	16.9 (100.0%)
Beans/Pulses	23.4 (99.2%)	0.2 (0.8%)	23.6 (100.0%)
Subtotal (Foodcrops)	257.7 (96.3%)	9.9 (3.7%)	267.6 (100.0%)
II Main Cashcrops:			
Groundnuts	2.4 (49.0%)	2.5 (51.0%)	4.9 (100.0%)
Sunflowers	5.2 (73.2%)	1.9 (26.8%)	7.1 (100.0%)
Subtotal	7.6 (63.3%)	4.4 (36.7%)	12.0 (100.0%)
III All Other Crops	5.4 (76.1%)	1.7 (23.9%)	7.1 (100.0%)
TOTAL ALL CROPS	270.7 (94.4%)	16.0 (5.6%)	286.7 (100.0%)

Source: Traditional versus commercial agriculture in Botswana, Planning and Statistics Department, Ministry of Agriculture, June 1981

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Cattle are the major source of draught power on traditional farms but tractors are also used. Tractors are the main source of power on commercial farms.

PLAN PRIORITIES

In 1980 the government embarked on an Arable Lands Development Programme (ALDEP) which aims to increase arable production by 4-6 percent per year. One of the major components of the programme is farm investment schemes - in the form of credit and subsidies. These include, for instance:

(i) animal draught power scheme provides assistance for the purchase of 2-3 oxen or a span of donkeys;

(ii) implements scheme provides assistance for the purchase of an implement package (single row planter and cultivators) and also ploughs and harrows.

A direct subsidy of 35% and loans are provided, payable over 5 years.

Implements : Animal drawn & hand tools

Data suggests the following:

Implement	Demand per annum	Stock
Single furrow plough	250	50,000
2 furrow plough	75	2,000
single row planter	450	1,500
cultivators	350	2,500
hoes (hand)	100,000	240,000

Implements : Tractor Drawn

Implement	Demand per annum	Stock
Plough	250	1,300
Harrow	150	1,000
Planter	200	700
Other	200	800

Tractors

Year	New Registrations	Renewals Government	Renewals Private	Total
1977	204	399	1,286	1889
1978	228	439	1,409	2076
1979	195	447	1,473	2115
1980	255	532	1,727	2514
1981	325	307	1,799	2686

Source: Transport Statistics, 1980. Statistics Unit, Ministry of Works and Communications

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The size mix is estimated as:

* 50 - 70 hp (37 - 52 kw) - 70% of total
  40 - 50 hp (30 - 37 kw) - 20% of total
  Less than 40 hp (30 kw) - 5% of total
  More than 70 hp (52 kw) - 5% of total

MANUFACTURE OF IMPLEMENTS AND TRACTORS

IMPLEMENTS

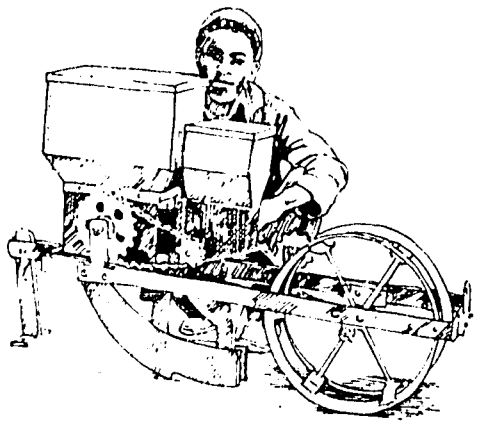
Until this year there was no manufacture of either tractor or animal drawn implements in Botswana. The demand has been met by imports. This year a general engineering works and 2 vocational training institutions have been asked by ALDEP to make 150 plough planters and conventional single row planters designed by a team of engineers on Evaluation of Farming Systems and Agricultural Implements Project (EFSAIP). Tractor, animal-drawn and truck trailers are also made in the country. There are artisan units producing animal drawn carts and hand tools.

TRACTORS

No tractors are manufactured in Botswana. All tractors sold in Botswana are imported from South Africa.

The market for farm machinery in Botswana is very small and the only way of establishing manufacturing of farm implements is by using existing engineering works. Demand for hand tools could be met by encouraging artisan production. The market for farm machinery is likely to grow at a fast pace because of the Government's policy of aiming for food self-sufficiency within the next five years. Ministry of Agriculture estimates an annual growth rate of 10 percent for tractors and implements and 5 to 10 percent for animal drawn implements over the next 5 years.

MOCHUDI SEEDER



Manufactured by:

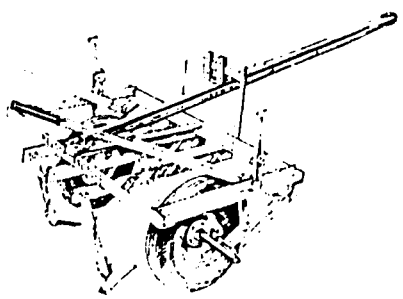
Mochudi Brigade
PO Box 248
MOCHUDI
Botswana

Telephone: Mochudi 912

Telegrams: BRIGADES, MOCHUDI

Description: The planter is based on a 'seed and agitator' design of seed hopper, which will meter and plant a wide range of seed sizes without blockage. It can be used with ungraded seed, and good results have been obtained with millet, sorghum, cowpeas, sunflowers and maize, although it should be noted that it is not a precision spacing planter. Seed depth is controlled either by an adjustable mounting on a toolbar, or by skids in the single row version. Seed-covering is achieved by the 40cm. diameter split-rim wheel.

MAKGONATSOTLHE TOOL-BAR



Manufactured by:

Kgatleng Development Board
PO Box 208
MOCHUDI
Botswana

Telephone: Mochudi 356

Description: The Makgonatsothlhe Tool-Bar has been developed from designs of existing multi-purpose tool-bars. It is perhaps unique in that it has been designed for either ox or donkey draught.

It is designed to be fitted with: planter, disc-cultivator, sweeps for minimum tillage, fertilizer applicator, water-drums (for water transport) and a scotch-cart frame.

The basic frame of the tool-bar is made from heavy angle iron, and the rubber-tyred wheels are mounted on stub-axles. Implements are attached to the main frame with sub-frames which can be positioned variably at any position on the main frame. This enhances the adaptability of the machine: e.g. by being capable of bearing either one or two planter units for single or double row planting.

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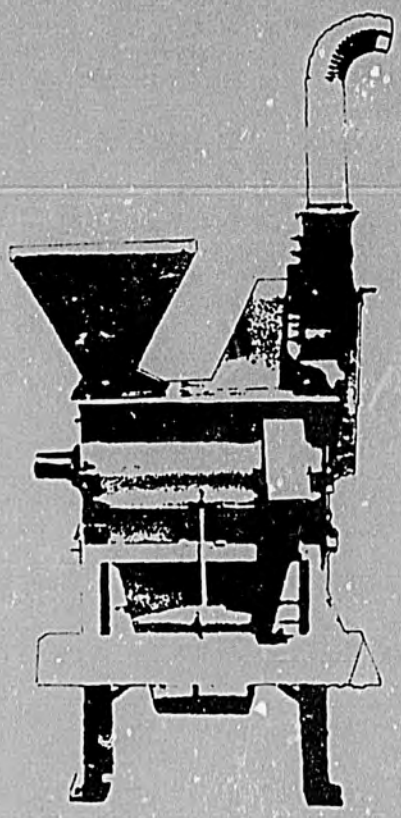
RIIC SORGHUM DE-HULLER AND MILL

Manufactured by:

Rural Industries Innovation Centre
Private Bag 11
KANYE
Botswana

Telephone: Kanye 392/3



Description: In cooperation with the International Development Research Centre (IDRC) of Canada, RIIC at Kanye have developed a package of machinery that is of suitable scale for village operation in the making of sorghum flour.

The package consists of a de-huller and a hammer-mill and both are supplied together with extensive advice and operational brochure. The de-huller consists of a barrel-shaped container. The hammer-mill is of standard design, with interchangeable screens for different grades of flour.

Both can be powered with a single power source and whether petrol or diesel, it should be of a 24HP rating. The package of machinery is designed to operate either by batch method or continuous flow, and can thus be used either for milling individual lots or for commercial quantity milling.

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LESOTHO

CROPPING PATTERN

The agricultural sector is dominated by smallholders. Cropped area has declined from 318,900 hectares in 1973/74 to 221,900 hectares in 1977/78, a reduction of 30 percent. This is attributed mainly to relative unattractiveness of returns from farming. The average size of holding is about 2 hectares and the majority of the farmers use draught animals. The major crops grown are maize, sorghum, wheat, beans and peas.

PLAN PRIORITIES

The expansion of agricultural output is a priority, both as a means of raising rural incomes and as a method of reducing the current dependence on imported basic foodstuffs. The long term objective is to transform crop farming, at present mainly subsistence farming, to the production of cash crops for import substitution and export, with forage crop areas in support of livestock production.

CROP STATISTICS

	1973/74	1974/75	1975/76	1976/77	1977/78
Area planted ('000 ha)					
Maize	129.7	107.8	115.5	92.6	111.5
Sorghum	83.3	54.8	55.4	46.8	62.0
Wheat	76.0	55.1	59.7	43.9	39.6
Beans	19.7	28.1	35.1	17.2	14.3
Peas	10.2	10.0	13.1	9.7	4.5
Total	318.9	255.8	278.8	210.2	221.9
Production ('000 tonnes)					
Maize	122.5	70.3	49.1	125.9	143.2
Sorghum	84.0	37.4	24.5	62.3	85.8
Wheat	57.1	45.3	44.6	61.4	57.9
Beans	7.5	13.4	8.7	14.7	10.8
Peas	7.2	5.8	5.8	7.0	4.4
Average yield (kg per ha)					
Maize	944.0	652.0	577.0	1567.0	1407.0
Sorghum	1008.0	682.0	591.0	1466.0	1446.0
Wheat	745.0	822.0	740.0	1247.0	1358.0
Beans	381.0	477.0	292.0	1379.0	974.0
Peas	706.0	580.0	548.0	844.0	1018.0

Source: Bureau of Statistics and data provided by the Lesotho authorities

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To fulfil the above objectives the Government has embarked on various projects. Recently a Basic Agricultural Services Programme (BASP) has been launched. BASP is designed to increase crop output in the lowlands through training and technical assistance, providing equipment repair facilities, providing stores for input distribution and crop marketing, upgrading rural roads and providing credit for both machinery and crop inputs. About 2 years ago a Food Self-Sufficiency Programme (FSSP) was embarked on under the Technical Operations Unit (TOU) of the Ministry of Agriculture. The programme provides a management package to participating farmers, including machinery services and inputs. In 1979/80 8,000 hectares were serviced which have increased to 30,000 hectares in 1980/81. The programme has 295 tractors, 95 ploughs, 186 disc harrows, 246 planters, 10 sprayers, 40 combines, 5 stationary threshers and other equipment.

IMPLEMENTS AND TRACTORS

Implements

The demand for agricultural implements is estimated by UNIDO (1979) as:

	Annual Sales - Units (approximate)					
	1979/80	1982	1984	1986	1988	1990
Tractor chisel plough	0	25	50	100	200	300
Animal drawn mouldboard plough	1700	1800	1800	1500	1200	800
Animal drawn harrows (sections)	730	750	800	800	800	800
Animal drawn single row planters	1100	1200	1200	1000	800	600
Animal drawn inter row cultivators	790	1200	1300	1400	1400	1400
Animal drawn ridgers	0	20	25	50	100	100
Animal drawn trailers (carts)	400	500	500	500	400	300
Tractor drawn trailers	125	100	100	125	150	150

Source: UNIDO/UNDP Feasibility Study on the Establishment of a Manufacturing Plant for the Production of Agricultural Tools and Implements in the Kingdom of Lesotho. November, 1979

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Tractors

The stock of tractors is estimated as:

Year	Government New	Government Renewals	Private New	Private Renewals	Total
1974	NA	NA	-	-	600
1975	44	46	160	412	662
1976	31	97	185	840	1153
1977	27	113	174	989	1303
1978	32	173	162	1060	1427

MANUFACTURE OF IMPLEMENTS, TRACTORS & COMPONENTS

IMPLEMENTS

There is no manufacturing of hand tools; animal and tractor drawn implements. The only production has been at a vocational (agricultural) training institute where they have made prototypes of, among others, an animal drawn plough, weeder, cultivator, potato lifter. All implements are imported from South Africa.

In 1979 UNIDO carried out a feasibility study on establishing a manufacturing plant for agricultural tools and implements and came to the conclusion that the manufacture of agricultural tools and implements was uneconomic due to the low volume of market but could be viable if undertaken in an existing facility. In 1981/82 UNIDO carried out a prefeasibility study on the establishment of a forging/casting industry. Lesotho National Development Corporation feels that the two, manufacturing of agricultural tools and implements and a forging/casting works, together have more chance of being economically viable. In 1981/82 CID (EEC) did a study on metallurgical small industries.

The agricultural equipment presently produced by artisans and engineering works in Lesotho are ox carts, trailers and tankers.

TRACTORS

There is no production of tractors in Lesotho. All tractors are imported from South Africa.

Given the government's policy towards agriculture, there is going to be a high rate of demand for both tractors and implements and animal drawn implements.

MALAWI

CROPPING PATTERN

Malawi's agriculture comprises both smallholder and estate sectors. The smallholder agriculture is semi-subsistence, producing nearly half of the agricultural exports as well as the majority of the country's basic food requirements. The estate sector produces mainly export crops. The smallholder sector accounts for 91 percent of the cultivated area and its main feature is fragmentation of the holdings. Maize, groundnuts, tobacco, tea, cotton and rice are the main crops grown with maize accounting for almost 70 percent of the cultivated area.

Crop	% output grown by farms under 100 ha (approx)	% output grown farms over 100 ha (approx)
Tea	6	94
Maize	87	13
Tobacco	38	62
Cotton	100	0
Rice	100	0
Sugarcane	0.0	100

Source: National Sample Survey of Agriculture

Average of Principal Crops - (in 000 ha, 1970s)

Maize	1,070
Sorghum & millet	500
Pulses	480
Groundnut	450
Cassava	300

PLAN PRIORITIES

The Ministry of Agriculture encourages labour intensive methods of production. Tractor hire schemes for smallholders have been tried. Currently mechanised services are provided for tenants on large estates by the estates themselves. There is also usage of power tillers by the farmers on irrigated projects.

IMPLEMENTS

The production of hand tools and animal drawn implements by the main plant of Agrimal (Malawi) Limited has been as follows:

	Hoes			Animal Drawn Implements		
Year	Local	Export	Total	Local	Export	Total
1977	623611	5000	628611	2010	1141	3151
1978	646579	42000	688579	3400	3000	6400
1979	548230	22000	570230	3569	2500	6069
1980	395382	0	395382	1700	1195	2895
1981	379000	9000	469000	779	0	779
Plant Capacity	1.5 million			30,000		

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The stock of tractor drawn implements is estimated below:

Year	Tillage Equipment	Planting & Seeding	Other (sprayer, mowers threshers etc)
1969	290	85	15
1970	320	95	20
1971	630	180	30
1972	630	180	30
1973	630	180	30
1974	770	220	35
1975	770	220	35
1976	1000	260	45
1977	1100	280	55
1978	1300	300	60
1979	1500	300	60

TRACTORS

The stock and imports of tractors are given below:

	Tractors licenced				
Year	Government	Private	Total	Percent Increase	Imported
1969	228	424	652	-	-
1970	283	466	749	15 %	-
1971	318	924	1242	66	-
1972	368	540	908	-27	-
1973	378	503	881	-3	-
1974	453	1133	1586	80	-
1975	442	972	1414	-11	-
1976	458	1733	2191	55	-
1977	808	2119	2927	34	236
1978	1031	2570	3601	23	365
1979	428	2719	3147	-13	400
1980	-	-	-	-	213
1981	-	-	-	-	43

MANUFACTURE OF IMPLEMENTS, TRACTORS AND COMPONENTS

IMPLEMENTS

Hand tools, mainly hoes, are produced by Agrimal (Malawi) Limited. The plant has a capacity of 1.5 million hoes per year but the capacity utilisation has averaged one-third. Major raw materials are imported from Zimbabwe.

Animal drawn implements are produced by Agrimal (Malawi) Limited. They make single furrow ploughs and ridgers, harrows, single row planters, cultivators and groundnut lifters. They can also make shellers and rice thrashers. This year they have programmed to produce animal drawn tool-bars developed at Chitedze Machinery Testing Unit. The plant has a capacity of 30,000 units per year. Ox carts are produced in the small scale sector.

Tractor drawn implements are assembled by Farming and Engineering Services. They make ploughs, harrows, ridgers and rippers from precast frames imported from Zimbabwe who also supply the jigs on which they are welded. Discs for the implements are imported from South Africa. The number of implements produced in 1975 were 438.

TRACTORS

There are two companies for assembling tractors in Malawi, viz. Farming and Engineering Services and Mandala Tractor Division. Farming and Engineering Services assemble partly knocked down (PKD) units of Massey Ferguson tractors imported from the UK. The company is owned by LONHRO subsidiaries in Malawi. It has a capacity of 3 units per day. Mandala Tractor division assembles Ford tractors the UK and is privately owned by Mandala Limited (previously known as African Lakes Corporation). Both companies assemble on demand and the staff is used for service work in between assembly. The extent of local value added is minimal.

COMPONENTS

The only tractor components made locally are batteries, radiators and front end weights but none of them are used in the assembly of the PKD units.

PROSPECTS

Malawi's manufacture of hoes is averaging 35 percent of capacity and that of animal drawn implements is 13 percent. The excess capacity can be utilised to supply other SADCC member countries. The Agrimal plant is planning to diversify its production range to utilise the idle capacity by manufacturing axes, slashers, cane knives, matchetes and wheelbarrows which are all imported at the moment. This would improve their profitability.

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MOZAMBIQUE

CROPPING PATTERN

About half of the soil area in Mozambique is said to be suitable for agriculture. The land utilisation pattern is broadly as follows:-

	Million hectares
Total land area	76.5
Arable & Permanent crops	3.1
of which:	
Arable	2.9
Permanent pasture	44.0
Forest & woodland	19.4
Other land	10.1
Irrigation, in 000 hectare	68.0

(Source: Southern Africa: Toward Economic Liberation)
Figures estimates for 1977

Note:

Arable Land refers to land under temporary crops, temporary meadows, market gardens and grass and temporary fallow. Permanent Crop refers to crops which occupy the land for long periods and need not be replanted after each harvest such as coffee, fruit trees, nut trees and vines. It excludes land under trees for wood or timber. Permanent Pasture refers to land used for five years or more for herbaceous forage crop either cultivated or wild. Forest and woodland refers to land under natural or planted stands of trees, whether or not productive, and forest which have been cleared but which will be replanted in the foreseeable future. Other Land refers to potentially productive land, built on areas, parks, roads, etc.

The present pattern of crop production is broadly as follows:

Small holdings:	maize, beans, cashewnuts, sweet potatoes, groundnuts
Large holdings:	sugar, sisal, cotton and tobacco
State farming:	wheat, rice, sugar, tea, citrus
Cooperative farming:	maize, beans, sorghum, cashewnuts, groundnuts, etc.

PLAN PRIORITIES

The major emphasis of Mozambique's 10 year plan is on agricultural development to be achieved through two programmes:

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1 Progressive cooperativisation of traditional agriculture.

In the first phase, co-operatives would be established in each of the 100 districts. This would then be broadened onto a countrywide programme of rural cooperativisation in the second phase.

At present, cooperatives account for about half a percent of marketed agricultural production. Nearly 80% comes from the family farms and about 15% from the State farms.

2. Expansion of State farming to establish at least one agro-industrial complex in each province by 1990.

The growth rate of agricultural sector in 1981 has been 13% with crop production increasing by 12%. The target rate of agricultural growth in 1982 is 32% with crop production to increase by 36%. The agricultural output in the Limpopo-Incomati region is targetted to increase by 79% with crop production increasing by 91%.

With the implementation of irrigation programmes, the area under cultivation would increase considerably from the present barely 5%.

Irrigation programmes for Koomali Valley and Limpopo, Oliphant, Ruvoma and Zambezi River areas alone, for example, would develop 60,000 hectares for cultivation.

IMPLEMENTS

Please see the main text.

TRACTORS

The above outlined thrust of Mozambique's planning towards agricultural development would have major impact on the provision of industrial inputs, especially farm machinery and implements.

Average imports over the last 3/4 years have amounted to 400 to 500 tractors per year:

Imports of Tractors	
1973	880
1977	900
1978	594
1979	146
1981	409
1982	509 (envisaged)

Mostly, their average size is around 80 HP. Since 1977, there have been no imports of lower sized tractors. The main sources of origin are GDR, USSR, Romania, Bulgaria, Brazil and England. The tractors imported are essentially for the requirements of cooperative and state farming sectors.

IMPLEMENTS AND TRACTORS

Implements

The demand for agricultural implements is estimated by UNIDO (1979) as:

	Annual Sales - Units (approximate)					
	1979/80	1982	1984	1986	1988	1990
Tractor chisel ploughs	0	25	50	100	200	300
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Animal drawn ridgers	0	20	25	50	100	100
Animal drawn trailers (carts)	400	500	500	500	400	300
Tractor drawn trailers	125	100	100	125	150	150

Source: UNIDO/UNDP Feasibility Study on the Establishment of a Manufacturing Plant for the Production of Agricultural Tools and Implements in the Kingdom of Lesotho. November, 1979

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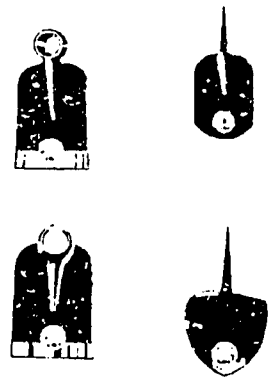
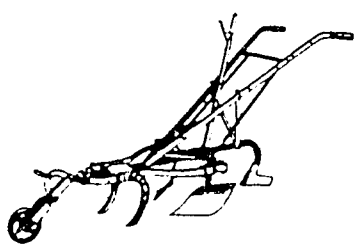
AGRICULTURAL HAND TOOLS

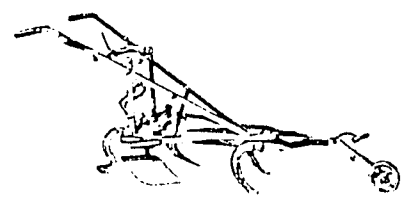


STANDARD CULTIVATOR S51



Description: The Standard Cultivator is an all-purpose cultivator which is designed to weed between rows of varying widths - from 60 cm. to 100 cm. It is equipped with 3 different types of tine; 2 reversible shares in the front, 2 mouldboard hillers in the centre and a 25 cm. sweep in the rear

5 TINE CULTIVATOR MC5



Description: The MC5 is designed for lighter cultivation than the Standard cultivator, although it is of similar configuration, with tines, tillers and a sweep. The width is adjustable by means of a crank-handle, whereas on the Standard it is by lever.

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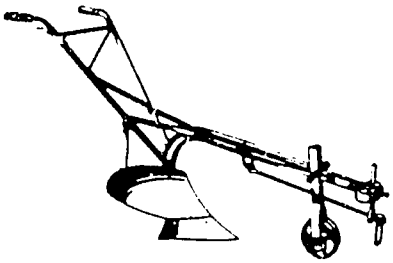
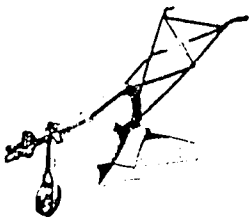
SINGLE-FURROW PLOUGH



Description: A single-furrow mouldboard plough of conventional design with a share made from heat-treated steel.

RIDGER

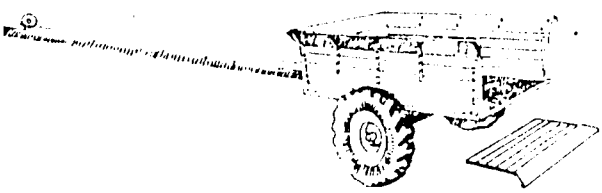


Description: This animal-drawn ridger/cultivator is suitable for ridging crops of maize, cotton, tobacco and potatoes. The wings of the ridging share can be adjusted to cultivate rows varying from 40 cm. to 75 cm. in width.

Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi

OX-CART

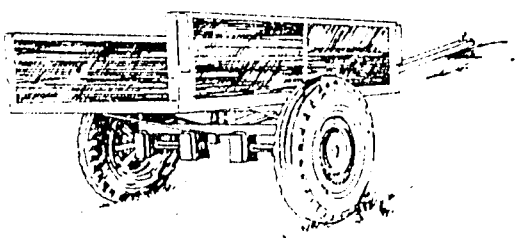


Description: The B&C ox-cart is a strong heavy-duty cart, mounted on a single axle fitted with tyred wheels. The front and rear panels of the body can be removed for taking long loads, and a 600 litre galvanized water tank is available as an extra.

Manufactured by:

Brown & Clapperton Ltd
PO Box 52
BLANTYRE
Malawi

NGOLO OX-CART



Manufactured by:

Ngolo Industries
LILONGWE

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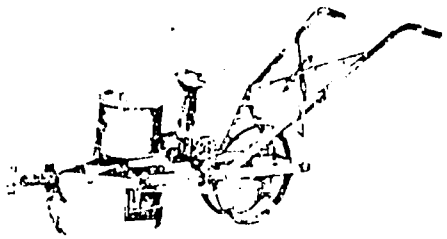
SINGLE-ROW PLANTER

Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi



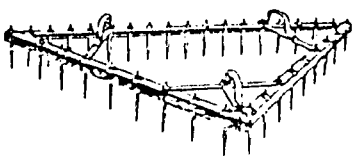
Description: The Agrimal planter is of simple and rugged construction and a double pitman drive operates the planting wheel, which ensures positive seeding. Several optional extras are available for the planter: fertiliser spreader, cotton-seed planter and a range of seed plates suitable for all sizes of maize, millet, sorghum and legume seeds.

HARROWS

Triangular, Diamond and Zig-zag

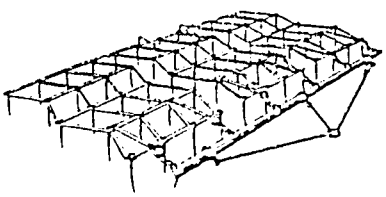
Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi

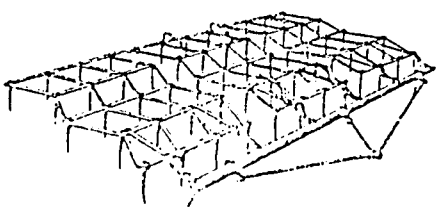


Triangular Harrow

Description: Triangular, Diamond and Zig-zag Harrows are produced by Agrimal. The Diamond and Zig-zag harrows are available in sets of 2, 3 or 4 depending on the power source available and the type of cultivation.



Diamond Harrow



Zig-Zag Harrow

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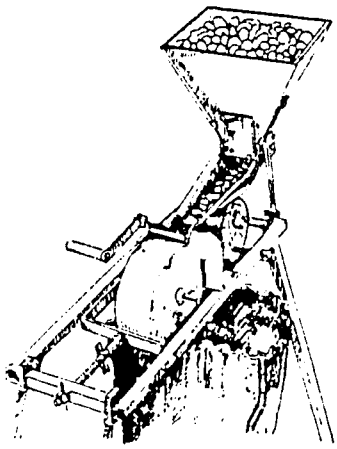
CHITEDZE GROUNDNUT CRACKER



Manufactured by:

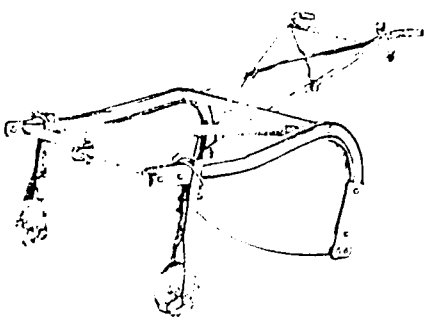
Chitedze Research Station
Ministry of Agriculture &
Natural Resources
PO Box 158
LILONGWE
Malawi

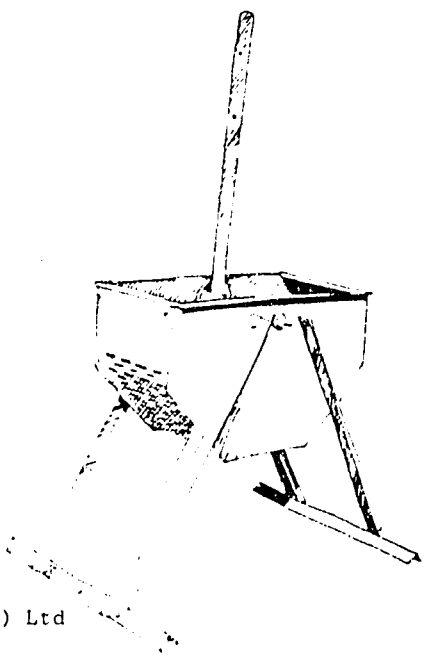
Telephone: Lilongwe 721855

Description: The groundnut cracker has been developed for cracking the shells of groundnuts before hand-shelling, as Malawi produces a large amount of 'Chalimbana' groundnuts for the confectionery trade. These are larger than the ordinary groundnut and can be damaged when processed with available groundnut shellers. 10% would be the maximum acceptable level of damage for these nuts: therefore they are shelled by hand.

The machine consists of 2 wheels, held together by spring-tension, which are covered with rubber from old inner-tubes. A hopper feeds the nuts between the wheels, which are cranked steadily to process the nuts. In setting the spring-loading, a balance must be struck between 100% undamaged nuts and 100% cracked shells. obviously a strong loading would crack all shells, but damage some nuts whereas a weak loading would damage no nuts but leave some shells uncracked. Tests have shown that 5% damage can be matched with 8% uncracking: whilst 12kg. of nuts can be cracked per hour.

GROUNDNUT LIFTER



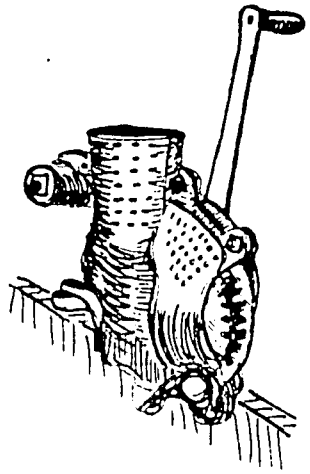


Description: Agrimal manufacture a robust groundnut lifter, whose design incorporates 2 plough beams spaced apart with a groundnut lifting blade. The weight of the implement is 54 kg.

Manufactured by:

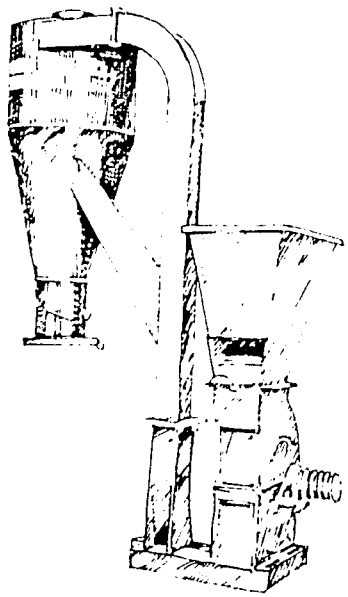
Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi

HAND MAIZE SHELLER



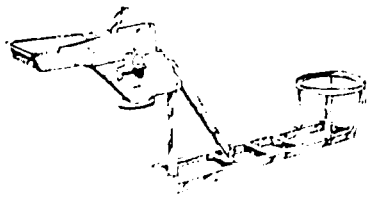
Description: A compact maize-sheller for hand-operation that can be fitted to the side of a container, allowing the kernels to drop into the container, and passing the shelled cobs out to the side. Tension is adjustable according to the diameter of the maize cobs.

KUSINJA MAIZE-MILL



Description: The Kusinja Maize Mill is designed to be powered by diesel motors of between 10-20HP, and the milling capacity will vary according to the power source. With a 10HP motor, the capacity would be 150kg/hour, with a 20HP motor, 400kg/hour.

ATOM MAIZE MILL



Descriptions: The Atom maize-mill is a small size hammer-mill designed to be powered by a 5-7HP diesel engine. It is fitted with reversible hammers, screens and sealed bearings. The average capacity is about 180kg per hour.

Manufactured by: Brown & Clapperton
PO Box 52
BLANTYRE
Malawi

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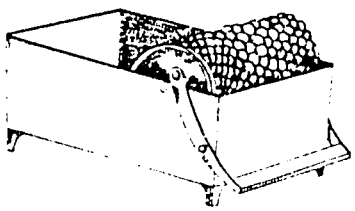
PADDY THRESHER



Description: The threshing drum is mounted in an oblong box and is operated by means of a foot treadle, allowing the operator to feed the sheaves of paddy by hand. The capacity of the thresher is about 200kg. of paddy per hour.

Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi

PRODUCTION PLAN

In view of the main thrust of Mozambique's planning on agricultural development through the introduction of modern farming practices, including mechanisation, the Government has been considering the establishment of tractor production facilities in the country. Various proposals have been considered over the last 5-6 years.

Currently a feasibility study for establishing a tractor factory, near Beira, is under preparation. The project to be set up with Soviet assistance envisages a production capacity of 3,500 tractors a year to be built up in stages. The tractor size is expected to be 60 - 80 HP. According to present indications, the project is likely to be commissioned towards late eighties. Existing engineering industry facilities including foundry at Beira would be utilised for the tractor project to the extent practicable.

SWAZILAND

CROPPING PATTERN

Under the prevailing system of land distribution, nearly 60 percent of land is held in trust as Swazi Nation Land, and distributed according to traditional arrangements. Subsistence farming, carried out mainly on small plots (averaging 2.6 ha of crop land per household), contributes about 13 percent of the GDP. Maize is the main staple food crop and other major crops; other major crops include cotton and groundnuts.

SWAZI NATION LAND : AREA AND PRODUCTION OF MAJOR CROPS
1975/76 - 1977/78

Crop	1975/76		1976/77		1977/78	
	Area ha.	Quantity produced tonnes	Area ha.	Quantity produced tonnes	Area ha.	Quantity produced tonnes
Maize	59,799	86,105	53,902	68,764	53,902	96,329
Groundnuts (nuts)	4,142	1,976	2,812	1,584	2,812	1,589
Cotton (seed cotton)	10,130	6,317	7,013	7,400	7,013	11,886
Jugo beans	1,603	1,301	1,766	1,138	1,766	2,741
Sorghum	2,826	3,216	1,007	596	1,007	538
Beans	2,167	[illegible],018	2,116	694	2,116	575
Sweet Potatoes	1,803	10,283	550	3,137*	-	-
Tobacco	561	425	582	441*	582	438*

SOURCE: Central Statistical Office

The principal items in the commercial agricultural sector are sugar, wood pulp, citrus, pineapples, cotton and rice produced on 790 plantations with an average size of 800 ha.

PLAN PRIORITIES

The Government is pursuing a programme of developing the traditional sector gradually to a semi-commercial mode of production, through land purchase, irrigation and settlement schemes. The establishment of rural development areas (RDA) in the early 1970s was designed to improve both productivity and incomes of the traditional farmer. RDAs cover a total area of 76,700 ha. The RDA programme has provided tractor hire service, agricultural machinery extension, general extension, rural roads and credit assistance.

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IMPLEMENTS

STOCK OF HAND AND ANIMAL DRAWN IMPLEMENTS

Implement/Tool	Number
Hoe	126,800
Plough	35,000
Cultivator	15,000
Matchet	21,500
Planter	11,680
Harrow	9,400
Sprayer	1,800

Source: Agricultural Sample Census (Swazi Nation Land) 1971/72

STOCK OF TRACTOR DRAWN IMPLEMENTS

IMPLEMENT	SWAZI NATION LAND	INDIVIDUAL TENURE (FREEHOLD) LAND	TOTAL
Plough	788	571	1359
Harrow	279	364	643
Planter	382	345	727
Cultivator	341	553	894
Sprayer	132	228	360
Trailer	386	1160	1546
Harvestor	-	56	56
Maize Sheller	-	113	113

Source: Census of Individual Tenure (Freehold) Farms 1975-76.
Annual Survey of Swazi National Land (Smallholder) 1976-77

TRACTORS

Year	Government	Private	Total
1979	349	2,357	2,700

Source: Annual Statistical Bulletin, 1979

MANUFACTURE OF IMPLEMENTS, TRACTORS AND COMPONENTS

IMPLEMENTS

There are no manufacturing facilities and all the implements are imported.

TRACTORS

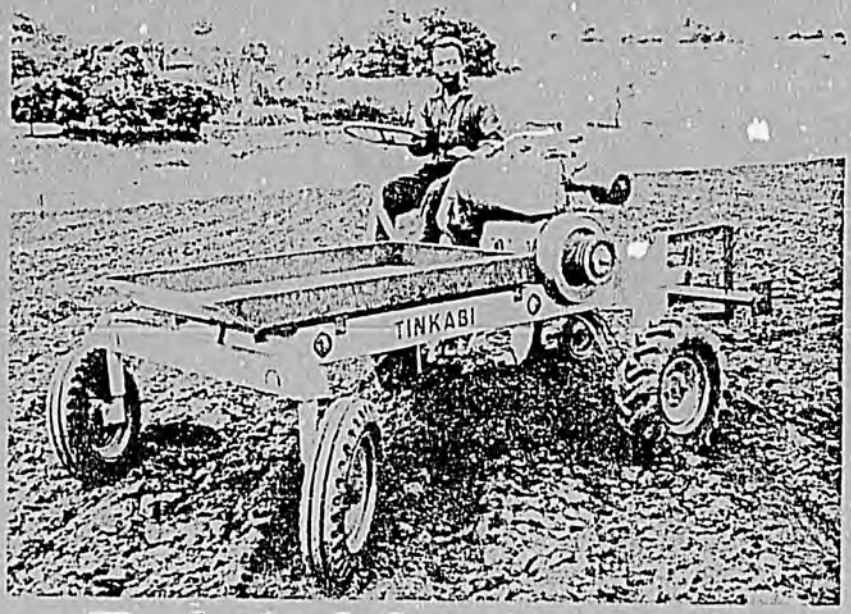
While the higher HP rated tractors are imported, Swaziland has pioneered the development of a small, 16HP tractor.

Tinkabi tractor project

The Tinkabi tractor project was embarked on for the purpose of introducing a low cost mechanised farming system to the small-holder farmer. Since 1972 it has been funded by the Swaziland Government as a development and prototype production unit. Currently commercialisation of the project is under consideration. It is estimated that E2 million will be needed for capital equipment and initial working capital.

The project has facilities at Matsapa with a production capacity of 1,500 tractor units per annum. The tractor is supplied as a package with ploughs, disc harrow, cultivator, planter and ridger. The implements are made by the project under agreement with International Harvester.

TINKABI TRACTOR



Technical data on tractor

SPECIFICATION
The tractor consists of a fabricated chassis with integral oil reservoir and fuel tank. Four wheels are positioned, one at each corner of the chassis with the front steering wheels attached to a central pivoting axle. The engine, hydrostatic unit and driver are positioned at the rear of the tractor and a load pan with a capacity of 1 000 kg is situated immediately in front of the driver and extends over the front. The unit is built high off the ground with a relatively wide track to compensate for stability on sloping ground. Weight distribution is in the ratio of 7:2 on the rear and front axles respectively.

ENGINE:
Diesel Type TA 132, cold starting, vertical, air cooled, totally enclosed, compression ignition, four stroke cycle, two cylinder, hand started diesel engine.

Bore: 87,5 mm
Stroke: 110 mm
Cylinder Capacity: 1318 cc
Ratio: 17:1
Torque: At 1500 rpm on full load: 7 Kg. M
Fuel Consumption: (Full load, 1500 rpm) 203 gm/bhp/hr (.42 lb/bhp/hr).
Lubrication: Force feed lubrication Full flow filter
Lub. oil sump capacity: 10 litres.

HORSE POWER:
Maximum Continuous
BS 649: 1958 16,2 BHP
Maximum Speed 2000 RPM
Weight 238 Kg.

AIR INTAKE:
Type — Replaceable dry paper element.

STEERING:
Re-circulated ball type ratio 17:1 all jounts pre-lubricated spherical bearings and vesco self lubricating bushes.

TRANSMISSION:
Hydrostatic with bi-direction variable displacement pump directly mounted on engine driven at crankshaft speed with hand/foot control lever. Radial piston motors directly mounted on each driving wheel. Oil supply reservoir integral part of chassis capacity 50 litres with full flow 10 micron suction filter.

PUMP:
Bi-directional axial piston variable displacement with integral vane auxiliary pump. Displacement main pump — 41 cc per rev. Maximum pressure — 350 bar.
Maximum speed — 3600 rpm.
Displacement auxiliary pump — 70 cc/rpm at 3000 rpm.
Maximum pressure — 140 bar.

MOTORS:
Bi-directional direct wheel mounted 5 radial piston with 4:1 epicyclic final drive, through lubrication. Maximum output — 219 kgf/m at 300 bar.
Maximum speed — 300 rpm.

DIMENSIONS:
Wheel base — 2,2 m
Wheel track — 1,80 m
Ground clearance front — 0,60 m
Ground clearance rear — 0,65 m
Overall width — 2,10 m
Overall length — 2,70 m
Weight unballasted — 1 050 kg
Front wheels — 500 x 15 x 4 ply ribbed
Rear wheels — 600 x 14 x 4 ply traction
Fuel tank capacity — 25 litres
Speed — Infinitely variable up to 10 KPH.
Drawer pull — maximum 818 kg

IMPLEMENT LIFT:
Four point over centre mechanical type. Depth controlled by chains. Mechanical advantage 3:1.

SERVICING:
Every 250 hours or 6 months whichever is earlier change engine oil, engine filter, air filter unit and fuel element.

MOULDEDBOARD PLOUGH:
Single furrow 350 wide x 250 deep. Average working capacity 1. ha per day.

PLANTER:
Single row placement type suitable for maize, beans, groundnuts and acid delinted cotton. Complete with fertiliser applicator. Average working capacity 7,5 ha per day in 1 metre rows.

CULTIVATOR:
Four tine, rigid shank with either straight or wing points. Average capacity 10 ha. per day.

RIDGER:
Single row one piece body rigid mounting in centre of drawbar for 0,75 rows. Average capacity 8 ha. per day.

HARROW:
1,5 m spiked tooth triangular type.

OPTIONAL EQUIPMENT:
Belt driven power take off
Trailer — capacity 1½ tonne
Water bowser capacity 700ℓ
Water pump — various capacities
Hammermill — up to 1 tonne per hour
Crop sprayer
Circular saw.
Hydraulic lift
Cat. one hydraulic lift
Hydraulic P.T.O.

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TANZANIA

Nearly two-thirds of Tanzania's total land area of 883,600 sq km is suitable for agriculture. At present hardly 6 - 7% is used for farming. Table I provides a picture of land utilisation in Tanzania as in 1975. Present area of cultivated land is estimated at around 6 million hectares. Traditional methods of cultivation predominate:

Type of cultivation	Estimated area in hectares
Traditional, by hand	4.2 million, 70%
Plough	1.2 million, 20%
Tractor	0.6 million, 10%

TABLE 1 LAND UTILIZATION IN TANZANIA (1975)

	Sq Km	%
Grazing	442,450	50.08
High altitude forest	3,900	0.44
Other forest	376,600	42.62
Total forest	380,500	43.06
Smallholdings cultivation	38,800	4.39
Largeholdings cultivation	5,850	0.66
Total cultivated	44,650	5.05
Other: urban, swamp, rocks etc	16,000	1.81
Total	883,600	

Due to increasing emphasis being placed on agricultural development, the eighties will see an expansion in the area under cultivation and an average growth rate of 5% per annum is foreseen.

About a quarter of the land lies in the Uhuru corridor comprising the four regions of Coast, Morogoro, Iringa and Mbeya. Hardly 4% of this area is cultivated. This area is considered especially suitable for growing rice and sugar. The Kilombero-Rufiji basin has a potential of 400,000 hectares of land that could be irrigated (at an estimated cost around $ 1 billion) and another 120,000 hectares of potential irrigable land in the Usangu plains.

The major food crops of Tanzania are:

Maize, Sorghum, Rice, Millet, Cassava and Wheat

The major cash crops grown are:

Cotton, coffee, sisal, tea, tobacco, pyrethum, sugar, cashewnuts, groundnuts, coconuts and cloves

The average yield of maize, wheat and cotton varies between 1200 to 1700 kg per hectare and that of coffee and millet between 750 to 1200 kg per hectare.

Table II indicates the percentage of cultivated land for the major crops and the contribution of this output from the smallholders (10 hectares or less). Production targets for 1982-83 are also indicated.

TABLE II

Crop	Average % of cultivated land	Average % coming from smallholders	Production target in 000 tons 1982-83
Maize	25 - 27%	90%	2,116
Millet	10 - 12%	100%	
Rice	5 - 6%	80%	339
Sisal	5%	3%	108
Wheat	1%	15%	84
Cotton)		100%	71
Coffee)	50%	75%	61
Tobacco)		75%	23

TRACTOR USAGE

As mentioned earlier, the bulk of agriculture in Tanzania is in smallholdings with 70% of the cultivation based on traditional methods of hand tools application. With increasing irrigation and the coming into being of various parastatals, especially for cash crops, the extent of mechanisation is increasing.

Present estimates of total tractor stock in the country are around 6,000 - 7,000. However a large proportion of it is out of use because of spares and maintenance difficulties. The average life of a tractor is said to be barely 3-4 years, almost half the African average. According to one estimate, the output of tractors used in Tanzanis has been only 70-80 hectares a year.

The regions with major tractorisation are Arusha, Kilimanjaro, Morogoro, Mara, Iringa, Mbeya and Shinyanga. The majority of tractors in use are in the size range 50-80 HP with 60 HP as a good average:

Tractor Size Structure

Below 50 HP	15 - 20%
50 to 80 HP	75 - 80%
Above 60 HP	3 - 5%

In the initial stages, especially for the cotton growing region in the uplands of Tanzania, use of medium sized tractors has been favoured. It is surmised that soil conditions in the coastal area of the country - especially favourable for paddy - are such as to warrant more usage of tractors of below 50 HP.

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A variety of tractor models have been imported - Massey Ferguson, Ford, International Harvester, John Deeres, Swaraj, Fiat & Chinese with Massey Ferguson model accounting for the bulk of the market:

Market share of various models (1969-72)

Massey Ferguson	54%
Ford	31%
John Deere	12%
International	3%

PRODUCTION OF IMPLEMENTS, TRACTORS & COMPONENTS

The agricultural implements sector is currently dominated by one large-scale unit and two additional large-scale factories are under implementation. Approximately 600 tonnes of hand-tools are produced in the large-scale sector, including 400,000 hoes, 300,000 machete, 80,000 axes. Ox ploughs production is currently at 10,000 per annum. Present production is insufficient to meet local demand.

Besides the large-scale sector a number of small factories are also in operation producing items such as trailers, ox carts, maize and rice mills. In the artisan sector, surveys have revealed that roughly 300 tons of metal implements may be produced per annum by rural blacksmiths - particularly implements with specialised local use. Ox cart production is also actively being encouraged at village level.

A tractor project, starting with assembly and adding on local components as the industry develops, is under implementation. Details of implements and tractor industry have been included in the respective chapters.

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Manufactured by:

Ubungo Farm Implements Ltd (UFI)
PO Box 20126
DAR es SALAAM
Tanzania

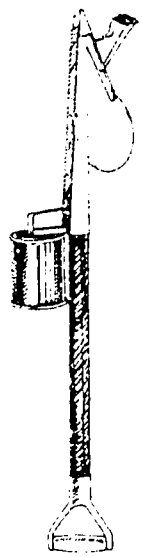
AGRICULTURAL HAND TOOLS

Description: UFI manufacture both Round-eyed and Tanged Hoe Blades, in weights of 0.9 kg., 1.1 kg. and 1.3 kg.

Manufactured by:

TAMTU
PO Box 1389
ARUSHA
Tanzania

TAMTU HAND PLANTER

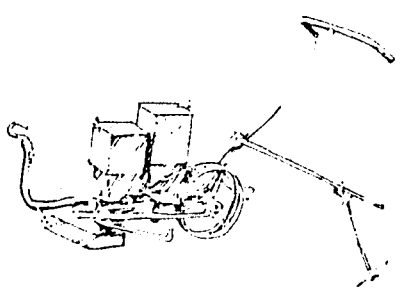


Description: The hand planter is a jab planter with wooden handles and a wooden slide seed metre. The jabbing action automatically meters seeds into the planting hole.

N'GOMBE OX-PLOUGH

Description: The N'gombe ox-plough is a single furrow mould-board plough of standard design. It is of all steel fabrication and the share is of heat-treated steel

TAMTU OX-DRAWN PLANTER



Description: The TAMTU ox-drawn planter is a heavy duty ox-drawn planter with 2 hoppers mounted in tandem ; one for seed, the other for fertiliser. The frame is made from welded tubular steel.

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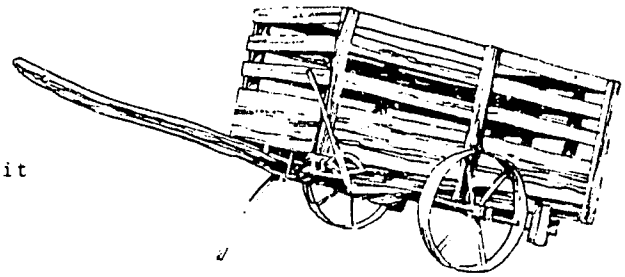
TAMTU OX-CART

(metal or rubber wheeled)



Manufactured by:

Tanzania Agricultural
Machinery Testing Unit
PO Box 1389
ARUSHA
Tanzania

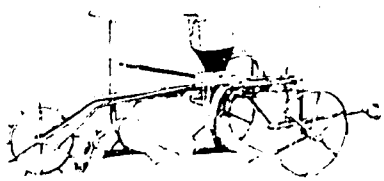
Telephone: Arusha 3666

Description: A 2 wheel ox-cart that can be built with either metal or rubber wheels. The model as shown is designed for oxen: a derivative can be constructed for donkey draught, in which case the shafts can be lighter and attached laterally to the front of the cart rather than centrally. The cart is fitted with wooden bushes and brakes, can be serviced quite simply by lubricating the bearing grease-cup, and can carry up to 750kg.

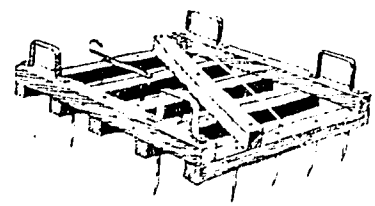
Manufactured by:

TAMTU
PO Box 1389
ARUSHA
Tanzania

KIFARU PLOUGH



RECTANGULAR HARROW



Description: The Kifaru is a heavy duty, double-furrow mouldboard plough, manufactured from locally available steel components. The frame is mounted on 3 wheels, 2 forward and one rear.

As cultivation with the Kifaru is usually carried out twice prior to planting, the Kifaru can be fitted with a metered seeding unit, for planting during the second cultivation pass. The whole seeding unit includes a metering wheel which trails.

Description: The TAMTU harrow is made from a heavy 10cm x 10cm timber frame, fixed with cross-members. To these are attached heavy duty steel spikes that protrude 15cm. On the top of the frame are fixed steel slides so that the harrow can be inverted for transport as a sled.

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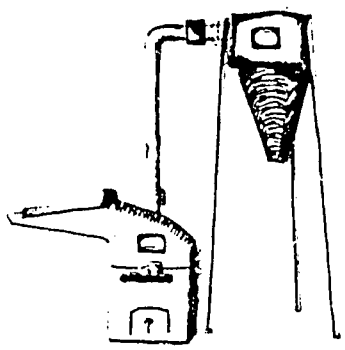
UNITED MAIZE MILLS

NM 25, NM 50, NM 75, NM 100



Manufactured by:

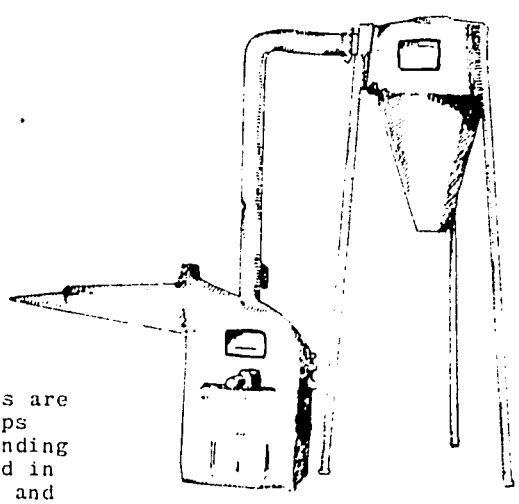
United Engineering Works Ltd
PO Box 3082
ARUSHA
Tanzania

Telephone: Arusha 3424

Description: United makes 4 sizes of hammer-mills with different capacities. The casing of each is made from durable heavy welded steel, inside which the steel shaft is mounted on sealed bearing units. The steel hammers are reversible and replaceable.

MANIK GRINDING MILLS

MGM2, MGM 5, MGM 7 and MGM 10



Manufactured by:

Manik Engineers
PO Box 1274
ARUSHA
Tanzania

Telephone: Arusha 3520

Description: Manik grinding mills are designed to mill a variety of crops but are especially useful for grinding maize. The mills are manufactured in 4 sizes: small, medium, standard and large. Construction of all models is from heavy welded steel, and the grinding mechanism is mounted on imported sealed bearing units. The hammers are reversible, and can be used on 4 different faces before replacement.

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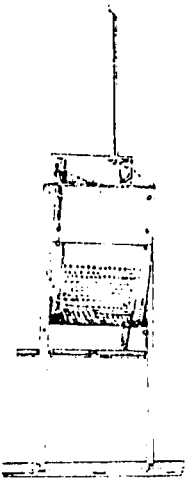
GROUNDNUT SHELLER



Description: The groundnut sheller is a hand-operated reciprocating design, with interchangeable screens. The potential capacity is 25-30kg./hour.

Manufactured by:

Ubungo Farm Implements Ltd (UFI)
PO Box 20126
DAR es SALAAM
Tanzania

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ZAMBIA

CROPPING PATTERN

The cropping pattern, as in most SADCC countries, is oriented towards cereal crops, notably maize which accounts for about 55% of total production of principal crops. Other major crops include sugar cane, cassava and groundnuts. Rice, wheat, soyabeans, tobacco, sunflower, and cotton are also grown. Nearly 70% of the rural population have smallholdings of below 2 Ha. The 'large farm' sector (over 20 Ha) is confined to 10% of the population. Most of the tractors in use are in the large farm sector. Oxen ploughing takes place to a limited extent.

	1979		1980	
	Area (Ha 000)	Production (tons 000)	Area (Ha 000)	Production (tons 000)
Cereals	1105	798	1215	905
(of which) maize	900	700	1000	800
Roots, tubers	58	198	59	200
(of which) cassava	55	175	56	177
Pulses	13	12	15	14
Groundnuts	138	74	145	80
Sunflower seed	25	13	25	13
Vegetables, fruit etc.	202	72	209	74
Sugarcane	10	1024	12	1150
Tobacco	6	5	6	5

IMPLEMENTS

Agricultural equipment production is not as yet developed towards self-sufficiency. However, handtools and ox implements are manufactured in 2 enterprises and plans are in hand for expansion of a major unit, Northland Engineering. Imports of ox ploughs are no longer required. Estimates of average local production are as follows:

Ox ploughs	5,000 pcs/year
Hoes	500,000 pcs/year

Agricultural tools and implements have been selected as a priority area in the current 5 year plan. Imports until recently were put at 15,000 ploughs per annum, and 200,000 hoes per annum. It is expected that local production will expand fairly rapidly for these items. Some limited capacity also exists for maize mills, trailers and harrows, including one unit producing approx 2,000 pcs per annum. At the artisan level a UNDP/FAO project has been started to set up village workshops. About 12 small scale enterprises exist which supply agriculture-related equipment.

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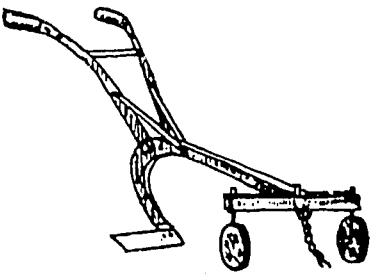
TRACTORS

There are no manufacturing facilities though assembly of Swaziland's Tinkabi tractor under licence has been considered. FAO/UNIDO data indicates average imports of 700-900 a year. There is a significant demand for tractors in the range below 50 HP.

Details of agricultural implements and tractor sectors have been included under the respective chapters earlier.

'BORNU' GROUNDNUT-LIFTER



Designed by:

Farm Machinery Research Unit
Regional Research Station
PO Box 11
MAGOYE
Zambia

Telephone: Magoye 420

Description: The 'Bornu' Groundnut-lifter is merely a blade that can be attached to the standard 'Victory' mouldboard type of ox-plough frame. The adaption, therefore, is limited to the blade, which can be bolted on in place of a mouldboard, and an extra wheel and axle-bar in place of the single wheel of a plough.

The lifter was originally developed in Nigeria, hence the name, where it is used, and the design was brought to Zambia. It is designed for lifting groundnuts which have been planted in 1 metre ridges, and in normal use can harvest about 1.2 hectares per day.

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ZIMBABWE

1. CROPPING PATTERN

The most important factor in the Zimbabwe agricultural sector relating to implement usage is the relatively high proportion of output originating from large-scale commercial agriculture. The average price of holding in commercial sector is about 100 hectares. This situation has resulted in a relatively high usage of tractors and tractor-based farm implements compared to other SADCC countries. Hand tools and animal drawn implements provide the main power inputs in the non-commercial agricultural sector with an average holding of 3-4 hectares.

The cropping pattern, both within and outside the commercial sector, is weighted towards maize and cereal crops (over 60%); the next largest single item is sugarcane (15%). A wide range of other crops are grown including tobacco, cotton, tea, coffee, oilseeds, and horticultural crops. Bulk of the demand for agricultural equipment is estimated to be for tillage, maintenance and processing of maize, other cereals and sugarcane.

Principal Crops

	1979		1980	
	Area (Ha 000)	Production (tons 000)	Area (Ha 000)	Production (tons 000)
Cereals	1323	1781	1697	2038
(of which) maize	800	1200	1146	1600
Roots, tubers	20	76	21	82
(of which) cassava	18	54	19	60
Pulses	50	24	50	24
Groundnuts	161	113	120	84
Vegetables, fruit etc	125	n.a.	212	177
Sugarcane	29	2614	29	2700
Tobacco	60	85	62	114
Cotton		55		61

The large commercial sector is capital intensive, and consequently demand for irrigation equipment is also relatively high. The irrigated area is relatively extensive in relation to arable land.

IMPLEMENTS, TRACTORS & COMPONENTS

Zimbabwe is more or less self-sufficient in almost all types of agricultural equipment. Three major producing units specialising in agricultural equipment are operating in Zimbabwe. There are a number of other enterprises manufacturing agricultural equipment or components, or with engineering capacity to do so. This includes the manufacture of processing equipment, pumps and haulage equipment.

584

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IMPLEMENTS, TRACTORS & COMPONENTS

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A wide range of equipment is exported, the following table shows 1980 trade figures:

1980 Agricultural equipment

Imports		Exports	
Agricultural handtools (tons)	200 (approx)	Harvesting machinery (nos)	104
Binders, reapers, harvesters (nos)	59	Cultivator, rotary hoe (nos)	2102
Harvesting/threshing equipment (tons)	25	Harrows (nos)	1811
Tractors (nos)	1590	Mould Board Ploughs (nos)	6586
Tractor parts, spares (tons)	407	Planters etc (tons)	71
Soil cultivator parts (tons)	11	Harrow, cultivator parts (tons)	37
Other equipment (tons)	228	Plough parts (tons)	332
Water pumps (nos)	4642	Other agricultural equipment & spares (tons)	483
Pump parts (tons)	154		
Sprayers (tons)	10		
		Axes, hatchets (nos)	24000
		Hoes (nos)	65000
		Picks/mattocks (nos)	55000
		Forks (nos)	34000
		Other handtools (nos)	34000

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From the above figures it may be estimated that a total of 1,800-2,000 tonnes of equipment were exported and a total of about 600 tonnes imported during 1980.

The tractor assembly data is included in the main report. Considering the state of engineering industries in Zimbabwe, the country could well emerge as a significant source of tractor components in the SADCC. The present assembly operations (at PKD stage) also need to be upgraded.

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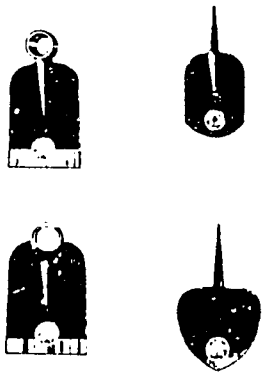
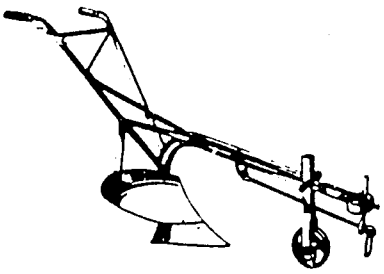
Manufactured by:

Rhoplow Ltd
PO Box 1039
BULAWAYO
Zimbabwe

"MEALIE BRAND" HOES

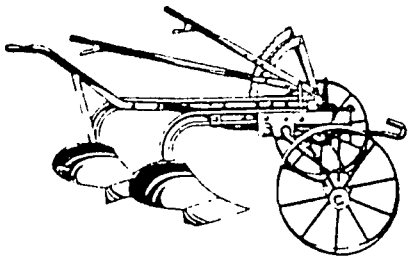


SINGLE FURROW PLOUGH



1.

TWO-FURROW PLOUGH



2

1 Description: A standard design light-weight mouldboard plough, weighing 38 kg.

2 Description: The two beams are mounted on an axle between 2 widely spread metal-rimmed wheels. One beam is shorter, which presents the two shares in an off-set pattern to the land. The hand-levers are used to adjust the angle of the shares.

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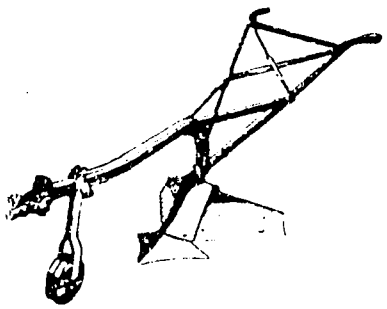
HIGH-WING RIDGER



Manufactured by:

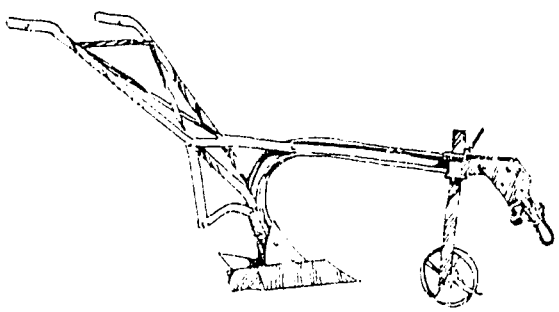
Rhoplow Ltd
PO Box 1059
BULAWAYO
Zimbabwe

Description: The same beam and handle assembly of the Rhoplow ox-plough is fitted with adjustable ridging blades.

SILVER MEDAL OX-PLOUGH

Manufactured by:

Bulawayo Steel Products
8 Ironbridge Road
Donnington
PO Box 1603
BULAWAYO
Zimbabwe

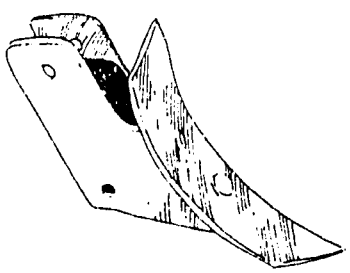


Description: The standard ox-plough design has been modified to eliminate the need for spanners to adjust the blade and handle setting. The wheel adjustment and linkage have also been modified, and the frog has been strengthened. The Institute of Agricultural Engineering in Harare have designed alternative attachments which can be fitted in place of the mouldboard. These are:

(a) a single tine for reduced tillage;

(b) a ridger blade; and

(c) a groundnut-lifting blade.

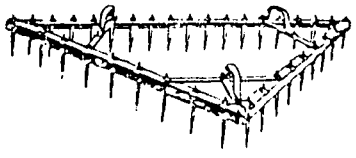


586

Manufactured by:

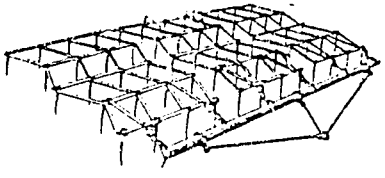
Rhoplow Ltd
PO Box 1059
BULAWAYO
Zimbabwe

HARROWS

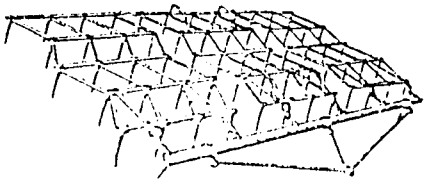


Triangular Harrow

Description: A standard range of harrows, of which the diamond and the zig-zag are available in sets of 2, 3 or 4 sections.

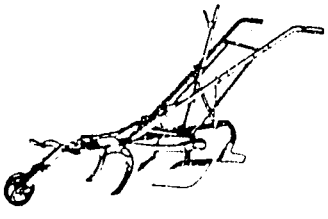


Diamond Harrow



Zig-Zag Harrow

5-TINE CULTIVATOR



Description: The cultivator comes in 2 forms:-

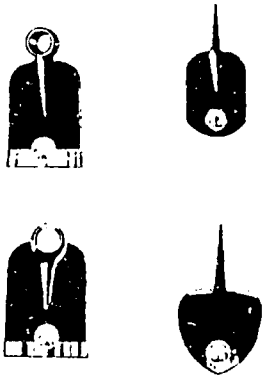
(a) S 51 cultivator - fitted with 1 sweep, 2 hillers and 2 tines (as in the illustration).

(b) Light cultivator - fitted with 1 sweep and 4 tines.

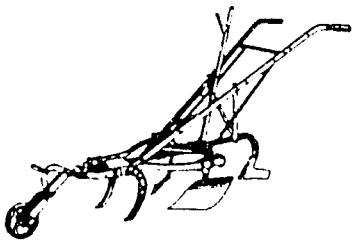
The light cultivator is for lighter cultivation and inter-row weeding, whilst the S51 can be used for heavier work. A ratchet and lever mechanism enables adjustment of the cultivator span.

589

AGRICULTURAL HAND TOOLS

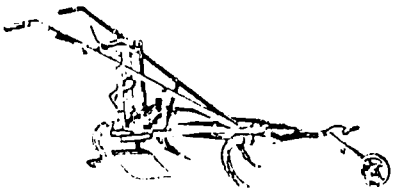


STANDARD CULTIVATOR S51



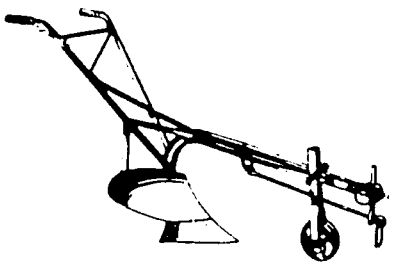
Description: The Standard Cultivator is an all-purpose cultivator which is designed to weed between rows of varying widths - from 60 cm. to 100 cm. It is equipped with 3 different types of tine; 2 reversible shares in the front, 2 mouldboard hillers in the centre and a 25 cm. sweep in the rear

5 TINE CULTIVATOR MC5



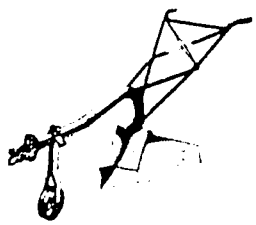
Description: The MC5 is designed for lighter cultivation than the Standard cultivator, although it is of similar configuration, with tines, tillers and a sweep. The width is adjustable by means of a crank-handle, whereas on the Standard it is by lever.

SINGLE-FURROW PLOUGH



Description: A single-furrow mouldboard plough of conventional design with a share made from heat-treated steel.

RIDGER

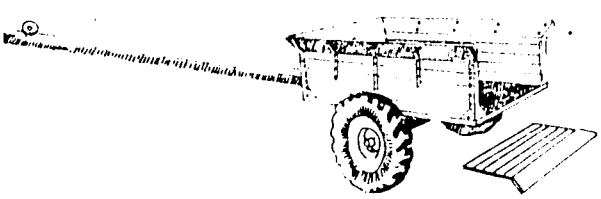


Description: This animal-drawn ridger/cultivator is suitable for ridging crops of maize, cotton, tobacco and potatoes. The wings of the ridging share can be adjusted to cultivate rows varying from 40 cm. to 75 cm. in width.

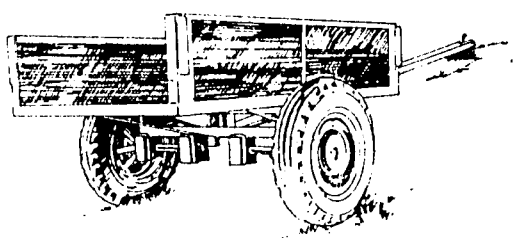
Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi

OX-CART



NGOLO OX-CART



Description: The E&C ox-cart is a strong heavy-duty cart, mounted on a single axle fitted with tyred wheels. The front and rear panels of the body can be removed for taking long loads, and a 600 litre galvanized water tank is available as an extra.

Manufactured by:

Brown & Clapperton Ltd
PO Box 52
BLANTYRE
Malawi

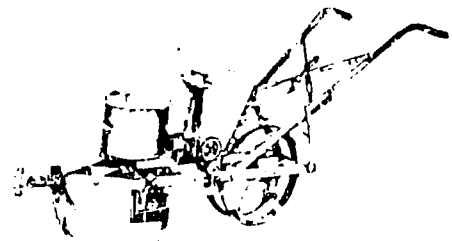
Manufactured by:

Ngolo Industries
LILONGWE

SINGLE-ROW PLANTER

Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi



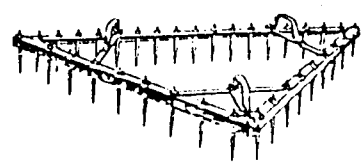
Description: The Agrimal planter is of simple and rugged construction and a double pitman drive operates the planting wheel, which ensures positive seeding. Several optional extras are available for the planter: fertiliser spreader, cotton-seed planter and a range of seed plates suitable for all sizes of maize, millet, sorghum and legume seeds.

HARROWS

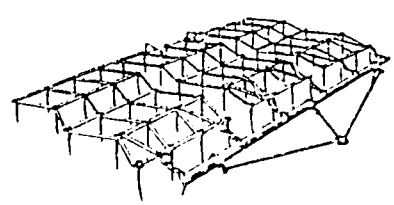
Triangular, Diamond and Zig-zag

Manufactured by:

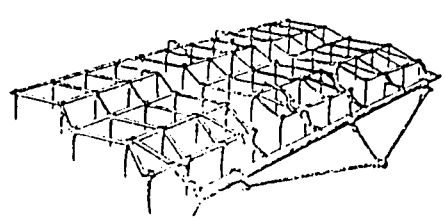
Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi



Triangular Harrow



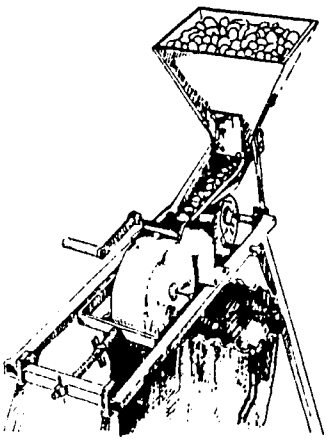
Diamond Harrow



Description: Triangular, Diamond and Zig-zag Harrows are produced by Agrimal. The Diamond and Zig-zag harrows are available in sets of 2, 3 or 4 depending on the power source available and the type of cultivation.

59.V

CHITEDZE GROUNDNUT CRACKER



Manufactured by:

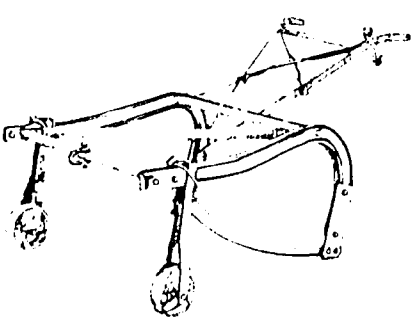
Chitedze Research Station
Ministry of Agriculture &
Natural Resources
PO Box 158
LILONGWE
Malawi

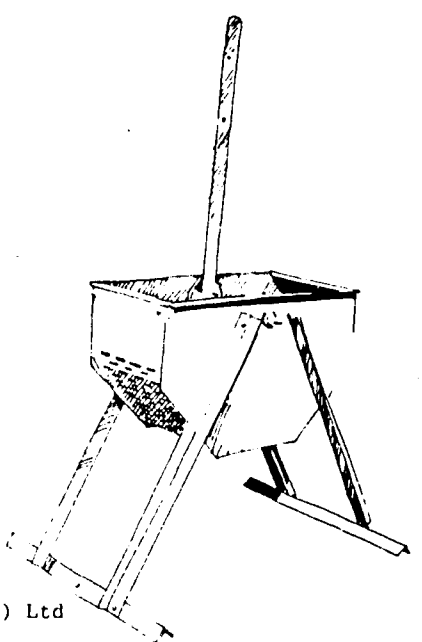
Telephone: Lilongwe 721855

Description: The groundnut cracker has been developed for cracking the shells of groundnuts before hand-shelling, as Malawi produces a large amount of 'Chalimbana' groundnuts for the confectionery trade. These are larger than the ordinary groundnut and can be damaged when processed with available groundnut shellers. 10% would be the maximum acceptable level of damage for these nuts: therefore they are shelled by hand.

The machine consists of 2 wheels, held together by spring-tension, which are covered with rubber from old inner-tubes. A hopper feeds the nuts between the wheels, which are cranked steadily to process the nuts. In setting the spring-loading, a balance must be struck between 100% undamaged nuts and 100% cracked shells: obviously a strong loading would crack all shells, but damage some nuts whereas a weak loading would damage no nuts but leave some shells uncracked. Tests have shown that 5% damage can be matched with 8% uncracking: whilst 12kg. of nuts can be cracked per hour.

GROUNDNUT LIFTER





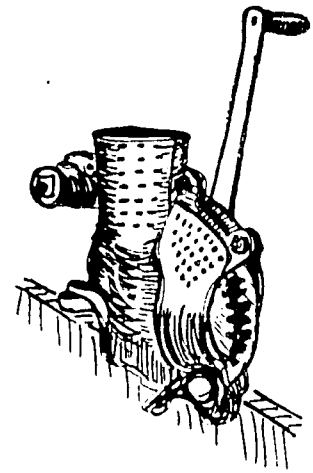
Description: Agrimal manufacture a robust groundnut lifter, whose design incorporates 2 plough beams spaced apart with a groundnut lifting blade. The weight of the implement is 54 kg.

Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE

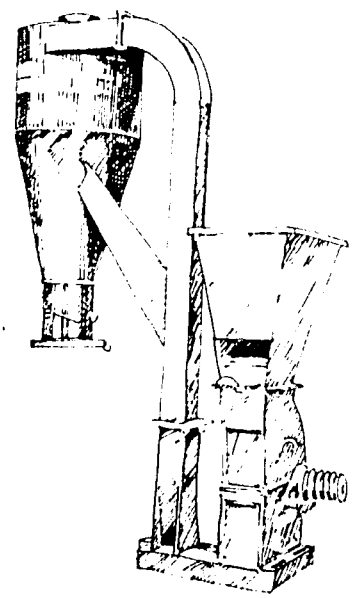
593

HAND MAIZE SHELLER



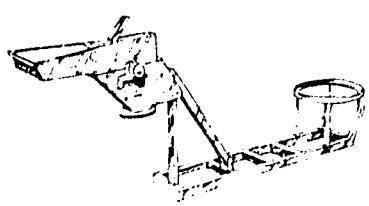
Description: A compact maize-sheller for hand-operation that can be fitted to the side of a container, allowing the kernels to drop into the container, and passing the shelled cobs out to the side. Tension is adjustable according to the diameter of the maize cobs.

KUSINJA MAIZE-MILL



Description: The Kusinja Maize Mill is designed to be powered by diesel motors of between 10-20HP, and the milling capacity will vary according to the power source. With a 10HP motor, the capacity would be 150kg/hour, with a 20HP motor, 400kg/hour.

ATOM MAIZE MILL

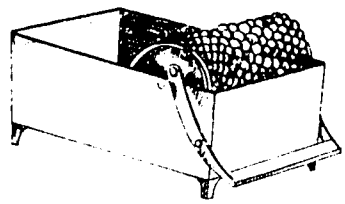


Descriptions: The Atom maize-mill is a small size hammer-mill designed to be powered by a 5-7HP diesel engine. It is fitted with reversible hammers, screens and sealed bearings. The average capacity is about 180kg per hour.

Manufactured by: Brown & Clapperton
PO Box 52
BLANTYRE

544

PADDY THRESHER



Description: The threshing drum is mounted in an oblong box and is operated by means of a foot treadle, allowing the operator to feed the sheaves of paddy by hand. The capacity of the thresher is about 200kg. of paddy per hour.

Manufactured by:

Agrimal (Malawi) Ltd
PO Box 143
BLANTYRE
Malawi

595

TINKABI TRACTOR

Technical data on tractor

SPECIFICATION
The tractor consists of a fabricated chassis with integral oil reservoir and fuel tank. Four wheels are positioned, one at each corner of the chassis with the front steering wheels attached to a central pivoting axle. The engine, hydrostatic unit and driver are positioned at the rear of the tractor and a load pan with a capacity of 1 000 kg is situated immediately in front of the driver and extends over the front. The unit is built high off the ground with a relatively wide track to compensate for stability on sloping ground. Weight distribution is in the ratio of 7:2 on the rear and front axles respectively.

ENGINE:
Diesel Type TA 132, cold starting, vertical, air cooled, totally enclosed, compression ignition, four stroke cycle, two cylinder, hand started diesel engine.

Bore: 87,5 mm
Stroke: 110 mm
Cylinder Capacity: 1318 cc
Ratio: 17:1
Torque: At 1500 rpm on full load: [illegible] Kg. M
Fuel Consumption: (Full load, 1500 rpm) 203 gm/bhp/hr (,42 lb/bhp/hr).
Lubrication: Force feed lubrication Full flow filter
Lub. oil sump capacity: 10 litres.

HORSE POWER:
Maximum Continuous
BS 649. 1958 16,2 BHP
Maximum Speed 2000 RPM
Weight 238 Kg.

AIR INTAKE:
Type — Replaceable dry paper element.

STEERING:
Re-circulated ball type ratio 17:1 all jounts pre-lubricated spherical bearings and vesco self lubricating bushes.

TRANSMISSION:
Hydrostatic with bi-direction variable displacement pump directly mounted on engine driven at crankshaft speed with hand/foot control lever. Radial piston motors directly mounted on each driving wheel. Oil supply reservoir integral part of chassis capacity 50 litres [illegible]

PUMP:
Bi-directional axial piston variable displacement with integral vane auxiliary pump. Displacement main pump — 41 cc per rev. Maximum pressure — 350 bar.
Maximum speed — 3600 rpm.
Displacement auxiliary pump — 70ℓpm at 3000 rpm.
Maximum pressure — 140 bar.

MOTORS:
Bi-directional direct wheel mounted 5 radial piston with 4:1 epicyclic final drive, through lubrication. Maximum output — 219 kgf/m at 300 bar. Maximum speed — 300 rpm.

DIMENSIONS:
Wheel base — 2,2 m
Wheel track — 1,80 m
Ground clearance front — 0,60 m
Ground clearance rear — 0,65 m
Overall width — 2,10 m
Overall length — 2,70 m
Weight unballasted — 1 050 kg
Front wheels — 500 x 15 x 4 ply ribbed
Rear wheels — 600 x 14 x 4 ply traction
Fuel tank capacity — 25 litres
Speed — Infinitely variable up to 10 KPH.
Drawer pull — maximum 818 kg

IMPLEMENT LIFT:
Four point over centre mechanical type. Depth controlled by chains. Mechanical advantage 3:1.

SERVICING:
Every 250 hours or 6 months whichever is earlier change engine oil, engine filter, [illegible]

MOULDEDBOARD PLOUGH:
Single furrow 350 wide x 250 deep. Average working capacity 1. ha per day.

PLANTER:
Single row placement type suitable for maize, beans, groundnuts and acid delinted cotton. Complete with fertiliser applicator. Average working capacity 7,5 ha per day in 1 metre rows.

CULTIVATOR:
Four tine, rigid shank with either straight or wing points. Average capacity 10 ha. per day.

RIDGER:
Single row one piece body rigid mounting in centre of drawbar for 0,75 rows. Average capacity 8 ha. per day.

HARROW:
1,5 m spiked tooth triangular type.

OPTIONAL EQUIPMENT:
Belt driven power take off
Trailer — capacity 1½ tonne
Water bowser capacity 700ℓ
Water pump — various capacities
Hammermill — up to 1 tonne per hour
Crop sprayer
Circular saw.
Hydraulic lift
Cat. one hydraulic lift
Hydraulic P.T.O.

596

Manufactured by:

Ubungo Farm Implements Ltd (UFI)
PO Box 20126
DAR es SALAAM
Tanzania

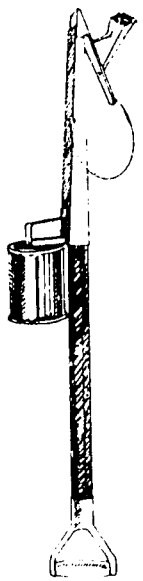
AGRICULTURAL HAND TOOLS

Description: UFI manufacture both Round-eyed and Tanged Hoe Blades, in weights of 0.9 kg., 1.1 kg. and 1.3 kg.

Manufactured by:

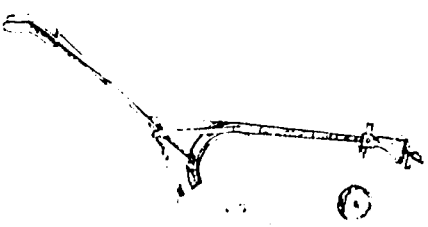
TAMTU
PO Box 1389
ARUSHA
Tanzania

TAMTU HAND PLANTER



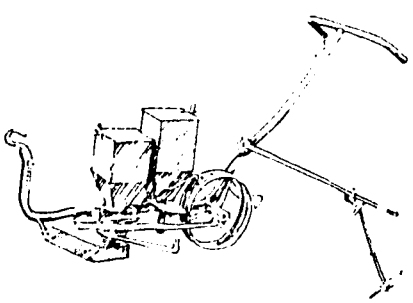
Description: The hand planter is a jab planter with wooden handles and a wooden slide seed metre. The jabbing action automatically meters seeds into the planting hole.

N'GOMBE OX-PLOUGH



Description: The N'gombe ox-plough is a single furrow mould-board plough of standard design. It is of all steel fabrication and the share is of heat-treated steel

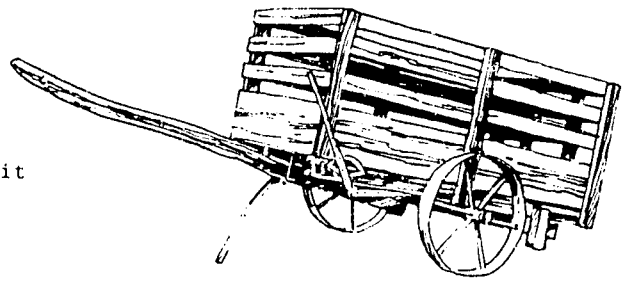
TAMTU OX-DRAWN PLANTER



Description: The TAMTU ox-drawn planter is a heavy duty ox-drawn planter with 2 hoppers mounted in tandem ; one for seed, the other for fertiliser. The frame is made from welded tubular steel.

TAMTU OX-CART

(metal or rubber wheeled)



Manufactured by:

Tanzania Agricultural
Machinery Testing Unit
PO Box 1389
ARUSHA
Tanzania

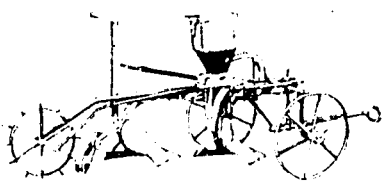
Telephone: Arusha 3666

Description: A 2 wheel ox-cart that can be built with either metal or rubber wheels. The model as shown is designed for oxen: a derivative can be constructed for donkey draught, in which case the shafts can be lighter and attached laterally to the front of the cart rather than centrally. The cart is fitted with wooden bushes and brakes, can be serviced quite simply by lubricating the bearing grease-cup, and can carry up to 750kg.

Manufactured by:

TAMTU
PO Box 1389
ARUSHA
Tanzania

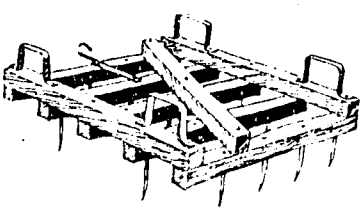
KIFARU PLOUGH



Description: The Kifaru is a heavy duty, double-furrow mouldboard plough, manufactured from locally available steel components. The frame is mounted on 3 wheels, 2 forward and one rear.

As cultivation with the Kifaru is usually carried out twice prior to planting, the Kifaru can be fitted with a metered seeding unit, for planting during the second cultivation pass. The whole seeding unit includes a metering wheel which trails.

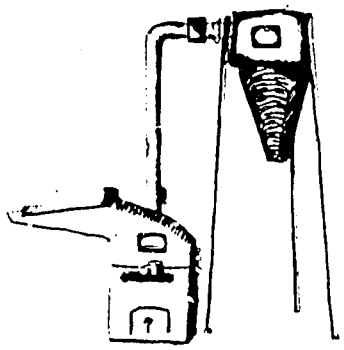
RECTANGULAR HARROW



Description: The TAMTU harrow is made from a heavy 10cm x 10cm timber frame, fixed with cross-members. To these are attached heavy duty steel spikes that protrude 15cm. On the top of the frame are fixed steel slides so that the harrow can be inverted for transport as a sled.

UNITED MAIZE MILLS

NM 25, NM 50, NM 75, NM 100



Manufactured by:

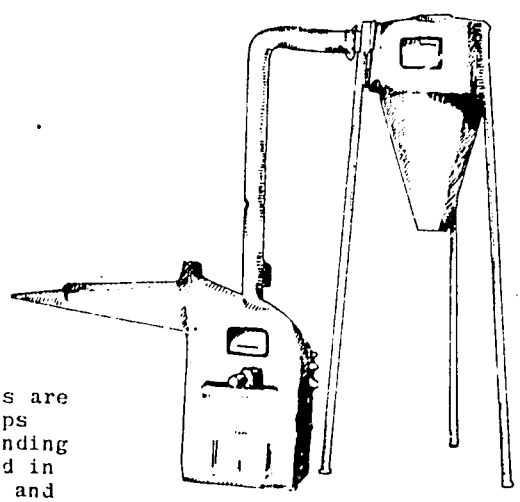
United Engineering Works Ltd
PO Box 3082
ARUSHA
Tanzania

Telephone: Arusha 3424

Description: United makes 4 sizes of hammer-mills with different capacities. The casing of each is made from durable heavy welded steel, inside which the steel shaft is mounted on sealed bearing units. The steel hammers are reversible and replaceable.

MANIK GRINDING MILLS

MGM2, MGM 5, MGM 7 and MGM 10



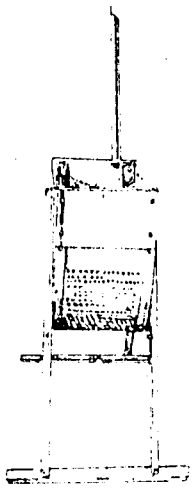
Manufactured by:

Manik Engineers
PO Box 1274
ARUSHA
Tanzania

Telephone: Arusha 3520

Description: Manik grinding mills are designed to mill a variety of crops but are especially useful for grinding maize. The mills are manufactured in 4 sizes: small, medium, standard and large. Construction of all models is from heavy welded steel, and the grinding mechanism is mounted on imported sealed bearing units. The hammers are reversible, and can be used on 4 different faces before replacement.

GROUNDNUT SHELLER



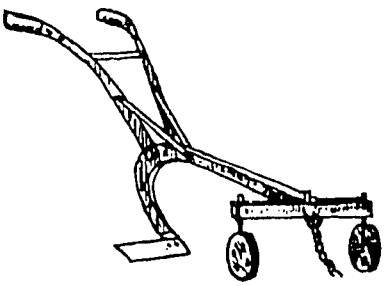
Description: The groundnut sheller is a hand-operated reciprocating design, with interchangeable screens. The potential capacity is 25-30kg./hour.

Manufactured by:

Ubungo Farm Implements Ltd (UFI)
PO Box 20126
DAR es SALAAM
Tanzania

600

'BORNU' GROUNDNUT-LIFTER



Designed by:

Farm Machinery Research Unit
Regional Research Station
PO Box 11
MAGOYE
Zambia

Telephone: Magoye 420

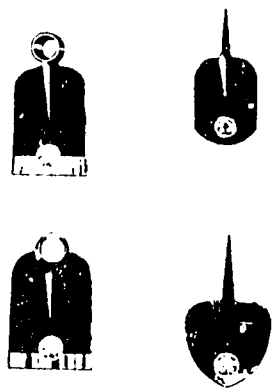
Description: The 'Bornu' Groundnut-lifter is merely a blade that can be attached to the standard 'Victory' mouldboard type of ox-plough frame. The adaption, therefore, is limited to the blade, which can be bolted on in place of a mouldboard, and an extra wheel and axle-bar in place of the single wheel of a plough.

The lifter was originally developed in Nigeria, hence the name, where it is used, and the design was brought to Zambia. It is designed for lifting groundnuts which have been planted in 1 metre ridges, and in normal use can harvest about 1.2 hectares per day.

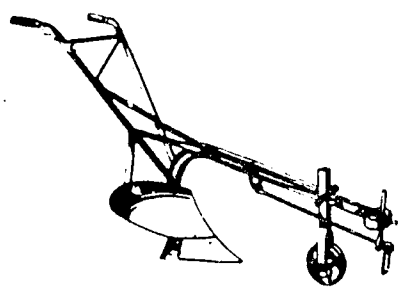
Manufactured by:

Rhoplow Ltd
PO Box 1059
BULAWAYO
Zimbabwe

"MEALIE BRAND" HOES

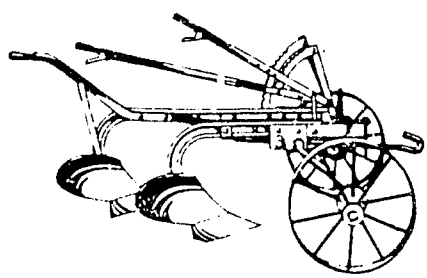


SINGLE FURROW PLOUGH



1.

TWO-FURROW PLOUGH

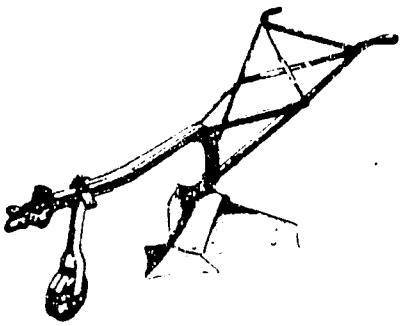


2.

1. Description: A standard design light-weight mouldboard plough, weighing 38 kg.

2. Description: The two beams are mounted on an axle between 2 widely spread metal-rimmed wheels. One team is shorter, which presents the two shares in an off-set pattern to the land. The hand-levers are used to adjust the angle of the shares.

HIGH-WING RIDGER



Manufactured by:

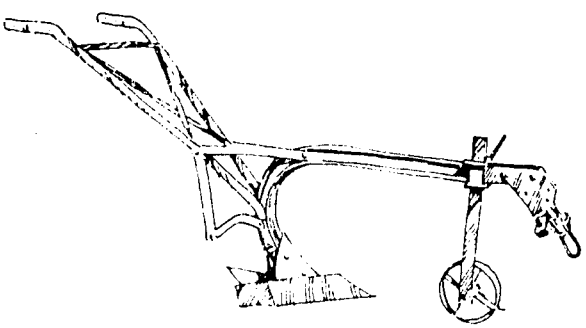
Rhoplow Ltd
PO Box 1059
BULAWAYO
Zimbabwe

Description. The same beam and handle assembly of the Rhoplow ox-plough is fitted with adjustable ridging blades.

SILVER MEDAL OX-PLOUGH

Manufactured by:

Bulawayo Steel Products
8 Ironbridge Road
Donnington
PO Box 1603
BULAWAYO
Zimbabwe

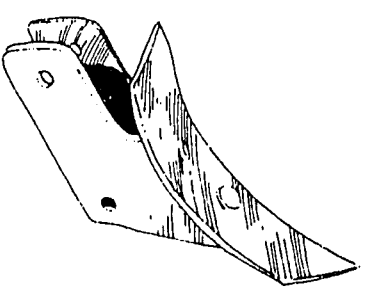


Description: The standard ox-plough design has been modified to eliminate the need for spanners to adjust the blade and handle setting. The wheel adjustment and linkage have also been modified, and the frog has been strengthened. The Institute of Agricultural Engineering in Harare have designed alternative attachments which can be fitted in place of the mould-board. These are:

(a) a single tine for reduced tillage;

(b) a ridger blade; and

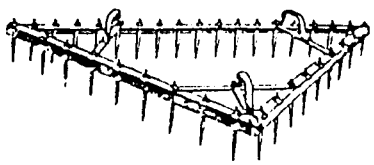
(c) a groundnut-lifting blade.



Manufactured by:

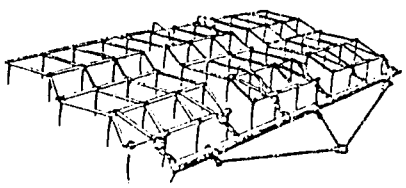
Rhoplow Ltd
PO Box 1059
BULAWAYO
Zimbabwe

HARROWS

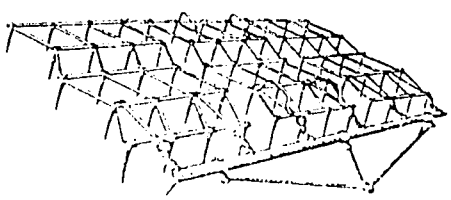


Trigular Harrow

Description: A standard range of harrows, of which the diamond and the zig-zag are available in sets of 2, 3 or 4 sections.

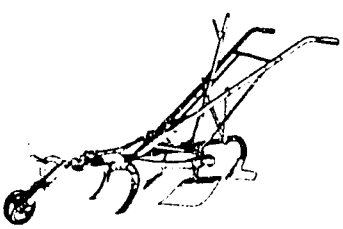


Diamond Harrow



Zig-Zag Harrow

5-TINE CULTIVATOR



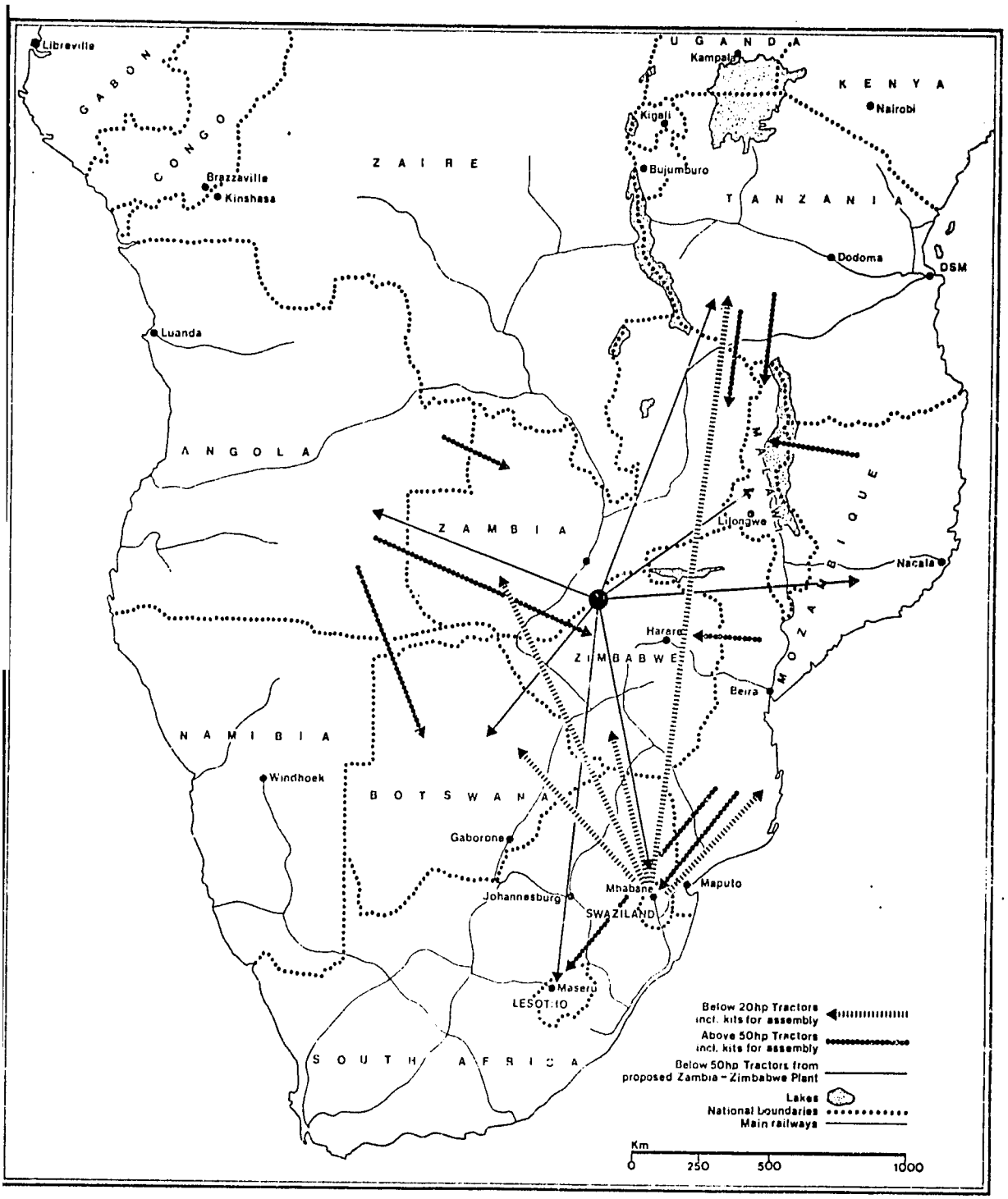
Description: The cultivator comes in 2 forms:-

(a) S 51 cultivator - fitted with 1 sweep, 2 hillers and 2 tines (as in the illustration).

(b) Light cultivator - fitted with 1 sweep and 4 tines.

The light cultivator is for lighter cultivation and inter-row weeding, whilst the S51 can be used for heavier work. A ratchet and lever mechanism enables adjustment of the cultivator span.

604


Libreville
GABON
CONGO
Brazzaville
Kinshasa
ZAIRE
UGANDA
Kampala
KENYA
Nairobi
Kigali
Bujumburo
TANZANIA
Dodoma
DSM
Luanda
ANGOLA
ZAMBIA
Lilongwe
MALAWI
MOZAMBIQUE
Nacala
Harare
ZIMBABWE
Beira
NAMIBIA
Windhoek
BOTSWANA
Gaborone
Johannesburg
Mhabane
Maputo
SWAZILAND
Maseru
LESOTHO
SOUTH AFRICA
Below 20hp Tractors incl. kits for assembly
Above 50hp Tractors incl. kits for assembly
Below 50hp Tractors from proposed Zambia - Zimbabwe Plant
Lakes
National boundaries
Main railways
Km
0
250
500
1000

605

RATIONALISATION OF TRACTOR PRODUCTION

TERMS OF REFERENCE FOR THE PROJECT STUDY

1. INTRODUCTION

Presently, many of the SADCC member states are thinking of setting up capacities for tractor assembly and production.

Malawi, Swaziland, Tanzania and Zimbabwe are among the countries already undertaking some assembly of tractors. The size range varies widely - 16 HP to 100 HP and so does the technology stream. It is not uncommon to find over a dozen makes of tractors being imported into many of the SADCC national markets. Such proliferation, especially of size and the associated production technology calls for rationalisation in the context of SADCC industrial co-operation.

Accordingly, a study is proposed for recommendations on rationalising tractor production in the SADCC region with following terms of reference:

1. To evaluate the existing tractor usage practices in SADCC region and to suggest the product-mix, in terms of power, technology and other characteristics of tractors, desired for the future, keeping in view particularly the following:

   - land-holding structure
   - cropping pattern
   - soil variations
   - farming mechanisation

2. To analyse the present assembly and production facilities in the SADCC region with a view to their suitability for specific types of tractor assembly/production.

3. To suggest a pattern of tractor production and supply in the SADCC region considering:

   - the demand-supply estimates as presented in table I
   - proposals under consideration/study
   - transport logistics

4. To estimate the financial implications of the suggested rationalisation of tractor production.

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Table 1. SADCC TRACTOR DEMAND-SUPPLY ANALYSIS

Country	Present Estimated Stock	Present Production p.a.	Present Average Imports p.a.	Present Estimated Demand p.a.	Likely Demand late eighties p.a.	Capacity Under Consideration p.a.	Remarks
1 Angola	10,000	-	700-800	1000	2000-3000	6000	Preliminary stage, technical parameters to be selected
2 Botswana	2,500	-	200	200-250	400-500	-	
3 Lesotho	1,500	-	125	100-150	250-300	-	
4 Malawi	3000-3500	-	250-300	300	350-400	-	
5 Mozambique	6000-7000	-	400-500	700-800	1,500	3,500	Feasibility report under preparation by USSR.
6 Swaziland	3,000	(700-800 of 16 HP)	200 of 30HP	200-300 of 30 HP	500 of 30 HP	(2,500) of 16HP	Financing package for commercialisation under consideration
7 Tanzania	7,000	-	300-400	800-1000	1500-2000	500-1500	$32 m project with Valmet of Finland under implementation - finances to be arranged
8 Zambia	5,000	-	700-800	1,000	1500-2000	-	
9 Zimbabwe	18000-20000	-	1,200	2,000	3,000	-	
Total	56000-59500				11000-13700		

1. **PRODUCT RANGE**

Tractors of above 50 HP size. Exhibit 1 provides the tecnical specifications.

The annual capacity at full production would be 1,500 units per annum; initial operations are to start with assembly of 500 nos. of tractors per annum.

2. **SADCC MARKET POSITION & EXISTING CAPACITY**

Please see table 1.

Exhibit 1 Technical specification of Valmet 502, 602, 602T, 802 and 802-4 (Four wheel drive) Agricultural tractors.

	502	602	602T
ENGINE	Valmet 310B	Valmet 311C	Valmet 311CS
Number of cylinders	3	3	3
Displacement l	2,7	3,3	3,3
Bore mm	100	108	108
Stroke mm	114	120	120
Rated hp SAE/rpm	45/2000	65/2300	85/2300
Torque kpm/rpm	17,3/1300	21,6/1300	26/1500
Aspiration	natural	natural	supercharged
Cooling	water	water	water
TRANSMISSION			
Clutch	dry, single plate, Ø 11 in.		
Gearbox no of speed	6 + 2R	partially synchronised	
Differential lock	mechanical	partially synchronised	
POWER TAKE-OFF			
Standard speed/ engine speed	540 rpm at 1720 rpm		
Dimensions	Ø 1 3/8 in., 6 splines		
HYDRAULICS			
Lifting capacity kg	1900	1900	1900
Functions	position and draft control		
Category	II		

610

	502	602	602T
DIMENSIONS AND WEIGHTS			
Total length cm (without bumper)	346	346	346
Total height to cab	268	268	268
Wheelbase cm	211	211	211
Tyres, front	7.50-16/6	7.50-16/6	7.50-18/6
Tyres, rear	14.9-30/6	13.6-36/6	18.4-30/6
Front axle weight	1000 kg	1050 kg	1070 kg
Rear axle weight	1650	1700	1750
Total weight kg	2650	2750	2820
Weight with max ballast kg	3670	3670	3720
CAPACITIES			
Fuel tank l	65	65	65
Gearbox l	15	15	15
Final drive l	2 x 5,5	2 x 5,5	2 x 5,5
Hydraulic system l	20	20	20
Radiator l	13	13	15
Steering gear l	1,2	1,2	1,2

	802	802-4
ENGINE	Valmet 411C	Valmet 411CS
Number of cylinders	4	4
Displacement l	4.4	4.4
Bore mm	108	108
Stroke mm	120	120
Rated hp SAE/rpm	82/2200	82/2200
Torque kpm/rpm	31.2/1200	31.2/1200
Aspiration	supercharged	supercharged
Cooling	water	water

	802	802-4

TRANSMISSION

Clutch	double action, Ø 12 in.
Gearbox no of speeds	8 + 2R totally synchronised
Differential lock	mechanical

POWER TAKE-OFF

Standard speed/ engine speed	540 rpm at 1556 rpm
Dimensions	Ø 1 3/8 in., 6 splines

HYDRAULICS

Lifting capacity kg	2900	2900
Functions	position and draft control	
Category	II	

DIMENSIONS AND WEIGHTS

Total length cm (without bumper)	384	415
Total height (to cab top)	265	270
Wheelbase cm	234	245
Tyres, front	10.00-16/8	13.6-28/6
Tyres, rear	16.0-34/8	18.4-34/8
Front axle weight kg	1350	1650
Rear axle weight kg	2190	2310
Total weight kg	3540	3960
Weight with max. ballast kg	4500	4970

CAPACITIES

Fuel tank l	91	91
Gearbox l	21	21
Final drive l	2 x 6,5	2 x 6,5
Hydraulic system l	23	23
Radiator l	16	16

Table 1. SADCC TRACTOR DEMAND-SUPPLY ANALYSIS

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3 Lesotho	1,500	-	125	100-150	250-300	-	
4 Malawi	3000-3500	-	250-300	300	350-400	-	
5 Mozambique	6000-7000	-	400-500	700-800	1,300	3,500	Feasibility report under preparation by USSR.
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8 Zambia	5,000	-	700-800	1,000	1500-2000	-	
9 Zimbabwe	18000-20000	-	1,200	2,000	3,000	-	
Total	56000-59500				11000-13700		

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3. TECHNOLOGY PACKAGE

Phase I

Starting with assembly operations and test drive, this phase would culminate in establishing the following manufacturing operations:

1) Machining small parts

2) Heat treatment

3) Manufacturing of steel parts by means of:

- plate technology
- arc welding technology
- sand and shot blasting technics
- dip-painting technology

4) Manufacturing sheet metal parts by means of

- sheet metal technology
- spot welding technology

5) Component assembly including assembling of gear box, fuel tank, final drive, housing cover, and front axle and accessories for the lifting system

6) Main assembly

7) Surface treatment and painting operations:

- grease removing
- phosphatising
- neutralising
- drying
- painting
- furnace drying

8) Final adjustments

The repairs and reconditioning services will also be organised.

The total capital requirements in this phase are estimated at about $ 30 million.

Phase II

Manufacture of transmissions, shafts and gears.

Phase III

Manufacture of diesel engines.

Both Phase II and Phase III depend on feasibility studies to be undertaken later on.

4. PROJECT COSTS

Initially about $15.5 million is proposed to be spent till 1984-85 as follows:-

		(in $ million)
Land & buildings		1.7
Plant & machinery		2.7
Office equipment		0.2
Technical assistance		9.5
Working capital		1.4
Total	15.5	

Out of this, nearly 80%, $12.2 million is in foreign exchange.

Currently the premises of MTAVA and East African Motors Assemblers Co are being used on lease basis by the Project.

The capital expenditure to be incurred at leased EAMA premises is as follows:

(in $ 000)

	Local	Foreign
A. CIVIL WORKS		
Tractor service centre	23.65	6.45
Central Store	23.65	6.45
Assembly Hall	33.85	24.75
Assembly Store	43.00	5.35
	124.15	43.00
B. HOUSING	419.35	354.85
C. FURNITURE, PLANT AND EQUIPMENT		
Tractor Service Centre	30.10	354.85
Central Store	10.75	75.25
Assembly Hall	102.15	180.65
Assembly Store	10.70	-
	153.70	610.75
TOTAL	697.20	1008.60

615

5. **SADCC TRADING LOGISTICS**

Bulk of the output would be for Tanzania's own requirements.

6. **PROMOTING INSTITUTION**

State Motor Corporation (parastatal of Tanzania) and Valmet (of Finland).

7. **EQUITY PARTICIPATION**

Enterprise: Tanzania Tractors Manufacturing Company Limited

Equity stakes:

State Motor Corporation	: 80%
Valmet of Finland	: 10%
Finnfund	: 10%

TRACTOR MANUFACTURE IN TANZANIA

617

8. INTENDED IMPLEMENTATION SCHEDULE

The estimated assembly and production programme over the next ten years is as follows:-

Year	Assembly/Production
1	500
2	750
3	1000
4	1000
5	1100
6	1200
7	1200
8	1200
9	1300
10	1500

9. INPUTS REQUIRED FROM DONORS

Capital financing.

618

TRACTOR MANUFACTURING IN SWAZILAND

619

1. **PRODUCTS RANGE**

The main line is the development and marketing of a low cost mechanised farming system to cater for the small scale rural farmer. At the centre of it is Tinkabi tractor (16 HP size). In addition, a few other miscellaneous/agricultural implements are made to complement the unit mentioned above. These are: maize shellers, water pump etc. The main unit has a power take-off suitable for driving a hammer mill, circular saw, irrigation pump, etc.

2. **SADCC MARKET POSITION**

The demand-supply analysis of tractors in the SADCC region is shown in Table I. The Tinkabi tractor project has been at a testing and development stage since its establishment.

3. **EXISTING CAPACITY**

The existing capacity is 1,500 units per annum on a single shift.

4. **TECHNOLOGY PACKAGE**

Exhibit I gives the technological specifications.

5. **RAW MATERIALS SITUATION**

Engine, transmission system, hydraulics etc are imported.

6. **PROJECT COST**

About $ 2 million for commercialisation of the project.

7. **PROMOTING INSTUTITION**

The National Industrial Development Corporation of Swaziland.

8. **INTENDED IMPLEMENTATION SCHEDULE**

12 months.

9. **INPUTS REQUIRED FROM DONORS**

Capital financing.

Table 1. SADCC TRACTOR DEMAND-SUPPLY ANALYSIS

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4 Malawi	3000-3500	-	250-300	300	350-400	-	
5 Mozambique	6000-7000	-	400-500	700-800	1,500	3,500	Feasibility report under preparation by USSR.
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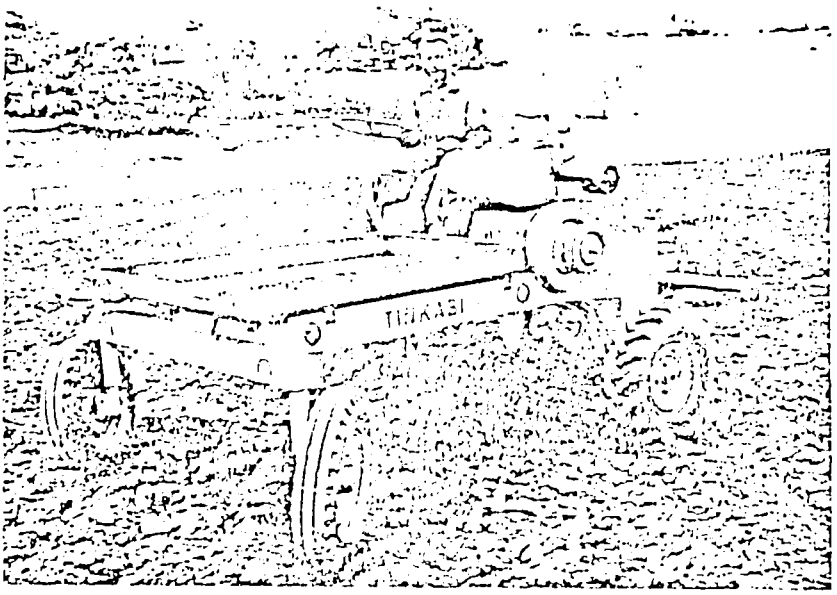
8 Zambia	5,000	-	700-800	1,000	1500-2000	-	
9 Zimbabwe	18000-20000	-	1,200	2,000	3,000	-	
Total	56000-59500				11000-13700		

TINKABI TRACTOR

EXHIBIT I



Technical data on tractor

SPECIFICATION

The tractor consists of a fabricated chassis with integral oil reservoir and fuel tank. Four wheels are positioned, one at each corner of the chassis with the front steering wheels attached to a central pivoting axle. The engine, hydrostatic unit and driver are positioned at the rear of the tractor and a load pan with a capacity of 1 000 kg is situated immediately in front of the driver and extends over the front. The unit is built high off the ground with a relatively wide track to compensate for stability on sloping ground. Weight distribution is in the ratio of 7 2 on the rear and front axles respectively

ENGINE:
Diesel Type TA 102, cold starting, vertical, air cooled, totally enclosed, compression ignition four stroke cycle, two cylinder, hand started diesel engine

Bore: 87.5 mm
Stroke: 110 mm
Cylinder Capacity: 1018 cc
Ratio: 17:1
Torque: At 1500 rpm on full load: [illegible] Kg. M
Fuel Consumption (Full load, 1500 rpm) 203 gm/bhp/hr (.42 lb/bhp/hr).
Lubrication: Force feed lubrication Full flow filter
Lub. oil sump capacity 10 litres.

HORSE POWER:
Maximum Continuous
BS 649: 1958 16.2 BHP
Maximum Speed 2000 RPM
Weight 238 Kg.

AIR INTAKE:
Type — Replaceable dry paper element.

STEERING:
Re-circulated ball type ratio 17.1 all joints pre-lubricated spherical bearings and vesco self lubricating bushes.

TRANSMISSION:
Hydrostatic with bi-direction variable displacement pump directly mounted on engine driven at crankshaft speed with hand/foot control lever. Radial piston motors directly mounted on each driving wheel. Oil supply reservoir integral part of chassis capacity 50 litres with full flow 10 micron suction filter.

PUMP:
Bi-directional axial piston variable displacement with integral vane auxiliary pump. Displacement main pump — 41 cc per rev. Maximum pressure — 350 bar
Maximum speed — 3600 rpm
Displacement auxiliary pump — 70/rpm at 3000 rpm.
Maximum pressure — 140 bar

MOTORS:
Bi-directional direct wheel mounted 5 radial piston with 4:1 epicyclic final drive, through lubrication. Maximum output — 219 kgfm at 300 bar. Maximum speed — 300 rpm.

DIMENSIONS:
Wheel base — 2.2 m
Wheel track — 1.60 m
Ground clearance front — 0.60 m
Ground clearance rear — 0.65 m
Overall width — 2.10 m
Overall length — 2.70 m
Weight unballasted — 1 350 kg
Front wheels — 500 x 15 x 4 ply ribbed
Rear wheels — 600 x 14 x 4 ply traction
Fuel tank capacity — 25 litres
Speed — Infinitely variable up to 10 KPH
Drawer pull — maximum 818 kg

IMPLEMENT LIFT:
Four point over centre mechanical type Depth controlled by chains. Mechanical advantage 3:1.

SERVICING:
Every 250 hours or 6 months whichever is earlier change engine oil, engine filter, air filter unit and fuel element.

MOULDEDBOARD PLOUGH:
Single furrow 350 wide x 250 deep Average working capacity 1 ha per day.

PLANTER:
Single row placement type suitable for maize, beans, groundnuts and acid delinted cotton. Complete with fertiliser applicator. Average working capacity 7.5 ha per day in 1 metre rows.

CULTIVATOR:
Four line, rigid shank with either straight or wing points. Average capacity 10 ha. per day

RIDGER:
Single row one piece body rigid mounting in centre of drawbar for 0.75 rows. Average capacity 8 ha. per day.

HARROW:
1.5 m spiked tooth triangular type.

OPTIONAL EQUIPMENT:
Belt driven power take off
Trailer — capacity 1½ tonne
Water bowser capacity 700l
Water pump — various capacities
Hammermill — up to 1 tonne per hour
Crop sprayer
Circular saw
Hydraulic lift
Cat. one hydraulic lift
Hydraulic P.T.O.